The 25th Academy of African Business and Development (AABD) Annual Conference Proceedings

May 20-24, 2025
University of the Witwatersrand, Johannesburg, South Africa

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

ACADEMY OF AFRICAN AABD BUSINESS AND DEVELOPMENT

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Reshaping Africa's Sustainable Development through Digital Inclusion

Confident in Africa's Future

Confiant en l'Avenir de l'Afrique

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Edited By

Dr. Richard N. Hayes
Hofstra University
Hempstead, NY USA

CONFIDENCE IN AFRICA'S FUTURE

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FOREWORD

The **25th Annual Conference of the Academy of African Business and Development (AABD)**, convened at the **University of the Witwatersrand, Johannesburg, South Africa**, from **May 20–24, 2025**

The conference theme, **"Reshaping Africa's Sustainable Development through Digital Inclusion,"** underscores the imperative of examining the transformative role of digital technologies in fostering inclusive and sustainable growth. In an era defined by rapid technological change and the diffusion of artificial intelligence, digital platforms, and data-driven innovations, Africa faces both unprecedented opportunities and complex challenges. The focus on digital inclusion is therefore timely, inviting reflections on how technological advancement may be leveraged to strengthen economic resilience, advance social equity, assist entrepreneurs in growing their businesses and promote environmental sustainability.

The papers included in this year's conference book were selected through a meticulous and rigorous peer-review process, designed to uphold the highest scientific standards and ensure alignment with the conference theme. This process was led by distinguished track chairs and subject matter experts, who carefully evaluated each submission for its scholarly contribution.

Each paper underwent review by multiple anonymous experts chosen for their subject-specific knowledge. Reviewers thoroughly assessed the submissions for technical merit, readability, relevance and originality, offering detailed feedback and recommendations for refinement. Final selections were based on several criteria, including thematic relevance, scientific rigor, clarity, and the potential to advance knowledge in the field. Only those that met these high standards were accepted for inclusion.

The diversity of work presented in this volume reflects the broad academic backgrounds and interdisciplinary strengths of our contributors. These papers offer a rich blend of perspectives, approaches, and findings that enhance dialogue and foster cross-disciplinary collaboration. While the reviewers applied rigorous standards throughout, the views expressed in the papers are those of the authors and do not necessarily reflect those of the conference organizers or reviewers. Beyond the full papers, the conference also featured numerous works-in-progress presentations, adding further depth to the exchange of ideas and scholarly engagement. As we embark on this shared intellectual journey, let us carry forward the values of inquiry, collaboration, and innovation. May our efforts bring us closer to a future where sustainable development becomes a realized goal, not just a guiding principle. Thank you for your continued belief in Africa's future.

Richard N. Hayes, Ph.D.
Proceedings Editor
May 2025

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A CONCEPTUAL FUNDING STRUCTURE FRAMEWORK FOR RENEWABLE ENERGY INDEPENDENT POWER PRODUCER INFRASTRUCTURE PROJECTS

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Abstract

Access to sustainable energy in Developing Economies is a concerning issue. Current energy supply fails to meet the growing demand for households and businesses, as recognised by The United Nations Educational and Cultural Organisation (UNESCO) 2030 programme on sustainable development. Despite the urgent need to electrify Developing Economies, Small and medium size Renewable Energy Independent Power Producers (REIPP) companies face significant challenge in securing appropriate funding for energy transitions. Current funding structures are insufficient to address REIPP funding dynamics. The aim of the study is to propose a blended model by incorporating other financial instruments which attract the lowest interest, or no interest at all, denominated in local currency to fund REIPP projects in developing economies, given that developing economies capital markets and the banking sectors are poorly developed. The study adopted a systematic literature review research design to develop structure that incorporate community participation and evaluate data related to REIPP and country risk factors. The finding reveals that existing funding structures fail to incorporate other financial assets with low interest rates while taking in to account country risk factors. Hence, this study will serve to provide local community organisations and small to medium size REIPP's with alternative funding models that incorporate community involvement in Renewable Energy (RE) projects. The study makes contribution to general finance literature.

Keywords: Developing Economies; funding structures; Renewable energy independent Power Producers, Capital Structure, Risk.

Introduction

Sustainable Funding solution for REIPPs that supports the participation of Small and Medium IPP companies is a keystone to stimulate Africa's transition to inclusive and sustainable economic growth more specifically Southern African Development Community (SADC). Africa needs a sustainable long-term Renewable Energy (RE) funding solution to meet the current energy demand to cope with the current economic transition in the SADC region, which has been the main driver of energy consumption (Dahunsi et al., 2020). SADC region has the potential to become a leading global producer of clean energy, given the abundance of RE sources as per the International Renewable Energy Agency (Soumonni, 2016). All things considered, the participation of Small - and Medium IPP companies in the RE industry remains inadequate owing to several challenges such as, inter alia, financial barriers. Small IPP companies still face significant financial constraints in providing energy for the SADC region. They often express concern about accessing funding from conventional financial institutions mainly due to their small-medium size profiles and limited record in the energy sector. In South Africa's case, most debt facilities provided by commercial banks and other financial institutions feature credit margins that price small and medium IPP companies out of the market. These bottlenecks reflect the market failure to attract small and medium IPP companies 'participation in the energy sector and the enhancement of commercial markets 'contributions to the energy transition. The purpose of this study is to incorporate inclusive blended financial instruments such as grants, community investments and government surety bonds as a proposed funding structure for energy projects in emerging communities with a specific focus on SADC.

Literature Review

Contribution of various financial securities 'risk factors to the capital structure of RE for IPPs in emerging economies.

Financial securities significantly provide small and medium IPPs with the necessary liquidity to effectively manage and overcome the funding gap for RE projects (Falchetta et al.,2022). However, given the capital intensity of the RE infrastructure developments in emerging markets, accessibility and capital structure play significant roles in energy transition. Capital structure critically benchmarks the level of risk preference for RE IPP which ultimately influences pricing for energy transition and sustainability (Brown et al.,2021). According to Lawrence (2020), REIPP companies in emerging markets are exposed to the following risk factors, such as exchange rate risk, revenue risk, participant risk, Transmission and Infrastructure Risk, Change in Law Risk, Political Risk, Bribery and Corruption.

Exchange rate risk

Currency risk significantly contributes to the REIPP capital structure in emerging markets. RE cost components in emerging markets are funded in foreign currency such as dollars, euros, and pounds sterling, however, revenues are in local currency, creating a mismatch, resulting in devaluation risk over time (Ilzetzki et al., 2022). The risk associated with this type of foreign trade transaction creates uncertainty about the project's financial outcomes, which can ultimately render the RE project unprofitable (Ghadge et al., 2021). Furthermore, that currency risk reduces REIPP's chances of future survival and necessitates currency hedging to protect against currency volatility

(Ghadge et al., 2021). Currency hedging traditionally can be achieved through derivatives contracts (Seok et al., 2020). Derivative contracts are complex and detailed which may require country and market policy interventions permitting this type of transaction (Seok et al., 2020). Further to that, in most cases they are directed by market structures and rules (Seok et al., 2020). Additionally, hedging protects REIPPs from any unexpected market volatility (Liu et al., 2021). Liu et al. (2021) further argue that the exchange movements can substantially put pressure on REIPPs capital structure when project costs and commitments are denominated in foreign currency, while revenues are in local currency. However, in most cases, these hedging strategies are difficult and expensive for small and medium-sized organisation especially startup companies (Nani & Ndlovu, 2022). Furthermore, hedging strategies require good trading skills and experience to be implemented accurately and successfully (Nani & Ndlovu, 2022). Hence in most cases, the only option for small and medium REIPPs is to observe, identify and assess the impact of currency risk on the company capital structure due to a lack of expertise and experience in applying hedging strategies (Pellegrino et al., 2024). Further to that given timeframe and exchange rate variability, small and medium IPPs are highly exposed to real exchange rate volatility resulting in forced reliance on internal funding as opposed to external funds (Pellegrino et al., 2024). However, small, and medium REIPPs do not have sufficient cash flow to cover most of their operating costs (Sabău-Popa., 2021). Hence obtaining appropriate external funding for REIPP is critical to support the uneven cash flow experienced by these companies (Yu et al., 2021).

Revenue risk

It is critically important for REIPPs to generate sufficient revenue to cover operating costs over time. However, it is equally important for REIPP to consider elements of risk for undertaking RE projects (Kul et al., 2020). Furthermore, revenue risk is the area in which REIPPs need to pay particular attention to and effectively consolidate in the organisation strategic plan and capital structure (Kul et al., 2020). According to Durana et al. (2021), revenue risk refers to any potential situation that negatively affects a company's future revenue. Durana et al. (2021) further state that potential factors that might affect IPPs' future cash flow and capital structure may emanate from internal and external factors such as business decisions and economic conditions. Company internal factors consist of agency and leverage costs, bankruptcy, and reorganisation costs, debt & nondebt tax shields, collateral value, liquidation costs and asymmetric information amongst others (Bolarinwa & Adegboye, 2020). Agency costs can be defined as the costs associated with settling conflicting interests between shareholders (principal) and company management (agents) on the debt agreement (Pinelli et al., 2022). Further to that, debt holders put restrictions on extended capital distribution on the assumption that management will take actions that may positively favour the principal instead of debt holders as a result increase in the cost of debt (Pinelli et al., 2022).

Hence small and medium REIPPs turn to rely more on equity to mitigate agency costs for the RE projects (Probst et al., 2021). Regarding the effect of financial leverage on company profitability, Dalci (2018) concluded that companies that are highly leveraged earn lower rates of return than those that are less leveraged. This is consistent with Laborda et al. (2020), who found that increasing leverage for a company increases the volatility of earnings and cash flow, as well as the credit risk of the said company. The

risk of funding with more debt than equity is that debt increases default and bankruptcy risk (Murphy, 2018).

Participant risk

Kovalenko et al. (2020), define participant risk as a type of risk management technique in which the lender transfers the risk and interest associated with the transaction to a third party, such as a financial institution to assume the liability in case of default or project failure. Schmidt et al. (2017), argue that in most cases private sector participants in the RE sector both local and international often susceptible to participant risk, which could pose financial distress for REIPP companies in emerging markets. Emerging markets are viewed as being riskier, unstable, and unpredictable, hence investors in the RE sector require higher rates of return which ultimately increases the cost of debt for REIPPs further (Abaidoo et al., 2023). Furthermore, RE investors are still sceptical to actively engage in the implementation of effective risk management strategies in emerging markets due to regulatory country regulatory framework amongst others (Chakabva et al., 2021).

Efforts have been made to address issues relating to risk mitigation in emerging markets; however, the focus has been directed at the deployment of financial risk-sharing instruments (Fawzy et al., 2020). Despite the regular deployment of these financial products to emerging markets, they still impose financial costs on the transaction, and ultimately costs are passed on to end users, such as REIPP, through higher tariffs (Solwa, 2019). Financial de-risking instruments are transaction-specific and focus on addressing risks related to specific transactions; hence, a broader approach is required (Solwa, 2019). Some of these risks emanate from broader regulatory and institutional constraints; hence, one needs to look at the non-financial de-risking approach (Anagnostopoulos & Kabeega, 2019). Non-financial de-risking measures are long-term solutions aimed at addressing and removing barriers that are the root cause of specific financial risks at the transaction level (Yang et al., 2021). Non-financial de-risking, such as de-risking at a project level, may be an appropriate solution to address participant risk in emerging markets (Mungai, 2021).

Change in law risk

REIPPs must adhere to and operate under the country's regulatory framework to meet planned objectives. The regulatory framework varies per country in the emerging markets, Sharma et al. (2021). REIPPs are daily faced with regulatory and compliance costs (Fan et al., 2021). Hence when deciding on the organisation's capital structure policy, REIPPs must take cognisance of change in law risk (Soumonni & Ojah, 2021). Changes in law risk affect project outcome and IPP cash flow negatively, consequently impacting on cost of capital (Gandhi et al., 2022). Hence REIPPS need to track and comply with country laws and regulations (Chetty et al., 2023).

Iddrisu and Alagidede (2020) highlighted that inflation control policies by countries' central banks significantly affect domestic investments directly through the cost of capital and indirectly through bank lending policies. Government policies that maintain low interest rates stimulate banks' lending position to private companies and ultimately improve domestic investments (Alagidede, 2020). Sensible, innovative policy design is a key to bridging the funding gap in emerging markets (Bloom et al., 2019). However, Polzin et al. (2019) emphasised that policies should focus more on addressing risk and

return relationships simultaneously. Furthermore, these authors state that generic instrument design features have an impact on investment risk if designed in such a way as to reduce RE project risk while improving project returns. However, policies should align with the country's energy policies to be effective (Gatto & Drago, 2020).

Political risk, bribery and corruption

Political risk contributes to the RE sector by actively encouraging private sector participation in the RE sector through political interventions such as creating a conducive regulatory framework for small and medium REIPPs (Sanders et al., 2024). Further to that, for government to effectively encourage private sector participation in the RE sector, both financial and non-financial incentives need to be applied on the policy level and company level (Allui & Pinto, 2022). Hence it is essential for REIPPs to effectively analyse political risk by paying attention to structural, governance and regulatory issues when deciding on an appropriate capital structure policy for RE projects (Ben & Belkacem, 2022).

Political risk on investment returns emanates from political corruption and bureaucratic inefficiency (Elie et al., 2021). Lee and Xiao (2021) highlighted that from the basis of political influence on corporate finance behaviour, REIPP needs to be cognisant of how political risk affects capital structure decisions. PeiZhi and Ramzan (2020) argue that for an organisation to correctly identify and select an appropriate capital structure in response to the type of political risk, risk should be identified per country. PeiZhi and Ramzan (2020) further state that political risk affects optimal financing decisions differently per country.

Financial strategies applied in the REIPP capital structure

The potential impact of climate change on the global community is currently receiving notable attention due to the risk posed to human beings and other forms of life and the urgency for sustainable solutions. At the recent Glasgow Climate Change Conference 2023, emerging markets raised concerns that they are falling short of the US $ 100 billion a year promised by developed nations to transition to clean energy, Kyriakopoulou et al. (2023). Emerging markets are still faced with a funding gap despite commitments from developed countries to honour their pledge by 2023 (Larionova, 2023). According to the United Nations climate change white paper, climate finance was proposed as part of the financial strategy to address the funding gap in emerging markets. Climate finance consists of public, private and alternative sources of funds directed at emerging markets. This type of funding is facilitated through financial mechanisms such as the Global Environment Facility and Green Climate Fund. Furthermore, this financial mechanism is liable to the Conference of the Parties (COP), under which certain criteria for funding, policies and programmes to be prioritised are decided and designed. Prasad and Sud (2021) argue that regardless of good intentions by the COP to bridge the funding gap, this funding mechanism failed to deliver on its previous promises to support emerging markets on sustainable development programmes and to favour the interest of contributing countries, such as the United States of America (USA), China, the United Kingdom (UK) and Germany, among the few, hence an urgent need for alternative funding solutions at both the global and national levels. Prasad and Sud (2021) further propose that new financial mechanisms

at the global and multiple national levels be introduced with a focus on capacity and creativity.

In South Africa's case, the world's richest countries (Germany, the UK, the USA, France and the European Union) pledged $5 billion towards transforming the energy sector (Zhang et al., 2021). This pledge consists of loans and interest-free grants (Zhang et al., 2021). However, South Africa indicated that the pledge has to be under its current national goals to reduce the current debt of $27 billion faced by Eskom (Winkler et al., 2021). Furthermore, the pledge must be structured in such a way that most funds must be in the form of grants with loans made up of concessionary rates. However, Michaelowa et al. (2021) argue that the South African government does not provide clear guidance on how transition and funding will be managed and channelled to small, medium, and microenterprises and communities and the role of financial institutions such as the African Development Bank, Development Bank of Southern Africa and Industrial Development Corporation. Historically, South Africa and other Sub-Saharan African countries channel energy funds through IPP programmes without a proper management framework, hence misallocation and a lack of accountability and transparency (Elsner et al., 2021). Fagbemi et al. (2021) argue that misallocation and lack of accountability prevailing from country political institutions driven by corruption in Africa limit economic transformation.

Countries in emerging markets have adopted several policy instruments to bridge the funding gap for energy projects. It is, however, equally important for policymakers to align policy instruments with country energy policies to create a sustainable energy sector under the country's economic conditions (Johnsson et al., 2020). Johnsson et al. (2020) assert that emerging markets are characterised by financial and economic instability few.

Discussion

Impact of financial securities on the capital structure of REIPP

Optimal, Capital structure effectively ensures that organisation successfully and efficiently distribute its funds Ngatno et al. (2021). How companies decide on capital structure and the combination will effectively reduce finance risk during the startup period, alternatively negatively influencing how profit and market value perform over time (Derbali, 2022). This study focuses on the incorporation of blended finance, which consists of different risk profiles, to minimise the cost of capital while encouraging small IPP and private and public participation in the energy sector. Blended finance consists of financial securities characterised by favourable market terms and conditions on the capital structure to reduce the cost of capital (Attridge & Engen, 2019). This study further employs a strategic combination of different risk-return profiles of capital with those that do not require high returns, or no interest reduces risk. Blended finance encourages public and private investment by improving the risk-return relationship and mitigating perceived risk in areas that investors would consider risky (Rode et al., 2019). Combining capital with different risk profiles encourages public involvement and private investment to accelerate financing in emerging markets (Attridge & Engen, 2019). In their study on the development of the impact of blending and associated quantitative and qualitative risk. Küblböck and Groh (2019) concluded that blending

does not necessarily encourage activities and programmes that are beneficial to poor communities. The study also noted that in some cases, projects might not be aligned with the country's plans and policies as a result of a failure to incorporate stakeholder participation and accountability measures. Hürlimann et al. (2020) researched the valuation of RE investments, focusing on key drivers that impact the proportion of debt and the equity ratio for IPP companies. The authors suggest that capital structure has several implications for the future cash flow of RE projects, of which variability is provided by the weighted average cost of capital (WACC). Ehlers et al. (2020) researched demand side management (DCM), focusing on how to measure the feasibility of financial instruments. The study drew attention to traditional capital structure theory by stating that the lower the WACC is, the greater the net present value of RE projects. Further, the study concluded that by achieving low WACC, IPP companies could service other project-related commitments.

Irawati et al. (2019) researched the role of loan quality, focusing on the relationship of financial performance. The study concluded that it is important for the IPP company to appropriately decide on a funding instrument that minimises WACC while enhancing future value as per traditional capital structure theories. Steffen's (2018) study draws attention to Miller and Modigliani's (M M) theory on capital structure. The study stated that, given a perfect market, how a project is funded is not relevant to its future value. Muhammad et al. (2020) researched timing behaviour and how it affects capital structure decisions. The study argued that considering emerging economies' market conditions, MM theory is not relevant in emerging economies as a basis to evaluate company capital structure due to market instability. Ganiyu et al. (2019) investigated Nigerian company performance and capital structure. The study suggested that capital structure should be examined from the emerging economy context without tempering with the economic imperfections that characterise operating conditions. Martinez et al. (2019) reviewed capital structure theories and suggested that other traditional capital structure theories, such as trade-off theory and market timing, be considered to provide in-depth insights into financing decisions in emerging markets due to their ability to adjust to dynamic situations that characterise emerging economies. The study also drew attention from earlier traditional theories. The study concluded that regardless of trade-off and market timing theories providing insights into emerging economies' capital structure, they are not flexible and must be modified to accommodate emerging economies' dynamics, which differ from developed markets. Nguyen et al. (2019) conducted a study to test capital structure theories with a specific focus on Vietnamese-listed organisations. Empirical tests revealed that most Vietnamese companies prefer the trade-off theory as opposed to other theories. The study noted that insufficient evidence is available to support the efficiency of other theories, such as the pecking order theory when deciding on the financing structure for Vietnamese companies. Ganiyu et al. (2018) focused on capital structure with a specific focus on emerging markets and noted that studies conducted previously on capital structure theories do not consider agency cost theories between principals and agents, especially during the construction phase of the project to minimize risk on RE projects from an emerging economies perspective. Doğan and Acar (2020) reviewed agency theory and concluded that it plays an important role, as it brings out agency costs, negatively affecting WACC as agency costs rise. The debt level also grows due to WACC increases, so the optimal structure will be at a lower optimal level.

Capital market conditions and the capital structure of the REIPP

Simatupang et al. (2019) investigated the determinants of capital structure with a specific focus on the pecking order and trade-off theories. The authors concluded that a company will always raise funds internally for new projects from retained earnings to avoid default risk as opposed to external funding. If the necessity arises to raise external funds, debt is preferred over issuing new security. The study also noted that the pecking order theory contradicts MM's perfect market theory. It suggests that given asymmetric information between internal and external parties, managers prefer internal funding first and debt over issuing new stock. Tripathi (2019) investigated the Indian automobile sector with a specific focus on the agency theory. The author concluded that agency theory brings with it agency costs, which arise from conflicting decisions between stakeholders and agents when opting for debt as a source of funding. Delis et al. (2020) investigated enforcement actions by banks on loan structures. The study noted that in most cases, banks impose restrictions on loan agreements to safeguard their investments and to restrict management's actions, resulting in limitations on target gearing ratio and limited operating freedom. Rajverma et al.'s (2019) study on capital structure with a specific focus on ownership structure and cost of equity supports Delis et al. (2020) who concluded that conflicting interests between debt providers, managers and principals can result in agency problems, the cost of which will reduce free cash flow over time.

MM theory further assumes that the market value of an organisation is affected by operating income apart from the risk attached to funding instruments. However, recent studies by Sumiati et al. (2019) show that a company can influence its value by stretching its capital structure between debt and equity to reach an optimal ratio to improve its future outlook. Conversely, Ganiyu (2019) argues that the agency cost model, which extends from the dynamic trade-off theory by Jensen and Meckling (1976), can be applied to emerging markets, especially in Africa, due to imperfections that characterise the markets. Emerging markets are characterised by several market instabilities, such as the failure of the banking sector to act as an intermediary, resulting in expensive credit funding and a lack of innovative funding instruments geared towards infrastructure development projects, as highlighted earlier in the study. Recent studies by Pandey and Sahu (2019) show that limiting debt funding can significantly and positively impact performance while increasing the degree of leverage can negatively affect performance. Kudtarkar (2020), in support of Pandey and Sahu (2019), argues that a company should get funding through equity, especially for a new project, to avoid default in case of a project failure. Santoleri et al. (2020) argue that equity funding is favoured in the case of investment in intangible assets and can internally generate growth opportunities, especially in a situation where asymmetric information and agency costs are high. Thus, Fliers (2019) argues that decision makers' objective is to target the debt-equity ratio with the main objective of preserving financial flexibility.

In support of the pecking order theory, Fu and Smith (2021) argue that, due to market dynamics, organisations turn to deviate from their optimal capital structure temporarily, and as time goes on, they gradually move towards the optimum level of working capital. Several studies such as Liaqat et al. (2021) suggest that, given emerging economies' market dynamics, capital structure be based on the correct mixture of debt and equity, considering the cost and benefits of each funding instrument. In support of the trade-off, theory, Ronic and Amadi (2021) suggest that companies should strive for an optimal

capital structure that minimises the cost of capital while enhancing the value of organisations and capitalising on the advantages of using selected funding instruments, such as tax shields. Butt (2019) argues that the trade-off theory consists of a single optimal leverage ratio, and the benefits and costs of equity and debt funding are traded. However, according to Jarallah et al. (2019), the trade-off theory is inconsistent with other theories when analysing organisations' external funding following risk adjustment. Jarallah et al. (2019) further stated that companies turn to issue equity when risk increases and issue debt following risk decreases.

Banking sector conditions suitable for the optimal RE IPP capital structure

Traditional theories define the optimal capital structure as the best mix of debt and equity funding that minimises the cost of capital while enhancing the organisation's value. However, each funding option comes with advantages that address funding needs for energy projects and drawbacks associated with servicing the funding, as highlighted earlier in the study.

As a result, the pecking order theory states that given a lack of internal funding, companies should opt for debt funding. However, in the presence of asymmetric information, banks turn to put measures in place to minimise adverse selection discounts (Vives, 2019). In support of the MM theory of perfect markets with the absence of agency costs and taxes, the trade-off theory states that banks will always issue financial instruments that minimise the cost of capital to achieve optimal capital structure, as results prefer to issue a combination of debt and equity. However, given that emerging economies are characterised by imperfect conditions and high levels of asymmetric information, banks turn to use screening and monitoring strategies to alleviate the problem. Bank capacity and incentives to screen and monitor borrowers differ (Havrylchyk & Verdier, 2018). Large commercial banks can screen borrowers more effectively as opposed to small banks (Havrylchyk & Verdier, 2018).

Conclusions

Current funding structures fail to incorporate other financial instruments that attract the lowest interest, denominated in local currency, to fund RE projects in emerging economies. Emerging economies' capital markets and the banking sector are poorly developed. An appropriate funding structure should incorporate grants, community investments in the form of land as part of equity and government surety bonds in the capital structure for RE IPP project initiatives in emerging economies. This combination consists of financial instruments that offer tax shields and a mixture of debt and equity that results in the lowest WACC. The funding structure results in an optimal capital structure by replacing more expensive equity with cheaper debt to lower the WACC. It balances the leverage level by taking advantage of the pros and cons of debt and equity.

The consistency with the trade-off theory principles supports the proposed funding structure for REIPP in emerging markets. The study provides local community organisations with alternative models for community involvement in RE projects. It contributes to the capital market and banking sector with conditions to be considered when small IPP companies decide on the funding structure for RE projects.

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CATALYSING GROWTH: THE STRATEGIC ROLE OF DEVELOPMENT FINANCE IN BOOSTING DOMESTIC PRIVATE INVESTMENT IN SOUTH AFRICA

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Abstract

This study explores the strategic role of Development Finance Institutions (DFIs) in boosting domestic private investment in South Africa, with a particular focus on their influence on economic growth and sectoral development. DFIs play a crucial role in bridging the financing gap by providing financial resources and risk mitigation mechanisms to sectors that are typically underfunded or deemed too risky for conventional commercial financiers. Drawing on a documentary analysis of annual reports, government policy documents such as the National Development Plan (NDP), and relevant academic literature, this study identifies key themes such as financial intermediation, risk mitigation, financial product innovation, capacity building, and challenges faced by DFIs in scaling their impact. The findings indicate that DFIs are instrumental in driving economic growth by fostering private sector engagement in high-risk sectors such as renewable energy, infrastructure, and agriculture. They accomplish this by providing tailored financial products, including loan guarantees, equity financing, and blended finance models, which lower investment risks and attract private investors. Additionally, DFIs contribute to local capacity building through technical assistance and support for small and medium-sized enterprises (SMEs), further strengthening the private sector's role in economic development. However, the study also reveals several challenges, including bureaucratic inefficiencies, policy constraints, and limited risk-sharing capacity in certain sectors, which hinder the scalability of DFIs' impact. Despite these challenges, DFIs remain vital players in South Africa's development finance landscape, and their potential to contribute to inclusive economic growth is evident. The study concludes with practical recommendations for enhancing the effectiveness of DFIs, such as improving coordination between DFIs, government, and the private sector, streamlining regulatory processes, and fostering greater innovation in financial products. The findings also point to opportunities for future research, particularly in assessing the long-term impact of DFIs and exploring their role in other emerging markets.

Keywords: capacity building. DFIs, domestic private investment, economic growth, financial intermediation, financial product innovation, risk mitigation.

Introduction

Development finance serves as a powerful instrument for addressing market inefficiencies and catalysing economic growth in regions often underserved by conventional financial institutions. Thorne and du Toit (2019) define development finance as the provision of funding to market segments inadequately served by traditional financial systems. Globally, development finance institutions (DFIs) bridge critical financing gaps, combining the developmental objectives of multilateral aid agencies with the commercial approaches of private sector banks and investors (Adian, Doumbia, Gregory, Ragoussis, Reddy & Timmis, 2020). For instance, Brazil's BNDES (Banco Nacional de Desenvolvimento Econômico e Social) has significantly contributed to industrial growth, while India's Small Industries Development Bank has improved credit accessibility for small and medium enterprises (Le & Hoang, 2022). These institutions are pivotal in mobilizing capital for projects deemed too risky by commercial banks, while maintaining a focus on sustainable returns to ensure operational longevity (Krahnen, 2022).

In South Africa, DFIs play an indispensable role in funding infrastructure projects, fostering industrial growth, and stimulating private sector investment, especially in sectors and regions traditionally overlooked by private investors (World Bank, 2021). The establishment of DFIs has been instrumental in addressing economic disparities and fostering sustainable development. Institutions such as the Development Bank of Southern Africa (DBSA) and the Industrial Development Corporation (IDC) have strategically invested in infrastructure, industrialization, and inclusive growth (Le & Hoang, 2022). However, despite these efforts, South Africa continues to face significant challenges, including a stagnant GDP growth rate, high unemployment, and declining foreign direct investment (FDI), highlighting the complexity of their mission (Krahnen, 2022).

However, persistent unemployment, with youth unemployment exceeding 42% (Stats SA, 2023), combined with credit rating downgrades, creates a challenging environment for DFIs to achieve impactful results. The literature on financial development and economic growth reveals the importance of threshold variables such as GDP, credit accessibility, and financial stability. When these variables fall below critical levels, the impact of financial interventions on growth may be limited, but when they exceed thresholds, their influence is significantly amplified (Erdoğan, Yıldırım, & Gedikli, 2020).

This study investigates how DFIs in South Africa, such as the DBSA and IDC, can better align their strategies with local economic conditions to maximize developmental impact. By examining their contributions to domestic private investment, the research explores lessons from successful DFIs in emerging markets, such as Brazil's BNDES and India's SIDBI, to derive actionable insights. It contextualizes these findings within South Africa's unique economic landscape to advance understanding of how DFIs can drive sustainable economic growth. In doing so, it fills a critical gap in empirical research and provides both theoretical and practical contributions to the field of development finance.

Literature Review

Understanding Development Finance Institutions

Development finance encompasses a diverse array of financial tools and strategies with the overarching goal of promoting economic development (Cui, Wang & Wang, 2020). It encompasses both public and private sector initiatives, foreign aid, loans, grants, and investments. Renowned scholars such as Krahnen (2022) underscore the pivotal role of development finance institutions in poverty alleviation and stimulating growth in developing nations. It is a multifaceted concept that involves financial resources, mechanisms, and strategies tailored to support economic growth, reduce poverty, and enhance the well-being of communities (Songwe, Stern & Bhattacharya, 2022).

According to Cui, Wang and Wang (2020), Development Finance Institutions (DFIs) are specialized entities, including development banks and subsidiaries, established to bolster private sector development in developing countries. These institutions are typically majority owned by national governments and derive their capital from domestic or international development funds, often benefiting from government guarantees (Songwe, Stern & Bhattacharya, 2022). This financial backing ensures their creditworthiness, enabling them to access significant funding from global capital markets and offer financing on highly competitive terms.

DFIs occupy an intermediary role, bridging the gap between public aid and private investment (Gabor & Brooks, 2020). As the Chief Executive of Commonwealth Development Corporation (CDC), the UK's DFI, has noted, they ‘facilitate international capital flows.' Distinct from traditional aid agencies, DFIs focus on profitable investments while adhering to market principles (Schuetz & Venkatesh, 2020). However, their overarching objective aligns with fostering economic growth and sustainable development. Therefore, they primarily address the investment gaps in developing countries, serving as a vital link between commercial investment and state development aid (Schuetz & Venkatesh, 2020).

DFIs provide an extensive range of financial services in developing nations (Gabor & Brooks, 2020). This includes extending loans or guarantees to investors and entrepreneurs, participating in equity stakes in firms or investment funds, and funding public infrastructure projects. DFIs often initiate or develop projects in industries or regions where commercial banks are hesitant to invest without some form of official backing (Schuetz & Venkatesh, 2020). According to Gabor and Brooks (2020), the DFIs are also active in financing small and medium-sized enterprises, as well as supporting microloans to companies that are typically viewed as too risky by private financing sources. An advantage of this approach is that DFIs often gain a first-mover advantage in markets with substantial growth potential (Songwe, Stern & Bhattacharya, 2022). A notable example is the success story of Celtel, a telecommunications company in Africa, where DFIs made early investments as part of their developmental mandate and later reaped substantial profits.

In addition, DFIs rely on profits generated from their investments to secure resources for future engagements (Schuetz & Venkatesh, 2020). Currently, this model has proven successful, with institutions like CDC and the European Bank for Reconstruction and Development (EBRD) surpassing emerging market indices. Bilateral development finance institutions are primarily owned by national governments and have historically been instrumental in implementing

government foreign development and cooperation policies (Gabor & Brooks, 2020). Multilateral DFIs, often referred to as international finance institutions (IFIs), possess greater financial capacity and serve as platforms for close cooperation among governments (Gabor & Brooks, 2020). Thus, both types of institutions maintain operational independence from their funding governments. Supported by government funds and guarantees that bolster their creditworthiness, DFIs can raise substantial funds from international capital markets, offering loans or equity investments on competitive, and sometimes subsidized or terms which enables them to support long-term projects and contribute to economic development in sectors often overlooked by traditional banks (Madura, 2020).

Impact of Development Finance Institutions on Economic Growth

Development Finance Institutions (DFIs) play an instrumental role in promoting domestic private investment, especially within developing economies where access to capital is often constrained. While the direct impact of DFIs is visible through the financial resources they allocate to key sectors, their indirect impact on economic growth is equally profound. The mechanisms through which DFIs influence growth encompass financial innovation, fostering entrepreneurship, and enhancing access to credit. As Osei and Kim (2020) argue, DFIs contribute significantly to financial innovation by introducing novel financial products and services that reduce costs, mitigate risks, and meet the evolving needs of businesses. This innovation is particularly crucial in emerging markets, where financial markets often lack the sophistication required to support long-term investment. By facilitating access to credit, DFIs help reduce the bias toward marginal investments, thereby promoting more diverse and impactful economic activities (Magdalena & Suhatman, 2020). As a result, DFIs serve as catalysts for broader economic growth, especially by enabling sectors such as technology and infrastructure to thrive, which in turn attracts further private investments.

The relationship between DFIs and economic growth is multifaceted, extending beyond direct financial provision to influencing structural changes within the economy. DFIs contribute to the development of a robust financial sector, which in turn supports private investment. Financial development, as highlighted by Magdalena and Suhatman (2020), has been shown to drive technological progress, making capital more accessible for research and development (R&D). The provision of credit by DFIs, particularly to the private sector, can stimulate R&D expenditure, fostering innovation and improving the competitiveness of domestic industries. For instance, in countries like Mexico, the increase in private credit has been associated with enhanced technological advancements and productivity (Gabor & Brooks, 2020). Furthermore, DFIs encourage private sector development by creating an enabling environment through their financing and policy advocacy, which promotes market efficiency, attracts foreign capital, and bolsters local entrepreneurial ventures. Thus, DFIs are not just providers of capital but also pivotal players in building the infrastructure necessary for a thriving, innovative economy.

Beyond fostering technological innovation and private investment, DFIs also contribute significantly to achieving broader socio-economic goals, such as poverty reduction, improved healthcare access, and gender equality. These objectives align with the Sustainable Development Goals (SDGs) and reflect the continuing relevance of DFIs in addressing developmental challenges. Financial development through DFIs enhances access to credit for marginalized sectors, thereby driving socio-economic development. Research by Kirikkaleli, Güngör and

Adebayo (2022) has demonstrated that an increase in private credit can significantly reduce poverty, underscoring the potential of DFIs to catalyse positive social change. However, while DFIs have made substantial progress in these areas, challenges persist, particularly in low-income regions with limited financial inclusion (Rauhut & Humer, 2020). DFIs, by promoting financial inclusion and supporting sustainable economic practices, remain crucial to addressing these gaps. The transition from the Millennium Development Goals (MDGs) to the SDGs has further emphasized the need for DFIs to continue mobilizing resources, fostering innovation, and ensuring that the benefits of financial development are broadly shared across society (Songwe, Stern & Bhattacharya, 2022). Thus, the role of DFIs in driving economic growth, technological innovation, and socio-economic development remains vital in achieving sustainable progress in emerging economies.

The Finance-Growth Nexus in Theory

The relationship between finance and growth is a core concept in economics that explores the relationship between financial development and economic growth (Asanović, 2020). The theories and models within this framework aim to understand how financial systems and institutions promote or hinder economic growth. Theoretical concepts in the relationship between finance and growth are very applicable to development finance that promotes economic growth (Dykas, Tokarski & Wisła, 2022). Understanding these theories can help policymakers and practitioners design more effective strategies and policies to promote economic development.

Financial Intermediation Theory

Financial intermediation theory posits that well-operating financial intermediaries, including banks and financial institutions, play a pivotal role in fostering economic growth (Asanović, 2020). These intermediaries serve as conduits, channeling savings from households and directing them toward productive investments. This process enhances the allocation of resources, ultimately fueling economic growth (Ratnawati, 2020). In essence, a robust financial system that adeptly mobilizes savings and guides them into productive investments has the potential to stimulate economic growth.

Development finance institutions can effectively step into the role of proficient financial intermediaries (Asanović, 2020). They possess the capacity to mobilize savings from households and allocate these resources strategically, particularly in sectors crucial for development, such as infrastructure, small and medium-sized enterprises (SMEs), and human capital enhancement (Ratnawati, 2020). By efficiently directing funds towards projects with substantial social and economic benefits, development finance can significantly contribute to the promotion of economic growth.

Endogenous Growth Theories

Endogenous growth theories, exemplified by scholars like Romer (1986) and Lucas (1988), propose that technological advancement and the accumulation of human capital are influenced by the economic environment of the country itself. Financial development plays a pivotal role in nurturing innovation and the development of human capital, thus acting as a catalyst for long-

term economic growth (Dykas, Tokarski & Wisła, 2022). In this context, policymakers should prioritize strategies aimed at cultivating human capital, fostering innovation, and supporting research and development (R&D) to bolster the prospects for sustained economic growth over time (Akcigit & Ates, 2021).

Development finance institutions are well-positioned to champion policies that bolster human capital through initiatives in education and training (Wójcik & Ioannou, 2020). Additionally, they can allocate funding for R&D endeavours and champion innovation and entrepreneurship (Akcigit & Ates, 2021). By directing investments toward human capital and the advancement of technology, development finance can make significant contributions to the promotion of enduring economic growth that is knowledge driven.

Financial Market Development

A well-developed financial market offers a range of financial instruments, including stocks, bonds, and derivatives, and efficient mechanisms for capital allocation (Wójcik & Ioannou, 2020). This robust financial ecosystem enables companies to secure funding and manage risks effectively, thereby fostering entrepreneurship, investment, and ultimately, economic growth (Donaubauer, Neumayer & Nunnenkamp, 2020). Encouraging the growth of financial markets and institutions holds paramount importance in nurturing economic development, particularly in emerging economies.

Development finance can play a pivotal role in advancing the establishment and expansion of financial markets (Donaubauer, Neumayer & Nunnenkamp, 2020). For instance, development banks can issue bonds to raise capital for vital infrastructure projects, thereby contributing to the deepening of capital markets. The presence of a well-established financial market can attract both domestic and foreign investors, thereby propelling economic growth by facilitating efficient capital allocation (Le & Hoang, 2022).

The intersection of finance and economic growth has garnered considerable attention, although it was not a central focus among classical economists (Le & Hoang, 2022). The fundamental argument in this framework is that these funds are held in banks until someone with productive investment prospects emerges to utilise them. This leads to various forms of trade, resulting in prosperity as funds are allocated to the development of these trades, subsequently triggering other related developments driven by profitability (Akcigit & Ates, 2021). Ultimately, this prosperity filters down to other sectors of the economy due to the cumulative nature of this process.

The core of this argument lies in the belief that factors of production, such as land, labor, human capital, and technological progress, are all instrumental in driving growth (Akcigit & Ates, 2021). The endogenous growth theory identifies finance as a critical factor that propels technological progress. Within the endogenous growth theory literature, numerous models have been formulated to explore the mechanisms through which financial development may influence per capita GDP growth and technological advancements. These models are supported by extensive datasets that capture various facets of financial development. A substantial body of econometric evidence tends to suggest a causal and positive relationship between finance and growth (Le & Hoang, 2022). Ogbeifun and Shobande (2022) posit that the direction of causality between finance and growth changes with the level of development. According to this

perspective, at lower stages of development, finance acts as a catalyst for economic growth, whereas at higher levels, the causal relationship shifts, with economic output becoming the primary driver of financial development.

Research Methodology

This study adopts a qualitative research methodology underpinned by the interpretivist paradigm to explore the strategic role of Development Finance Institutions (DFIs) in stimulating domestic private investment in South Africa. The interpretivist approach focuses on understanding the subjective meanings and experiences of stakeholders within the financial and economic sectors (Creswell, 2021). Documentary analysis, as a qualitative method, involves systematically reviewing existing documents to uncover insights and patterns relevant to the research question (Flick, 2022. The documents selected for this study include the annual reports of South African DFIs, government policy documents such as the National Development Plan (NDP), sector-specific reports, and relevant academic literature. These sources were chosen for their direct relevance to the study's aim of understanding how DFIs influence economic growth and private investment, with a particular focus on the contextual factors that shape their operations.

The data collection process involved gathering a wide range of publicly available documents from institutional websites, government publications, and reports obtained through formal requests to DFIs and other relevant organizations. Thematic analysis, a core technique in qualitative research, was used to identify key themes and patterns within the documents. This process involved reading and coding the data iteratively, categorizing emerging themes such as financial intermediation, policy advocacy, private sector engagement, and DFIs' influence on economic development (Creswell, 2021; Flick, 2022). Therefore, by adopting an interpretivist lens, the study aimed to explore how DFIs perceive their role and how their actions are framed in the context of South Africa's economic challenges, as well as the mechanisms through which they drive private investment and economic growth.

Discussions

In examining the role of Development Finance Institutions (DFIs) in stimulating domestic private investment in South Africa, several key themes emerged from the documentary analysis. These themes shed light on how DFIs contribute to economic growth, address market failures, and foster private-sector engagement in developmental projects. The four prominent themes that emerged include financial intermediation and risk mitigation, the role of DFIs in driving financial innovation, capacity building and private sector engagement and challenges in expanding their reach and improving their effectiveness.

Financial Intermediation and Risk Mitigation

Financial intermediation and risk mitigation have emerged as a central theme. The study highlighted the critical role of DFIs in facilitating financial intermediation and mitigating risk, particularly in high-risk sectors such as infrastructure, renewable energy, and agriculture. The documents reviewed, including the National Development Plan (NDP) and annual reports from South African DFIs like the DBSA (Development Bank of Southern Africa), provide compelling evidence that DFIs bridge critical financing gaps in high-risk sectors such as infrastructure, renewable energy, and agriculture. According to the DBSA Annual Report (2021), the institution

provided over R15 billion in funding to infrastructure projects across South Africa in the past year, with a substantial portion dedicated to renewable energy projects. These efforts align with findings in international secondary studies, such as the World Bank's (2020) report on infrastructure development, which noted that DFIs in Brazil have similarly employed risk-mitigation mechanisms, such as equity financing and loan guarantees, to attract private investors into infrastructure sectors. In South Africa, the Independent Power Producers (IPP) Programme, facilitated by DFIs, has attracted more than R200 billion in private-sector investment since its inception, as reported in the NDP and the DBSA Annual Report (2021). This investment highlights how DFIs de-risk high-reward sectors, making them more attractive to private investors and promoting economic growth. Statistically, the IPP Programme has been responsible for increasing South Africa's renewable energy capacity by 25% over the last five years, as shown in the Department of Energy's 2020 report.

Globally, DFIs like the Brazilian Development Bank (BNDES) have mirrored these efforts, with the BNDES Annual Report (2020) revealing that it facilitated over R100 billion in private sector investments in infrastructure through risk-sharing mechanisms. This illustrates the broader global trend of DFIs using risk mitigation to promote private sector engagement, especially in markets with a high perceived risk.

Innovation and Financial Product Development

DFIs have also been key players in fostering financial innovation to unlock private investment in emerging sectors. According to DBSA's Annual Report (2021), DFIs in South Africa have introduced financial products such as green bonds, venture capital funds, and blended finance models to attract investment into critical sectors, such as renewable energy and technology. The South African Reserve Bank (2021) highlighted that the DBSA's issuance of green bonds in 2017 raised R1.46 billion, funding environmental sustainability projects. This mirrors the findings in the academic literature on financial product innovation, such as a study by Segura, Franco and Perán (2023), which emphasized how DFIs have pioneered the development of green bonds in South Africa to address both economic and environmental challenges. According to the National Treasury (2020), the green bond market in South Africa has grown by over 30% annually, illustrating the growing role of DFIs in promoting innovative financial solutions.

Internationally, the International Finance Corporation (IFC) has played a similar role. IFC Annual Report (2020) documented how the IFC's green bond program in India raised $2.5 billion in 2019, channelling private investments into sustainable projects. Additionally, Belkhaoui (2023) found that in South Africa's renewable energy sector, DFIs' involvement in creating blended finance products has resulted in a 40% increase in private sector investment in clean energy projects since 2018. These statistics confirm the catalytic role of DFIs in financial product development, specifically tailored to meet the needs of developing economies, thus promoting private sector involvement in sectors critical to sustainable growth.

Capacity Building and Private Sector Engagement

A plethora of studies also emphasized the role of DFIs in building local business capacity and fostering private-sector engagement. According to the DBSA Annual Report (2021), the institution invested R500 million in capacity-building initiatives aimed at local entrepreneurs and

SMEs, particularly in emerging sectors like renewable energy and agriculture. A case study highlighted in the DBSA's Technical Assistance Programme (2020) showed how the bank provided technical support to over 100 small businesses in the renewable energy sector, enabling them to access finance and scale up operations. These efforts align with the findings of Chinoda and Kapingura (2024), which identified DFIs as key drivers of capacity-building efforts through business development services, training, and technical assistance. Moreover, Gumpert (2024) highlights how DFIs in India have similarly helped SMEs gain access to finance and market opportunities, citing an increase of 20% in SME investments since the implementation of capacity-building programs.

Statistically, the DBSA's capacity-building programs have enabled more than 60% of SMEs in the renewable energy sector to secure funding from private investors. This reflects the broader trend observed globally, as in the World Bank (2020) report, which noted that DFIs in Sub-Saharan Africa invested approximately $1.2 billion in capacity-building initiatives for SMEs, resulting in a 35% increase in private sector engagement in local businesses.

Challenges in Expanding the Reach and Impact of DFIs

Despite the positive outcomes, secondary studies have also revealed significant challenges in scaling the impact of DFIs. According to the DBSA Annual Report (2021), DFIs often face challenges in overcoming bureaucratic red tape, securing timely funding, and coordinating efforts across government, DFIs, and private sector actors. The NDP acknowledges that such barriers limit the speed at which DFIs can respond to emerging opportunities, particularly in high-priority sectors such as healthcare and infrastructure. Similarly, Makhanya (2022) highlighted that DFIs in South Africa have struggled to effectively engage with the informal sector, which remains largely underserved despite being a significant part of the economy.

Globally, secondary studies show that DFIs in other emerging economies face similar issues. The World Bank (2020) report noted that DFIs in countries like India and Brazil have encountered challenges in addressing systemic issues, such as regulatory barriers and limited access to finance for informal businesses. Furthermore, the IFC Annual Report (2020) pointed out that the lack of coordination between DFIs, governments, and private actors has hindered efforts to achieve broader developmental goals such as poverty alleviation and inclusive growth. Statistically, the World Bank estimates that over 40% of DFIs globally face delays in project implementation due to bureaucratic inefficiencies, which underscores the need for improved operational coordination (Patel & Bansal, 2020).

Conclusions

This study established the critical role of Development Finance Institutions (DFIs) in stimulating economic growth and boosting domestic private investment in South Africa. The study concluded that DFIs effectively bridge financing gaps in sectors deemed too risky by commercial financial institutions. They achieve this by offering tailored financial products such as loan guarantees, equity financing, and risk-sharing mechanisms, which mitigate the perceived risks of investment. Notably, DFIs have played a transformative role in sectors such as renewable energy and infrastructure, where their intervention has attracted significant private sector involvement, both locally and internationally. Additionally, DFIs have proven to be a driving force in financial

innovation, developing instruments like green bonds and blended finance models that align private investment with broader sustainability goals. These efforts have not only enhanced the economic growth potential of South Africa but have also helped establish a robust foundation for long-term developmental objectives.

Despite the evident successes, this study also highlights the challenges that continue to impede the full potential of DFIs. While DFIs contribute significantly to financial intermediation, their impact is limited by factors such as bureaucratic inefficiencies, insufficient coordination with government entities, and limited outreach to sectors like the informal economy. Although DFIs have demonstrated their value in addressing critical developmental challenges, the barriers to scaling up their impact, particularly in promoting inclusive economic growth, remain a substantial concern. This study concludes that for DFIs to expand their reach and effectively support the South African economy, strategic reforms are needed, particularly in improving operational efficiency and fostering greater collaboration between DFIs, government, and private stakeholders.

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DIGITAL EQUITY IN CHIRUMANZU, MIDLANDS PROVINCE, ZIMBABWE: ADDRESSING SYSTEMIC BARRIERS FOR MARGINALIZED GROUPS

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Abstract

This paper explores the systemic barriers hindering marginalized groups in Chirumanzu, Midlands Province, Zimbabwe, from fully benefiting from digital advancements. Focusing on infrastructure deficits, affordability issues, digital literacy gaps, and socio-cultural constraints, the study evaluates the role of digital platforms, particularly mobile money services like EcoCash and OneMoney, in promoting financial inclusion. Employing a mixed-methods approach, data were collected through surveys of 150 residents and interviews with 20 stakeholders, supplemented by secondary data from regulatory and academic sources. Findings reveal significant challenges, including inadequate network coverage, high costs of digital tools, and entrenched gender norms. Recommendations include infrastructure investments, targeted digital literacy programs, and policy interventions to foster digital inclusion. The study underscores the need for community-centric, gender-sensitive strategies to ensure equitable participation in the digital economy.

1. Introduction

The digital revolution has transformed economies and societies globally, offering unprecedented opportunities for development and inclusion. However, digital disparities persist, particularly in rural areas of developing countries like Zimbabwe. Chirumanzu, a district in the Midlands Province, exemplifies the challenges faced by marginalized groups—such as women, youth, and low-income households—in accessing and benefiting from digital technologies. These systemic barriers not only exclude vulnerable populations but also exacerbate existing socio-economic inequalities (World Bank, 2021).

This study investigates the barriers to digital equity in Chirumanzu and explores the potential of mobile money platforms in enhancing financial inclusion. By identifying systemic obstacles and proposing actionable strategies, the research aims to contribute to policy discussions and interventions that promote equitable digital participation.

1.1. Research Objectives

1. To identify and analyze systemic barriers to digital equity in Chirumanzu.
2. To assess the role of mobile money platforms in fostering financial inclusion.
3. To propose strategies for achieving digital equity and promoting socio-economic development.

2. Literature Review

2.1. Defining Digital Equity

Digital equity refers to the fair distribution of digital resources, ensuring all individuals have the necessary access, skills, and opportunities to participate fully in the digital society (Cullen, 2001). It encompasses access to technology, affordability, digital literacy, and inclusive policies that address systemic inequalities.

2.2. Infrastructure and Accessibility Challenges

In sub-Saharan Africa, rural areas often lag in digital infrastructure development. Chirumanzu faces similar challenges, with inconsistent mobile network coverage and limited internet penetration (POTRAZ, 2022). Rural households also lack reliable electricity, compounding digital exclusion (Mutungwazi et al., 2021).

2.3. The Role of Mobile Money Platforms

Mobile money services have transformed financial access in Zimbabwe. EcoCash, for instance, enables users to send and receive money, save, and access micro-loans without a traditional bank account (FinMark, 2023). However, rural adoption remains constrained by high transaction fees, network issues, and limited awareness (Mutsvangwa et al., 2023).

2.4. Socio-Cultural Barriers to Digital Inclusion

Gender disparities are pronounced in rural Zimbabwe. Women often lack access to digital devices and financial tools, limiting their participation in the digital economy (Makumbe, 2021). Addressing these socio-cultural norms is essential for achieving digital equity.

2.5. Global and Regional Best Practices

Globally, countries have adopted strategies such as subsidized devices, public-private partnerships, and digital literacy programs to bridge the digital divide. For instance, Kenya's M-Pesa has achieved remarkable success in rural financial inclusion through user-friendly platforms and extensive agent networks (Jack & Suri, 2014). Lessons from these initiatives can inform strategies in Chirumanzu.

3. Methodology

3.1. Research Design

This study employed a mixed-methods approach to provide a comprehensive analysis of the challenges and opportunities for digital equity in Chirumanzu. The combination of quantitative and qualitative methods ensured both breadth and depth in data collection.

3.2. Data Collection Methods

1. **Quantitative Surveys:**
    - **Sample Size:** 150 residents of Chirumanzu.
    - **Topics:** Access to digital technologies, use of mobile money, and perceived barriers.
    - **Instrument:** A structured questionnaire with closed and open-ended questions.
2. **Qualitative Interviews:**
    - **Participants:** 20 stakeholders, including local leaders, financial agents, and community development officers.
    - **Topics:** Community perceptions, socio-cultural norms, and solutions for digital inclusion.
3. **Secondary Data Analysis:**
    - **Sources:** Reports from POTRAZ, GSMA, and academic studies.
    - **Focus:** Mobile network coverage, digital adoption rates, and policy frameworks.

3.3. Data Analysis

Quantitative data were analyzed using descriptive and inferential statistics to identify patterns and correlations. Qualitative data were thematically analyzed to uncover key insights on barriers and opportunities.

4. Findings

4.1. Infrastructure Challenges

Over 50% of survey respondents reported inadequate mobile network coverage as a significant barrier. Many rural villages remain underserved, limiting residents' ability to access mobile money services. Figure 1 highlights mobile network coverage gaps in Chirumanzu.

Figure 1: Mobile Network Coverage in Chirumanzu
(Insert chart showing coverage levels: Fully covered (50%), Partially covered (25%), Uncovered (25%))

4.2. Affordability Issues

Economic barriers emerged as a major theme. Survey data revealed that 65% of households cannot afford basic smartphones, and 70% cited high data costs as prohibitive. Table 1 compares income levels and the cost of digital tools.

Table 1: Monthly Income vs. Cost of Digital Access

Category	Average Cost (USD)	Average Income (USD)
Smartphone (Basic)	$50	$30
Data Bundle (1GB)	$5	

4.3. Digital Literacy Gaps

Digital literacy rates are alarmingly low in Chirumanzu, with only 30% of respondents reporting confidence in using digital platforms. Women and older adults were the most disadvantaged groups.

4.4. Socio-Cultural Barriers

Interviews highlighted gender norms as a significant barrier. Women often rely on male relatives to access mobile money services, limiting their financial independence and decision-making power.

4.5. Role of Mobile Money Platforms

Despite challenges, EcoCash and OneMoney have made significant strides in financial inclusion. Over 60% of respondents use mobile money for remittances and bill payments, but high transaction fees deter broader adoption.

5. Recommendations

5.1. Infrastructure Investments

- Expand mobile network coverage through partnerships with telecom providers.
- Introduce solar-powered charging stations to address electricity shortages.

5.2. Affordability Solutions

- Subsidize smartphones and offer affordable data packages.
- Implement policies to cap transaction fees on mobile money platforms.

5.3. Digital Literacy Programs

- Develop community-based training initiatives targeting women and youth.
- Collaborate with schools to integrate digital education into the curriculum.

5.4. Gender-Sensitive Policies

- Promote women's access to financial resources and digital tools through awareness campaigns and inclusive policies.
- Address socio-cultural norms through community dialogues and advocacy programs.

5.5. Public-Private Partnerships

- Encourage collaborations between government, NGOs, and telecom providers to fund digital inclusion projects.
- Adopt flexible pricing models to accommodate rural users.

6. Conclusion

Achieving digital equity in Chirumanzu requires addressing systemic barriers through multi-faceted interventions. By expanding infrastructure, reducing costs, and fostering digital literacy, Chirumanzu can unlock the potential of digital technologies to drive socio-economic development. Lessons from this study can guide similar initiatives in other rural communities across Zimbabwe and sub-Saharan Africa.

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Appendices

Appendix A: Questionnaire Sample

1. Do you own a smartphone? (Yes/No)
2. How often do you use mobile money platforms? (Daily/Weekly/Monthly/Never)
3. What challenges do you face when using digital technologies?
4. How would you rate your understanding of mobile money services? (1–5 scale)

Appendix B: Interview Guide

1. What do you see as the biggest barriers to digital inclusion in Chirumanzu?
2. How has mobile money impacted financial inclusion in your community?
3. What solutions do you recommend to improve digital equity in Chirumanzu?

EMPOWERING AFRICA: THE TRANSFORMATIVE IMPACT OF DIGITAL FINANCIAL INCLUSION ON ECONOMIC GROWTH FOR MARGINALIZED GROUPS

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Abstract

The study empirically analyzes the effect of digital financial inclusion on economic growth in Africa. The digital financial inclusion variables are ownership of digital financial devices/mobile money accounts and usage of digital financial services for female, poor, less educated, and unemployed individuals in the region. Panel data is collected from 39 African countries over 3 years (2014, 2017 and 2022). The Fixed Effect (Fe) Model and system Generalized Method of Moments (GMM) estimation techniques are employed. The results show that the usage of digital financial services has a positive and statistically significant impact on the economic growth of all marginalized groups; female, poor, less educated, and unemployed individuals in Africa. Therefore, the study recommends that the government and other stakeholders formulate specific policies to ensure that marginalized groups are empowered in the digital financial world and contribute to the overall development of the countries on the continent.

Keywords: Digital financial inclusion, Economic growth, Africa, Fixed Effect Model, GMM.

Introduction

The advent of digital financial inclusion in Africa, in recent years, has facilitated economic growth and development. Digital finance technology, such as mobile money and digital banking, has increased the number of people with access to financial services (Willige, 2023). This trend is of particular importance for a continent where the availability of traditional banking infrastructure is low, and the gap between supply and demand for finance is wide. The prevalence and easy access to mobile devices and digital platforms offer unprecedented opportunities to promote financial inclusion, enabling more and more people to actively participate in the economy and better withstand crises of any nature. Specifically, digital financial inclusion refers to the use of digital devices and platforms to engage in critical financial services, including savings, credit, insurance, and payments (World Bank, 2023). This definition implies active usage and the full integration of such services into the daily economic activities of individuals. For example, millions of Africans, including the populations of rural and under-developed areas, transferred their financial transactions to mobile money, minimizing the risk of fraud and theft and increasing ease of operation (World Bank, 2023).

In the last decade, Africa has seen remarkable economic growth. This growth, however, has been far from inclusive, as a large portion of the population: women, the poor, the less educated, and the unemployed, have been excluded from the formal financial sector (Adria-bt, 2024). As they tend to live in areas where traditional banking infrastructure has limited reach, these people lack access to financial services desperately needed to facilitate both their economic participation and resilience (Adria-bt, 2024). The expansion of digital finance and various types of digital banking, such as mobile money, offers a revolutionary way of addressing this limitation and thus promoting financial inclusion. Nonetheless, how much digital financial inclusion contributes to economic growth, including growth per income belt, based on this poorly served population in Africa, While many studies (e.g., Ikechukwu, 2021; Minjin et al., 2018; Mhlanga, 2023) have examined the role of digital financial services in improving financial access, few have disaggregated the effects on specific marginalized groups such as women, the unemployed, and the less educated in Africa. Moreover, the intersection between digital financial service usage and ownership and its differentiated impact on economic growth among these groups remains largely unexplored. This study seeks to fill this precise empirical gap by isolating and evaluating the economic outcomes

associated with digital financial inclusion across underrepresented demographic segments. This paper intends to fill this gap and, particularly, how the ownership of digital finance equipment or usage of mobile money accounts relates to economic growth across the continent feature known vulnerable population groups with perennial risk of exclusion from financial activities: women, the poor, the less educated, and the unemployed.

The ownership of digital financial devices, including mobile phones, and mobile money accounts serves as crucial indicators of financial inclusion because ownership marks the first step towards integrating individuals into the formal financial system (Shaikh S. A., 2024). Nevertheless, ownership is not enough by itself; implemented financial devices should be actively used by populations. This study will address how both variables as ownership and usage have contributed to economic growth and development and have done so in the case of female, poor, less educated, and unemployed people. Through the disaggregation of the data by these demographic factors, the current research aims to reveal the ways DFI has led to economic and developmental growth within heterogeneous African contexts. Thus, the study is important since it can inform policy. As governments, financial institutions, and development organizations actively work to improve financial inclusion that would directly result in economic growth, understanding the significance of DFI is important. Hence, the research suggests some valuable insights about the success of enabling digital finances that reach underserved populations, contributing to achieving wider economic goals. Overall, the results of the present study can inform the development of broad efforts aimed at the implementation of DFI to achieve inclusive economic growth in Africa.

Due to these implications, the study has major implications for practice and policy. As for the implications for practice, the findings of the study may suggest new, more advanced ways of improving financial inclusion in such a way that more categories of people will be able to access and benefit from financial services. The findings may also guide the development of policy guidelines that steer the implementation of measures that enhance financial stability among various people. Lastly, the study may be useful to future scholars working on the same or related topics.

1. Empirical review

In Africa, the influence of digital financial inclusion and economic growth has been examined in other empirical studies. Ikechukwu (2021) examined the correlation between mobile phones, the internet, financial inclusion, the informal economy, and poverty reduction. The study found that

mobile phones, financial inclusion, and internet usage have a positive influence on the informal economy and poverty reduction. Klyton (2020) examined the impact of the use of digital technology on economic growth in the region and found that the impact is positive and significant. The results abide with Minjin et al. (2018) and Yawe et al. (2022), who examined the influence of mobile money and digital payments on financial inclusion. Elouaourti et al. (2024) examined factors affecting digital financial services and found that low levels of education and income and poor infrastructure are significant barriers to digital financial inclusion in the region. But, Mhlanga et al. (2023) found that blockchain technology is the dominant factor in promoting digital financial inclusion. Nabieu et al. (2023) examined the financial inclusion and economic growth interrelationships in the region. The study found that financial inclusion has a positive influence on economic growth. The results correspond with the study by Olaniyi et al (2023) who also found that digital financial inclusion has reduced poverty, and inequality and increased economic growth. Elouardighi et al. (2023) analyzed the relationship between digital financial inclusion and women's labor force participation in Africa. The study found that digital financial inclusion has a positive influence on the level of women's participation in the labor market. Also, Laura (2019) examined the effects of female financial inclusion on inclusive economic development in 91 countries. The study found that there is a positive effect on economic development influenced by women's financial inclusion. The results abide with other studies by Odu (2020), Raji (2020), and Nandwa et al. (2021). Ojo (2022) took a case study from four African countries: Ghana, Kenya, Namibia, and Lesotho to examine the influence of digital financial inclusion on women's economic empowerment. The study found a significant influence of digital financial inclusion towards economic development among women in those countries, which abides with another study by Gao et al. (2022) and Mishra et al. (2016). Azu et al. (2023) found that the financial digital inclusion of women has a significant influence on their economic empowerment and labor participation rate in Africa. Ngong et al. (2024) examined the relationship between financial technology to economic growth in the East African countries. The study found a significant relationship between financial technology and economic growth. In Ghana, Amidu et al. (2018) examined the influence of mobile money on welfare and they found that mobile penetration and financial inclusion significantly increase household welfare in the country. Mishra et al. (2022) found that the use of mobile money promotes economic empowerment for the marginalized group in South Africa. These results contradict what Onwere et al. (2023) found by estimating the relationship between financial

development and economic growth in Kenya and Nigeria. The study found that in the long run, mobile banking has an insignificant impact on economic growth. Olanrewaju et al. (2024) examined the accessibility of financial services and the role of digital finance in addressing the gender gap in Nigeria. The study found that more men than women have access to digital finance platforms but digital finance has great potential to encourage financial inclusion. These results align with Shaikh et al. (2023) who found that mobile money stimulates inclusion and customer empowerment.

Manasseh et al. (2020) analyzed the effect of digital financial inclusion on economic growth in sub-Saharan Africa. The study found a causal relationship between digital financial inclusion and economic growth in the long run. The results align with Ugwuanyi et al. (2022), who found that digital financial inclusion has a positive and significant impact on economic growth across income levels. Green et al. (2023) used a sample from sub-Saharan Africa and the rest of the world and found that mobile money positively affects economic growth through direct and indirect channels. Specifically, mobile money tends to improve financial inclusion which in turn promotes growth. The results abide with another study by Ahmad et al. (2020), who also found the positive significant influence of mobile money on financial inclusion and growth in Sub-Saharan countries.

Taking a case study from countries outside Africa, Ozturk et al. (2022) examined the effect of digital financial inclusion on economic growth in one Belt and Road Initiative (OBRI). The study found that digital financial inclusion increases economic growth. Geng et al. (2021) also conducted a case study on countries along the Belt and Road (B&R) and also found that digital financial inclusion drives sustainable employment and economic growth. Wu et al. (2021) analyzed the influence of digital financial inclusion on economic growth in China and found that digital financial inclusion development has a significant contribution to economic growth. The results abide with another study by Majeed et al. (2021), who also took a case study in China. Shi et al. (2022) examine the effect of digital financial inclusion on regional economic growth in China. The study found that the development of digital financial inclusion has a significant direct promotion effect on economic growth. In India, Pradhan et al. (2021) examined the relationship between financial inclusion, mobile phones, and economic growth. The study found short and long-run causal relationships between the variables. Shen et al. (2021) examined the correlation between digital financial inclusion and economic growth in developing countries. The study found that digital financial inclusion has a significantly positive effect on economic growth. Also, Omar et

al. (2020) who examined the effect of financial inclusion on poverty reduction in developing countries, found that financial inclusion significantly reduces poverty rates and maximizes overall welfare.

While existing studies provide valuable insights into various aspects of the digital financial inclusion-economic growth relationship, there is a need for research specifically focusing on how the usage and ownership of digital financial services by marginalized and underprivileged people affect the economy in Africa. Through this analysis, this study aims to fill a gap in the literature and provide a comprehensive understanding of the role of digital finance in increasing economic growth in the region in the region. Also, by building upon existing research and addressing the regional-specific nexus of digital financial inclusion and economic growth, this study seeks to contribute valuable insights to the ongoing discourse on the issue.

2. Methodology

3.1.Sample and Data Sources

This study uses panel data from 39 African countries pooled over 3 years (2014, 2017 and 2022). The data is collected from secondary sources whereby, the dependent variable: is gross domestic product data collected from the World Bank indicators. The main independent variables: ownership and usage of digital payment for female, less educated, poor, and unemployed people data were also collected from the Global Findex Database. All other control variables which are gross capital formation, money supply, inflation rate, infrastructure, population growth, trade openness, and level of technology are also obtained from the World Bank indicators except foreign direct investment which is collected from UNCTAD.

3.2.Variables description

The GDP growth rate is the dependent variable, measured as a percentage value. The main independent variables are the ownership of digital payment which is measured by the percentage of respondents who report personally having a mobile money service in the past year and usage of digital payment which is measured by the percentage of respondents who report using mobile money, a debit or credit card, or a mobile phone to make a payment from an account. The prior expectation for all independent variables is positive, implying that an increase in the ownership and usage of digital financial services for marginalized individuals increases the economic growth

in Africa. This hypothesis is supported by other literature, such as Ikechukwu (2021), Klyton (2020), Minjin et al. (2018), Yawe et al. (2022) and Mhlanga (2023).

Other control variables that also affect the GDP growth rate are Gross capital formation a proxy for domestic investment measured in percentage of GDP, the Foreign Direct Investment (FDI) inflow measured as a percentage of GDP, money supply which is the proxy for financial deepening and is measured as a percentage of GDP, inflation rate measured in percentage growth annually, infrastructure which is proxied by air transportation, the population is the number of people in the country, trade openness is the summation of import and export, and level of technology is proxied by high-technology exports as a percentage of the GDP. The prior expectation of these variables is positive except for population, implying that an increase in gross capital formation, money supply, inflation rate, infrastructure, trade openness, and level of technology increases the GDP growth rate. This hypothesis is supported by other literature, such as Onwere (2023), Ebimobowei et al. (2023), Manasseh et al. (2020), Ugwuanyi et al. (2022), Sarpong et al. (2022), and Green et al. (2023) and this study as shown in in **Error! Reference source not found.**.

The ownership and usage variables in this study are not general population averages. Instead, they are subgroup-specific measures (e.g., digital payments by unemployed, poor, less educated individuals), as provided in the Global Findex microdata. This ensures that the analysis directly focuses on individuals from marginalized socioeconomic backgrounds.

Table 1: Variable name, definition, and source and priori hypothesis

Variable	Definition	Source	Priori expectations
Gross Domestic Product (GDP)	The annual percentage growth rate of GDP	World Bank (WDI)	
usage of digital payment services (digital)	The percentage of respondents who report using mobile money, a debit or credit card, or a mobile phone to make a payment from an account; or who report using the internet to pay bills or to buy something online or in a store in the past year.	Global Findex database	+
usage of digital payment services for females (digitalpf)	The percentage of respondents who report using mobile money, a debit or credit card, or a mobile phone to make a payment from an	Global Findex database	+

	account; or who report using the internet to pay bills or to buy something online or in a store in the past year for female (% age 15+)		
usage of digital payment services for less educated (digitalpeduc)	The percentage of respondents who report using mobile money, a debit or credit card, or a mobile phone to make a payment from an account; or who report using the internet to pay bills or to buy something online or in a store in the past year for primary educated or less (% ages 15+)	Global Findex database	+
usage of digital payment services for poor (digitalpoor)	The percentage of respondents who report using mobile money, a debit or credit card, or a mobile phone to make a payment from an account; or who report using the internet to pay bills or to buy something online or in a store in the past year for poorest 40% (% ages 15+)	Global Findex database	+
usage of digital payment services for unemployed (digitalunemp)	The percentage of respondents who report using mobile money, a debit or credit card, or a mobile phone to make a payment from an account; or who report using the internet to pay bills or to buy something online or in a store in the past year for unemployed (% ages 15+)	Global Findex database	+
ownership of digital payment service (moacc)	The percentage of respondents who report personally having a mobile money account in the past year.	Global Findex database	+
ownership of digital payment service for females (moaccf)	The percentage of respondents who report personally having a mobile money account for females in the past year.	Global Findex database	+
ownership of digital payment service for less educated (moaccpeduc)	The percentage of respondents who report personally having a mobile money account for primary education or less in the past year.	Global Findex database	+
ownership of digital payment services for the poor (moaccpoor)	The percentage of respondents who report personally having a mobile money account for the poor in the past year.	Global Findex database	+
ownership of digital payment service for the unemployed (moaccunemp)	The percentage of respondents who report personally having a mobile money account for the unemployed in the past year.	Global Findex database	+
Gross capital formation (gcf)	Gross capital formation (% of GDP)	World Bank (WDI)	+
Money supply (ms)	Broad money (% of GDP)	World Bank (WDI)	+

Inflation rate (infl)	Inflation, consumer prices (annual %)	World Bank (WDI)	+
Trade	The summation of import and export (% of GDP)	World Bank (WDI)	+
Population (pop)	The number of people in the country	World Bank (WDI)	-
Infrastructure (lninfras)	Air transport, registered carrier departures worldwide	World Bank (WDI)	+
level of technology (tech)	high-technology exports (% of GDP)	World Bank (WDI)	+
Foreign direct investment (fdi)	Foreign direct investment inflow (% of GDP)	UNCTAD	+

3.3.Model specification

For regression analysis, the econometric model is formulated which includes the coefficients and error term. To incorporate the dynamic behavioral relationship of economic growth in each country, fixed effect panel model is estimated. Therefore, the two econometric models (representing digital usage and ownership) are specified as follows:

$$gdprate_{it} = \alpha_0 + \alpha_1 digital_{it} + \alpha_2 gcf_{it} + \alpha_3 ms_{it} + \alpha_4 inf_{it} + \alpha_5 trade_{it} + \alpha_6 lnpop_{it} + \alpha_7 lninfras_{it} + \alpha_8 tech_{it} + \alpha_9 fdi_{it} + \mu_i + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$gdprate_{it} = \alpha_0 + \alpha_1 moacc_{it} + \alpha_2 gcf_{it} + \alpha_3 ms_{it} + \alpha_4 inf_{it} + \alpha_5 trade_{it} + \alpha_6 lnpop_{it} + \alpha_7 lninfras_{it} + \alpha_8 tech_{it} + \alpha_9 fdi_{it} + \mu_i + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Whereby, α_0 is the intercept term that measures the impact on economic growth when all the independent variables are zero. The coefficients $\alpha_1 \ldots \alpha_9$ measure the impact magnitude of each variable has on economic growth, ε is the error term capturing all other factors that the study did not include in the model but affect the dependent variable. μ_i represents the unobserved effect which is country-specific. They are assumed to be different across the country i while they are fixed over time. Finally, i and t represent the specific country and time period (yearly) respectively.

Although fixed and random models take into account country-specific heterogeneities, the difficulty arises when the lagged variables are correlated with the error term even if I assume that the disturbances are not themselves auto-correlated (M. Babajide Wintoki, 2012). To reduce these

problems I will employ the Arellano-Bond/Blundell-Bond estimator which addresses the problem of omitted variable bias, endogeneity, and unit root effects in the choice of instruments (Bond M. A., 1991; Bond R. B., 1998; Bover, 1995; Holtz-Eakin, 1988).

We first differentiate the variables to remove any major bias that may arise in the time-variant variable heterogeneity. Then these first differences are used as instrument variables in an equation with level variables (D.Roodman, 2009). Therefore, this system of equations where both the differenced and level variables are incorporated in one equation is called the system Generalized Methods of Moments (GMM).

$$\begin{bmatrix} \boldsymbol{gdprate_{it}} \\ \boldsymbol{\Delta gdprate_{it}} \end{bmatrix} = \boldsymbol{\alpha} \begin{bmatrix} \boldsymbol{gdprate_{it-1}} \\ \boldsymbol{\Delta gdprate_{it-1}} \end{bmatrix} + \boldsymbol{\beta} \begin{bmatrix} \boldsymbol{lnX_{it}} \\ \boldsymbol{\Delta lnX_{it}} \end{bmatrix} + \boldsymbol{\varepsilon_{it}} \dots\dots\dots.\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.. \boldsymbol{(3)}$$

Whereby Δ means the difference and t-1 means the lag term. Arellano-Bond developed moment conditions by using the lagged levels of the dependent variables and determined variables with the first differences of the disturbances. However, according to Arellano and Bover, 1995; Blundell and Bond, 1998, the lagged levels can be weak instruments if the autoregressive process is too persistent. Therefore, Arellano and Blundell suggested using extra moment conditions whereby there is an orthogonal relationship between the lagged changes of dependent variables and the level of the disturbances

To ensure the robustness of the panel estimates, we tested for cross-sectional dependence using the Pesaran CD test. Results indicated no significant cross-sectional dependence, confirming that fixed effects and system GMM estimates are unbiased. Furthermore, the inclusion of robust standard errors corrected for potential heteroskedasticity and serial correlation

3. Estimation Results

4.1. Regression analysis between usage of digital financial service and economic growth

Table 2 represents a Fixed Effect (Fe) regression analysis between the usage of digital financial services and economic growth. The results show that the usage of digital financial services has a positive and statistically significant impact on the economic growth of all marginalized groups in Africa. The positive coefficients imply that an increase in the usage of digital financial services for females, less educated, poor, unemployed, and overall, increases the economic growth rate by

0.104, 0.131, 0.116, 0.110, and 0.0982 percent respectively. The results correspond with the priori hypothesis of the study and other studies by Ikechukwu (2021), Klyton (2020), Minjin et al. (2018), Yawe et al. (2022), Mhlanga (2023), Onwere (2023), Ebimobowei et al. (2023), Manasseh et al. (2020), Ugwuanyi et al. (2022), Sarpong et al. (2022), and Green et al. (2023).

Control variables that also abide by the priori hypothesis are gross capital formation (columns 2-4), money supply (columns 2 and 3), inflation rate, population growth, trade openness, and level of technology (columns 1, 3, and 4). The coefficients representing gross capital formation, money supply, inflation rate, trade openness, and level of technology are positive and significant implying that an increase in these factors increases the economic growth in Africa. The coefficient representing population is negative and statistically significant implying that an increase in population decreases the economic growth in the region.

These results underwent some diagnostic tests which justify the results. The Hausman test is used to determine whether the random or fixed effects model is an appropriate model to use in analyzing panel data in this study. The results show the p-values are 0.0001, 0.0069, 0.0120, 0.0154, and 0.0151 for all the columns which are less than 1 percent, which means the study rejects the null hypothesis that difference in coefficient is not systematic and concludes that fixed effect model is appropriate than random effect model.

Table 2: Fixed effect estimation: The dependent variable is the GDP growth rate

Model	Fe	Fe	Fe	Fe	Fe
Variables	gdprate	Gdprate	gdprate	gdprate	gdprate
Digital	0.104**				
	(0.0435)				
digitalpeduc		0.131***			
		(0.0397)			
digitalpoor			0.116**		
			(0.0423)		
digitalunemp				0.110**	
				(0.0468)	
digital					0.0982**
					(0.0414)
gcf1	0.110	0.113*	0.114*	0.116*	0.107
	(0.0662)	(0.0613)	(0.0645)	(0.0668)	(0.0662)
ms	0.0634	0.0645*	0.0629*	0.0583	0.0632
	(0.0372)	(0.0337)	(0.0359)	(0.0381)	(0.0373)
infl	0.0576**	0.0503**	0.0527**	0.0584**	0.0558**

	(0.0225)	(0.0212)	(0.0222)	(0.0225)	(0.0227)
trade	0.0793*	0.0977**	0.0988**	0.0864**	0.0943**
	(0.0417)	(0.0383)	(0.0402)	(0.0415)	(0.0413)
lnpop	-13.84**	-14.87***	-13.41**	-12.29**	-13.52**
	(5.485)	(4.776)	(4.984)	(5.095)	(5.418)
lninfras	0.110	0.0216	0.155	0.144	0.0780
	(0.358)	(0.333)	(0.340)	(0.355)	(0.364)
tech	0.0940*	0.0691	0.0906*	0.0975*	0.0900
	(0.0542)	(0.0514)	(0.0529)	(0.0542)	(0.0545)
fdi1	-0.123	-0.137	-0.145	-0.153	-0.135
	(0.108)	(0.101)	(0.106)	(0.110)	(0.109)
Constant	218.3**	234.7***	209.8**	192.5**	212.2**
	(91.70)	(79.71)	(83.03)	(85.20)	(90.36)
Observations	61	61	61	61	61
R-squared	0.580	0.638	0.601	0.577	0.578
Number of id	26	26	26	26	26

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Error! Reference source not found. represents a system GMM analysis between the usage of digital financial services and economic growth. The results show that the usage of digital financial services has a positive and statistically significant impact on economic growth across all marginalized groups in Africa. The positive coefficients imply that an increase in the usage of digital financial services for females, less educated, poor, and unemployed, overall, increases the economic growth rate by 0.0735, 0.0884, 0.0896, 0.0901, and 0.0663 percent respectively. The results correspond with the priori hypothesis of the study and other studies by, Mhlanga (2023), Onwere (2023), Ebimobowei et al. (2023), Sarpong et al. (2022), and Green et al. (2023).

Table 3: System GMM estimation: The dependent variable is the GPD growth rate

Model	sys-gmm	sys-gmm	sys-gmm	sys-gmm	sys-gmm
Variables	gdprate	gdprate	gdprate	gdprate	Gdprate
L.gdprate	0.365**	0.386**	0.344**	0.356**	0.371**
	(0.170)	(0.166)	(0.173)	(0.173)	(0.168)
digital	0.0663***				
	(0.0209)				
digitalf		0.0735***			
		(0.0235)			
digitalpeduc			0.0884***		
			(0.0276)		

digitalpoor				0.0896***	
				(0.0283)	
digitalunemp					0.0901***
					(0.0284)
Observations	78	78	78	78	78
Number of id	39	39	39	39	39

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.2. Regression analysis between ownership of the digital financial account and economic growth

Table 4 represents a Fixed Effect (Fe) regression analysis between ownership of mobile money accounts and economic growth. The results show that ownership of digital financial accounts has a positive and statistically significant impact on the economic growth of all marginalized groups in Africa. The positive coefficients imply that an increase in the ownership of digital financial accounts for females, less educated, poor, unemployed and overall, increases the economic growth rate by 0.120, 0.136, 0.114, 0.117, and 0.104 percent respectively. The results correspond with the priori hypothesis of the study and other studies by Ahmad (2020), Alhassan et al. (2021), Jungo et al. (2022), and Pradhan et al. (2021).

Control variables that also abide by the priori hypothesis are gross capital formation (columns 1 and 2), money supply, inflation rate, population growth, trade openness (columns 2-5), and level of technology. The coefficients representing gross capital formation, money supply, inflation rate, trade openness, and level of technology are positive and significant implying that an increase in these factors increases the economic growth in Africa. The coefficient representing population is negative and statistically significant implying that an increase in population decreases the economic growth in the region.

These results underwent some diagnostic tests which justify the results. The Hausman test is used to determine whether the random or fixed effects model is an appropriate model to use in analyzing panel data in this study. The results show the p-values are 0.0102, 0.0108, 0.0205, 0.0203, and 0.0144 for all the columns which are less than 1 percent, which means the study rejects the null hypothesis that difference in coefficient is not systematic and concluding that fixed effect model is appropriate than random effect model.

Table 4: Fixed effect estimation: The dependent variable is GPD growth rate

Model	Fe	Fe	Fe	Fe	Fe
Variables	gdprate	gdprate	gdprate	gdprate	gdprate
moaccf	0.120***				
	(0.0425)				
moaccpeduc		0.136***			
		(0.0425)			
moaccpoor			0.114**		
			(0.0435)		
moaccunemp				0.117**	
				(0.0539)	
moacc1					0.104**
					(0.0391)
gcf1	0.115*	0.123*	0.108	0.109	0.105
	(0.0641)	(0.0622)	(0.0650)	(0.0674)	(0.0646)
ms	0.0757**	0.0759**	0.0757**	0.0771**	0.0744**
	(0.0345)	(0.0333)	(0.0352)	(0.0364)	(0.0351)
infl	0.0585**	0.0534**	0.0556**	0.0590**	0.0578**
	(0.0215)	(0.0211)	(0.0222)	(0.0228)	(0.0219)
trade	0.0646	0.0740*	0.0793*	0.0769*	0.0788*
	(0.0412)	(0.0392)	(0.0411)	(0.0427)	(0.0410)
lnpop	-15.10***	-14.39***	-12.10**	-12.41**	-14.07**
	(5.379)	(4.823)	(4.871)	(5.444)	(5.305)
lninfras	0.100	0.107	0.200	0.198	0.111
	(0.345)	(0.330)	(0.342)	(0.358)	(0.350)
tech	0.113**	0.109**	0.113**	0.111*	0.117**
	(0.0522)	(0.0504)	(0.0531)	(0.0549)	(0.0529)
fdi1	-0.128	-0.115	-0.124	-0.124	-0.125
	(0.105)	(0.101)	(0.106)	(0.110)	(0.106)
Constant	240.0**	227.5***	189.4**	194.5**	222.2**
	(89.97)	(80.54)	(81.35)	(90.90)	(88.60)
Observations	59	59	59	59	59
R-squared	0.615	0.640	0.601	0.573	0.604
Number of id	25	25	25	25	25

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5 represents a system GMM analysis between ownership of mobile money accounts and economic growth. The results show that ownership of mobile money accounts has a positive and statistically significant impact on economic growth across all marginalized groups in Africa. The positive coefficients imply that an increase in the ownership of mobile money accounts for female, less educated, poor, and unemployed overall, increases the economic growth rate by 0.0735, 0.0884, 0.0896, 0.0901, and 0.0663 percent respectively.

Table 5: System GMM estimation: The dependent variable is the GPD growth rate

Model	(sys-gmm)	(sys-gmm)	(sys-gmm)	(sys-gmm)	(sys-gmm)
Variables	gdprate	gdprate	gdprate	gdprate	gdprate
L.gdprate	0.404**	0.411**	0.363*	0.399**	0.408**
	(0.173)	(0.171)	(0.187)	(0.170)	(0.173)
moacc1	0.0947***				
	(0.0325)				
moaccf		0.106***			
		(0.0364)			
moaccpeduc			0.140***		
			(0.0483)		
moaccpoor				0.131***	
				(0.0438)	
moaccunemp					0.135***
					(0.0467)
Observations	76	76	76	76	76
Number of id	38	38	38	38	38

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Discussion and Conclusion

The findings of this research paper confirm that digital financial inclusion has a strong and transformative effect on economic growth in Sub-Saharan Africa, particularly for several disadvantaged groups like women, the poor, the less educated, the jobless, and others. These findings support prior research by Mhlanga (2023) and Minjin et al. (2018), who established that digital access can stimulate inclusive economic development. Notably, the significance of usage and ownership among women and the poor echoes the conclusions of Azu et al. (2023) and Elouardighi et al. (2023), highlighting the critical role digital inclusion plays in female empowerment and labor market participation. However, the results differ from Iddrisu et al. (2022), who found no significant effects suggesting that country-specific infrastructure, policy environments, and digital literacy may moderate the impacts of financial inclusion. As the majority of this population has a high rate of access exclusion, mobile-based services are breaking this barrier, and those households are now able to grow their economic output and increase their income-generating ability, contributing to their improved living standards. Economically, women benefit from financial inclusion in this manner by providing the financial ability to start and expand businesses, invest in their children's health and education, and secure financial independence. This

has not only helped individual women and their children, but it has also spurred broader development and gender equality. Among the poor and less educated, digital financial inclusion has improved access to economic opportunities. For instance, they cannot save with local institutions, but with mobile money, save with banks, and choose better loans. This way, they can invest in profitable income-generating activities, upgrading the standard of living. A sufficient mobile account and other digital financial management tools give the poor the necessary resources for handling extreme risk and seizing the economic opportunities that arise. Finally, the jobless have grown through digital financial inclusion. For example, digital modes make it easier for people to work because there are no entry obstacles.

Thus, the proven positive and statistically significant influence of digital financial services on economic growth for all these marginalized groups indicates the indispensable role of financial inclusion in promoting sustainable development. This study implies that policymakers concerned with financial institutions and development-oriented organizations could use this information to develop and implement coherent strategies to increase the uptake of digital financial services among the disadvantaged. By so doing, they would be able to fasten the pace of economic growth to related exponents, with inclusivity and socio-transformational equity forming the edifice of an economic-friendly economy for everyone in Africa. From the discussion above, I would assert that digital financial inclusion in Africa is a great weapon for economic growth and socio-transformation. Towards the direction of sustainable development and inclusivity. Africa would realize some of the greatest moments, raining every potential candidate down in the stream of economic strides.

Policy recommendations

Based on the findings of this study, which showed that digital financial inclusion had a statistically significant positive effect on economic growth for marginalized populations in Africa, the following policy recommendations have been suggested to realize the above benefits and promote inclusive economic growth. *Digitization of Financial Infrastructure*: The government should collaborate with private sector players to build and expand mobile network coverage, which is the foundation for digital access, increase internet connectivity, and make affordable digital devices widely available. As a ripple effect, this infrastructure will also make or break financial institutions

by making marginalized populations like women, the poor, the less educated, the unemployed, and others easy to access and use. *Promotion of Financial Literacy and Digital Skills*: The government should promote Financial Literacy and Digital Skills to empower marginalized populations. Governments, NGOs, and financial institutions can achieve this through the implementation of targeted training programs to equip people with the skills to use digital financial services effectively. Through these efforts, people can manage their finances better and leverage digital tools to drive economic growth.

Develop inclusive services: Financial institutions must come up with services that cater to the particular needs of the financially excluded. Some of the inclusion services include microloans, low-balance savings accounts, insurance services, and remittance services operated under a framework suitable for women, the financially weak, the less educated, and the jobless. The characteristics of inclusive services include usability, affordability, and accessibility to ensure high adoption and engagement levels.

Foster public-private collaboration: Public-private partnerships are vital to scaling digital initiatives for improving financial inclusion. It means that governments should partner with fintech, mobile network operators, and financial organizations. These collaborations will help to innovate, enhance performance, and ensure that digital financial services are utilized by the most marginalized groups.

Promote Data-Driven Policy Making: Policies should rely on data and research to ensure more efficient decision-making. Regular collection and analysis of data about digital financial inclusion should support the identification of the gaps, measuring progress and the impact of policies and initiatives. Governments should support data-sharing agreements between responsible agencies, finance institutions, and research organizations. This way, all the relevant information will be gathered and analyzed and, therefore, intervention strategies can be more personalized and effective. *Support Gender-Sensitive Approaches*: As seen above, women face particular difficulties in achieving financial inclusion. In conclusion, gender-sensitive and focused policies are critical.

Following the above policy recommendations, African countries may successfully promote digital financial inclusion through economic growth and social equity. Moreover, these specific policies ensure that not only are traditionally marginalized groups empowered but also contribute to the overall development of the countries on the continent. This way, all stakeholders are engaged and benefit from economic progress.

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FACTORS CAUSING CUSTOMERS TO RESIST ADOPTING INTERNET BANKING SERVICES IN TANZANIA

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Abstract

Innovations and technologies have significantly revolutionized the financial sector. Advances in technology have enabled banks to reach and serve more customers than when traditional banking was operational and has enhanced their efficiency and performance. Internet banking which refers to the electronic system that allows customers to conduct a range of financial transactions and access all available banking services around the clock, from anywhere as long as they have an internet connection is among the advances in banking technology. Despite the global advancement in internet banking and its numerous benefits, its adoption in Tanzania is low compared to other countries.

Employing the innovation resistance theory, this study aimed to understand the factors influencing customers' resistance to adopting internet banking services. Specifically, the study focused on the effect of functional (value, usage, and risk) and psychological (image and tradition) barriers. A quantitative approach was used, and data were randomly collected from bank customers in the Dar es Salaam Region. Multiple regression analysis was used to establish the extent of the relationship.

The results indicate that Value, Image, and tradition barriers significantly influence customers' resistance to adopting internet banking services, while the risk barrier does not. The results conform with the innovation resistance theory, showing that both practical concerns and emotional or personal factors contribute significantly to resisting the adoption of innovations. The study highlights the need for policymakers and banks to enhance initiatives that will enable more customers to see the value of internet banking, hence increasing their adoption. Banks and financial institutions need to enhance their communication, customer education, and support services to increase customers' trust in the internet banking technology. Further, they have to continue offering an integration of digital and in-person services, to allow customers to build trust in internet banking over time and gradually transform to the same.

1.0 Introduction

Internet banking has transformed the financial sector from traditional banking business and enhanced financial inclusion. Several efforts have been made by financial service providers and internet providers to ensure the platform get the required attention among the existing and prospective bank customers (Kessy, 2021; Teka, 2020). Despite the global advancement in internet banking and its numerous benefits, its adoption in Tanzania is still low compared to other countries (Chanda, 2020; Kibanda, 2020; Mihambo, 2020). According to TCRA (2024), 48 million Tanzanians have access to internet services. This is a 16.1% increase from September 2024. This is equivalent to 71% of the estimated Tanzania population. FinScope (2023) indicates that 75% of the adult population owns a mobile phone, and 98% have network coverage in their areas. Formal financial inclusion increased from 65% in 2017 to 76% in 2023. However, data shows that for the past five years, the transactions passed via internet banking were less than 10% of all transactions conducted in the country (BOT, 2023). Furthermore, Kibanda (2020) observed that some of giant Banks in Tanzania still serve long queues customers throughout the day. FinScope (2023) shows that the percentage of those who use bank transfers in their transactions reached only 5% in 2023 and increase of only 2% from 2017. Implying that although most people have access to internet services and mobile phones, they do not use internet banking. Literature in European countries like Norway, indicate that almost 95% of the whole population have access to internet banking (Syerov et al., 2021). In the USA, over 80% of U.S. households used some form of Internet Banking (Federal Reserve, 2020). Internet banking is believed to be more convenient and low costing (Bahia et al., 2021).

Literature explains that there are functional barriers on one hand which are practical limitations or constraints that hinder the adoption and usage of innovative service (Talwar, 2021) and on the other hand, psychological barriers which pertain to the individual's perceptions, attitudes, and beliefs that may act as obstacles to accepting and using innovations (Arif et al., 2020a; Eyl & Doi, 2018; Wong, 2017). Innovation Resistance Theory (IRT) provides the foundation of this study as it gives probable causes in understanding why people might oppose or delay the acceptance of new products, services, or technologies. Empirical literature gives inconclusive results when considering different context. Moreover, Ridwan, 2022; Wong, 2017; and Yu & Chantatub, 2016) concluded that little is known about the barriers that inhibit bank customers from adopting internet banking in the context of developing countries. Wong (2017) further, argued that it is essential to consider the unique functional and psychological barriers that may influence innovation resistance in a respectable nation. Pantano et al., (2017) argued that customers from different countries, markets, and traditions can react differently to new products and innovations, even if they share the same economic level. Tanzania has diverse cultural traditions and socio-norms that may influence the acceptance or resistance towards new products or services (Kibanda, 2020). This study, thus, focused on understanding the extent at which functional and psychological barriers

influence customers to adopt internet banking in Tanzania. The study is important in assisting banks re-strategizing how to accommodate more customer efficiently. The study informs policy makers how they should formulate regulations and policies that enhance the innovation compatibility, security, and reliability of internet banking platforms.

2.0 Literature Review

Internet Banking, also known as online banking or e-banking, refers to the electronic system that allows customers of a financial institution to conduct a range of financial transactions through the internet (Andy & Sujatha, 2021). Customers using this service can typically access all available banking services around the clock, and from anywhere as far as they have an internet connection. Functional barriers on one hand include value, usage, and risk barriers. Value barrier refers to the situation where users of a certain technology do not get the relative expected advantages (Owais, 2021; Talwar et al., 2020). Usage barrier is the obstacle in the form of technology itself, if it is complex or does not match with users' habits (Talwar, 2021; Ridwan, 2022). This forces users to use a lot of effort to generate benefits, hence the slow adoption of the same. Risk barrier refers to uncertainties when there are possibilities of bad situations happening as a result of using those innovations (Owais, 2021).

Psychological barriers on the other hand include image and traditional barriers. Image barrier refers to perceptions toward a certain technology innovation due to the pre-information available or information that keeps popping up (Ridwan, 2022; Talwar et al., 2020). Traditional barrier is a certain way of behaviour that becomes an acceptable routine in a certain community; difficult to change that behavior becomes a traditional barrier (Arif et al., 2020a; Teka, 2020).
Adopted from different references (Ridwan, 2022; Laukkanen et al., 2008; Ram & Sheth, 1989), this study considers customer resistance as any behavior developed by customers that goes contrary to adoption of new technology, in this case, internet banking.

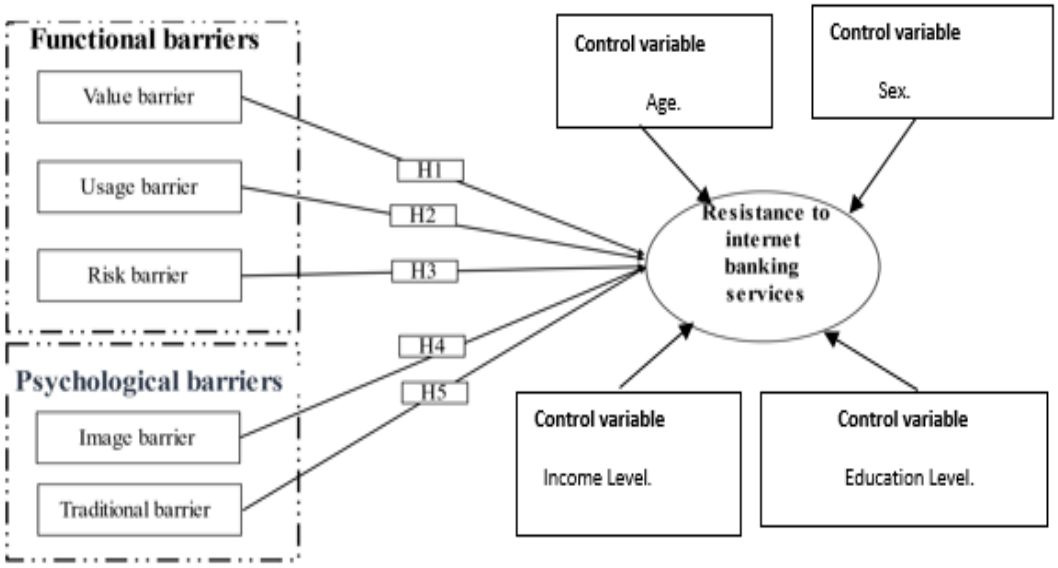
2.1 The Theory

Innovation Resistance Theory (IRT)
IRT was initially developed by Ram and Sheth in 1989 examines the reasons behind individuals' reluctance or resistance to adopt new innovations, despite their potential benefits. According to this theory, resistance can be influenced by both functional and psychological barriers (Ridwan, 2022). Functional barriers include usage, value, risk, and tradition barriers, while psychological barriers encompass image and cultural barriers (Vikas & Vipin, 2018; Yu & Chantatub, 2016). These barriers interact in complex ways to shape consumer attitudes and behaviors towards innovation adoption. Functional barriers, such as the perceived complexity or incompatibility of an innovation with existing workflows, can deter potential adopters who fear disruptions in their routine. Psychological barriers, on the other hand, can stem from a lack of trust in innovation or a strong attachment to established practices and cultural norms. Recent studies have expanded Innovation Resistance Theory application across various domains, including digital innovations,

sustainable products, and organic food consumption. For instance, a study by Talwar et al. (2020) examined the resistance to digital innovations in the retail finance sector, specifically focusing on barriers like image, usage, tradition, risk, and value, and how these barriers vary with demographic factors such as age and gender.

The Conceptual Framework of the Study

Independent Variable Dependent Variable



Source: Adopted from Patsiotis, Hughes, & Webber (2021)

2.2 Empirical Literature and Hypotheses

A study conducted in Madurai city-India with the aim of assessing customers' attitudes towards problems of internet banking services, revealed that consumers were seriously affected by poor internet connection, low speed, forgeries of password, and complexity of procedures designed to deliver the internet banking services (Andy & Sujatha, 2021). The same was reported by (Shneor & Munim, 2019). Yu & Chantatub (2016) assessed the influence of risk barrier, traditional barrier, value barrier, image and usage barrier to the adoption of e-banking in Thailand and Taiwan. They established that both countries did not have the problem of traditional barrier pertaining adoption of e- banking services. The rest of the constructs proved to be causative of low adoption of e-banking in both countries. Borraz-mora et al., (2017) find similar results.

Arif et al., (2020) conducted a study in Karachi, Pakistan to establish the obstacles in adopting internet banking using 300 responses from bank customers. The study revealed that the traditional barrier was not among the barriers that inhibit male customers from adopting internet banking. Image barrier, risk barrier, value barrier, and usage barrier were found to be among the factors constraining mostly female customers from adopting banking innovation. Atienza (2018), using Innovation Resistance theory and data from 212 respondents in Ozamizy City, Philippines,

explored the effect of socio-economic influence in internet banking. The study observed that customers are frequent users of the internet, mobile phones, and computers. Further, they have a positive image on internet platforms, but indicate that risk barriers are so high, especially to elder customers, that they impede them from adopting mobile banking innovations. The study also observed that highly educated customers with high socio status and better income were early adopters of internet banking. Modabberniya et al., (2020) observed that low adoption of internet banking in Tehran was mostly caused by difficulties in using internet banking technology. AbdElMohsen & AbdElAziz (2020) observed that non adoption of internet banking in Budapest was due to the complexity of the technology. Customers considered the online banking platform design to be unfriendly. In Ekiti State, Nigeria, Omotayo & Akinyode (2020) examined the reasons for resistance to internet banking among elderly banking customers. It was found out that most elder customers prefer to use traditional banking systems. For the few who use internet banking, convenience was the main reason. The study also established that customers who did not use internet banking were not aware of the technology and were worried about security matters. Aidonojie et al., (2022) further, in Nigeria established that the lack of specific legislation to protect digital banking in Nigeria, poor internet infrastructure, and increased cyber fraud are among the challenges for digital banking. In Tanzania, there is a proper regulatory system for digital banking, well well-established internet infrastructure, but yet, the level of internet banking usage by customers in questionable.

Talwar et al., (2020) applied also the innovation resistance theory (IRT) to examine the barriers to positive purchase intentions toward online travel agencies. Results suggested the benefits barrier to be the chief inhibitor of purchase intentions. Furthermore, privacy and security concerns and the vulnerability barriers show a positive association with purchase intentions. Apaua & Lallie (2022), observed the institutional and technological trust to be key predictors of mobile banking adoption in India while perceived risk was not a significant factor. Ilmudeen & Bao (2019) also established that in Sri Lanka, perceived risk, security, and privacy concerns did not significantly affect internet banking acceptance. Trust and website usability on the other hand, were more influential. AlSoufi & Ali (2014), also found that perceived cost and risk were not statistically significant for mobile banking adoption in the Kingdom of Bahrain, whereas perceived usefulness and ease of use were.

The reviewed literature identifies different reasons for banking customers to resist adopting and using digital banking, internet banking being one among them. The findings, however, are neither consistent nor conclusive. They differ in different countries due to the perception customers have on the use of the said technology. This study, therefore, hypothesizes as follows:

H_1: Value barrier positively influences internet banking customer resistance.
H_2: Usage barrier positively influences internet banking customer resistance.
H_3: Risk barrier positively influences internet banking customer resistance.
H_4: Image barrier positively influences internet banking customer resistance.
H_5: Traditional barrier positively influences internet banking customer resistance.

3.0 Methodology

The quantitative explanatory design was employed to explain the relationship between value, usage, risk, image and traditional barriers (independent) variables and the resistance to adoption of internet banking services (dependent) variable. A random sample of 200 banking customers in Dar es Salaam, a major city in Tanzania, was used. This is the city where most systems are well developed. Further, there is a mixture of people of all tribes, and therefore, cultural diversity. There are also people with different levels of education as well as income. A well semi-structured questionnaire was used to collect data.

Variables were measured using a Likert-type scale. Likert scale is particularly relevant to studies that are objectively designed, where respondents indicate their level of agreement with a structured set of statements (Cooper and Schindler, 2014; Bryman and Bell, 2011). A 5-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree" was used as it was deemed appropriate for this study. Table 3.1 provides details of the study variables. The control variables were gender, age, education and income.

Table 3.1: Variable Measurements

Variables	Definition
Dependent	
Resist Internet Banking	Five questions reflecting unwillingness to adopt internet banking innovation that allows customer to personally handling and receiving banking services via internet – Likert scale
Independent	
Value Barrier	Six questions reflecting unwillingness in adopting internet banking technology due to the facts of not getting the relative advantages as expected.– Likert scale
Usage Barrier	Six questions reflecting obstacle created by the internet banking technology being very complex or not matching with daily habits of the users, thus users must engineer a lot of efforts to benefit – Likert scale
Risk Barrier	Five questions reflecting possibility of uncertainties to happen while adopting the internet banking technology – Likert scale.
Image Barrier	Five questions reflecting the perception towards adoption of the internet banking technology/ innovation – Likert scale.
Traditional Barrier	Five questions reflecting the psychological barrier caused by unwillingness of customers from changing their routine accepted habits, lifestyles, and values – Likert scale
Control	
Gender	measured as a binary variable: Male =1 and Female = 2;
Age	Measured categorically;
Income level	Measured categorically;
Education level	defined as a binary variable equal to 1 if the customer had a Bachelor's Degree or higher and 0 if it was below a Bachelor's Degree

A Likert scale of 1 to 5 was used, where by 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree.

3.1 Analysis and Findings

3.1.1 Descriptive Analysis

Respondents' Profile

Description of the characteristics of the respondents is provided in Table 3.2.

Table 3.2: Characteristics of the Respondents [N = 200]

Characteristics	Frequency	Valid Percent
Gender		
Female	92	46
Male	108	54
Age:		
Below 18	4	2.0
18-30	63	31.5
31-40	76	38.0
41-50	44	22.0
Above 51	13	6.5
Education		
Doctorate Degree	2	1.0
Master Degree	21	10.5
Bachelor Degree	37	18.5
Professional Qualification	4	2.0
College Certificate & Diploma	81	40.5
Secondary Education	37	18.5
Primary Education	18	9.0
Employment Status		
Formally employed (White Color)	113	56.5
Not employed	36	18
Self employed	51	25.5
Employment Position		
Managerial/Senior position	82	41
Junior position	82	41
Not applicable (not employed)	36	18
Income Level		
Below 270,000	69	34.5
From 270,001-520,000	35	17.5
From 520,001-760,000	28	14.0
From 760,001 -1,000,000	35	17.5
Above1,000,000	33	16.5
Use of Internet Banking		

Characteristics	Frequency	Valid Percent
Not aware of it	7	3.5
Never	29	14.5
No	32	16.0
Yes	132	66.0

Table 3.2 indicates that the majority of the respondents were male (54%). The distribution indicates a gender disparity among the respondents. Age-wise, the majority tends to be the youth category (between 18 and 40 years). The majority of the respondents had either a college certificate and diploma (40.5%) or a University degree (30%), suggesting they are likely capable of understanding internet banking applications. However, 30.5% were not using internet banking. As for the occupation, the majority are employed in white color jobs (56.5%). A significant percentage are also self-employed (25.5%). Cross tabulation was conducted to establish the relationship between different categorical characteristics of respondents against the use of internet banking. This analysis assists in revealing patterns and associations that might not be immediately shown in raw data. Table 3.3 gives the results of the cross-tabulation analysis.

Table 3.3: Cross Tabulation between Respondents' Characteristics and Internet Banking Use [N = 200]

		Uses_Internet_Banking						
		Not aware of it		Never/No		Yes		Total
Age	Below 18	0	0%	3	2%	1	1%	4
	18-30	0	0%	20	10%	43	22%	63
	31-40	2	1%	24	12%	50	25%	76
	41-50	3	2%	9	5%	32	16%	44
	Above 51	2	1%	5	3%	6	3%	13
	Total	7	3.5%	61	30.5%	132	66.0%	200
Gender	Female	4	2%	29	15%	59	30%	92
	Male	3	2%	32	16%	73	37%	108
	Total	7	3.5%	61	30.5%	132	66.0%	200
Education	Doctorate Degree	0	0.0%	0	0.0%	2	1.0%	2
	Master's degree	0	0.0%	9	4.5%	12	6.0%	21

	Bachelor's degree	1	0.5%	13	6.5%	23	11.5%	37
	Professional Qualification	0	0.0%	1	0.5%	3	1.5%	4
	College certificate & Diploma	4	2.0%	21	10.5%	56	28.0%	81
	Secondary education	0	0.0%	14	7.0%	23	11.5%	37
	Primary education	2	1.0%	3	1.5%	13	6.5%	18
	Total	7	3.5%	61	30.5%	132	66.0%	200
Employment status	Formal employed (White Color)	4	2.0%	39	19.5%	70	35.0%	113
	Not employed	1	0.5%	11	5.5%	24	12.0%	36
	Self employed	2	1.0%	11	5.5%	38	19.0%	51
	Total	7	3.5%	61	30.5%	132	66.0%	200
Income_level	Below 270,000	4	2.0%	18	9.0%	47	23.5%	69
	From 270,001-520,000	0	0.0%	7	3.5%	28	14.0%	35
	From 520,001-760,000	1	0.5%	8	4.0%	19	9.5%	28
	From 760,001 - 1,000,000	1	0.5%	15	7.5%	19	9.5%	35
	Above1,000,000	1	0.5%	13	6.5%	19	9.5%	33
	Total	7	3.5%	61	30.5%	132	66.0%	200

Results indicate that most users of the internet banking are aged between 18 and 40 years (47%), and they are male (37%). 30.5% have not used internet banking, while 4% are not even aware of the service. Interestingly, of the 66% who use the service, 28% are those with college certificates and diplomas. Most of these have white color jobs and are at the income level of TZS 520,000 and below. Talwar (2021) observed that not all bank customers who subscribed to internet banking are frequent users. That some were proved to be dormant users, probably due to different reasons like high-risk notions, cultural conservatism, and usage barriers. Our results suggest that the young population with low-level income is more likely to take risks of using new technologies. The frequency of usage is shown in Table 3.4, where 50% use once or more than once a day for paying bills, checking their bank statements, and performing different financial transactions, as indicated in Table 3.5.

Table 3.4: Usage Frequency

	Frequency	Valid Percent
I don't use at all	68	34.0
Not every day	31	15.5
Once in a day	62	31.0
More than one time in a day	39	19.5
Total	200	100.0

Table 3.5: Usage Purpose

	Frequency	Valid Percent
Conducting financial transactions and checking Account balances and statements	25	12.5
Financial transactions, checking Account statements, and Online bill payments	80	40.0
Online bill payments	27	13.5
I'm not using it at all	68	34.0
Total	200	100.0

The study used a principal component factor analysis, given that the study used a Likert scale in capturing the variables (Hair et al., 2010). Factor analysis identifies internal attributes that can explain the covariation observed among a set of observed variables. A principal-axis factor was also used to extract the factors with an eigenvalue higher than 1 (Hair et al., 2010). Table 3.6 presents the Likert-based questions, factor loadings, and the reliability result (Cronbach alpha).

Table 3.6: Variables, Indicators, and Factor Loadings

	Variable	Factor Loadings	Cronbach Alpha Coefficient
	Value Barrier		0.662
VB1	The use of Internet banking services is economical*	0.670	
VB2	I own a computer/phone which can access internet services*	0.482	
VB3	The use of Internet banking services increases my ability to control my financial matters*	0.770	
VB4	The use of Internet banking is a convenient way to manage my financial transactions*	0.770	
VB5	The use of Internet banking is very helpful in my financial transactions*	0.570	
VB6	I like to make use of technology*	0.562	
	Usage Barrier		0.655
UB1	Internet banking services are easy to use*	0.495	
UB2	I don't have any problem with using internet banking (as the technology itself) *	0.893	
UB3	I can easily do myself online banking transactions *	0.783	
UB4	The use of Internet banking services is very convenient and stress free*	0.369	
UB5	Internet banking services are fast to use*	0.394	
UB6	The use of changing PIN codes in Internet banking services is convenient*	0.695	
	Risk Barrier		0.623
RB1	My money can easily be stolen if I use Internet banking	0.778	
RB2	I am not feeling totally safe providing personal information over Internet banking	0.573	
RB3	I am worried about using Internet banking because other people may be able to access my account	0.688	
RB4	I don't trust at all the Internet banking system as it is not secure	0.707	
RB5	Internet banking systems can be attacked or hacked easily	0.858	
	Image Barrier		0.577
IB1	New technology is often too complicated to use.	0.517	

	Variable	Factor Loadings	Cronbach Alpha Coefficient
IB2	I have such an image that Internet banking services are challenging to use.	0.627	
IB3	Internet banking make me feel frustrated	0.667	
IB4	Internet banking make me feel anxious	0.427	
IB5	I don't trust Internet banking as my transactions maybe be treated wrongly.	0.317	
	Traditional Barrier		
TB1	Visiting the bank branch and chatting with the teller is a nice occasion.	0.648	0.648
TB2	I find personal customer service more pleasant than self-service alternatives	0.585	
TB3	I prefer to carry out my financial transactions through the bank branch rather than using Internet banking services as I feel safe over there	0.655	
TB4	I am so used to the means provided by the bank branch to do the financial transactions that I find it difficult to move to Internet banking.	0.623	
TB5	I have fewer problems in using bank branches for my transactions than internet banking.	0.248	
	Resistance to Internet Banking		0.666
RIB1	I would use Internet banking for all my banking needs*	0.652	
RIB2	I see myself using Internet banking always when handling my banking transactions*	0.452	
RIB3	I intend not to stop using Internet banking in the future*	0.752	
RIB4	I will recommend others to use Internet banking*	0.622	
RIB5	I'm willing to buy internet bundles for the purpose of using Internet banking services*	0.552	

A description analysis of the factors causing customers to resist adopting internet banking is given in Table 3.7 [N = 22].

Table 3.7: Description Analysis of the Variables

Attribute	Mean	Std. Deviation
Value Barrier	3.634	.7325
Usage Barriers	3.286	.6899

Risk Barrier	3.793	.7177
Image Barrier	3.896	.7549
Traditional Barrier	3.864	.7457

Source: Survey Data, 2024

The results indicate that on average, the respondents agree that all mentioned factors influence their adoption level to internet banking. As shown in Table 3.7, the average scores for all variables are above 3.8. Image barriers i.e. the perception toward new technology seem to be highly perceived to be the relative leading factor towards resistance in adopting internet banking. Composite means were further established and Pearson correlation analysis was conducted to establish the association among the variables as shown in Table 3.8.

Table 3.8: Correlation Analysis

Variable	ValueBarrier	UsageBarrier	RiskBarrier	ImageBarrier	TraditionalBarrier	ResistanceIB	Gender	Age	Income	Education
ValueBarrier	1									
UsageBarrier	.973**	1								
RiskBarrier	-.461**	-.499**	1							
ImageBarrier	.362**	.515**	-.503**	1						
TraditionalBarrier	-.432**	-.477**	.508**	-.429**	1					
ResistanceIB	.361**	.499**	.300**	.303**	.408**	1				
Gender	-.145*	-0.107	0.120	0.005	-0.071	0.120	1			
Age	.284**	.329**	-.351**	-.448**	-0.067	-.351**	0.028	1		
Income	.326**	.375**	-.427**	-.566**	-.192**	-.427**	0.018	.552**	1	

Variable	Value Barrier	Usage Barrier	Risk Barrier	Image Barrier	Traditional Barrier	ResistanceIB	Gender	Age	Income	Education
Education	-0.019	0.007	-0.070	-0.014	-0.001	-0.070	-0.072	.142*	0.050	1

**. Correlation is significant at the 0.05 and * at the 0.1 level (2-tailed).

Value and usage barriers were established to be highly correlated and therefore, the usage barriers variable was removed from further analysis to eliminate the multicolleniarity effect. Other variables' association was not high and were subjected to multiple regression analysis. The multiple regression model for the study was as follows:

$$Y = a + \beta_1 VB + \beta_2 RB + \beta_3 IB + \beta_4 TB + \beta_5 G + \beta_6 AG + \beta_7 IN + \beta_8 Edu + \varepsilon$$

Where:

Dependent Variable (Y) = Resistance to internet banking; Independent Variables: VB = Value Barrier, RB = Risk Barrier, IB = Image Barrier, TB = Traditional Barrier, G = Gender, AG = Age, IN = Income, Edu = Education, and ε = Error.

Table 3.9 provides the multiple regression analysis results, which show a significant increasing impact of customers' resistance to adopt internet banking due to increasing value, image, and traditional barriers. The increase in risk barriers also increases the resistance towards internet banking adoption, but the influence is not significant. As for the control variables, the older customers become, the more they tend to resist adopting internet banking. Interestingly, the higher the income received, the more customers tend to resist adopting internet banking. Exposure to education reduced their resistance level to adopting internet banking. Gender was established not to be significant, though women seem to be more resistant than men.

Table 3.9: Multiple Regression Analysis

Variable	Standardized Coefficients	Sig.
	Beta	p
(Constant)		.000
ValueBarrier	.112*	.000
RiskBarrier	.145	.065
ImageBarrier	.340*	.000
TraditionalBarrier	.558*	.000
Gender	.122	.677
Age	.273**	.010
Income	.423*	.001
Education	-.157**	.010

** is significant at the 0.05 and * at the 0.1 level (2-tailed).

The established adjusted R^2 was .546, implying that value, image, risk, and traditional barriers influence the resistance towards adoption of internet banking by almost 55%.

3.2 Findings and Discussion

Results indicate a gender disparity among the respondents, with more males using internet banking than women. Previous studies indicate that women are often more concerned with privacy and security issues than men. Ogedengbe & Talib (2020) argued that men are more likely to use internet banking services. Age-wise, the youth category (between 18 and 40 years) tends to use internet banking more than other categories. Literature reports that elder customers are more skeptical and resistant towards internet banking (Ridwan, 2022). Arif et al., (2020) and Talwar (2021) found further that, elder bank customers, above 55 years, believed that, these banking digital platforms are not for them. That, they are for the young generation who have born in tech era. Customers with either a college certificate and diploma or a University degree, tends to adopt internet banking more, suggesting that they are likely capable of understanding the said technology. Mori and Mlambiti (2020) also established that higher education levels correlate with better comprehension of mobile banking adoption. As for the occupation, the majority are employed in white color jobs. Suggesting that some income assurance may positively influence customers to adopt internet banking. FinScope (2023), observed that, only 13% of Tanzanians' main source of income is paid regularly. Thus, the irregularity of many of the dominant income sources could affect their adoption to internet banking.

Hypothesis one which stipulated that value barrier positively influence the resistance in adopting internet banking was accepted. Customers perception that using internet banking is not economical, does not assist them in controlling their financial matters, and is not convenient

significantly make them resist adopting internet banking. This is coherent with the results presented by Borraz-mora et al., (2017) and Owais (2021) who established that value barrier positively related to internet banking resistance. These findings also match with those by Yuldinawati et al., (2018) who reported that, in Indonesia, small scale entrepreneurs do not recognize the value created by internet banking despite the bank's efforts in promoting the same. That most of them remain conservatives and mainly rely on traditional banking. Brahim et al., (2019) however, established that in Tunisia, customers recognize internet banking as convenient and find digital banking platform valuable. Serener, (2018) observed a slow progress in improving adoption to internet banking in many of developing countries. Banks and other financial institutions need to enhance their initiatives and enable more customers see the value of the internet banking hence increase their adaptation.

Hypothesis three predicted also a positive influence of the risk barrier to resistance towards internet banking. Results rejected the hypothesis as they were not significant. These results tally with Ilmudeen & Bao (2019) and Apana & Lallie (2022) but are on contrary with Borraz-mora et al., (2017); Jibril et al., (2020) and Owais (2021) who found out that, many customers are wary of entrusting their financial transactions to an online platform due to fears of fraud, identity theft, and data breaches. Maybe the introduction of the 'Personal Data Protection Act, 2022' in Tanzania has made customers somehow comfortable on the risk matters as far as digital banking is concerned.
Hypothesis four states that the image barrier positively influences resistance to adopting internet banking. The study found that customers' lack of trust in internet banking technology significantly makes them resist adopting the same. These results match with those of Apana & Lallie (2022) who observed that trust in technology remains one of the most important factors in online transactions. Yu & Chantatub (2016) and Serener, (2018) reported that negative media reports of online banking mishaps of money contribute to the image barrier. Banks and other financial institutions need to enhance their communication, customer education, and support services to increase customers' trust in the internet banking technology.

Hypothesis five states that the traditional barrier positively influences banking customers to resist adopting internet banking. The results accepted the hypothesis. The barrier was found to be the most significant barrier with the highest beta value of 0.558. Customers' preferences for face-to-face interactions and the habitual use of physical banking methods, significantly make them resist adopting the internet banking. These results are similar with those by Santos & Panchio (2020) and Yu & Chantatub (2016) which highlighted that, preference for in-person service is particularly strong among older adults and those with limited exposure to digital technologies. The results are in contrary however, with the results by Jibril et al., (2020 and Teka (2020) who found that among other barriers traditional is no longer considered a barrier to adoption of internet banking. The relatively newlyness of the technology in Tanzania could be one among the reasons for this behavior. Serener, (2018) established that in Zimbabwe, even the young generation have inherit the tradition of physical visit to bank. FinScope (2023) observed that 100% of Tanzanians reside

in urban areas live in 5kms radius of the financial access points. National-wise, the percentage increased from 86% in 2017 to 89% in 2023. Banks need to continue offering an integration of digital and in-person services, to allow customers build the trust in internet banking with time and gradually transform to the same.

4.0 Conclusion and Implications

This study focused on understanding the extent to which functional barriers (value, usage, and risk) and psychological barriers (image and tradition) influence customers to resist adopting internet banking services in Tanzania. The results indicate that 30.5% of the respondents have not used internet banking, while 4% are not even aware of the service. For those who have adopted internet banking, most of them are male, aged between 18 and 40 years, and the majority are those with college certificates and diplomas. Most of these have white color jobs and are at the income level of TZS 520,000 and below. Suggesting that the young population with low-level income is more likely to take risks of using new technologies. The frequency of usage is either once or more than once a day for paying bills, checking their bank statements, and performing different financial transactions. Value, Image, and tradition barriers significantly influence customers' resistance to adopting internet banking services, while the risk barrier does not. The results conform with the innovation resistance theory, showing that both practical concerns as well as emotional or personal factors contribute significantly to resisting the adoption of innovations.

For policy and practice, this study emphasizes the need to enhance initiatives that will enable more customers see the value of the internet banking hence increase their adaptation. Banks and financial institutions also need to enhance their communication, customer education, and support services to increase customers' trust in the internet banking technology. Further, they have to continue offering an integration of digital and in-person services, to allow customers build the trust in internet banking with time and gradually transform to the same.

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INCLUSIVE GROWTH, TECHNOLOGY AND INNOVATION, AND PRODUCTIVE CAPACITIES: A COMPARATIVE ANALYSIS

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Abstract

This study examines how technology and innovation, and productive capacities affect inclusive growth. We apply a random effect and a fixed effect models to data from sub-Saharan Africa, Middle East and North Africa, South Asia and the Pacific, Latin America and the Caribbean, and Europe from 2008 to 2022. Our findings suggest that productive capacities, and technology and innovation have a positive relationship on inclusive growth for sub-Saharan. For the Middle East and North Africa, and Latin America and the Caribbean, we find that productive capacities have a significant positive effect on inclusive growth. However, we find that the relationship between productive capacities and inclusive growth for sub-Saharan Africa to be monotonically increasing and that of the Middle East and North Africa to be monotonically decreasing. For South Asia and the Pacific, and Europe, the relationship between productive capacities and inclusive growth is U-shaped, with a turning point of 22.7133 and 23.728, respectively. These values fall within the range for productive capacities data. These finding have policy implications.

Keywords: Inclusive growth, Productive capacities, Technological innovation, sub-Saharan Africa, South Asia and the Pacific, Middle East and North Africa, Latin America and Caribbean, Europe

JEL classification: F35; I38; O38; O55

1. Introduction

According to the UNCAD (2020), productive capacities are defined as "the productive resources, entrepreneurial capabilities, and production linkages which together determine the capacity of a country to produce goods and services and enable it to grow and develop". Sustained economic growth can only be made possible through expanding, developing, and fully utilising productive capacities. Technology and innovation include technological capacities related to physical investment, human capital, and technological effort. This covers national capacities to use, adopt and adapt these technologies. Economic growth refers to the increased production of goods and services valued by people, providing the means for a better standard of living. Economic growth creates job opportunities and helps pull people out of poverty. Also, economic growth increases the resources that the government can tap through taxation to finance public service provision.

Economic growth has long been used to measure the development and progress of countries. Technology and innovation, and productive capacities are some of the factors affecting economic growth contributing to development. The Solow-Swan exogenous growth model of Solow (1956) and Swan (1956) has already established the theoretical relationship between economic growth, production, and technology. In this model, long-run economic growth is explained by looking at capital accumulation, labour or population growth, and increases in productivity primarily driven by technological progress. Arrow (1962) posited that improvement in production methods and techniques comes with time through the learning experience, which ultimately raises productivity and economic growth.

Empirically, Griffith, Huergo, Mairesse, and Peters (2006) Griffith, Redding, and Reenen (2004) and Mairesse and Monhen (2010) have established convincing evidence of positive links between technology, productivity, and growth for industrialised countries. However, Broughel and Thierer (2019), argue that nearly all the existing studies on technological change measured factor productivity, which is essentially different from technological innovation; also, the Solow model did not go beyond the traditional factor productivity to explain technological innovation, unlike the so-called new growth theory. In this paper, like Romer (1990), we highlight technological innovation processes that are essential precursors for economic growth. Romer (1990) pioneered a new growth theory, which placed emphasis on factors including expenditure on resources and development, and spillover effects from one aspect of the economy to the other.

The Causality between technological Innovation and economic growth has been examined extensively in the literature. Mohamed, Liu and Nie (2022) investigated the impact of technological innovation on economic growth in developing countries from the period 1990–2018. They applied an error correction model (ECM) method, and they found an increase in technological innovation indicators leads to an increase in economic growth. Corroborating these findings, Anakpo and Oyenubi (2022) used panel dynamic ordinary least squared regression on data from ten Southern African countries (South Africa, Angola, Botswana, Zimbabwe, Mozambique, Malawi, Lesotho, Zambia, Swaziland, and Namibia) from 2004 to 2017. They report that technological innovation indicators such as researchers in research and development, graduates from information and communication technology, patents-non-residents, graduates from science, technology, engineering and mathematics, and scientific and technical outputs have a significant positive relationship with per capita economic growth in the long run.

However, Lomachynska and Podgorna (2018) found no relationship between innovation and economic growth; and between financial development and innovation when they used a panel VAR model to examine the causal relationship between innovation, financial development, and economic growth for a sample of 27 OECD countries from the period 2001–2016.

On productive capacities growth nexus, Gnangnon (2021) reports that productive capacities promote economic growth and reduce economic growth volatility in countries that face a high degree of structural economic vulnerability using fixed effects and the generalised least squares test on data from 117 developing countries over the period 2000-2018.

The forgoing studies examined the impact of technology and innovation, and productive capacities on economic growth, which is proxied by gross domestic growth (GDP). Stiglitz, Fitoussi and Durand (2018) have argued that the over-reliance on GDP as the yardstick of economic performance misled policymakers who did not see the 2008 crisis coming. Thus, when the crisis occurred, governments concentrated on the wrong indicators and made inadequate policy choices, with severe and long-lasting consequences for many people. While GDP is the most well-known and powerful economic indicator, it can't tell us everything we need to know about the health of countries and societies. In fact, it can't even tell us everything we need to know about economic performance.

However, inclusive growth goes beyond economic growth in the sense that inclusive growth refers to broadly sharing the improvements in economic growth (GDP) in living standards among all groups of society, as well as across regions, and protecting future generations. Thus, at its heart, inclusive growth is, growth that benefits everyone: economic success combined with a more equitable society. Inclusion can be summarised by four general objectives: benefit-sharing; opportunity; participation; and empowerment:

Understanding the impact of technology and innovation on inclusive growth; productive capacities on inclusive growth; and the combined effect of technology and innovation, and productive capacities on inclusive growth is very relevant for governments in Africa. This is important for guiding policymakers to determine where emphasis should be placed to promote growth and improvement in the welfare of individuals, particularly in income and non-income aspects of individual and societal well-being, which is the key focus of this paper.

This study analyses the impact of technology and innovation, and productive capacities on inclusive growth. Specifically, the study examines the following questions: firstly, do technology and innovation affect inclusive growth? Secondly, do productive capacities affect inclusive growth? And thirdly, do technology and innovation, and productive capacities affect inclusive growth? These questions are examined comparatively among developing countries in Africa, South Asia, South America, and developed countries in Europe.

We apply a random effect and a fixed effect models to data from sub-Saharan Africa, Middle East and North Africa, South Asia and the Pacific, Latin America and the Caribbean, and Europe from 2008 to 2022. Our findings suggest that productive capacities (PC) and technology and innovation (TI) have a positive relationship on inclusive growth (IG) for sub-Saharan. For the Middle East and North Africa, and Latin America and the Caribbean, we find that PC has a significant positive effect on IG. However, we find that the relationship between PC and IG for sub-Saharan Africa is monotonically increasing and that of the Middle East and Africa to be monotonically decreasing. For South Asia and the Pacific, and Europe, the relationship between PC and IG is U-shaped, with a turning point of 22.7133 and 23.728, respectively. These values fall within the range for PC data.

The study contributes to the literature in the following respects: (1) this is the first study that examines the linkages between technology and innovation, productive capacities, and the combined effects of technology and innovation, and productive capacities on inclusive growth; (2) this study uses a quadratic model to determine the point where the function of the impact of technology and innovation, and

productive capacity on inclusive changes; (3) this study comparatively analyses the effect of technology and innovation, productive capacities, and the combined effects of technology and innovation, and productive capacities on inclusive growth in Africa, Asia, South America, and western Europe (a proxy for developed economies).

The rest of the paper is organised as follows: Section 2 presents the methodology, Section 3 presents the data and preliminary statistical analysis, Section 4 covers the empirical results, while Section 5 offers concluding remarks.

2. Methodology

The study employs a panel data set of 118 countries consisting of 18 countries from Asia, 28 from Europe, 18 from Latin America, 19 from the Middle East and Africa and 35 countries from Africa (see Table 2 for a list of the countries). The model is stated as follows:

$$IG_{it} = \alpha + \beta_1 PC_{it} + \beta_2 TI_{it} + \beta_3 GE_{it} + \beta_4 HD_{it} + \beta_5 TO_{it} + \beta_6 GCF_{it} + \beta_7 FSD_{it} + \beta_8 PG_{it} + \xi_{it} \quad (1)$$

$$IG_{it} = \alpha + \beta_1 PC_{it} + \beta_2 TI_{it} + \beta_3 PC * TI_{it} + \beta_4 GE_{it} + \beta_5 HD_{it} + \beta_6 TO_{it} + \beta_7 GCF_{it} + \beta_8 FSD_{it} + \beta_9 PG_{it} + \xi_{it} \quad (2)$$

$$IG_{it} = \alpha + \beta_1 PC_{it} + \beta_2 TI_{it} + \beta_3 PC_{it}^2 + \beta_4 GE_{it} + \beta_5 HD_{it} + \beta_6 TO_{it} + \beta_7 GCF_{it} + \beta_8 FSD_{it} + \beta_9 PG_{it} + \xi_{it} \quad (3a)$$

$$IG_{it} = \alpha + \beta_1 PC_{it} + \beta_2 TI_{it} + \beta_3 TI_{it}^2 + \beta_4 GE_{it} + \beta_5 HD_{it} + \beta_6 TO_{it} + \beta_7 GCF_{it} + \beta_8 FSD_{it} + \beta_9 PG_{it} + \xi_{it} \quad (4a)$$

$$IG_{it} = \alpha + \beta_1 PC_{it} + \beta_2 TI_{it} + \beta_3 PC * TI_{it} + \beta_4 (PC * TI)^2_{it} + \beta_5 GE_{it} + \beta_6 HD_{it} + \beta_7 TO_{it} + \beta_8 GCF_{it} + \beta_9 FSD_{it} + \beta_{10} PG_{it} + \xi_{it} \quad (5a)$$

where *IG* is the natural logarithm of inclusive growth, *PC* is the natural logarithm of productive capacities, *TI* is the natural logarithm of technology and innovation*, GE* is the annual growth rate in government expenditure*, HD* is human development index, which is between zero to one, *TO* is trade openness which is the sum of imports and exports divided by the gross domestic product, *GCF* is gross capital formation divided by the gross domestic product (from the World Bank, 2023, GCF consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories), *FSD* is financial sector development, which is domestic credit provided by the financial sector divided by the gross domestic product, and finally, *PG* is population growth rate. The parameter $\xi_{it} = \lambda_t + \varepsilon_{it} + \varepsilon_i$, and *i* denotes the number of countries, (i.e., *i* = 1, 2, 3…), *t* denotes the time which runs from 2008 to 2018; this is because the *PC* and the *TI* from the UNCTAD database starts from 2008 and end at 2018. The parameter ε_i denotes the unobserved country effects that do not change over time, ξ_{it} captures the panel error term, ε_{it} is the idiosyncratic or random error term and λ_t, is the symmetric year effect and β_i represents the slope parameters. The *IG*, *TI* and *PC* are the variables of interest, and from the literature (see Gyamfi, Bokpin, Aboagye and Ackah, 2022; Mutiiria, Ju and Dumor, 2020; and Whajah, Bokpin and Kuttu, 2019), we select *GE*, *HD*, *TO*, *GCF*, FSD and *PG* as control variables (see Table 1 for the list of the variables used in the regression). Equations (1) and (2) are the basic model and the interactive model with the interactive term, $PC * TI$, respectively. The nonlinear equations are represented by Equations (3a) and (4a). These two equations will enable us to examine whether the relationship between *IG* and *PC* or *IG* and TI is nonlinear, monotonic (increasing or decreasing), parabolic, and how does *IG* respond when *PC* or *TI* increases.

Table 1: Variables Used in the Regression

Variable	Name	Definition	Source
TOPNS	trade openness	export of goods and services (% of GDP) + import of goods and services (% of GDP)	WDI
GCF	gross capital formation	gross capital formation (% of GDP)	WDI
FSD	financial sector development	domestic credit provided by the financial sector (% of GDP)	WDI
PGTH	population growth rate	population growth (annual %)	WDI
GE	government expenditure growth rate	General government final consumption expenditure (annual% growth)	WDI
HD	Human development	Human capital index (scale 0 – 1)	WDE
IG	Inclusive growth	PCA of 35 variables (change to natural logarithm)	WDI and WGI
TI	Technological innovation	Absolute value (changed to the natural logarithm)	UNCTAD
PC	Productive capacities	Absolute Value (change to the natural logarithm)	UNCTAD

Note: WDI is World Development Indicators (The World Bank), WGI is World Governance Indicators (The World Bank) and UNCTAD is United Nations Commission on Trade and Development.

Table 2: Countries Used in the Study

Asia Pacific	European Countries	European Countries	Latin America	Middle East and North Africa	Sub-Saharan African	Sub-Saharan African
Bangladesh	Austria	Portugal	Argentina	Algeria	Benin	Mauritius
Cambodia	Belgium	Romania	Belize	Bahrain	Botswana	Mozambique
China	Croatia	Slovakia	Bolivia	Djibouti	Burkina Faso	Namibia
Fiji	Cyprus	Slovenia	Brazil	Egypt	Cabo Verde	Nigeria
India	Czechia	Spain	Colombia	Iran	Cameroon	Rwanda
Indonesia	Denmark	Sweden	Costa Rica	Iraq	Comoros	Sao Tome and Principe
Lao People's Dem. Rep.	Estonia	Switzerland, Liechtenstein	Dominican Republic	Israel	Congo	Senegal
Malaysia	Finland	United Kingdom	El Salvador	Jordan	Congo, Dem. Rep.	Sierra Leone
Mongolia	France		Guatemala	Kuwait	Côte d'Ivoire	Mauritius
Myanmar	Germany		Guyana	Lebanon	Eswatini	Mozambique
Nepal	Greece		Haiti	Libya	Ethiopia	South Africa
Pakistan	Hungary		Honduras	Malta	Gabon	Sudan
Papua New Guinea	Ireland		Jamaica	Morocco	Gambia	Tanzania,
Philippines	Italy		Mexico	Oman	Ghana	Togo
Sri Lanka	Latvia		Paraguay	Qatar	Guinea	Uganda
Thailand	Lithuania			Saudi Arabia	Kenya	Zambia
Timor-Leste	Luxembourg			Tunisia	Madagascar	Zimbabwe
Viet Nam	Netherlands			United Arab Emirates	Malawi	
	Norway				Mali	
	Poland				Mauritania	

Also, Equations (3a), (4a) and (5a) will allow us to test the various forms of *PC* and *TI* and relationships with IG, that is if $\beta_1 < 0, \beta_2 > 0$, then a U-shaped relationship exists, conversely, if $\beta_1 > 0, \beta_2 < 0$, then an inverse U-shaped relationship exists. Also, if $\beta_1 > 0, \beta_2 > 0$, then a monotonically increasing relationship exits, but if $\beta_1 < 0, \beta_2 < 0$, then a monotonically decreasing relationship. However, if $\beta_1 = 0, \beta_2 = 0$, then a level relationship exists. To determine the turning point, if any, we take the first derivatives of Equations (3a) and (4a) with respect to *PC* and *TI*, respectively and set them to zero. Thus,

$$\frac{\partial IG}{\partial PC} = \beta_1 + (2 * \beta_2)PC = 0 \quad (3b)$$

$$\frac{\partial IG}{\partial TI} = \beta_1 + (2 * \beta_2)TI = 0 \quad (4b)$$

To obtain the optimal point, $\hat{\tau}$, from Equation (3b) we derive $\beta_1 = (-2 * \beta_2)PC$ and from Equation (4b) we derive $\beta_1 = (-2 * \beta_2)TI$. To determine the threshold for *TI*, and *PC*, we estimate $PC^* = -0.5\frac{\beta_1}{\beta_2}$ and $TI^* = -0.5\frac{\beta_1}{\beta_2}$ where PC^*, and TI^*, respectively, denotes the threshold beyond which *PC* and *TI* reduces or increases *IG*. However, the increase or decrease depends on the exact signs of β_1 and β_2 such that if $\beta_1 < 0, \beta_2 > 0$, then a U-shaped relationship exists, and the turning point of this curve is given by $\hat{\tau} = 0.5\frac{\widehat{\beta_1}}{\widehat{\beta_2}}$. Furthermore, if $\beta_1 > 0, \beta_2 < 0$ then an inverse U-shaped relationship exists, and the turning point of this curve is computed as $\hat{\tau} = 0.5\frac{\widehat{\beta_1}}{\widehat{\beta_2}}$. We take the exponent of $\hat{\tau}$, $\hat{\tau} = exp\left(0.5\frac{\widehat{\beta_1}}{\widehat{\beta_2}}\right)$, to get the real values of the turning point.

3. Data and preliminary statistical analysis

The inclusive growth variable consists of data on selected variables spelt out under the four pillars of inclusive growth by the Asian Development Bank (2014) (see Table 3). The data was acquired from the World Bank's World Development Indicators and World Governance Indicators databases for the Sub-Saharan African countries used in the study. The countries were selected the span of the data are due to data availability for the other variables used in the panel regression for this study. The data span from 2002 to 2022. To

generate the *IG* variables, a principal component analysis is used to minimise the size and scale of the data. According to Jolliffe and Cadima (2016), principal component analysis (PCA) lowers dimensionality and boosts interpretability while minimising information loss in such datasets. It does this by generating new uncorrelated variables that maximise variance sequentially. Finding such additional variables simplifies to an eigenvalue/eigenvector issue. PCA is an adaptive data analysis approach since the dataset defines new variables rather.

Table 3: Inclusive Growth Indicators

Inclusive growth Indicators
Poverty and Inequality
Annualised average growth rate in per capita real survey mean consumption or income, total population (%)
Poverty headcount ratio at $1.90 a day (2011 PPP) (% of population)
Poverty headcount ratio at national poverty lines (% of population)
Compulsory education, duration (years)
Primary education, duration (years)
Secondary education, duration (years)
Mortality rate, under-5 (per 1,000 live births)
Prevalence of underweight, weight for age (% of children under 5)
Growth Expansion of Economic Opportunity
GNI per capita, PPP (constant 2017 international $)
GDP per capita, PPP (constant 2017 international $)
Contributing family workers, total (% of total employment) (modelled ILO estimate)
Employment to population ratio, 15+, total (%) (national estimate)
Employment to population ratio, 15+, total (%) (modelled ILO estimate)
GDP per person employed (constant 2017 PPP $)
Electric power consumption (kWh per capita)
Mobile cellular subscriptions (per 100 people)
Depositors with commercial banks (per 1,000 adults)
Social Inclusion to Ensure Equal Access to Economic Opportunity
Government expenditure on education, total (% of government expenditure)
Pupil-teacher ratio, primary
Immunisation, DPT (% of children ages 12-23 months)
Immunisation, HepB3 (% of one-year-old children)

Immunisation, measles (% of children ages 12-23 months)
Domestic general government health expenditure (% of general government expenditure)
Physicians (per 1,000 people)
Nurses and midwives (per 1,000 people)
Access to Basic Infrastructure Utilities and Services
Access to clean fuels and technologies for cooking (% of population)
Access to electricity (% of population)
People using safely managed drinking water services (% of population)
People using safely managed sanitation services (% of population)
Gender Equality and Opportunity
School enrolment, primary (gross), gender parity index (GPI)
School enrolment, primary and secondary (gross), gender parity index (GPI)
School enrolment, secondary (gross), gender parity index (GPI)
School enrolment, tertiary (gross), gender parity index (GPI)
Ratio of female to male labour force participation rate (%) (national estimate)
Proportion of seats held by women in national parliaments (%)
Governance Indicators
Voice and Accountability
Government Effectiveness
Control of Corruption

Table 4. Descriptive statistics

	IG	PC	TI	GE	HD	TO	GCF	FSD	PG
Sub-Saharan Africa									
Obs.	385	385	385	385	385	385	385	385	385
Mean	1.265	0.965	2.394	1.429	0.091	60.118	22.358	6.997	2.398
Maximum	332.170	12.801	352.946	80.025	0.626	130.778	79.401	156.043	4.156
Minimum	-326.231	-4.866	-314.588	-16.848	0.000	-36.481	-7.915	0.000	0.055
Std. Dev.	69.252	1.738	47.437	6.173	0.170	33.334	13.301	28.922	0.793
Middle East and North Africa									
Obs.	209	209	209	209	209	209	209	209	209
Mean	-3.246	0.747	0.984	4.073	0.144	104.064	-3.355	9.133	2.806
Maximum	288.428	8.379	337.294	32.902	0.763	322.675	72.162	127.101	13.423
Minimum	-319.479	-6.289	-389.790	-25.958	0.000	0.000	-644.032	0.000	-5.280

Std. Dev.	65.958	1.591	47.484	7.480	0.256	66.384	57.035	28.681	2.660
South Asia and the Pacific									
Obs.	198	198	198	198	198	198	198	198	198
Mean	-3.744	1.134	2.253	5.070	0.114	72.480	6.974	20.425	1.279
Maximum	346.945	7.565	335.046	85.359	0.687	164.664	75.526	171.159	3.048
Minimum	-218.326	-8.777	-442.978	-15.786	0.000	0.000	-30.064	0.000	-0.003
Std. Dev.	59.007	1.574	51.723	8.855	0.223	46.188	13.806	44.629	0.626
Latin America									
Obs.	198	198	198	198	198	198	198	198	198
Mean	-1.544	0.778	0.597	3.031	0.114	55.014	1.902	30.031	1.119
Maximum	244.224	5.958	85.989	15.880	0.619	122.217	45.864	97.415	2.875
Minimum	-246.253	-6.103	-134.235	-6.516	0.000	0.000	-44.242	0.000	-0.587
Std. Dev.	61.557	1.268	18.772	3.433	0.223	31.238	12.226	29.637	0.688
Europe									
Obs.	308	308	308	308	308	308	308	308	308
Mean	-3.763	0.305	0.568	0.876	0.218	114.216	0.635	5.251	0.262751
Maximum	280.114	4.248	16.530	7.589	0.817	362.424	50.082	151.248	2.430976
Minimum	-337.824	-3.850	-11.969	-10.055	0.000	45.419	-54.327	0.000	-2.258464
Std. Dev.	58.961	0.581	3.530	2.368	0.340	56.787	12.235	26.338	0.776949

These summary statistics are in levels. The abbreviation IG stands for Inclusive Growth, PC is Productive Capacity, TI is Technological Innovation, GE is Government Effectiveness, HD is Human Development, TO is Trade Openness, GCF is Gross Capital Formation, FSD is Financial Sector Development, PG is Population Growth, Obs. is observations, Std. Dev. is standard deviations, Min is minimum and Max is maximum.

Table 5. Panel unit root tests

	IG	PC	TI	GE	HD	TO	GCF	FSD	PG
Sub-Saharan Africa									
LLC	-81.616**	-26.927**	-21.599**	-6.497**	-1.780**	-3.896**	-8.168**	1.349**	11.156**
ADF	217.257**	261.699**	256.518**	44.413**	33.198**	95.002**	127.955**	8.859**	144.907**
PP	311.169**	271.087**	356.110**	60.651**	33.198**	100.210**	98.162**	12.275**	92.034**
Middle East and North Africa									
LLC	-16.760**	-21.037**	-12.220**	10.245**	-2.095**	-7.506**	-10.793**	-0.651**	-6.039**
ADF	148.692**	143.481**	123.918**	93.550**	29.833**	65.803**	105.139**	6.621**	91.177**
PP	189.532**	123.770**	183.766**	86.429**	29.833**	52.837**	140.852**	14.331**	60.808**
South Asia and the Pacific									
LLC	-9.660**	-12.073**	-27.274**	-7.843**	-0.948**	-2.971**	-9.671**	-2.391**	0.441**
ADF	98.938**	117.952**	126.675**	78.972**	10.029**	32.896**	92.756**	15.793**	46.374**
PP	122.585**	178.240**	171.790**	105.230**	10.029**	39.989**	97.196**	28.218**	35.016**
Latin America									
LLC	-6.894**	-11.118**	15-104**	-9.534**	-1.635**	-8.757**	-18.528**	0.375**	1.333**
ADF	126.199**	127.991**	147.184**	94.476**	17.137**	82.434**	154.452**	7.259**	53.626**
PP	151.476**	162.200**	220.254**	95.573**	17.137**	89.101**	166.462**	7.155**	63.058**
Europe									
LLC	-16.201**	-22.954**	-15.119**	-10.746**	-3.124**	-14868**	-22.649**	-0.507**	-1.576**
ADF	154.322**	197.160**	185.425**	163.350**	60.843**	152.467**	238.325**	0.703**	79.949**
PP	197.190**	205.367**	212.003**	119.515**	60.843**	67.312**	164.487**	0.628**	93.636**

** denotes significance at the 5% level, with data from 2008 to 2018. The abbreviation IG stands for Inclusive Growth, PC is Productive Capacity, TI is Technological Innovation, GE is Government Effectiveness, HD is Human Development, TO is Trade Openness, GCF is Gross Capital Formation, FSD is Financial Sector Development, PG is Population Growth, LLC: Levine-Lin-Chu statistics, IPS: Im-Pessaran-Shin statistics, ADF: augmented Dickey-Fuller statistics and PP: Philips–Perron statistics.

From Table 4, the summary statistics show that *IG*, *TO* and *FSD* from a cross-section of countries in sub-Saharan Africa, Middle East and North Africa, South Asia and the Pacific, Latin America and Europe exceed 100%. For *TI* and *FSD* only Europe and Latin America, respectively are below 100%. For sub-Saharan Africa and South Asia and the Pacific maximum *GE* is above 80% with Europe recording about 8%. Predictably Europe has the lowest *PG* with Middle East and North Africa having the highest. For *HD* Europe has the highest

number with Latin America and Africa having the lowest numbers. The null of unit root is rejected in all the panel series from Table 5. The Levin, Lin and Chu (2002) and the Fisher-type ADF and PP unit root tests show the presence of unit root in all the panel series. The relatively low pairwise correlations in Table 6 show the absence of multicollinearity. From Table 7, all the series in each geographical region are cross-sectionally correlated. The presence of cross-sectional dependence makes the choice between available estimators more difficult, hence, with the cross-sectional dimension larger that the time dimension for our panel data, we settle on the Pesaran (2004) cross-sectional dependence test. The Pesaran (2004) test shows that for each geographical area selected for the study, there is a certain level of dependence among the series across. Dependence may be attributed to the effect of some unobserved common factors, which are common to a particular geographical region and affecting each country with the geographical region selected for the study.

Table 6. Correlation matrix

	IG	PC	TI	GE	HD	TO	GCF	FSD	PG
Sub-Saharan Africa									
IG	1.000								
PC	-0.056	1.000							
TI	-0.041	0.046	1.000						
GE	0.022	0.138	0.085	1.000					
HD	-0.008	-0.125	-0.127	-0.062	1.000				
TO	-0.019	0.025	-0.023	0.055	-0.003	1.000			
GCF	-0.027	0.014	-0.006	-0.017	-0.040	0.664	1.000		
FSD	-0.013	-0.005	0.000	-0.009	0.060	0.007	-0.040	1.000	
PG	-0.024	0.013	0.027	0.014	-0.068	0.020	0.279	-0.261	1.000
Middle East and North Africa									
IG	1.000								
PC	-0.006	1.000							
TI	-0.013	0.085	1.000						
GE	-0.101	0.149	0.010	1.000					
HD	-0.062	-0.007	0.014	-0.046	1.000				
TO	0.057	-0.024	-0.081	0.087	0.013	1.000			
GCF	-0.034	0.020	-0.286	-0.172	0.071	-0.225	1.000		
FSD	-0.122	0.008	0.028	0.073	0.092	-0.003	0.045	1.000	
PG	-0.089	0.143	-0.014	0.119	-0.116	-0.029	0.051	-0.204	1.000

South Asia and the Pacific									
IG	1.000								
PC	-0.001	1.000							
TI	0.034	0.300	1.000						
GE	0.030	0.154	0.011	1.000					
HD	0.129	-0.052	-0.026	-0.053	1.000				
TO	0.052	0.041	0.006	0.126	0.085	1.000			
GCF	-0.007	0.230	0.019	0.130	0.039	0.107	1.000		
FSD	0.067	-0.055	-0.010	-0.116	0.048	0.243	-0.172	1.000	
PG	-0.049	-0.163	-0.010	0.052	-0.016	-0.119	0.015	-0.361	1.000

The abbreviation IG stands for Inclusive Growth, PC is Productive Capacity, TI is Technological Innovation, GE is Government Effectiveness, HD is Human Development, TO is Trade Openness, GCF is Gross Capital Formation, FSD is Financial Sector Development and PG is Population Growth.

Table 6. Correlation matrix (Continued)

	IG	PC	TI	GE	HD	TO	GCF	FSD	PG
Latin America									
IG	1.000								
PC	0.003	1.000							
TI	-0.005	-0.130	1.000						
GE	0.125	0.090	-0.019	1.000					
HD	-0.109	-0.116	-0.053	-0.075	1.000				
TO	0.092	0.062	0.004	0.133	-0.057	1.000			
GCF	0.007	-0.222	0.140	0.012	0.219	0.088	1.000		
FSD	0.059	0.056	0.010	0.037	0.041	0.225	0.089	1.000	
PG	0.015	0.075	0.023	0.363	0.017	0.559	0.025	0.060	1.000
Europe									
IG	1.000								
PC	-0.015	1.000							
TI	0.129	0.032	1.000						
GE	0.049	0.075	-0.150	1.000					
HD	-0.042	0.127	-0.064	0.029	1.000				
TO	-0.022	0.061	-0.002	0.201	0.016	1.000			
GCF	0.064	0.041	-0.060	0.220	0.215	0.172	1.000		
FSD	0.013	-0.103	0.002	0.093	0.013	-0.160	0.007	1.000	
PG	0.031	-0.058	-0.062	0.269	0.004	0.304	-0.007	0.206	1.000

The abbreviation IG stands for Inclusive Growth, PC is Productive Capacity, TI is Technological Innovation, GE is Government Effectiveness, HD is Human Development, TO is Trade Openness, GCF is Gross Capital Formation, FSD is Financial Sector Development and PG is Population Growth.

Table 7. Pesaran cross-sectional dependence test in the estimated residuals

Variable	Sub-Saharan Africa	Middle East and North Africa	South Asia and the Pacific	Latin America	Europe
IG	25.263**	3.539**	3.281**	2.100**	0.514**
PC	39.231**	23.098**	21.001**	30.598**	37.899**
TI	17.986**	20.274**	15.738**	14.123**	18.515**
GE	0.167	0.146	1.904*	2.216**	15.455**
HD	47.701**	32.173**	22.018**	23.819**	64.024**
TO	1.527**	7.744**	2.983**	9.346**	40.461**
GCF	-0.539**	1.694**	-1.442	11.869**	34.245**
FSD	0.370**	0.034**	-1.154**	3.640**	3.435**
PG	-0.702**	3.017**	5.754**	3.216**	4.310**

The abbreviation IG stands for Inclusive Growth, PC is Productive Capacity, TI is Technological Innovation, GE is Government Effectiveness, HD is Human Development, TO is Trade Openness, GCF is Gross Capital Formation, FSD is Financial Sector Development and PG is Population Growth.

Table 8. Hausman test and test for heteroskedasticity

	Basic model	Interactive model
Panel A: Breusch-Pagan / Cook-Weisberg test for heteroskedasticity		
Sub-Saharan Africa	5.79	4.57
Middle East and North Africa	7.78	15.8
South Asia and the Pacific	166.86***	101.26***
Latin America	86.83***	134.39***
Europe	32.96***	5.08
Panel B: Hausman test for fixed effects model and random effects		
Sub-Saharan Africa	5.79	4.57
Middle East and North Africa	7.78	15.8
South Asia and the Pacific	166.86***	101.26***
Latin America	86.83***	134.39***
Europe	32.96***	5.08

** denotes significance at the 5% level

In panel linear regression, the error term is assumed to be homoscedastic across observations. Violation of this assumption will cause the estimates of standard errors for the regression coefficients to be biased. A priori, the direction of the bias is not known, and this may increase or decrease the *t* tests coefficients. In this study we used the Breusch-Pagan / Cook-Weisberg test to check for heteroskedasticity in the basic model (Equation 1) and the interactive model (Equation 2). The results are reported in Panel A of Table 8. For both models, we observe the presence of heteroskedasticity in the panel data for South Asia and the Pacific, Latin America and Europe. However, there is not heteroskedasticity in the panel data for sub-Saharan Africa, and the Middle East and North Africa. We use the Hausmann test to check if there is a correlation between the unique errors and the regressors in our model. The preferred model in Hausmann test would help us to choose the appropriate panel regression model. In the Hausmann test, the preferred model is random effects and from Panel B in Table 8, the test statistic is not significant for sub-Saharan Africa, the Middle East and North Africa and in the interaction model for Europe, hence a random model is preferred, however, for the other geographical regions and for the basic model for Europe, the test statistic is significant at 5%, meaning that the appropriate model is a fixed effect is preferred. In estimating the fixed effects and the random effects regression models for the various geographical regions, we apply the Driscoll and Kraay (1998) estimator to control for higher-order autocorrelation, cross-sectional dependence and heteroskedasticity. Hoechle (2007) has argued that when the residuals of the linear panel model are cross-sectionally dependent, pooled ordinary least squares, White (White, 1980, 1984), Rogers (Rogers,1993) and Newey-West (Newey and West, 1987) standard errors are well calibrated when the residuals of a panel regression are homoscedastic as well as spatially and temporally independent. However, when the residuals are cross-sectionally correlated, then the aforementioned covariance matrix estimators lead to severely downward biased standard error estimates. However, the Driscoll and Kraay (1998) estimator do not suffer from this malaise.

4. Empirical Analysis

The Hausmann test was used to select the appropriate model. The empirical results from the random effect model using Driscoll-Kraary standard errors for sub-Saharan Africa, Middle East and North Africa are reported in Tables 9 and 10. The results from the fixed effect model for South Asia and the Pacific, Latin America and the Caribbean are reported in Tables 11 and 12. For Europe, the results from the random and fixed effect models are reported in Table 13.

From the Tables, we estimate the basic model which is represented by Equation 1 and the interaction model represented by Equation 2. Equations 3 and 4 enable us to test the nonlinear relationship between PC and IG, and TI and IG. For sub-Saharan Africa, we find a positive relationship between PC and IG across all three models. For TI and IG, we find a significant positive relationship in the basic and in the nonlinear models. This relationship increases monotonically because the nonlinear term for TI is also positive and significant. Similarly, for the Middle East and North Africa, we find that PC has a positive effect on IG across the basic, interactive, and nonlinear models. For TI, we observe a significant negative relationship between TI and IG across the basic, interactive, and nonlinear models. We also observe that the relationship between TI and IG decreases monotonically because the nonlinear term for TI is negative. For both geographical regions, the interaction between PC and TI was not significant.

The estimates for South Asia and the Pacific in Table 11 show a significant negative relationship between PC and IG for the basic and the interactive model, but the relationship turns positive and statistically significant for the nonlinear model. This shows that the relationship between PC and IG is U-shaped with a turning point of 3.123. The exponent of 3.123 is the real value of the turning point which is given as 22.7133. This falls with the maximum and the minimum observations for PC. However, TI is only negatively significant in the basic model, and the interaction term for PC and TI were not significant. For Latin America and the Caribbean, the relationship between PC and IG is positive and statistically significant for the basic model, but the relationship between TI and IG is negative and significant for the basic, interactive and nonlinear models. However, the relationship between TI and IG is monotonically decreasing because the nonlinear term is negative. The interactive term is not significant. For Europe, the relationship between PC and IG is negative and statistically significant in the basic, interactive and the nonlinear model. But in the nonlinear term for PC turns positive and statistically significant. This indicates that a U-shaped relationship exists between PC and IG. The relationship between TI and IG is negative in the basic and the interactive models. The turning point of the U-shaped relationship between PC and IG is 3.167. The real turning point is 23.728 which is the exponent of 3.167. The 23.728 fall with the maximum and minimum observation for PC. The interactive term for PC and TI is positive and statistically significant showing the combine effect of PC and TI on IG.

Table 9. Random Effect Model for Sub-Saharan Africa

Variables	(1)	(2)	(3)	(4)	(5)
PC	0.402**	0.379**	-0.167	0.505**	0.492 **
	(0.139)	(0.114)	(0.734)	(0.154)	(0.160)
TI	0.119**	0.023	0.075	0.469**	0.434**
	(0.040)	(1.019)	(0.035)	(0.140)	(0.156)
PC*TI		-0.295			
		(0.326)			
PC^2			0.472		
			(0.245)		
TI^2				0.074**	
				(0.028)	
(PC*TI) ^2					0.007
					(0.003)
GE	-0.008**	-0.008**	-0.008**	-0.009	-0.009**
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
HD	-0.258	-0.301	-0.353	-0.289	-0.303
	(0.243)	(0.291)	(0.294)	(0.262)	(0.272)
TO	0.007**	0.007 **	0.007**	0.007**	0.007**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
GCF	-0.001	-0.002	-0.003	-0.002	-0.002
	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)
FSD	0.007**	0.007**	0.005**	0.006**	0.006**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
PG	-0.237**	-0.202**	-0.101	-0.201**	-0.196**
	(0.028)	(0.042)	(0.084)	(0.030)	(0.031)
Constant	-0.869**	-0.910**	-0.039**	-0.920**	-0.927**
	(0.354)	(0.378)	(0.395)	(0.321)	(0.331)
P-value	0.000	0.0000	0.0000	0.0000	0.0000
Wald	13736.83	11205.76	13234.05	26384.78	22660.01
R-squared	0.2699	0.2726	0.2871	0.2723	0.2715
Observations	385	385	385	385	385
Number of id	35	35	35	35	35

** denotes significance at the 5% level, numbers in parenthesis are Driscoll-Kraay standard errors. The abbreviation IG stands for Inclusive Growth, PC is Productive Capacity, TI is Technological Innovation, GE is Government Effectiveness, HD is Human Development, TO is Trade Openness, GCF is Gross Capital Formation, FSD is Financial Sector Development and PG is Population Growth.

Table 10. Random Effect Model for the Middle East and North Africa

Variables	(1)	(2)	(3)	(4)	(5)
PC	0.407**	0.731**	-0.653	0.885**	0.933**
	(0.492)	(0.725)	(20.415)	(0.724)	(0.745)
TI	-0.092**	-1.706	-0.074**	-0.363**	-0.378**
	(0.022)	(1.420)	(0.013)	(0.134)	(0.146)
PC*TI		0.501			
		(0.438)			
PC^2			0.282		
			(3.014)		
TI^2				-0.036**	
				(0.014)	
(PC*TI) ^2					-0.004**
					(0.002)
GE	-0.011	-0.011	-0.010	-0.010	-0.010
	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)
HD	-0.371 **	-0.378**	-0.386**	-0.360**	-0.361**
	(0.065)	(0.071)	(0.076)	(0.063)	(0.063)
TO	-0.000	-0.000	-0.001	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
GCF	0.000	-0.000	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FSD	-0.006 **	-0.005**	-0.005**	-0.005**	-0.005**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
PG	-0.038 **	-0.037**	-0.031**	-0.039**	-0.039**
	(0.011)	(0.011	(0.012)	(0.011)	(0.011)
Constant	-0.901 **	-0.970**	0.681	-0.786**	-0.968**
	(1.795)	(2.556)	(34.359)	(2.679)	(2.762)
P-value	0.0000	0.0000	0.0000	0.0000	0.0000
Wald	522.65	728.72	24019.13	4026.25	1263.38
R-squared	0.3022	0.2943	0.3175	0.3210	0.3228
Observations	209	209	209	209	209

Number of id	19	19	19	19	19

** denotes significance at the 5% level, numbers in parenthesis are Driscoll-Kraay standard errors. The abbreviation IG stands for Inclusive Growth, PC is Productive Capacity, TI is Technological Innovation, GE is Government Effectiveness, HD is Human Development, TO is Trade Openness, GCF is Gross Capital Formation, FSD is Financial Sector Development and PG is Population Growth.

Table 11. Fixed Effect Model for South Asia and Pacific

Variables	(1)	(2)	(3)	(4)	(5)
PC	0.764**	-0.757	-0.381**	-0.761**	-0.746**
	(0.313)	(0.453)	(11.207)	(0.711)	0 .716
TI	-0.134**	-0.449	0.0222	-0.084	-0.094
	(0.041)	(0.529)	(0.030)	(0.066)	0.070
PC*TI		0.250			
		(0.149)			
PC^2			0.061**		
			(1.667)		
TI^2				-0.010	
				(0.006)	
(PC*TI) ^2					-0.001
					0.001
GE	0.001	0.001	0.000	-0.000	-0.245
	(0.003)	(0.004)	(0.002)	(0.002)	0.057
HD	-0.271**	-0.259	-0.343**	-0.244**	-0.245**
	(0.107)	(0.057)	(0.077)	(0.057)	(0.057)
TO	-0.002**	-0.002	-0.001	-0.003	-0.003
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
GCF	-0.002**	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.002)	0.002	(0.002)	(0.002)
FSD	0.004**	0.003	0.006**	0.001**	0.008**
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
PG	0.225**	0.144	-0.197	-.183	-0.182
	(.064)	(0.235)	(0.259)	(0.266)	(0.266)
Constant	-0.059**	-0.341	0.580**	0.414**	0.008**
	(1.034)	(3.490)	(19.004)	(2.574)	(0.001)
P-value	0.000	0.195	0.000	0.000	0.000
R-squared	0.073	0.053	0.105	0.0735	0.074
F-statistic	334.870	460.830	82.400	342.570	285.000
Observations	198	198	198	198	198
Number of id	18	18	18	18	18

** denotes significance at the 5% level, numbers in parenthesis are Driscoll-Kraay standard errors. The abbreviation IG stands for Inclusive Growth, PC is Productive Capacity, TI is Technological Innovation, GE is Government Effectiveness, HD is Human Development, TO is Trade Openness, GCF is Gross Capital Formation, FSD is Financial Sector Development and PG is Population Growth.

Table 12. Fixed Effect Model for Latin America and the Caribbean

Variables	(1)	(2)	(3)	(4)	(5)
PC	0.819 **	0.498	-0.127	0.256**	0.587**
	(0.717)	(1.683)	(30.260)	0.746	(0.782)
TI	-0.103**	-0.837**	-0.141**	-0.755**	-1.003**
	(0.067)	(3.553)	(0.030)	(0.324)	(0.367)
PC*TI		-0.288			
		(1.107)			
PC^2			0.726		
			(4.565)		
TI^2				-0.143**	
				(0.057)	
(PC*TI) ^2					-0.019**
					(0.007)
GE	0.003	0.003	0.003	0.001	0.001
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
HD	-0.618**	-0.620**	-0.627**	-0.637**	-0.640**
	(0.156)	(0.150)	(0.160)	(0.153)	(0.153)
TO	0.004	0.004	0.004	0.004	0.004
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
GCF	-0.002	-0.002	-0.002	-0.002	-0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
FSD	-0.004**	-0.004**	-0.004**	-0.004**	-0.004**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
PG	0.0213	0.022	.0297	0.028	0.029
	(0.079)	(0.080)	(0.072)	(0.076)	(0.076)
Constant	-0.41**	-0.350	0.458	-0.440**	-0.755**
	(2.464)	(5.615)	(49.977)	(2.631)	(2.803)
P-value	0.000	0.000	0.0000	0.000	0.000
R-squared	0.063	0.064	0.065	0.067	0.069
F-statistic	39.980	127.240	45.980	16.630	19.800
Observations	198	198	198	198	198
Number of id	18	18	18	18	18

**denotes significance at the 5% level, numbers in parenthesis are Driscoll-Kraay standard errors. The abbreviation IG stands for Inclusive Growth, PC is Productive Capacity, TI is Technological Innovation, GE is Government Effectiveness, HD is Human Development, TO is Trade Openness, GCF is Gross Capital Formation, FSD is Financial Sector Development and PG is Population Growth.

Table 13. Ransom and Fixed Effect Model Europe

Variables	(1) FE	(2) RE	(3) RE	(4) FE	(5) RE
PC	-0.359** (0.399)	-0.252** (0.300)	-0.399** (32.561)	-0.398 ** (2.133)	0.880 (0.604)
TI	-0.435** (2.19)	-0.542** (6.106)	0.7262 (0.266)	0.690 (0.912)	-0.187** (0.807)
PC*TI		0.811** (1.676)			
PC^2			0.063** (4.382)		
TI^2				0.461 (1.403)	
(PC*TI) ^2					0.247** (0.067)
GE	0.007 (0.016)	0.009 (0.019)	0.011 (0.018)	0.006 (0.017)	0.009 (0.019)
HD	0.061 (0.059)	0.081 (0.065)	0.066 (0.067)	0.067 (0.052)	0.081 (0.062)
TO	0.006 (0.003)	0.001 (0.001)	0.001 (0.001)	(0.006) 0.004	0.001 (0.001)
GCF	0.003 (0.002)	0.004 (0.002)	0.004 (0.002)	(0.003) 0.002	0.004 (0.002)
FSD		0.008** (0.002)	0.008** (0.002)	(0.001) 0.003**	0.007** (0.002)
PG	0.254** (0.089)	0.258** (0.064)	0.224** (0.066)	(0.256) 0.092	0.227** (0.067)
Constant	0.003 (0.004)	-0.552** (1.097)	0.451** (60.400)	0.327 7.640	0.460 (3.009)
P-value	0.000	0.000	0.000	0.000	0.000
R-squared	0.0400	0.224	0.185	0.041	0.1831
F - statistics	28.58			55.23	
Wald		1118.44	7040.48		948.98
Observations	308	308	308	308	308
Number of id	28	28	28	28	28

** denotes significance at the 5% level, numbers in parenthesis are Driscoll-Kraay standard errors. The abbreviation IG stands for Inclusive Growth, PC is Productive Capacity, TI is Technological Innovation, GE is Government Effectiveness, HD is Human Development, TO is Trade Openness, GCF is Gross Capital Formation, FSD is Financial Sector Development and PG is Population Growth.

The positive relationship between PC and IG recorded for Africa, Middle East and North Africa, and Latin America and the Caribbean has been corroborated by Gnangnon (2021) who reports that productive capacities promote economic growth and reduce economic growth volatility in countries that face a high degree of structural economic vulnerability. However, Lomachynska and Podgorna (2018) found no relationship between innovation and economic growth; and between financial development and innovation.

For Africa, Griffith, Huergo, Mairesse, and Peters (2006) Griffith, Redding, and Reenen (2004) and Mairesse and Monhen (2010) have corroborated our findings, albeit using GDP growth. They found that significant positive relationship between GDP growth rate, and technology and productivity. For developing countries, Mohamed, Liu and Nie (2022) found that an increase in technological innovation indicators leads to an increase in economic growth. Corroborating these findings, Anakpo and Oyenubi (2022) used panel dynamic ordinary least squared regression on data from ten Southern African countries (South Africa, Angola, Botswana, Zimbabwe, Mozambique, Malawi, Lesotho, Zambia, Swaziland, and Namibia) and found that technological innovation indicators such as researchers in research and development, graduates from information and communication technology, patents-non-residents, graduates from science, technology, engineering and mathematics, and scientific and technical outputs have a significant positive relationship with per capita economic growth in the long run. However, for Europe, when we interact PC with TI, the relationship between combined PC and TI with IG becomes positive and significant.

5. Conclusion

Given that the GDP growth rate measures the developmental growth in a country, it does not measure how the benefits of the economic growth are distributed to benefit society. However, inclusive growth measures how the benefits from growth are distributed to benefit all in society. It is against this backdrop that this study examined how PC and TI affect IG and how the combined effects of PC and TI affect IG. Specifically, we answer the following question. Firstly, do technology and innovation affect inclusive growth? Secondly, do productive capacities affect inclusive growth? And thirdly, do technology and innovation, and productive capacities affect inclusive growth?

Our analysis suggests that PC and TI have a positive relationship with IG for sub-Saharan countries. For the Middle East and North Africa, and Latin America and the Caribbean, we find that PC has a significant positive effect on IG. However, we find that the

relationship between PC and IG for sub-Saharan Africa is monotonically increasing, and that of the Middle East and Africa is monotonically decreasing. For South Asia and the Pacific, and Europe, the relationship between PC and IG is U-shaped, with a turning point of 22.7133 and 23.728, respectively. These values fall within the range for PC data.

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Table 4. Descriptive statistics

	IG	PC	TI	GE	HD	TO	GCF	FSD	PG
Sub-Saharan Africa									
Obs.	385	385	385	385	385	385	385	385	385
Mean	1.265	0.965	2.394	1.429	0.091	60.118	22.358	6.997	2.398
Maximum	332.170	12.801	352.946	80.025	0.626	130.778	79.401	156.043	4.156
Minimum	-326.231	-4.866	-314.588	-16.848	0.000	-36.481	-7.915	0.000	0.055
Std. Dev.	69.252	1.738	47.437	6.173	0.170	33.334	13.301	28.922	0.793
Middle East and North Africa									
Obs.	209	209	209	209	209	209	209	209	209
Mean	-3.246	0.747	0.984	4.073	0.144	104.064	-3.355	9.133	2.806
Maximum	288.428	8.379	337.294	32.902	0.763	322.675	72.162	127.101	13.423
Minimum	-319.479	-6.289	-389.790	-25.958	0.000	0.000	-644.032	0.000	-5.280
Std. Dev.	65.958	1.591	47.484	7.480	0.256	66.384	57.035	28.681	2.660
South Asia and the Pacific									
Obs.	198	198	198	198	198	198	198	198	198
Mean	-3.744	1.134	2.253	5.070	0.114	72.480	6.974	20.425	1.279
Maximum	346.945	7.565	335.046	85.359	0.687	164.664	75.526	171.159	3.048
Minimum	-218.326	-8.777	-442.978	-15.786	0.000	0.000	-30.064	0.000	-0.003
Std. Dev.	59.007	1.574	51.723	8.855	0.223	46.188	13.806	44.629	0.626
Latin America									
Obs.	198	198	198	198	198	198	198	198	198
Mean	-1.544	0.778	0.597	3.031	0.114	55.014	1.902	30.031	1.119
Maximum	244.224	5.958	85.989	15.880	0.619	122.217	45.864	97.415	2.875
Minimum	-246.253	-6.103	-134.235	-6.516	0.000	0.000	-44.242	0.000	-0.587
Std. Dev.	61.557	1.268	18.772	3.433	0.223	31.238	12.226	29.637	0.688
Europe									
Obs.	308	308	308	308	308	308	308	308	308
Mean	-3.763	0.305	0.568	0.876	0.218	114.216	0.635	5.251	0.262751
Maximum	280.114	4.248	16.530	7.589	0.817	362.424	50.082	151.248	2.430976
Minimum	-337.824	-3.850	-11.969	-10.055	0.000	45.419	-54.327	0.000	-2.258464
Std. Dev.	58.961	0.581	3.530	2.368	0.340	56.787	12.235	26.338	0.776949

These summary statistics are in levels. The abbreviation IG stands for Inclusive Growth, PC is Productive Capacity, TI is Technological Innovation, GE is Government Effectiveness, HD is Human Development, TO is Trade Openness, GCF is Gross Capital Formation, FSD is Financial Sector Development, PG is Population Growth, Obs. is observations, Std. Dev. is standard deviations, Min is minimum and Max is maximum.

Table 5. Panel unit root tests

	IG	PC	TI	GE	HD	TO	GCF	FSD	PG
Sub-Saharan Africa									
LLC	-81.616**	-26.927**	-21.599**	-6.497**	-1.780**	-3.896**	-8.168**	1.349**	11.156**
ADF	217.257**	261.699**	256.518**	44.413**	33.198**	95.002**	127.955**	8.859**	144.907**
PP	311.169**	271.087**	356.110**	60.651**	33.198**	100.210**	98.162**	12.275**	92.034**
Middle East and North Africa									
LLC	-16.760**	-21.037**	-12.220**	10.245**	-2.095**	-7.506**	-10.793**	-0.651**	-6.039**
ADF	148.692**	143.481**	123.918**	93.550**	29.833**	65.803**	105.139**	6.621**	91.177**
PP	189.532**	123.770**	183.766**	86.429**	29.833**	52.837**	140.852**	14.331**	60.808**
South Asia and the Pacific									
LLC	-9.660**	-12.073**	-27.274**	-7.843**	-0.948**	-2.971**	-9.671**	-2.391**	0.441**
ADF	98.938**	117.952**	126.675**	78.972**	10.029**	32.896**	92.756**	15.793**	46.374**
PP	122.585**	178.240**	171.790**	105.230**	10.029**	39.989**	97.196**	28.218**	35.016**
Latin America									
LLC	-6.894**	-11.118**	15-104**	-9.534**	-1.635**	-8.757**	-18.528**	0.375**	1.333**
ADF	126.199**	127.991**	147.184**	94.476**	17.137**	82.434**	154.452**	7.259**	53.626**
PP	151.476**	162.200**	220.254**	95.573**	17.137**	89.101**	166.462**	7.155**	63.058**
Europe									
LLC	-16.201**	-22.954**	-15.119**	-10.746**	-3.124**	-14868**	-22.649**	-0.507**	-1.576**
ADF	154.322**	197.160**	185.425**	163.350**	60.843**	152.467**	238.325**	0.703**	79.949**
PP	197.190**	205.367**	212.003**	119.515**	60.843**	67.312**	164.487**	0.628**	93.636**

** denotes significance at the 5% level, with data from 2008 to 2018. The abbreviation IG stands for Inclusive Growth, PC is Productive Capacity, TI is Technological Innovation, GE is Government Effectiveness, HD is Human Development, TO is Trade Openness, GCF is Gross Capital Formation, FSD is Financial Sector Development, PG is Population Growth, LLC: Levine-Lin-Chu statistics, IPS: Im-Pessaran-Shin statistics, ADF: augmented Dickey-Fuller statistics and PP: Philips–Perron statistics.

Table 6. Correlation matrix

	IG	PC	TI	GE	HD	TO	GCF	FSD	PG
Sub-Saharan Africa									
IG	1.000								
PC	-0.056	1.000							
TI	-0.041	0.046	1.000						
GE	0.022	0.138	0.085	1.000					
HD	-0.008	-0.125	-0.127	-0.062	1.000				
TO	-0.019	0.025	-0.023	0.055	-0.003	1.000			
GCF	-0.027	0.014	-0.006	-0.017	-0.040	0.664	1.000		
FSD	-0.013	-0.005	0.000	-0.009	0.060	0.007	-0.040	1.000	
PG	-0.024	0.013	0.027	0.014	-0.068	0.020	0.279	-0.261	1.000
Middle East and North Africa									
IG	1.000								
PC	-0.006	1.000							
TI	-0.013	0.085	1.000						
GE	-0.101	0.149	0.010	1.000					
HD	-0.062	-0.007	0.014	-0.046	1.000				
TO	0.057	-0.024	-0.081	0.087	0.013	1.000			
GCF	-0.034	0.020	-0.286	-0.172	0.071	-0.225	1.000		
FSD	-0.122	0.008	0.028	0.073	0.092	-0.003	0.045	1.000	
PG	-0.089	0.143	-0.014	0.119	-0.116	-0.029	0.051	-0.204	1.000
South Asia and the Pacific									
IG	1.000								
PC	-0.001	1.000							
TI	0.034	0.300	1.000						
GE	0.030	0.154	0.011	1.000					
HD	0.129	-0.052	-0.026	-0.053	1.000				
TO	0.052	0.041	0.006	0.126	0.085	1.000			
GCF	-0.007	0.230	0.019	0.130	0.039	0.107	1.000		
FSD	0.067	-0.055	-0.010	-0.116	0.048	0.243	-0.172	1.000	
PG	-0.049	-0.163	-0.010	0.052	-0.016	-0.119	0.015	-0.361	1.000

The abbreviation IG stands for Inclusive Growth, PC is Productive Capacity, TI is Technological Innovation, GE is Government Effectiveness, HD is Human Development, TO is Trade Openness, GCF is Gross Capital Formation, FSD is Financial Sector Development and PG is Population Growth.

Table 6. Correlation matrix (Continued)

	IG	PC	TI	GE	HD	TO	GCF	FSD	PG
Latin America									
IG	1.000								
PC	0.003	1.000							
TI	-0.005	-0.130	1.000						
GE	0.125	0.090	-0.019	1.000					
HD	-0.109	-0.116	-0.053	-0.075	1.000				
TO	0.092	0.062	0.004	0.133	-0.057	1.000			
GCF	0.007	-0.222	0.140	0.012	0.219	0.088	1.000		
FSD	0.059	0.056	0.010	0.037	0.041	0.225	0.089	1.000	
PG	0.015	0.075	0.023	0.363	0.017	0.559	0.025	0.060	1.000
Europe									
IG	1.000								
PC	-0.015	1.000							
TI	0.129	0.032	1.000						
GE	0.049	0.075	-0.150	1.000					
HD	-0.042	0.127	-0.064	0.029	1.000				
TO	-0.022	0.061	-0.002	0.201	0.016	1.000			
GCF	0.064	0.041	-0.060	0.220	0.215	0.172	1.000		
FSD	0.013	-0.103	0.002	0.093	0.013	-0.160	0.007	1.000	
PG	0.031	-0.058	-0.062	0.269	0.004	0.304	-0.007	0.206	1.000

The abbreviation IG stands for Inclusive Growth, PC is Productive Capacity, TI is Technological Innovation, GE is Government Effectiveness, HD is Human Development, TO is Trade Openness, GCF is Gross Capital Formation, FSD is Financial Sector Development and PG is Population Growth

RESOURCE COSTS OF CASH AND DIGITAL RETAIL PAYMENT INSTRUMENTS IN GHANA

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Abstract

This study estimates the resource costs of five retail payment instruments used in Ghana, namely cash, mobile money, cheque, debit card and automatic clearinghouse (ACH) credits. As financial systems and economies grow and develop, reliance on currency to undertake transactions decreases, while use of other payment instruments increases. Estimates of costs of payment instruments in African economies are not common, but efficiency of payment methods is important to central banks and economic managers. To estimate the resource cost of cash, we ran a cross-sectional regression with the output of the informal economy as a fraction of official gross domestic product (GDP) as the explanatory variable and the resource cost of cash payments as a fraction of official GDP as the dependent variable. The resource cost of mobile money payments is estimated in two ways - analysing i) financial statements of service providers, and ii) direct out-of-pocket expenses incurred by consumers. Opportunity cost of consumer time is added to each. Estimates of the resource cost of using cheques and ACH credits are guided by the detailed work of Wells (1996). The total resource cost for debit card payments is obtained as the sum of retailer cost, cost borne by banks and infrastructure providers and cost of customer time. For 2023, the non-cash instrument with the lowest resource cost per transaction is mobile money at USD 0.36. For 2023, resource costs as ratio of GDP are: cash, 0.765%; mobile money, 0.91%; all payment instruments investigated, 1.86%. Relative to GDP, Ghana's resource cost of payment is higher than most developed economies. Reduction in these costs will translate to a more efficient economy.

Keywords: cash, cheques, debit cards, Ghana, mobile money, payment instruments, resource cost.

Introduction

Payments are necessary for the smooth functioning of economies. All over the world, as financial systems and economies grow and develop, reliance on currency to undertake transactions decreases, while the use of other payment instruments increase. Costs are associated with the use of payment instruments. This study is interested in the resource costs (sometimes called social costs) of retail payment instruments in Ghana as a case study for Africa. The resource cost of a payment instrument is the sum of the cost of all resources deployed by society to produce and make available that payment instrument to the general public. These costs are borne by stakeholders involved in the payment chain. Stakeholders along the payment chain may include central banks, merchants/retailers and service providers, banks, credit-granting institutions, interbank payment infrastructure operators, cash-in-transit companies, payment processing companies, fintech companies, and consumers.

Estimates of the total cost of resources used in making retail payments have varied across studies. Schmiedel, Kostova and Ruttenberg (2013) report a range of 0.5% of gross domestic payments (GDP) to 0.9% of GDP. This wide range has been cited as a good reason for central banks to conduct their own cost studies. In addition, Hayashi and Keeton (2012) argue that cost studies of other economies can serve as useful inputs and yardsticks for undertaking studies on payment costs of economies of interest. Differences in findings have been traced to differences in scope (which instruments and which stakeholders along the value chain were included), the costing methodologies adopted, the thoroughness of the approach, etc. Thus, caution is called for when one is making comparisons across studies.

Fees charged by one stakeholder to another stakeholder in the chain are excluded in counting resource costs. However, such fees are counted when interest centres on private costs borne by an entity. In this context, private costs refer to all the costs borne by a stakeholder to ensure that a payment is effected, including payments made to other stakeholders in the payment chain.

Literature on costs of payment instruments in African economies is not common. In this paper, the author estimates the resource costs of payment instruments using secondary data. Studies that have estimated resource costs using primary data have required enormous amounts of resources, time, economic and political clout and substantial access to data and information which are not available to this author. For example, when thirteen members of the European System of Central Banks (national central banks) carried out a study of the social and private costs of retail payments under the auspices of the European Central Bank, enormous resources of all national central banks and the European Central Bank were required. And when the Better Than Cash Alliance (2017) (BTCA) studied the payments systems and incentives for digital payments in Ghana in 2017, they required collaboration and financial support of the Bill & Belinda Gates Foundation, United Nations Capital Development Fund, MasterCard, Visa, United States Agency for International Development and United Nations Capital Development Fund. In addition, collaboration with BTCA of approximately 80 organisations and individuals at their highest levels was required.

In general, policies that aim at reducing the use of cash in payments assume that electronic payment methods are more efficient. Efficiency of payment methods is important to central banks and other

regulators as they push to increase the efficiency of their economies. For example, Ghana has a policy that is referred to loosely as Cash-Lite policy. It is aimed at reducing the extent to which cash is used in payments, presumably because the resource cost of cash is higher than that of other payment instruments. This needs to be established empirically. Riksbank (2023) reported that their study of the Swedish payment system revealed that electronic payments cost about one-half what their paper alternatives cost per payment. Thus, if Sweden (and maybe other countries) switched from paper payment to entirely electronic payments, resource costs would reduce.

Payments in Ghana

As alluded to earlier, in 2016, BTCA undertook a very extensive study of the Ghanaian retail payment system (BTCA, 2017). BTCA estimated that, in 2016, 6.8 billion retail payment transactions (valued at USD 130 billion) were undertaken in Ghana, and that an overwhelming 98.72% of these transactions were in cash. Of the value, 63% were cash payments. BTCA noted that, Ghana is not different from many of the African countries they had studied. These include Nigeria in 2013, where 98.4% of payment transactions were cash; Malawi in 2014, 99% were cash payments; Uganda in 2015, 95% were cash payments; and Kenya in 2016, 95% were cash payments.

BTCA (2017) documented that the more important payment instruments in Ghana are cash, mobile money, cheque and debit cards. In addition, a quick analysis of the central bank of Ghana's, (Bank of Ghana, 2023), annual payment report shows that automated clearing house (ACH) direct credit is an important payment instrument. Thus, the resource costs of these five payment instruments are investigated.

To explain the overwhelming proportion of cash transactions, BTCA pointed to the high proportion of the informal economy, the high cost of bank cards and digital payments, lack of trust in formal systems and non-familiarity with digital payments. Chakravorti and Mazzotta (2013) documented, in addition, concerns about political instability and/or possible arbitrary government actions for the popularity of cash payments in India and Mexico.

Following this introduction, the literature on resource cost of payments is reviewed. Next, the methodology adopted in this study is presented, followed by presentation of findings. Discussion of findings and conclusions follow.

LITERATURE

The United Nations Economic Commission for Africa (UNECA) (1996) observed that many African countries display major weaknesses in their payments and clearing arrangements, within country and also with other countries in Africa and elsewhere. UNECA notes that financial deepening in Africa will have to be accompanied by more developed and effective payments and clearing system and by improvements in instruments and infrastructure that is needed to effect payments and clear obligations. Also, AfricaNenda (2024) in partnership with The World Bank

and the United Nations Economic Commission for Africa observed that “access to safe, low-cost, and efficient digital payments can transform lives, close the gender finance gap, and foster resilience.” For example, Mothobi and Grzybowski (2017) analysed survey data collected in 11 sub-Saharan African countries in 2011 and concluded that mobile phones improved the livelihood of individuals residing in remote areas because they ensure access to financial services which would otherwise not have been available to the people.

Resource costs of payment instruments

Consider cash purchase at a retail store. This would involve the purchaser and the retailer. The purchaser would spend time in a queue to get to the checkout counter. But before the purchaser goes to the retail shop, he/she may have had to go to a cash outlet for cash. Time spent in queues to obtain cash or to pay for purchase has opportunity cost besides actual out-of-pocket expenses the consumer may have incurred for transportation, etc. The cash outlet operator would have had to bear the cost of storing cash safely so that it could be assessed.

Back in the retail store. At the end of day, the retailer incurs costs to deposit cash on hand at bank. The retailer also pays the wages of its cashiers and back-office staff who count and pack the cash. In addition, the retailer bears the cost of equipment needed to receive cash payments, and the cost of electricity for the machines to work, and the paper on which receipts are printed.

To start the process of using cash as a payment instrument, the central bank would have had to bear the cost of designing and printing the currency. Then it would have had to store the cash safely so that deposit-taking institutions could access it. The cost of all resources expended by all these parties (purchaser, retailer, deposit taking institution and the central bank) to this payment transaction less any payments received by any party in the payment chain is the cost of the cash payment instrument to society.

For example, for Ghana, the Bank of Ghana spent USD 50.5 million to print the local currency in 2017; in 2018, she spent USD 30.5 million; in 2019, USD 55.3; in 2020, USD 58.6 million; in 2021, USD 29 million and in 2022, USD 34 million. Note that these do not constitute the full resource cost of paying by cash.

Variants of the cost of payments outlined for cash apply to other payment instruments. For example, a mobile money company would have to set up business with necessary infrastructure; a user may have to join human queues to access services provided by a mobile money agent; spend time waiting if the agent suffers network unavailability or not enough digital funds when the user arrives; etc. Even if one was loading funds onto a mobile money wallet from a bank account, the bank network or mobile money network could be down, etc.

Estimating the cost of payments

Studies that estimate resource cost of payments investigate a number of dimensions. They study the number of entities engaged in payment transactions (issuing authorities, banks and interbank infrastructure providers, merchants/retailers, cash-in-transit companies, households/individuals,

businesses, and government); the cost per transaction; the cost per unit value of payment; the cost of resources used up when individuals, businesses and governments make payments to each other; etc.

Cost categories

The World Bank Group (2016) and other authors identify necessary ingredients in estimating resource and private costs of payment instruments. Relevant ingredients include production costs (cost of materials and procedures followed to produce a payment instruments); service costs (fees and charges paid in using a payment instrument); time costs (opportunity cost of time spent to access and/or obtain a payment instrument, reconcile payments, etc.). Time costs may be broken down into travel time; waiting time; transactions time, operations time; reconciliation time; etc.

Other costs include payment infrastructure costs (installing and maintaining infrastructure); the hidden costs (risks) associated with the use of payment instruments (losses due to errors, theft, fraud, etc.); and the opportunity cost of not keeping funds in an interest-bearing account.

Further, there are environmental costs too. For example, to produce cheques or other paper money, trees, water and gas are used, and greenhouse gases are expelled. Also, once a cheque has been processed or paper money is considered withered, resources are used up in destroying it. Even digital payment instruments consume energy, especially payments based on blockchain technology.

Overall, the resource cost of making a payment would be the sum of at least four different components: consumer/payer costs; merchant/retailer cost of receiving payment; costs borne by a payment processing entity; and processing costs borne by a bank or entity that authorisies payment (central bank or a debit or credit card issuer).

Debit cards

To make an in-person debit card payment, a customer dips, taps, swipes, enters a code, etc. at a card terminal device at the point of sale (POS). The POS system captures the card information and transmits same to the customer's card processing system (MasterCard, Visa, etc.). Then, the card processing system verifies the transmitted data and forwards the data to the bank that issued the debit card. All being well, the issuing bank confirms and approves the debit transactions to the merchant.

Hayashi (2021) identified the resource costs incurred by merchants/retailers in accepting debit card payments in situations of in-person payments. She classified them into front office costs (processing at the checkout point including time to change receipt paper rolls, deliver receipts, cost of receipt paper and ink ribbons, etc.); back office costs (reconciling receipts and merchant accounts and processing chargeback requests, etc.); infrastructure costs (card readers, personal

identification number pads, telephone or internet service to request and receive authorization and clearing messages, cost of point-of-sale terminals, cost of software to record and analyze payments, etc.); and fraud losses incurred by merchants, insurance premiums against fraud and data breaches, and other mitigation measures.

Cheques

Following Wells (1996), the resource cost of payment by cheque may be decomposed into production cost and processing cost. Production costs are the cost to produce a physical cheque and the cost of mailing or transporting cheques to customers or bank branches for customer pickup. Processing costs include the cheque writer's costs and the cheque receiver's costs. The cheque writer's costs include the cost of receiving appropriate authorization, writing the cheques, receiving appropriate signatures and ensuring delivery of the cheque to the payee. The cheque receiver's costs include the cost of the system put in place to properly receive cheques and present to bank. If the cheque is honoured the cost of crediting the payer also counts. If it is not honoured, the receiver incurs the cost of reverting to the payer.

In jurisdictions like Ghana, use of the cheque as a payment instrument differs substantially from the US system. In Ghana, few retailers accept cheques as a payment instrument. For these few, the payer will present the cheque at the checkout counter only. A more popular use of cheques in Ghana is to physically present the cheque to settle indebtedness (not necessarily to retailers) or write cheques to cash money from the writer's own bank account.

In Ghana and the US, banks expend resources in receiving cheques over-the-counter or from automatic teller machines; processing internally if drawn on the receiving bank, else sending to the paying bank directly or through a correspondent bank, a clearinghouse, or capturing the cheque's image and magnetic ink character recognition data and sending same electronically to the cheque clearing system put in place by the central bank. If the bank on which the cheque is drawn accepts to make payment, it signals the beneficiary's bank to make payment, and the account of the payer is debited.

The US remains the country which issues the highest number of cheques per capita per annum. In 1995, 239 cheques were issued per capita. In that same year, Europe issued 32 cheques per capita, and Japan issued three, (Humphrey, Kim and Vale, 2001). In 2021, the US issued 30.13 cheques per capita, France 16.31, UK 2.23 and Japan 0.29, (Diallo and Shy, 2023). In 2017, Ghana issued 0.24 cheques per capita; in 2023, the ratio was 0.13, Bank of Ghana (2023).

Automated Clearing House (ACH) credits

To pay by ACH, a payer would instruct their bank, who is a member of the ACH network, to "push" money from the payer's bank account to a payee's bank account electronically. The payer could be an employer making payroll payments, pensions payments, dividend payments or

government payments. ACH payments are secure, reliable, cost-effective, faster and cheaper to process than cheques.

Mobile money

According to GSMA (2024), in 2023, Africa processed 62 billion transactions, valued at USD 919 billion (65.6% of global value). GSMA says Africa uses mobile money to pay for purchases and utility bills. Mobile money utility bill payments benefit utility service providers and end-users by increasing payment transparency, reducing leakage, curbing operational cost, and providing avenues for financial inclusion. They also benefit mobile operators by helping drive mobile money-adoption.

To set up a mobile money payment system, the mobile money service provider (MMSP) puts in place the required infrastructure to be paid for by users of the service over time. In addition, the MMSP expects to make a profit. This too must be paid for by users of the service. The MMSP itself may pay for leased signal towers, leased lines, spectrum and regulatory fees, interconnect costs, dealer commissions, etc., costs it passes on to users of her service.

Costs incurred by economic agents who use the services of MMSP to make payments comprise of i) out-of-pocket expenses paid to MMSPs; ii) other out-of-pocket expenses (e.g. cost of buying or renting a mobile phone); and iii) opportunity cost of time of users. Additional challenges encountered by mobile money patrons are documented in a Ghanaian study, Lambongang, Aborhey and Benarkuu, (2023). The potential of being defrauded is one of them.

Annan et al. (2023) in a paper for Innovations for Poverty Action (IPA), argued that cost is an important factor in the take-up and use of digital financial services and sought to painstakingly measure these costs so as to construct a Transaction Cost Index of using mobile money (to "develop an accurate, cost-effective approach to measuring transaction costs that can work across many contexts"). In a preliminary report in respect of Bangladesh, Tanzania and Uganda, IPA stated that "Across these countries, approximately one third of attempted mobile money transactions failed, because the agent was not present or was otherwise unable to complete the transaction."

Some empirical studies

The findings of Schmiedel et al. (2013) that aggregate resource costs of making retail payments have varied across studies were commented on earlier. They added that the resource costs of cash payments represent nearly half of the total resource costs of all payment instruments studied. An important shortfall of this study is that it did not include the costs borne by consumers. The authors noted that benefits too are important to consider. However, they argued that dimensions of benefits such as convenience and safety are hard to quantify.

Kosse et al. (2017) investigated the resource costs of the main payment instruments (cash, debit card and credit card) at points of sale in Canada in 2014. For each instrument, they obtained the

sum of all resources used by consumers, retailers, financial institutions, providers of payment instrument infrastructure including Bank of Canada. They estimated the resource costs of payments in Canada as 0.78 per cent of the country's GDP.

Stewart et al. (2017) investigated the resource costs incurred by financial institutions, retailers, and consumers in making, facilitating or accepting consumer-to-business payments in Australia in 2014 and compared these costs to what they were in 2006. Their findings suggest that the resource costs of payment instruments as per cent of GDP had fallen from 0.90% of GDP in 2006 to 0.71% of GDP in 2014. Per transaction, direct debit remained the lowest-cost payment instrument.

Álvez, Lluberas and Ponce (2020) estimated the resource cost of using cash in Uruguay to be 0.61% of GDP. They further reported that banks and retailers bore 77.1% of this cost, while households bore 21.0%. They reported that the resource cost for cheque payments was only 0.04% of GDP, and that replacing paper-cash and cheques by electronic payment instruments would translate to cost reduction for the private sector of 0.65% of GDP.

A commonly cited US study is Wells (1996). Using 1993 US data, Wells (1996) estimated the resource cost of cheque payments and automated clearing house credit payments. He estimated that payers bear 37% of the resource costs, payees 40% and banks 16%. Mailing costs consumed 6% of resources. He estimated the resource cost of each cheque payment to be USD 3.15.

METHODOLOGY

Estimating the resource cost of cash

It has been pointed out that BTCA (2017) and others ascribed the high proportion of cash payments in Ghana, Kenya, Nigeria, Uganda, Egypt, India and Mexico relative to other payment instruments to the high proportion of the informal economy - the set of economic activities that have value but have not been registered with the state and are therefore not regulated. It is well established that there are relatively more informal activities in developing economies than in developed economies. Capasso and Jappelli (2013) observe that the correlation between financial market development and the size of informality of the economy is negative, and added that factors that increase the size of the informal economy are precisely some of the characteristics of developing countries.

Thus, we hypothesize that the extent of use of cash in payments in an economy is directly proportional to the extent of informality of the economy and ran a simple regression, without an intercept, rationalizing that a zero percent informal economy translates to absence of those factors that promote use of cash. The explanatory variable is the output of the informal economy as a fraction of a country's official GDP (INFORMAL%). The dependent variable is the resource cost of cash payments as a fraction of GDP (CASH%).

Data on INFORMAL% are extracted from Elgin et al. (2021), while data on CASH% are extracted from a number of studies including Schmiedel at al. (2013), Kosse et al. (2017), Stewart et al.

(2014) and Riksbank (2023). Thus, possible differences in definition of variables may exist. However, we tried to minimize these.

The number of observations for the estimation was limited by the number of countries for which CASH% was available. We obtained CASH% for 23 countries. In Table 1, the INFORMALITY% of the African countries in 2020 was relatively high. The lowest was South Africa at 29%. Nigeria was highest at 58.2%. Ghana's extent of informality was 35.8%. Worldwide, the country with the least informal economy was the US, followed by the Netherlands, then Canada. Afghanistan was the most informal.

As a ratio of GDP, the total resource cost column of Table 1 may be interpreted as an efficiency indicator of the country's payment system. The data suggest that the US is the least efficient (1.75% of GDP) and the Netherlands most efficient (0.40%). On the other hand, the resource cost of cash column cannot be interpreted as an efficiency indicator because the figures in that column also reflect the extent to which cash is used in those economies.

Table 1: Ratio of informal GDP, resource cost of cash and total resource cost of payment instruments as ratios of GDP

Country	Ratio Informal GDP to Official GDP	Ratio Resource Cost of Cash to GDP	Ratio Total Resource Cost to GDP
Australia	0.127	0.0028	0.0054
Austria	0.091	0.0036	0.0041
Belgium	0.193	0.0025	0.0061
Canada	0.113	0.0035	0.0078
Denmark	0.153	0.0027	0.0052
Estonia	0.264	0.0049	0.0096
Greece	0.271	0.0080	0.0120
Hungary	0.235	0.0079	0.0175
India	0.184	0.0057	0.0121
Ireland	0.132	0.0049	0.0096
Italy	0.240	0.0058	0.0100
JAPAN	0.102	0.0035	0.0055
Latvia	0.251	0.0056	0.0093
Mexico	0.295	0.0048	0.0087
Netherlands	0.100	0.0028	0.0040
Norway	0.158	0.0010	0.0031
Poland	0.229	0.0098	0.0134
Portugal	0.223	0.0042	0.0096
South Africa	0.290	0.0052	0.0110
Spain	0.206	0.0049	0.0096
Sweden	0.136	0.0034	0.0093
Uruguay	0.340	0.0061	0.0113
US	0.072	0.0062	0.0175
Aafghanistan	0.736		
Gabon	0.518		
Ghana	0.358		
Nigeria	0.582		
Russia	0.382		

Resource cost of non-cash payments

The resource costs of four non-cash payment instruments were investigated, namely, mobile money, cheque, automatic clearing house credits and debit cards.

Resource cost of mobile money payments

To estimate the resource cost of mobile money payments, there was hardly any previous work to fall upon. We estimated resource costs in two ways, analysing i) financial statements of service providers, and ii) by valuing out-of-pocket expenses. The cost of costumer time is added to each of these.

Financial statements approach

Financial statements of mobile money service providers (MMSPs) are analysed for an estimate of the annual cost of resources deployed to provide mobile money services. MTN Ghana is a publicly traded on the Ghana Stock Exchange. Thus, its audited financial statements are publicly available. MTN Ghana is by far the biggest player in this segment of the payment systems. In 2023, MTN Ghana received 89.3% of the mobile money industry's revenues, (TechFocus, 2024). In fact, Ghana's National Communications Authority (NCA) has declared MTN as a Significant Market Player (in position to influences prices if left to itself).

MTN Ghana's financial statements give the breakdown of MTN's revenue streams along lines of business. These are Voice; Data; Mobile Money and Digital. Unfortunately, MTN's costs of (providing) services (COS) is not reported along business lines. They costs are lumped together. However, we argue that MTN's cost per line of business is in the same proportion as the ratio of revenues from that line of business to total revenues. For example, in 2023, the ratio of mobile money revenue to total MTN revenues was 21.7%. Thus, we estimate the cost of the mobile money business line as 21.7% of COS for 2023.

We argue further that the parent of MTN Ghana being a multinational company which repatriates its profit, includes its anticipated profits in fees that Ghanaian consumers pay. Hence, the proportion of MTN Ghana's annual profits due to its foreign owners count as part of the resource cost borne by Ghanaian consumers when they make mobile money payments using MTN services.

Further, given that MTN Ghana controlled 89% of industry mobile money revenues, we reasoned that MTN's cost of mobile money business also represented 89% of the industry's mobile money cost and prorated to 100% as the cost to the entire industry for providing mobile money services in Ghana.

We also noted that, mobile money services include Cash-in, Cash-out, on-net-transfers, off-net-transfers, wallet-to-banks services, bank-to-wallet services and account enquiries. BTCA (2017) in their detailed study observed that in Ghana, 67% of mobile money transactions are not payments in the traditional sense. We deduce from this that one-third of mobile money transactions are payments.

Out-of-pocket costs and customer time costs

As discussed earlier, Innovations for Poverty Action (IPA) argued that consumer time costs are an important factor in the uptake and use of digital financial services, especially in developing countries. In that report, IPA estimated how much time it took to make a successful mobile money transaction in Bangladesh, Tanzania and Uganda by incorporating the probability of unsuccessful transactions. They then converted these costs into monetary amounts using local wage rates. Table 2 is taken from IPA. It is clear that time costs are several orders of out-of-pocket costs and must be counted. Time to make a successful payment is an average of waiting times and network unavailability times.

To estimate how long it took to make a successful mobile payment in Ghana, we note that waiting times and network unavailability depend on a number of factors including quality of network infrastructure, number of mobile money agents, urbanization (light intensity), etc. To arrive at equivalent time cost for Ghana, the following are considered: Anderson-Manjang's (2021) Mobile Money Prevalence Index in 2020 for countries; Ghana's 2023 value of mobile money transactions as percent of GDP (300%) relative to Uganda (100%) and Tanzania (100%); and Ghana's mean urban nighttime light intensity of 32.1 versus Tanzania's 20.7 and Uganda's 23.3, (Mothobi and Grzybowski, 2017).

Table 2: Average time cost to make a successful payment transaction versus out-of-pocket cost of the transaction (in 2023).

Country	Bangladesh	Tanzania	Uganda
Average time	40 minutes	31 minutes	42 minutes
Average time cost , USD	0.69	0.34	0.31
Average Out-of-Pkt cost, USD	0.07	0.19	0.11
Cost per successful transaction	0.76	0.53	0.42

Source: Annan et al. (2023)

Cheque costs in Ghana

Our estimate of the resource cost of using a cheque as a payment instrument in Ghana is guided by the detailed work of Wells (1996) referred to earlier. First, noting how cheques are used in the payment system in Ghana relative to the US (outlined above), it is argued here that cheque payer cost, mailing cost and payee cost are very small in Ghana relatively to their US values. This researcher's observations and bankers' opinion is that Ghanaian costs of these three items are only about 25% of Wells' values for the US.

On the other hand, bank processing costs and cheque printing costs, which rely on use of equipment and technology, software and banking systems are higher in Ghana than the US by a factor of 156%. This factor is obtained as the ratio of The World Bank's Human Capital Index (HCI) for the US relative to the value for Ghana. The HCI tracks health, education and worker productivity per country. For 2020, the HCI value for the US was 0.702, while for Ghana, the value is 0.451.

These two factors (25% of US payer cost, mailing cost and payee cost, and 156% higher bank processing costs and cheque printing costs for US) are used to calculate a Ghanaian counterfactual scenario relative to the US's actual 1993 figures in Wells (1996). Next, the 1993 costs are adjusted yearly for the US dollar long-run inflation rate until 2023. Brealey, Myers and Allen, (2018) report the long-run US inflation rate as 3% per annum.

Estimating ACH credit resource cost

Wells (1996) also studied resource costs of ACH credit payments in the US. He estimated the resource cost per ACH credit payment as USD 0.36. To estimate the resource cost of ACH credit payments for Ghana in 1993, we once again construct a counterfactual scenario for Ghana.

ACH payments involve no production cost, but the payer gathers data and enters same into an ACH file and processes it before onward submission to the bank that makes the payments. We reason here that, like cheque payments, payers and banks in Ghana are less efficient, which should translate to higher processing costs (156% of US costs).

Debit cards

Hayashi (2021) reported that the resource cost to a merchant/retailer for accepting debit card payment in the US was USD 0.47 per transaction in 2018. Our earlier argument that the US economy is relatively more efficient than Ghana's applies here too. Thus, we apply the HCI ratio of the US human capital index to Ghana's (156%) to reflect lower productivity of capital and labour in Ghana to obtain the 2018 resource cost of Ghanaian retailers.

Next, we extrapolated from the resource cost borne by banks and infrastructure providers for debit cards in Schmiedel et al. (2013) for Ghana by applying the ratio of HCI in Germany to HCI in Ghana (167%), again to reflect lower productivity of capital and labour in Ghana relative to Germany.

Thirdly, using the average time it took to make debit card payments in the European Union (EU) reported in Schmiedel et al. (2013), we rationalize that it would have taken longer to make debit card payments in Ghana (the same 167%). Next, we reasoned that thanks to technological advancement, EU times would have reduced systematically from 29 seconds in 2012 to 20 seconds in 2019, then to 10 seconds in 2023. We then used Ghana's annual per capita GDP to value the time spent in making debit card payments in Ghana.

The total resource cost for debit card payments is the sum of merchant/retailer cost, cost borne by banks and infrastructure providers and customer time cost.

RESULTS

Cost of cash payments

As indicated in the methodology, we undertook a simple regression with CASH% as the dependent variable and INFORMAL% as the explanatory variable using data for 23 countries. The regression results are decent - the p-value of the F-statistic of the hypothesis that the regression coefficients are zero was zero. The standard error of regression was 0.002 and the adjusted R-squared was 0.783. The coefficient of the explanatory variable is positive (0.022) and statistically different from zero.

The World Bank database estimates Ghana's extent of informality annually from 2010 to 2020. We extended this to 2023, using the average reduction rate of the prior period. For the 2019 to 2023 period, our regression estimates of Ghana's CASH/GDP ratios are reported in Table 3. The ratio falls slowly as Ghana's informality reduces.

Table 3: Resource cost of cash as ratio of GDP

Year	2019	2020	2021	2022	2023
CASH/GDP	0.00784	0.00778	0.00773	0.00769	0.00765

Resource cost of non-cash payments

Table 4 says the average value of cheque payment is highest, followed by ACH credit transactions, then debit cards and finally mobile money. The average mobile money payment per transaction was the lowest. However, the most popular instrument among non-cash transactions was mobile money - 90% of payment transactions in 2019, rising to almost 99% in 2023. In the process, the proportions of transactions involving other non-cash instruments have trended down. The rise in value of mobile money transactions is even more dramatic – from 30% in 2019 to 81% in 2023.

Resource cost of mobile money payments

Estimates from MTN financial statements

As explained in the methodology, mobile money payment resource costs for MTN Ghana are prorated for the entire mobile money industry. Table 5 presents our estimates. The row FS says the resource cost per transaction based on financial statement analysis fell from USD 0.08 in 2019 to USD 0.03 in 2023.

Table 4: i) Average value of non-cash retail payments per instrument, ii) proportions of total transactions, and iii) total value of payments

	2019	2020	2021	2022	2023
	Average value per transaction - USD				
Mobile Money	28	34	38	25	23
Debit Cards	89	112	129	348	83
ACH Direct Credit	882	1063	1164	911	763
Cheques	4593	5224	5680	5141	4342
	Proportions of number of non-cash transactions				
Mobile Money	0.904	0.975	0.982	0.984	0.988
Cheque	0.009	0.002	0.001	0.001	0.001
ACH Direct Credit	0.010	0.003	0.002	0.002	0.001
Debit Card	0.076	0.020	0.014	0.013	0.010
TOTAL	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
	Proportions of value of non-cash transactions				
Mobile Money	0.301	0.680	0.758	0.670	0.809
Cheque	0.511	0.214	0.158	0.159	0.124
ACH Direct Credit	0.106	0.060	0.047	0.048	0.037
Debit Card	0.082	0.046	0.037	0.123	0.030
TOTAL	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**

Based on IPA's time cost estimates for Uganda and Tanzania, we used the factors outlined in the methodology section to conclude that the average time to making a successful mobile money payment in Ghana is less than in those two African countries and estimated the average time to making a successful mobile money payment in 2023 as 15 minutes in Ghana. Given that service providers continue to invest in their infrastructure to improve service quality and that more mobile money agents continue to be recruited and also that more and more people continue to have access to the internet, we reason that the average waiting time to making successful payments has been reducing year after year. We estimated 18 minutes for 2022, 21 minutes for 2021, 24 minutes for 2020 and 25 minutes for 2019. Next, we used Ghana's per capita GDP for each year to convert the times to monetary amounts (Table 5).

Table 5: Indicators of mobile money payment costs

	2019	2020	2021	2022	2023
	Resource cost per Transaction, USD				
Financial Statement Analysis (FS)	0.08	0.08	0.07	0.05	0.03
Out-of-pocket payment, (OPK)	0.12	0.14	0.16	0.10	0.10
Time cost (TIME)	0.48	0.41	0.40	0.31	0.26
(FS+TIME)	0.56	0.49	0.47	0.36	0.30
(OPK+TIME)	0.60	0.55	0.56	0.41	0.36
	Resource cost % of GDP				
TIME/GDP	0.47	0.57	0.80	0.66	0.78
(FS+TIME)/GDP	0.55	0.67	0.92	0.76	0.89
(OPK+TIME)/GDP	0.53	0.66	0.95	0.76	0.91

In Table 5, out-of-pocket payments (OPK) per transaction started at USD 0.12 in 2019, rose for two years then ended 2022 and 2023 at USD 0.10. The time cost per transaction (TIME) is several times the OPK cost, consistent with Annan et al. (2023). Since the true resource cost of mobile money includes customer time, the (FS+TIME) and (OPK+TIME) rows give realistic values per transaction, from USD 0.56 in 2019 to USD 0.30 in 2023. As a percentage of GDP, (FS+TIME) and (OPK+TIME) are very close, starting at 0.53% in 2019 and rising to 0.91% in 2023 reflecting increasing mobile payment transactions.

Table 6: Resource cost of cheque payments

	Wells (1996) in US, USD	Counterfactual in Ghana, USD			
Printing	0.04	0.06			
Payer	1.17	0.29			
Payee	1.25	0.31			
Bank processing	0.51	0.80			
Mailing	0.18	0.05			
Total	3.15	1.51			
After 30 years, 2023	7.65	3.66			
	Annual resource costs for Ghana				
Year	2019	2020	2021	2022	2023
Resource cost per Transaction, USD	3.252	3.350	3.450	3.554	3.660
Resource cost/GDP	0.033%	0.029%	0.029%	0.026%	0.027%

Cheques

As explained in the methodology section, based on Ghana's different use of cheques, we estimate what would have been (counterfactual) the resource cost of a cheque payment in Ghana in 1993. Our estimate is USD 1.51 versus USD 3.15 estimated by Wells (1996) for the US, (Table 6). The long-run US inflation rate suggests that in 2023, the cost would have been USD 3.66 in Ghana versus USD 7.65 in the US, holding other variables constant. Considering the number of cheque payments, Ghana's resource cost for cheque payments was 0.033% of her GDP in 2019, dropping to 0.027% in 2023.

Automated clearing house (ACH) credits

Our estimate of resource cost of payment by ACH credit followed the steps adopted for cheques. The result is that the counterfactual resource cost per ACH credit payment in Ghana would have been USD 0.56 in 1993 versus USD 0.036 estimated by Wells (1996) for the US, (Table 7). Ghana's payer costs would have been higher because these costs are mostly machine based and were impacted by Ghana's lower human capital index relative to the US. Again, applying the long-run US inflation rate of 3% per annum the resource cost per transaction would have been USD 1.22 in 2019 and USD 1.37 in 2023, all else equal. Correspondingly, the resource cost as a percentage of GDP would have risen from 0.013% to 0.018%.

Table 7: Resource cost of ACH credit payments

	Wells (1996) in US, USD	Counterfactual in Ghana, USD			
Production cost	0	0			
Processing costs					
Payer*	0.057	0.08892			
Payee	0	0			
Bank processing	0.26	0.4056			
Mailing	0.05	0.07			
Total	0.36	0.56			
After 30 years, 2023	0.88	1.37			
	Annual resource costs for Ghana				
Year	2019	2020	2021	2022	2023
Resource cost per transaction, USD	1.22	1.25	1.29	1.33	1.37
Resource cost/GDP	0.013%	0.015%	0.016%	0.016%	0.018%

Table 8: Debit card resource cost: components (merchant/retailer, customer; bank/infrastructure) and as ratio of GDP

Year	2019	2020	2021	2022	2023
Retailer Cost, USD	0.754	0.776	0.799	0.823	0.848
Customer Time cost, USD	0.009	0.008	0.007	0.006	0.005
Bank/Infrastructure Cost, USD	0.055	0.058	0.064	0.072	0.083
Resource cost per transaction, USD	0.817	0.842	0.870	0.901	0.936
Total Resource cost/GDP	0.069%	0.073%	0.070%	0.083%	0.102%

Debit cards

The approach outlined in the methodology was implemented. We estimated the resource cost that merchants/retailers, customers and bank and debit card infrastructure providers bear and summed them up.

Table 8 shows that the bulk of the resource costs are borne by retailers, followed by costs borne by banks and infrastructures. Also, the resource cost per transaction increased between 2019 and 2023, from USD 0.817 to USD 0.936. Correspondingly, as a percentage of GDP, total debit card resource cost increased from 0.069% in 2019 to 0.102% in 2023.

Discussion

Resource cost per non-cash instrument

Based on our findings in Tables 5, 6, 7 and 8 it is noted that the non-cash instrument with the lowest resource cost per transaction is mobile money, and this appears to be falling with time as the proportion of mobile money payments rises (Table 4). The resource cost per transaction of the other instruments appears to be rising as their proportion falls.

Resource cost %GDP

Between 2019 and 2023, the resource costs of cash and mobile money as percentage of GDP have been high relative to the other instruments. Since mobile money resource cost per transaction has been falling, it is the increasing volume of mobile money transactions that has been driving up the mobile money ratio. Indeed, over the 2019 to 2023 period, the number of mobile money payments increased 926%, while the value of payments increased 750%.

Table 9 says, other than 2019, the resource cost of the four non-cash instruments was higher than cash. Further, the resource cost of Ghana's five payment instruments as a ratio of GDP which was 1.47% in 2019 and rose to 1.86% in 2023 is higher than the total resource cost of most of the economies listed in Table 1. The is true also for the resource cost of cash payments.

Table 9: Cash and non-cash resource costs

	Estimates of Payment instrument cost per GDP - Ghana				
Instrument	2019	2020	2021	2022	2023
Cash	0.78%	0.78%	0.77%	0.77%	0.76%
TOTAL Non_Cash	0.69%	0.83%	1.13%	0.92%	1.10%
TOTAL - All instruments	1.47%	1.60%	1.90%	1.69%	1.86%

For international comparison in respect of non-cash instruments, we refer to Table 10. It shows that the resource cost per cheque is lower in Ghana and Uruguay than in the sample of developed economies. Earlier, we alluded to less use of cheques in Ghana. The same must hold for Uruguay. The debit card resource cost per transaction in Ghana is higher than only the Canadian figure. As percentage of GDP, the resource cost of cheques and debit cards are comparable to the other countries in Table 10 except US.

Other remarks - Cheque fraud in Africa

Our estimate of the resource cost of cheque payments does not capture the cost of fraud. However, fraud costs have been reported in Kenya, Uganda, Tanzanian and Ghana. Tanzanian authorities banned issuing cheques for amounts exceeding USD 8,000 effective February 2009; the South African payment authorities stopped use of cheque as a payment instrument effective January 1, 2021; and the government of Ghana stopped issuing and accepting cheques effective June 1, 2021.

CONCLUSION

This study is one of the few to estimate the resource costs of payment instruments in an African country. Relative to GDP, Ghana's costs are higher than for most other countries. Reduction in these costs will translate to a more efficient economy. The estimate of mobile money resource cost is probably the first for any economy. Mobile money cost per transaction has been falling, but mobile money resource cost to GDP ratio has been rising due to increasing volume of mobile money payments.

Table 10: Some international data

	Resource cost per transaction, USD in 2023		Resource cost per payment instrument % GDP*	
Country	Cheque	Debit Card	Cheque	Debit Card
European Union	6.16	1.23	0.03	0.10
USA	7.65	2.02	0.02	0.05
Australia	8.68	1.26		0.14
Canada	15.81	0.88	0.04	
Uruguay	1.44		0.47	0.85
Ghana	3.66	0.94	0.03	0.15
*Year of study varied				

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STRATEGIC MANAGEMENT ACCOUNTING PRACTICES OF HOSPITALS: A CASE STUDY OF A PRIVATE HOSPITAL IN GHANA

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Abstract

Strategic Management Accounting (SMA) has received considerable attention in academia and practice over the past few decades. SMA practices have been suggested to improve organizational competitive advantages and performance. Nonetheless, the potential benefits of SMA in organizations are in its nascent stage in service organizations, including healthcare services. This study examines the SMA practices of hospitals in an emerging economy, Ghana, using a private healthcare center as a case study. It further analyzes the benefits and challenges faced by health centers in adopting and implementing SMA techniques in a private health center in Ghana. Using data collected from interviews, the results indicate that hospitals use SMA techniques, such as Activity Based Costing (ABC), Customer Profitability Analysis and Integrated Performance Reports for strategic planning, strategic costing, strategic analysis and reporting, and strategic financing. This study contributes to the existing SMA literature by providing a comprehensive overview of SMA techniques employed in healthcare institutions. By emphasizing a single case study, the preliminary findings identify and highlight the specific business processes in which SMA techniques are used and how they are integrated and interrelated to influence the performance of the hospital. The findings become a useful starting point for further research into SMA practices of hospitals, including identifying the factors that influence the adoption and implementation of these techniques.

Keywords: Ghana, hospital, strategic management accounting practices.

Introduction

Strategic Management Accounting (SMA), 'a collection of techniques, approaches, tools, and applications essential in analyzing [management accounting and] competitor data and developing relevant workable strategies' (Abdullah et al. 2022, p.2) for organizations, has gained significant importance in contemporary organizational practices. Since Simmonds (1982) introduced the concept, SMA has been considered an intersection between management accounting and strategic management, serving as a critical tool in achieving organizational competitive advantage. SMA extends beyond traditional management accounting by emphasizing long-term strategic planning and using financial and non-financial information for decision-making (Roslender & Hart, 2010; Abdullah et al., 2022). For decades, businesses have been the subject of global rapid, dynamic, and changing environments. This changing business environment calls for adequate strategic positioning and fundamental changes in organizational strategies if companies want to remain competitive and survive (McWatters & Zimmerman, 2015). Hence, organizations must adopt and implement SMA practices.

Like any other business, organizations in the healthcare industry, particularly hospitals, applying SMA is even more crucial, considering the complexity and dynamism of the sector. Hospitals operate in a highly regulated environment with several stakeholders, including patients, healthcare professionals, and regulatory bodies. Globally, the healthcare industry faces significant challenges, including rising operational costs, limited financial resources, and increasing demand for healthcare services (Busanelli et al., 2022). Resource allocation, cost control, and performance management are crucial for hospitals to ensure operational efficiency and high-quality healthcare delivery. These challenges, coupled with the quest to achieve the global Sustainable Development Goals (SDG), specifically SDG 3,1 necessitate hospitals to adopt innovative financial and management practices that will optimize their resources while delivering high-quality patient care. SMA offers firms these capabilities; hence, integrating SMA practices in hospitals will potentially improve their effectiveness, performance, and sustainability by aligning their financial strategies with their long-term objectives and operational needs. For instance, SMA can facilitate cost control, pricing strategies, service quality enhancement, and the financial sustainability of hospitals needed for survival in a highly competitive healthcare environment (Cinquini & Tenucci, 2018).

Despite the increasing recognition of the benefits of SMA, studies on how these practices are integrated into operations in the healthcare sector are scarce. Existing studies have concentrated on SMA adoption and implementation in the manufacturing sector (Majeed et al., 2012; Branka et al., 2012). The few studies related to the health sector emphasize hospitals' general management and financial challenges without specifically addressing how SMA techniques are utilized in hospitals to improve their performance and alleviate challenges. This study explores the SMA practices and their impact on the performance of a private healthcare delivery institution in Ghana. Specifically, it assesses SMA tools and techniques used by the hospital,

1 The global SDG stipulate that countries provide quality and affordable healthcare to its citizenry. Specifically, SDG 3 aims to ensure healthy lives and promote well-being for all ages.

highlights the challenges faced in implementing these techniques, and describes how the hospital has benefited from SMA practices.

Ghana is a suitable setting for this research due to its reforms in the health sector over the years and the financial constraints that the reforms have resulted in. In Ghana, introducing and implementing the National Health Insurance Scheme (NHIS) has significantly reformed the healthcare system. Although the scheme has expanded healthcare access countrywide, it has also increased financial pressures in hospitals, particularly public and mission hospitals (Agyeman-Duah et al., 2021). Similarly, unlike public hospitals, private healthcare services that are usually not funded by the government are also challenged by limited financial resources due to delays in reimbursement from the National Health Insurance Authority (NHIA). Adopting SMA practices is, therefore, crucial for improving the financial sustainability and healthcare delivery of hospitals in Ghana. A study in this setting, where hospitals are under increasing pressure to provide affordable high-quality healthcare with limited financial resources, will provide valuable insights into how SMA can be leveraged to improve hospital performance while ensuring efficient use of scarce resources.

Data and Methodology

Research Approach

This study employed a qualitative approach to address the research questions. Specifically, a single interpretive case study was utilized to investigate the adoption and challenges of Strategic Management Accounting (SMA) techniques in a Ghanaian private hospital. This approach was selected as it facilitated an in-depth investigation of the research phenomena within the case firm. Furthermore, the case study approach can provide comprehensive and detailed insights into the contextual factors in the health sector that influence the adoption of SMA practices and their impact on the organization, which may not be fully captured through a quantitative approach (Yin, 2018).

Case Firm (Firm XYZ)

The case firm was established in Ghana approximately five decades ago to provide quality healthcare to its clients in Ghana and within the African sub-region. The core objectives of the firm include, but are not limited to, quality healthcare, sustainability and innovative practices, and commitment and accountability. The firm distinguishes itself as a private healthcare service that consistently innovates and adopts modern strategies and technologies, and has received several awards in Ghana and Africa. Firm XYZ was selected as the case firm because it met the inclusion criteria for selection (the utilization of SMA practices). Initially, the SMA techniques used and their evolution were determined. This inclusion criterion was employed to ensure that the selected case firm provided relevant and meaningful insights into the adoption of SMA techniques in the health sector.

Data Collection

The data were collected through semi-structured interviews. This method of data collection was deemed the most appropriate approach. Semi-structured interviews allowed the researcher to probe further for clarity from the interviewees, potentially yielding new insights during the conversations (Kallio et al., 2016). In interpretive case studies utilizing interviews, the selection of interviewees and the number of interviews are not predetermined, as researchers typically seek to reach the saturation point as the primary determinant for the number of interviews. The saturation point is defined as the stage at which additional interviews cease to contribute novel information to the existing data set. For this study, the selection of interviewees and the number of interviews were contingent upon two key factors: the number of individuals possessing the requisite skills and knowledge, and the total number of personnel within the relevant

department. A total of twelve distinct interviews were conducted with four individuals. Access to the firm was facilitated through a contact of one of the researchers, who ensured initial access to one interviewee. Subsequent interviewees were contacted through snowball sampling, beginning with the first interviewee. Interviewees were selected primarily based on their current roles, knowledge, and experience within the organization. The interviewees' extensive experience and knowledge of SMA techniques rendered them a valuable source of information for this study. By engaging with individuals closely involved in the organization's financial operations, this research aimed to obtain firsthand insights and in-depth perspectives on the utilization of SMA techniques and their impact on organizational performance. To ensure anonymity and adhere to the principle of confidentiality in qualitative research, pseudonyms were employed to represent the interviewees. The interviewees were assigned codes P1, P2, P3, and P4 to represent interviewees 1, 2, 3, and 4, respectively. All interviewees were integral members of the finance team at XYZ Medical Centre and held certifications as chartered accountants. Their ages ranged from 30 to 40 years, with a composition of three males and one female. Interviewee 1 (P1) assumes the role of an account analyst, Interviewee 2 (P2) serves as the finance analyst, Interviewee 3 (P3) holds the position of the Finance Manager and is the sole female in the group, and Interviewee 4 (P4) fulfils the role of a Senior Accounts officer with responsibilities in Tax and Payroll at firm XYZ. The collected data were transcribed and analyzed through an intra-case data analysis, wherein the single case was examined for its unique characteristics and peculiarities.

Literature Review

This section is divided into two sections. The first discusses the theoretical underpinnings of the study, while the second discusses the extant literature on SMA.

Theoretical Lens

Resource-based View (RBV) theory posits that organizations strive to develop and leverage strategic resources and capabilities to achieve and sustain competitive advantage (Madhani, 2010). RBV suggests that organisations can secure a long-term competitive edge by developing valuable, rare, inimitable, and non-substitutable resources (Wernerfelt, 1984). Barney and Hesterly (2019) assert that this perspective of RBV provides a theoretical lens through which firms' SMA practices can be understood. This is because SMA practices emphasize the role of unique organisational resources in driving performance outcomes. RBV provides a fitting theoretical framework for SMA, as it underlines the importance of leveraging firm-specific resources – information systems, managerial expertise and analytical capabilities – to create and sustain value (Barney, 1991). Thus, firms are more likely to adopt those SMA practices when they possess unique resources that can be utilised effectively within these SMA frameworks (Drury, 2018). For instance, firms with advanced data analytics and a skilled accounting team are more likely to implement SMA practices like BSC and competitor-focused accounting than competitors lacking these capabilities. This presupposes that the presence of resources influences the choice and success of SMA practices. Hence, firms tailor their SMA practices based on their internal strengths and strategic needs. According to Johnson et al. (2008), SMA practices are valuable resources that, when applied effectively, translate into improved organisational performance.

Empirical Literature

Strategic Management Accounting

Simmonds (1981) coined the concept of Strategic Management Accounting (SMA), and it has since evolved to encompass a range of practices that extend beyond traditional cost accounting.

A review of past literature on SMA techniques by Abdullah et al. (2022) revealed that there is no consensus or single definition of SMA, as its scope has been widely debated in the literature (Cadez & Guilding, 2017). According to Simmonds (1981), SMA is centered on distributing and analysing competitor information and its application to creating and overseeing corporate strategy. SMA adopts a strategic orientation to the generation, interpretation, and analysis of management accounting information and competitors' activities to provide the key dimension for comparison. SMA has, therefore, been viewed as crucial for firms' strategic positioning. The application of SMA techniques has also been found to influence corporate performance as it assists organisations in identifying areas of weakness and strengths (Roslender & Harts, 2003).

Strategic Management Accounting Techniques

Owing to the lack of a single definition and focus on SMA, various authors have identified various practices as SMA techniques. SMA techniques can be broadly classified into competitor-focus techniques, marketing-focus techniques, and future cost techniques (Guilding et al., 2000). Although Guilding (2000) identified 12 SMA techniques, Cadez and Guilding (2008) broadened the scope of SMA techniques and identified 16 SMA techniques. Cadez and Guilding (2008) further grouped these techniques into five categories: strategic costing, strategic planning, control, performance measurement, strategic decision-making, competitor accounting, and customer accounting2. Similarly, Alsoboa et al. (2015) also point out that some of the SMA practices implemented by firms include strategic costing, target costing, competitor accounting, consumer accounting, strategic decisions, planning, control and performance management, and evaluation. Table 1 below provides the SMA techniques and their classification by Cadez and Guilding (2008).

Table 1: SMA techniques and its categories

SMA technique categories	SMA techniques
Costing	1. Attribute Costing
	2. Life-cycle costing
	3. Quality costing
	4. Target costing
	5. Value-chain costing
Planning, control and performance measurement	1. Benchmarking
	2. Integrated Performance Measurement
Strategic decision-making	1. Strategic costing (strategic cost management)
	2. Strategic pricing
	3. Brand valuation
Competitor accounting	1. Competitor cost assessment
	2. Competitor positioning monitoring

2 This study will adopt the SMA techniques classification and groupings by Cadez and Guilding (2008). Although some of these techniques are mentioned and explained, Cadez and Guiding (2008) provide an extensive explanation and review of these techniques.

	3. Competitor performance appraisal
Customer accounting	1. Customer profitability analysis
	2. Lifetime customer profitability analysis
	3. Valuation of customers as assets

Source: Adopted from Cadez and Guilding (2008)

Strategic Planning, Control and Performance

The planning aspect of SMA has been emphasized as crucial for firms to pay attention to in order to adopt a proactive market orientation strategy and compete successfully in the market. According to the Corporate Finance Institute team (2020), strategic planning is "the art of creating specific business strategies, implementing them, and evaluating the results of executing the plan, regarding a company's overall long-term goals or desires." Bryson (2011, p.11) also defined strategic planning as a "deliberative, disciplined effort to produce fundamental decisions and actions that shape and guide what an organization (or other entity) is, what it does, and why." These definitions are similar in that strategic planning ensures that an entity achieves its long-term strategic goals and objectives, thus essential for decision-making. Benchmarking and Integrated performance measurement are some tools for strategic planning, control and performance (Cadez and Guilding).

Benchmarking

Benchmarking is a Management Accounting Innovation (MAI) that can be used in public and private sectors to monitor and improve performance. It can be used to evaluate performance (e.g., costs, productivity, or results) (Siverbo, 2014). Benchmarking is "an exemplar-driven teleological process operating within an organization with the objective of intentionally changing an existing state of affairs into a superior state of affairs."(Moriarty & Smallman, 2009). Originating from the private sector, Xerox Corporation was the first company to apply this SMA technique by redesigning its internal processes and quality by looking at what its competitors were doing (Ossiannilsson, 2011). Thus, benchmarking "simply means comparing one's organisation or a part of it with that of the other companies (Xerox Corporation, 1979).

Balanced Scorecard (BSC)

Cuc (2009) informs on the fact that Robert S. Kaplan and David P. Norton first discussed the idea of a "Balanced Scorecard" in the journal "Harvard Business Review" (January–February 1992). BSC aims to provide a comprehensive view of the performance of the business by assessing performance based on four key areas of the business: customer perspective, financial perspective, internal business perspective, and innovation and learning (Wongrassamee et al., 2003).

Strategic Costing

Shank and Govindarajan (1993) assert that strategic costing involves cost analysis that supports competitive strategy and execution (Drury, 2018). Strategic costing considers external factors like market dynamics, competitor actions and customer value (Langfield-Smith, 2017) in its cost analysis, unlike traditional costing, which mainly focuses on internal metrics and efficiency. Strategic costing enables organisations to achieve and sustain competitive advantage by making informed decisions on cost structures and pricing that align with strategic goals (Porter, 1987). Strategic costing approaches include target costing, life cycle costing, and activity-based costing (Kaplan & Norton, 1996).

Target Costing

Although the target costing notion has been widely researched by many authors, there is still disagreement over its actual meaning. These definitions can be divided into three groups: market-oriented, engineering-oriented, and oriented to product functionality (AL-Khasawneh et al., 2019). Target costing is described by Al-Matarneh (2008) as a technique or system that aims to manage the costs and profits anticipated through market research, price determination, customer demand, knowledge and satisfaction, and cost management during the product's conceptualization, design, and development phases.

Activity Based Costing (ABC)

Shihab (2022) defined activity-based costing as "an approach to the costing and monitoring of activities that involve tracing resource consumption and costing final outputs. According to Shihab (2022), the 1970s and the 1980s saw the development of the ABC concept in the American manufacturing industry. The SMA technique, known as "activity-based costing" (ABC), allows for more precise knowledge of expenses by linking costs to particular activities. It aids businesses in better decision-making, resource allocation, and cost identification. The impact of ABC on cost reduction and enhanced profitability has been documented. However, careful preparation, reliable data, and organizational commitment are necessary for a successful execution. Since it more closely associates indirect costs with various activities, ABC is a procedure that offers more accurate and effective management of activity costs when compared to standard costing approaches (Ellis-Newman & Robinson, 1998).

Customer Profitability Analysis

Customer Profitability Analysis (CPA) is a competitor accounting tool. CPA can be defined as the allocation of revenue and expenses among customer categories or specific customers, allowing for the determination of the profitability of such groups or individuals. (Van Raaij et al., 2003). The CPA's immediate advantages reside in the unequal distribution of costs and income among customers. Given that the firm is typically aware of the distribution of revenues, information on the spread of costs among clients will be particularly useful. Understanding how much a given consumer uses a company's resources opens up new possibilities for the company in three different areas: cost control, revenue management, and strategic marketing management. (Van Raaij et al., 2003). Furthermore, when considering future sales potential is taken into account, a volume- and profitability-based classification can offer guidance for client development and retention programs. This helps keep checks on customers and customer segments and informs strategic decision-making.

Preliminary Findings

SMA Practices

Through coding, four main themes were identified as broad categories of SMA practices being implemented at firm XYZ. These themes are strategic planning, costing, analysis, reporting, and financing.

Strategic Planning

Strategic planning is a structured and systematic process organisations use to define their long-term goals and objectives, as well as the strategies and actions required to achieve them. It involves analyzing an organization's current position, anticipating future challenges and opportunities, and developing a guide for making informed decisions that align with the organization's mission and vision. This can be done with the help of some SMA techniques

like Budgeting and Pricing Strategies. These two techniques work together and cannot function without each other.

Interviewee one mentions that pricing strategies are created for firm XYZ;

“Every year, we engage in pricing activities. Before we commence these pricing exercises, we receive a pricing strategy from the marketing department. The marketing department collaborates with external researchers who investigate market dynamics and industry trends.” (P1)

Pricing strategies are integral components of SMA landscapes. These strategies are crucial because they align an organization's financial goals with its broader strategic objectives. By receiving an annual pricing strategy from the marketing department, organizations such as Firm XYZ Medical Center integrate financial planning into their overall strategic decision-making process. These strategies are informed by extensive market research, a fundamental aspect of SMA. Collaboration with external researchers shows the importance of gathering data and insights, enabling organizations to make informed pricing decisions. In the SMA landscape, pricing strategies serve as tools for optimizing revenue, managing costs, and achieving long-term financial sustainability. They also show how financial management and strategic planning are intertwined, demonstrating the integrated nature of SMA techniques in guiding organizations toward their main goals.

Interviewee four also mentions that budgets are implemented to ensure discipline;

“And in becoming very disciplined, we have what we call the budgets. So, the budgets will normally be drawn during the year for the ensuing year. And the budget typically is a rolling budget.” (P4)

Budgets are fundamental components of SMA. They serve as crucial tools for aligning an organization's financial resources with its strategic objectives. By preparing budgets annually and utilizing a rolling budget approach, organizations ensure that their financial plans remain adaptable and responsive to changing circumstances. SMA incorporates budgets to facilitate cost control, resource allocation, and performance evaluation. These budgets not only allocate funds for recurrent expenditures but also allocate resources strategically to support long-term organizational goals. Moreover, budgeting involves collecting, analyzing, and forecasting financial data, which are essential SMA practices. In the SMA landscape, budgets provide a structured mechanism for organizations to plan, monitor, and optimize their financial performance, ensuring that financial decisions align with strategic priorities and contribute to the organisation's overall performance.

Interviewee one posits that budgets and pricing strategies are collaborative tools.

“So, the pricing strategies is another technique that we use in the hospital to price our product and also it helps us to do our budgeting. So, in terms of budgeting, it helps us to know what growth would be competitive for that year, looking at all the economic situations and indicators, how much growth should we bring to bear on our footfall and on our pricing.” (P1)

The connection between pricing strategies and budgeting is vital to financial management within organizations such as hospitals. Pricing strategies not only determine how products and services are priced but also play a key role in the budgeting process. By setting the right pricing strategies, organizations can ensure that their products remain competitive in the market and generate revenue that aligns with their budgetary goals. Pricing strategies consider economic conditions and indicators, helping organizations assess the feasibility of their growth targets for the year. This, in turn, informs budgeting decisions by providing insights into the expected revenue streams and expenditure requirements. Collaboration between pricing strategies and

budgeting enables organizations to create a balance between profitability and cost management, ensuring that their financial plans align with strategic objectives.

Strategic Costing

Strategic costing refers to the process of identifying and allocating costs in a manner that aligns with an organization's long-term strategic goals. It involves analyzing the costs associated with various activities, products, or services to make informed decisions that support the organization's strategic direction. The primary technique utilized by firm XYZ, classified under strategic costing, is activity-based costing.

Interviewee one acknowledges the use of Activity-based costing in the hospital;

“So, in Firm XYZ, we use the activity-based cost basically to apportion the operating cost. Okay, so that is one major technique that we use to look at how we apportion cost…. The reason we do that is before that we were using the common size kind of technique…. ” (P1)

The excerpt highlights the use of Activity-Based Costing (ABC) as an SMA technique in XYZ Medical Center. ABC is employed to allocate operating costs within an organization effectively. ABC is a major technique because it departs from traditional methods, such as the common size technique. Unlike the common size, ABC does not simply distribute costs uniformly or is based on a general percentage. Instead, ABC delves deeper into understanding how specific activities or processes consume resources and incur additional costs. It then allocates costs based on the actual drivers of these expenses, providing a more accurate view of where resources are being used. This precision enables organizations such as XYZ Medical Center to make informed strategic decisions regarding cost control, resource allocation, and, ultimately, their long-term performance and sustainability.

Strategic Analysis and Reporting

Strategic Analysis and Reporting are essential SMA techniques that focus on evaluating an organization's internal and external environments, generating valuable insights, and communicating key findings to support strategic decision-making. Strategic analysis involves examining factors such as market trends, competitor behavior, and internal capabilities to identify opportunities and threats. This provides a foundation for the formulation of effective strategies. Strategic reporting, on the other hand, involves presenting insights in a clear and accessible manner to stakeholders and decision-makers. It serves as a tool for circulating critical information and aligning an organization's actions with its strategic goals. Together, these SMA techniques empower organizations to make informed decisions, adapt to changing circumstances, and enhance their overall performance and competitiveness. This technique, as per what is currently being utilized by XYZ Medical Center, can be broken down into customer and profitability analysis, IPRs, and management accounts.

Interviewee one demonstrates how Customer and Profitability Analysis are utilized in the hospital;

“It's one thing that we do a lot here in XYZ, is to make analysis, we do analysis, or a financial analysis of every project that we're supposed to handle, or we're supposed to initiate. So, what we do is the SBAR, we look at the situation, background, we do the analysis, and then as part of the analysis, we do the financial viability of the project” (P1).

This analysis followed a structured approach known as SBAR, which stands for Situation, Background, Analysis, and Recommendation. Within this process, the financial viability of each project was thoroughly assessed. Customer analysis involves examining the specific needs, preferences, and behaviors of the target customer, and ensuring that the project aligns

with their demands. Profitability analysis assesses the potential financial gains or losses associated with the project. It delves into cost projections, revenue estimates, and return on investment considerations. Customer and profitability analysis not only helps XYZ make informed decisions regarding project initiation but also contributes to the organization's overall financial health and strategic alignment with customer-centered objectives.

Interviewee three also talks about how XYZ Medical Center utilizes the Management Account as an SMA Technique.

“So, I mean, the major thing that we do here in XYZ is the management accounts reporting, which helps management know what the financial performance is for the organisation on a periodic basis” (P3).

The excerpt highlights the utilization of Management Accounts as an SMA technique at Firm XYZ Medical Center. Management accounts involve the regular generation and presentation of financial performance reports specifically tailored for internal management and decision-makers. These reports provide essential insights into an organization's financial health, offering a periodic overview of income, expenses, profitability, and other critical financial metrics. By regularly assessing these reports, management can clearly understand how the organization is performing and make informed decisions in real-time to address challenges and align strategies with financial objectives. Management accounts, as an SMA technique, play a major role in ensuring that an organization's financial performance remains transparent, manageable, and supportive of its long-term goals.

Interviewee three also mentions the use of IPRs as an SMA technique;

“Based on that we have a breakdown into like a more summarised version, what they call the integrated performance report, the IPR. And that one looks at the total strategy of the company. So that's going back to our vision”(P3).

The excerpt highlights the utilization of Integrated Performance Reports (IPRs) as a crucial SMA technique at XYZ Medical Center. IPRs are comprehensive reports that provide a summarized view of the organization's overall performance, aligning it with the company's strategic vision and goals. These reports go beyond traditional financial metrics and provide a comprehensive assessment of the organization's strategy, including operational, financial, and non-financial aspects. IPRs serve as vital tools for senior management and decision-makers to evaluate the effectiveness of the organization's strategies and their alignment with the vision. By offering a strategic perspective, IPRs enable XYZ Medical Center to make informed decisions, adjust strategies as needed, and ensure that every aspect of the organization contributes to the realization of its long-term vision and objectives.

Strategic Financing

Strategic Financing, as an SMA technique, refers to the systematic approach an organization takes to secure and allocate financial resources in line with its strategic objectives. It involves the identification of funding sources, such as equity, debt, or capital investments, that best align with the organization's long-term goals. Strategic financing also includes financial planning and allocation processes that ensure efficient use of resources to support strategic initiatives. By strategically managing its finances, an organization can optimize its capital structure, minimize risks, and enhance its financial stability, ultimately contributing to the successful execution of strategic plans and long-term sustainability. This technique, as per what is currently being utilized by XYZ Medical Center, can be broken down into Debt and Equity Financing and Effective Cash management.

Interviewee two mentions Debt and Equity Financing as a SMA technique;

“The company is purely equity-owned. So, our source of funding has largely been driven by the equity contribution that was put in place and then also the earnings that we get from our normal operations to support it. Currently, we are trying to diversify to have a bit of debt mixed with equity…”

The interviewee's statement highlighted the utilization of Debt and Equity Financing as an essential SMA technique within the organization. Debt Financing involves obtaining external loans or credit to fund an organization's operations or strategic initiatives, often in the form of bonds or loans from financial institutions. By contrast, Equity Financing refers to raising capital by selling shares or ownership in a company, typically to investors or shareholders. In this context, the organization primarily relies on Equity Financing, where the source of funding originates from equity contributions and earnings generated through regular operations. However, the interviewee also mentioned the strategic consideration of diversifying the financing approach by introducing Debt Financing alongside equity. This strategic mix of Debt and Equity Financing allows the organization to optimize its capital structure, manage financial risk, and efficiently allocate resources to support its long-term strategic goals, demonstrating the adaptability of these SMA techniques in shaping financial strategies.

Interviewee two also posits another strategic financing tool: Effective cash management;

“The core mandate in finance is to ensure that we have adequate cash to service our liabilities when they fall due.” (P2).

The interviewee emphasized the significance of Effective Cash Management as a vital SMA technique within the organization's financial strategy. Effective Cash Management involves careful and strategic control of an organization's cash flow, aiming to ensure that it maintains an adequate amount of liquid assets to meet its financial obligations promptly. This technique encompasses various practices, such as optimizing the timing of cash inflows and outflows, minimizing idle cash, and strategically investing in surplus funds. By actively managing cash flows, an organization can enhance its liquidity position, reduce the risk of liquidity issues, and guarantee its ability to meet financial commitments when they come due. Effective Cash Management serves as a critical component of SMA, aligning financial resources with strategic objectives and safeguarding an organization's financial stability and sustainability.

Challenges in SMA Implementation

Investigating the challenges associated with implementing SMA techniques is crucial for understanding the issues organizations face when adopting SMA techniques and for developing strategies to overcome these obstacles effectively. This central theme can be divided into two key sub-themes: shareholder concerns and time-related challenges and resource and information constraints coupled with resistance to change.

Resource and information constraints coupled with resistance to change

Resource and information constraints, coupled with resistance to change, form a challenging triad for organizations implementing SMA techniques. Resource limitations, including financial, technological, and personnel constraints, can impede the acquisition of the necessary tools and training for SMA implementation. Moreover, information constraints may hinder the availability of the data needed to drive SMA processes effectively. Resistance to change, often arising from employees' reluctance to adopt SMA techniques, intensifies these challenges by creating internal friction. These interconnected challenges emphasize the importance of carefully managing resources, investing in training, and fostering a culture of acceptance of change readiness to overcome resistance and successfully implement SMA techniques while working within resource constraints.

Interviewee three expresses the resource constraint faced by the organization as a challenge in implementing SMA techniques.

“My challenge will not necessarily be with the technique itself, but then the enabler for that technique, or something like issues with applications, software applications. Those are the major challenges. So, not necessarily with the technique, but the enabler or the resource to help us implement that technique effectively, that has been a major challenge.” (P3)

One of the central resource and information challenges in implementing SMA techniques is the resources required for its effective application, particularly in software applications and ERPs. The availability and functionality of these tools are important for SMA adoption. Issues related to software applications, such as compatibility and accessibility, can hinder the implementation of SMA techniques. Thus, while SMA techniques themselves may offer valuable insights, the effective utilization and integration of these techniques into the organization's processes mainly depend on the availability and functionality of the enablers, making them critical components of SMA implementation.

Interviewee one emphasises information constraint as a challenge;

"I spoke about the pricing strategies, and that is a significant challenge because if you don't get it right, for instance, the pricing strategy—if you don't have our pricing information correct—you might price ourselves out of the market or the industry."(P1)

In the realm of SMA implementation, a significant information challenge revolves around pricing strategies. Obtaining pricing information rights is crucial, as it directly impacts an organization's competitive positioning within the market or industry. Failure to accurately determine the appropriate pricing strategy can have detrimental consequences, potentially pricing the organization's products or services out of the market, which will affect the overall performance of the organization.

Interviewee two talks more about resistance to a culture of change and the unacceptance of getting rid of the old ways.

“The only difficulty is that you know people find it difficult to change. Like if there's a change coming, people will have to resist it initially…” (P2)

One of the prominent challenges in the implementation of SMA techniques is resistance to change within the organization's culture, as highlighted by Respondent Two. People often exhibit reluctance to embrace new practices, particularly when they involve departing from established traditions or processes. This resistance to change can hinder the smooth adoption of SMA, as employees may initially resist departing from the old methods.

Shareholder Concerns and Time-related Challenges

Shareholder concerns and time-related challenges are closely interlinked challenges that organizations may face. Shareholders often expect quick returns on investments, which can create time pressures for organizations striving to implement strategic changes such as SMA techniques. The need to demonstrate the benefits of SMA in a relatively short timeframe to appease shareholders can strain resources and potentially compromise the thoroughness of its implementation. Balancing these competing demands requires careful planning, effective communication, and a strategic approach to ensure that shareholders’ interests are met without compromising the long-term benefits of SMA adoption.

Interviewee two explains briefly the shareholder concerns;

“So, I think on the challenges right, so what are the challenges implementing the SMA? So let me say that, what I know is that the equity holders will not be happy with us because it's not

all the SMA decisions that result in them getting their dividend. So, if it becomes prolonged that you are making losses, then it's like they've invested their resources, and you are not giving them anything." (P2)

One of the key challenges in implementing SMA techniques is the concern of the equity holders. SMA decisions may not always translate into immediate dividends for shareholders, potentially leading to dissatisfaction if losses persist for an extended period. Shareholders invest their resources with the expectation of returns, and any perceived delay or shortfall can erode their confidence in the organization's financial management. Balancing long-term strategic benefits with short-term shareholder expectations is a delicate challenge in the implementation of SMA.

Time-related challenges also pose prominent threats to SMA implementation.

Interviewee Two highlights the time dedicated to management reviews as a constraint;

"Management time reviewing already designed programmes because we have to almost review every programme again before we accept it. Whether we should continue it or we should delay it or we should avoid it altogether. That is one key to those reviews. It takes time that will be used to also do something beneficial." (P2)

One of the time challenges in the implementation of SMA techniques is the extensive management time required to review previously designed programs. The necessity to revisit and reevaluate each program before acceptance, whether to continue, delay, or avoid it, becomes a significant, time-consuming process. This extensive review demands valuable managerial resources that could otherwise be utilized for more productive endeavours that may be of equal importance. Balancing the need for thorough assessment with efficient allocation of management time poses a challenge in SMA implementation, as it is essential to ensure that resources are used wisely while making informed and sound decisions.

Interviewee four also argues how budget creation is time-consuming and laborious;

"The budget is very laborious and it takes a longer time…. as it stands now, it's very cumbersome. It's very involving and time-consuming and all of that." (P4)

Budgeting is a significant time challenge in the implementation of SMA techniques. According to Interviewee Two, the current budgeting system is laborious and time-intensive. This cumbersome nature of budgeting consumes valuable time and resources within an organization. The extensive efforts required for budget preparation and management can divert attention from other critical tasks and strategic initiatives, posing a notable time constraint.

Contributions of the Study

The findings of this study contribute to the current literature on SMA, especially from the healthcare sector in a developing context. Therefore, this study will add to this scanty but budding area of research. This serves as a reference point for future studies. This study is novel and shifts from what is seen in the literature on SMA as it provides context-specific techniques and challenges associated with SMA techniques.

The findings of this study can provide valuable insights to firms in the healthcare sector, helping them understand the current status of their SMA practices and the challenges associated with implementing SMA techniques.

Conclusions

In answering the objective of this study on SMA practices implemented in a private healthcare centre, the study revealed that XYZ healthcare centre utilizes strategic management accounting practices in its operations and also faces some context-specific challenges that need to be addressed.

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THE EFFECT OF FOREIGN DIRECT INVESTMENT ON INCOME INEQUALITY: THE CASE OF SOUTH AFRICA

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Abstract: The study focuses on the post-apartheid era, investigating the relationship between Foreign Direct Investment (FDI) and income inequality in South Africa. South Africa's inimitable political and economic history, characterized by apartheid and subsequent economic reforms, provides a rich context for exploring this relationship. While previous research has investigated the determinants and economic impact of FDI in Sub-Saharan Africa, particularly South Africa, few studies have examined its association with income inequality. Drawing on data from 1965 to 2019, this study employs an error correction model (ECM) to analyze the relationship between FDI and income inequality in South Africa. The findings indicate a positive relationship between FDI and income inequality in South Africa, suggesting that FDI inflows may aggravate existing income inequality. In addition, human capital, inflation, exchange rates, population growth, and trade openness are found to influence income inequality. These results highlight the importance of considering socio-economic factors when evaluating the effect of FDI on income inequality. The study contributes to the literature by addressing a significant knowledge gap and provides insights for policymakers aiming to maximize the benefits of FDI while mitigating its potential adverse effects on income inequality.

Keywords: FDI, Income Inequality, South Africa, Error Correction Model, Economic Reforms

1. Introduction

Since transitioning to democracy in the mid-1990s, South Africa has made significant efforts to enhance the well-being of its citizens, but progress has stalled over the past decade. The proportion of the population living below the upper-middle-income poverty line decreased from 68% to 56% between 2005 and 2010 but has since edged up, reaching 57% in 2015 and is approximated to have reached 62.7% in 2023 (World Bank 2024). Structural issues and sluggish growth have hindered advancements in poverty reduction, with the COVID-19 pandemic exacerbating these challenges. Progress in improving household welfare is significantly limited by increasing unemployment, which soared to 32.1% in the fourth quarter of 2023, surpassing the already elevated pre-pandemic levels. The unemployment rate is particularly severe among individuals aged 15 to 24, reaching 59.4%. These challenges make South Africa a dual economy with one of the world's highest and most persistent inequality rates.

This study looks at the effect of foreign direct investment on inequality in South Africa. South Africa is chosen as a case study because of its unique political and economic experience. Firstly, South Africa emerged out of a comprehensive apartheid system of institutionalized racial oppression where the Indigenous people were disposed of their land and its wealth. Secondly, when South Africa opened its economy in the 1990s, an inequality increase was registered. Her consumption expenditure Gini Coefficient increased from 0.59 in 1992 to 0.67 in 2018 (World Bank 2024). As discussed later, this increase coincides with a surge in foreign direct inflow in the country. While the impact of the apartheid system on inequality is indisputable, it is not clear whether foreign direct investment affects inequality or not.

Foreign direct investment (FDI) research in the context of SubSaharan Africa has often been looked at in relation to its determinants and economic impact (see for example, Asafo-Agyei G. & Kondogo O. 2022; Rodríguez-Pose, A., & Cols, G. 2017; Anynwu, 1998; Barthell, Busse and Osei, 2008; Enu, Havi, and Attah-Obeng, 2013; Fredderke and Romm, 2006; Luiz and Stephan,2011, Kurtishi-Kastrati, 2013, Sauvant and Mallampally, 2015). Hardly any studies look at the relationship between FDI and income inequality from the perspective of any of the sub-Saharan countries. This is somewhat surprising given the high levels of inequality in the region. This study addresses this gap in knowledge by looking at how FDI is associated with inequality in South Africa. The third reason South Africa was chosen as a case study is that it has the highest level of inequality compared to other countries in the Sub-Saharan region, Africa, and even the world (World Bank, 2024).

Previous studies examining the link between income inequality and FDI are based on data from developing countries (see, for example, Basu and Guariglia, 2004). Herzer and Nunnenkamp (2011) used European data to investigate issues related to FDI and inequality. On the other hand, Chintrakam, Herzer, and Nunnenkamp (2010) looked at the same variables from the US angle. Similarly, Bhandari (2007) looked at the Eastern Asian scenario. The dearth of African literature relating FDI to inequality is attributed to the unavailability of household budget surveys for most Sub-Saharan countries in the Sub-Saharan region (Okojie and Shimeles, 2006). With the advent of scholarly works on millennium development goals, inequality data relating to issues of poverty started to emerge in the region in the past decade or so. By investigating how FDI is linked to inequality in South Africa, policymakers would be better poised to develop policies that optimize the benefits of FDI without the dampening effect of inequality. The benefits of FDI, particularly to the South African economy, are that it provides capital to finance investment by bridging the savings gap in the country. In addition to that, FDI facilitates the transfer of technology and managerial skills from the

source country. Moreover, FDI positively impacts the balance of payment not only because of the impact capital inflow has on the balance of payment but also because FDI promotes the country's exports to world markets.

The downside of the economic reform process that saw an upswing in FDI inflows in South Africa from 1996 to 2019 coincides with the jobless growth that entrenched the dualistic nature of the South African economy. The question arises whether FDI inflows have a negative spillover effect that widens income inequality. While literature abounds with evidence of positive growth effects of FDI arising from technology transfer or knowledge spillovers (Odhiambo & Asongu, 2020; Byraktar, 2013; Sauvant and Mallampally, 2015; Basu & Guarglia, 2007; Blomström and Kokko, 2007; Nanda, 2009; Byraktar, 2013; Sauvant and Mallampally, 2015), there have not been sufficient studies that look at how FDI is linked to income inequality in the context of economic reforms that took place in South Africa post-1994. However, Blomström and Kokko (2007) recognized that FDI might contribute to income inequality. Their argument is based on the fact that, from a developing country perspective, the initial human capital capacity does not usually match the technology requirements of foreign companies investing in a host country. It is argued that this mismatch in human capital could further exacerbate income inequality as foreign investors introduce new technology in the host country. On that basis, this study explores the relationship between FDI and income in the context of the macroeconomic factors at play in South Africa. Conceptually and empirically, FDI has been positively linked to inequality (see Herzer and Nunnenkamp, 2011; Basu and Guariglia, 2007; Bhandari, 2007). This study seeks to determine whether the interaction between inequality and FDI exists in South Africa. Therefore, the objective of this study is to establish the effect of FDI on income inequality using South African data

2. Materials and Methods

2.1 Theoretical Framework of the Study

Two critical variables of concern in this study are inequality and foreign direct investment. FDI is heterogeneous and is undertaken by investors either to sell to foreign markets (horizontal FDI) or to take advantage of inter-country differences such as labour costs and/or capital costs that would maximize profit margins (vertical FDI). This study builds on previous work examining the relationship between foreign direct investment and inequality. For example, Herze & Nunnenkamp, 2011 and Velde, 2003 found that FDI increases inequality in a host country. Notwithstanding the positive relationship between FDI and inequality as observed by several authors (including Basu & Guariglia, 2007; Herzer & Nunnenkamp, 2011; Feenstra and Hanson, 1997; Figini and Görg, 2006; Taylor & Driffield, 2005), there are theoretical ambiguities.

Empirical studies that address the relationship between FDI and inequality in the context of sub-Saharan Africa are scarce. In line with Figini & Görg (2011), Bhandari (2006), Figini & Görg (2006), and Velde (2003), this study puts forward the hypothesis that as foreign direct investment flows in a dualistic economy, the demand for skilled labour increases, thus creating a surplus of unskilled workers in the economy. This surplus has an impact on employment rates and invariably on income inequality. The theoretical underpinnings of the relationship between inequality and FDI in this study are based on Figini and Görg's (2006) work, which is based on a production structure model in which output Y is produced using inputs x and labour L as factors of production.

$$Y = \left\{ \int_0^1 A_i^{\alpha} x_i^{\alpha} di \right\}^{1/\alpha} \quad (1)$$

Output *Y* is produced using input *x* in country *i,* using labour as the only factor of production. The parameter *A* represents production technology where *A = 1* if old technology is used, and *A* increases when new technology is adopted. This conceptualization assumes that when the economy uses old technology, it uses unskilled workers. The demand for skilled workers increases as the economy adopts new technology from FDI-related activities. Consequently, the economy shifts from old to new technology. Figini and Görg (2006) postulate that technology adoption leads to two stages of development and inequality. In the first stage, the economy is adopting change; as such, there is no difference in the wages paid to skilled and unskilled employees. In the second stage, skilled labour demand increases as economies adopt new technology. Accordingly, the demand for skilled labour increases, resulting in a segmented labour market in which skilled labour is paid a higher wage, thus driving inequality.

This study also takes into account Te Velde's (2003) conceptualization, which identifies three determinants of income inequality: (1) the distribution of factors of production, (2) the demand for those factors, and (3) the supply. The distribution of education in a dualistic economy such as South Africa is characterized by the poor with low income and low levels of human capital and the wealthy with high income and often with high levels of human capital. The demand for skilled workers characterizes the demand for the factors of production in this scenario.

Literature provides different definitions and measures of inequality. For example, Milanovic (2005) identifies three types of inequality: (1) unweighted international inequality measured by GDP per capita; (2) population-weighted inequality also measured by GDP per capita; and (3) inequality across all individuals in the world, where the unit of analysis is not a country but an individual. Milanovic is of the view that once inequality sets in a country as a result of globalization and modernization effects, it cannot be reversed. It is permanent. Okojoe and Shimeles (2006), on the other hand, consider seven levels of inequality, including (1) income/expenditure inequality; (2) asset inequality; (3) education inequality; (4) inequality in health and nutrition; (5) inequality in the use of public services; (6) labour market inequalities; and (7) multidimensional inequality. As Okojoe and Shimeles (2006) pointed out, the multidimensional inequality indicators include education, access to primary school, access to secondary school, access to potable water, access to health services, nutrition variables, type of habitation, energy, and communication. The multidimensional construct converges with McKay's (2002) notion that inequality reflects population lifestyles. The indicators of lifestyles and living standards include public and private assets, which literature also refers to as indicators of non-income inequality (Bhorat, can der Westhuizen, and Jacobs, 2009).

A growing body of literature supports the contention that as much as FDI inflows have significant benefits for host countries, they also have a propensity to increase inequality (Herze & Nunnenkamp, 2011; Velde, 2003). For example, Velde (2003) found that income inequality is persistently high in most Latin American countries; labour, specifically the distribution of education and returns to skills, seems to be the driver of income inequality. This view is supported by a number of authors (Leibrandt, Woolard, and Woolard, 1996; Jensen, 1999; Jensen, 1999; and Jenkins and Thomas, 2000). Blomström and Kokko (2007), as well as Basu & Guariglia (2007), account for the income inequality and FDI dynamic by arguing that technology infusion in economies with high inequalities tends to advantage the rich more than the poor who have limited or no access to technology. Basu and Guariglia (2007) explained that this happens because dualistic economies characterize typical unequal societies with two types of agents – the poor with the low initial human capital capacity to

access technology and the rich with sufficient initial human capital to access technology brought in through FDI. The tendency to expand the level of inequality does not diminish the benefits derived from FDI inflows, such as employment creation, economic growth, technology innovation, and knowledge spillovers.

In Chintrakam, Herzer and Nunnenkamp's (2010) study that looked at FDI and income inequality, the authors found that there is heterogeneity in the long-run effects of FDI on income inequality across states, with 21 out of 48 states exhibiting a positive relationship between FDI and income inequality. In a sample of 10 European countries, Herzer and Nunnenkamp (2011) found that FDI has a positive short-run effect on income inequality. However, the long-run effect of FDI on inequality, unlined in the US sample, was negative. Herzer and Nunnenkamp (2011) found that the long-run causality runs in both directions, implying that an increase in FDI reduces income inequality, while higher income inequality leads to lower FDI inflows.

Using a panel of 119 developing countries, Basu and Guariglia (2007) found that FDI promotes inequality and growth. Basu and Guariglia (2007) also found a positive relationship between functional inequality and GDP per capita, exchange rate, and trade openness. A somewhat different finding is observed in the case of Eastern Europe and Central Asia in a study conducted by Bhandari (2007). Using fixed effects, Bhandari (2007) found no evidence of the positive effect of FDI on income inequality. However, when the effect was broken down into its components, Bhandari found that FDI exacerbated income inequality while reducing capital income inequality.
In a study that looks at FDI and income inequality in Latin America, Te Velde (2003) found evidence to support the notion that labour income inequality plays a vital role in total income inequality. Te Velde's (2003) conceptualization is based on the distinction between skilled and unskilled labour.

Fedderke and Romm (2006) used the Vector Error Correction Model to estimate both the growth impact of FDI and the determinants of FDI using annual series data from South Africa from 1960-2002. The authors found that while the growth impact of FDI is positive for South Africa, there is a spillover effect of FDI on capital and labour, which impacts output in the long run. The findings also showed that FDI in South Africa is capital-intensive, suggesting that FDI is horizontal rather than vertical (2006: 758). Using the Error Correction Model (ECM), Akinlo (2004) looked at how FDI is linked to economic growth in Nigeria. The findings showed that FDI in Nigeria positively affects growth after a considerable lag. The results also show that extractive FDI might not be as growth-enhancing as manufacturing FDI.

The inequality measures are as divergent as the different conceptualizations of inequality captured above. The Gini coefficient is one of the several measures of inequality that scholars commonly use. The Gini coefficient captures income distribution across households. Due to data availability issues, this study uses household income to measure inequality. Wage inequality and access to essential services and private assets have been used to measure inequality.

2.2 Data and Methodology

The study empirically examines South African data covering the years 1965-2019 to test the hypothesis that FDI has a positive relationship with inequality. Continuous and annual income inequality data is scarce. Most authors use the Gini Coefficient as a measure of income inequality. For example, Lachman and Bercuson (1992) used ten-year and five-year

interval Gini coefficient measures between 1960 and 1985. Using the available Gini Coefficient data would have limited the number of observations for the econometric model tested in the study. The share of average household income in the top 5% average income sourced from the Top Incomes Database, generated by Alvaredo, Facundo, and Atkinson, Anthony (2021), was used to measure income inequality. The household income data was sourced from the Reserve Bank statistics database.

2.2.1 Variables and Priori Expectations

FDI is predicted to have a positive relationship with income inequality, which is in line with Basu and Guariglia's (2007) findings. This study adds economic growth and inflation as control variables in the test. Based on Li and Zou's (2002) work, which showed that inflation worsens income distribution, this study predicts that inflation will have a positive relationship with income inequality. Intuitively, this makes sense because a high inflation rate has a high propensity to erode incomes for those economic agents whose nominal incomes are not adjusted with inflation, thus leading to income inequality.

Household expenditure on education reflects wage income and is likely to impact access to education, which is expected to increase the skill set of employees in the economy. As the skill set of employees increases, the labour market will be segmented, which could lead to inequality in line with the theoretical model of this study. On the other hand, population growth is likely to increase inequality in a country with a high Gini Coefficient because it increases the dependency burden in the economy. The higher the dependency burden, the higher the income inequality. As such, this study postulates that population growth will have a positive relationship with income inequality.

Table 1: Variables, Data Source, and a priori expectations

Variable	Expected sign	Measure
FDI	+	FDI/GDP
Economic growth	-	The annual average growth rate.
Inflation	+	Percentage change of price index.
Population growth	+	Annual Percentage change of population.

This study attempts to understand the link between FDI and inequality and clarify the causality between the two variables. For this purpose, the study develops a single error correction equation model with the Engle-Granger (1987) two-step method. The error correction model (ECM) is a time series regression model based on the behavioural assumption that two or more time series exhibit an equilibrium relationship that determines short- and long-run behaviour (Brooks, 2008). Engle and Granger (1987) demonstrated that an error correction model (ECM) represents cointegrated time series well.

2.2.2 Econometric model

In order to find out the effect of FDI inflows to South Africa on income inequality, the study uses the Error Correction Model (ECM), a category of time series models that estimate the

speed at which a dependent variable Y returns to equilibrium after a change in an independent variable X. The basic structure of an ECM is as follows:

$$\Delta Y_t = a + b\Delta X_{t-1} + bEC_{t-1} + e_t \quad (1)$$

Where *EC* is the error correction component of the model and measures the speed at which prior deviations from equilibrium are correlated and e_t measures the error term (Brooks, 2008). The EC component is derived from a cointegrated time series called Z in the Engle and Granger Two-Step Method.

$$\Delta Y_t = b_0\Delta X_{t-1} - b_1 Z_{t-1} \quad (2)$$

b_0 captures the short-term effects of X in the prior period on Y in the current period. b_1 captures the rate at which the system Y adjusts to the equilibrium state after a shock. In other words, it captures the speed of error correction. Y is regressed on X to obtain Z, and all the variables that are expected to cointegrate are included. Secondly, the ΔY is regressed on Z_{t-1}.

This study specifies the equation of this type.

$$\Delta INEQUAL_t = a_0 + a_1\Delta FDI_{t-1} + a_2\Delta HC_{t-1} + a_3\Delta EXCH_{t-1} + a_4\Delta INF_{t-1} + a_5\Delta TROPEN_{t-1} + a_6\Delta POPGR_{t-1} + a_7 EC_{t-1} + \epsilon_t \quad (3)$$

Where:

INEQUAL = Inequality

FDI = foreign direct investment

HC = human capital

EXCH = exchange rate

INF = Inflation

TROPEN = trade openness

POPGR = population growth

EC = error correction component

ε = error term

2.2.3 Estimations

To prevent the use of non-stationary data, the Unit Root test (Augmented-Dickey-Fuller (ADF) test was carried out to test for stationarity of the endogenous and exogenous variables. The ADF test is based on the following regression:

$$\Delta X_t = \delta_0 + \delta_1 t + \delta_2 X_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta X_{t-1} + \varepsilon_t \quad (4)$$

Where Δ is the first difference operator, X_t, is the natural logarithm of the series δ_1, δ_2, and

δ_i, to be estimated; and ε_t is an error term. The null hypothesis of a unit root was tested against an alternative hypothesis of no unit root. A stationary series has a finite root and variance that do not depend on time.

$$X_t = \alpha + \rho X_{t-1} + \varepsilon_t \quad (5)$$

where $|\rho| < 1$ *and* ε_t is also stationary with a mean of zero and variance σ^2

After checking for stationarity, the number of cointegration equations among the variables was determined using the Johansen (1988) cointegration approach to check whether an equilibrium relationship exists. A necessary condition for equilibrium is that the data series for each variable involved exhibit similar statistical properties. In other words, data series should be integrated into the same order with evidence of some linear combination of the integrated series. An integrated series is expressed as a function of all past disturbances at any point in time.

$$Xt = \alpha + \rho X_{t-1} + \varepsilon_t \quad (6)$$

where α is a constant drift, $\rho = 1$

Given that ρ is a unit, X is said to have a unit root. If two-time series are integrated of the same order and some linear combination is stationary, then the two series are cointegrated. Cointegrated series share a stochastic component and a long-term equilibrium relationship. If X_t is non-stationary, the variance may become infinite, and any stochastic shock may not return to a proper mean level. As Engle and Granger (1987) show, such a non-stationary series has no error-correction representation.

3. Empirical Findings and Discussion

3.1 Findings

The following tests were performed

3.1.1 Unit Root Test Results

The results of the ADF for unit roots for the variables are listed below. The null hypothesis is that the exogenous variables have a unit root. The rejection of the null hypothesis for the ADF test is based on the Mackimon (1996) critical values and p-values 10%, 5%, and 1%.

Table 2: Level Series

	Augmented-Dickey-Fuller (ADF)	
Variable	**Intercept**	**Trend and Intercept**
FDI	-0.441964	0.963463
HC	-0.863287	-2.219379
EXCH	-5.028179**	-4.963590**
INFL	-1.480751	-1.931817
TROPEN	-0.412620	-1.790005
POPGROWTH	-4.725071**	-3.373446

* p ≤ 10%; ** p ≤ 5%, and *** p ≤ 1%

The results in Table 2 show that the null hypothesis of unit root cannot be rejected on most variables used in the model. The first difference also yielded a few non-stationary variables. In the second difference, all variables were stationary, as illustrated in Table 3.

Table 3: 2ND Difference Series

	Augmented-Dickey-Fuller (ADF)	
Variable	**Intercept**	**Trend and Intercept**
FDI	3.6244100*	2.733058
HC	-10.74641***	-10.61912***
EXCH	-7.634755***	-7.0998***
INFL	-5.870219***	-5.783345***
TROPEN	-6.126663***	-6.030197
POPGROWTH	-0.457937	-5.949265***

* p ≤ 10%; ** p ≤ 5%, and *** p ≤ 1%

3.1.2 Johansen Cointegration Results

The null hypothesis of no cointegration is rejected Based on the Trace statistic and the Maximum eigenvalue. The results suggest that a long-term relationship exists linking inequality with foreign direct investment, as specified in the model.

Table 4: Johansen Maximum Likelihood Cointegration

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.825858	213.3774	125.6154	0.0000
At most 1 *	0.691490	141.71.43	95.75366	0.0000
At most 2 *	.591963	93.49818	69.81889	0.0002
At most 3	0.510092	56.74590	47.85613	0.0059
At most 4	0.372706	27.49087	29.79707	0.0902
At most 5	0.050046	2.105004	3.841466	0.1468
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.825858	71.66318	46.23142	0.0000
At most 1 *	0.691490	48.21608	40.07757	0.0049
At most 2	0.591963	36.75228	33.87687	0.0220
At most 3	0.510092	29.25502	27.58434	0.0302
At most 4	0.372706	19.11995	21.13162	0.0934

At most 5	0.141722	6.265920	14.26460	0.5793
At most 6	0.050046	2.105004	3.841466	0.1468

The max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level, demoting rejection of the hypothesis at the 0.05 level.

Normalized cointegrating coefficients (standard error in parentheses)

INEQUAL	FDI	HC	EXCH	INF	TROPEN	POPGR
1.000000	0.203787	3.874771	-1.4633	0.02823	0.1839	-0.0184
	(0.24293)	(6.73281)	(1.439)	(0.04869)	(0.5306)	(4.64499)

The results indicate a positive relationship between inequality and foreign direct investment.

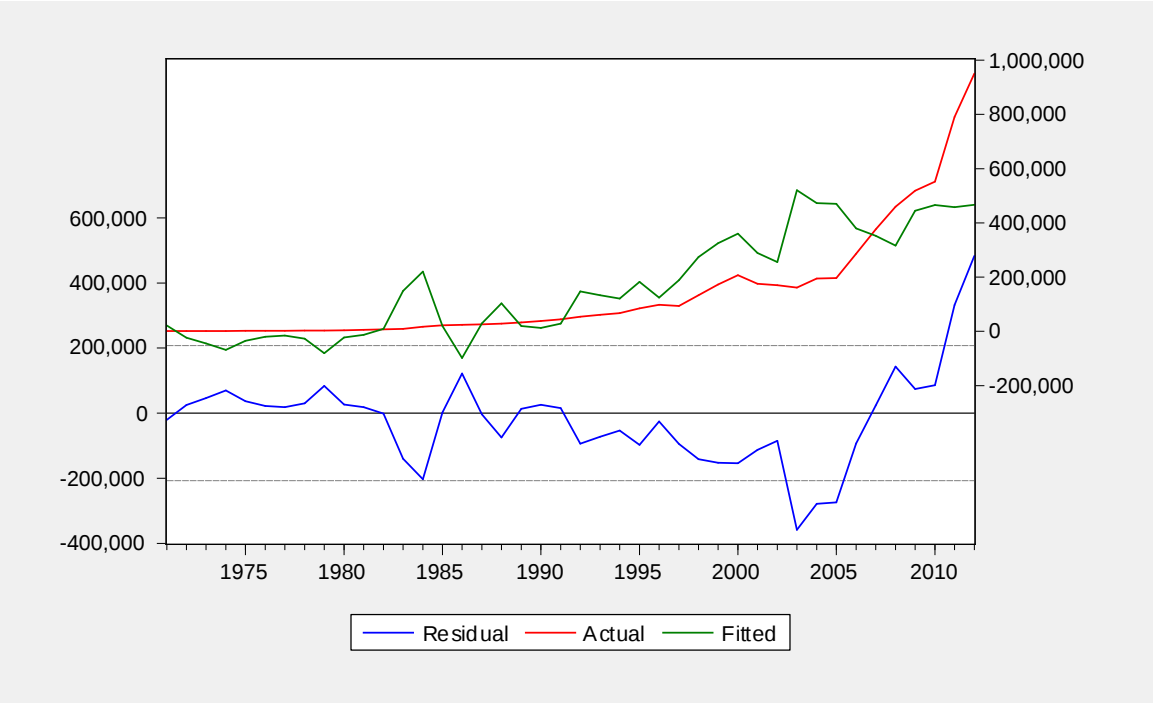
The Error Correction Model

The results presented in Table 5 below show

Table 5: Error Correction Model

Variable	Coefficient	Std Error	t-Statistic	Prob
FDI	1.422683	0.089289	15.93339	0.0000
HC	13.50176	3.840797	3.515354	0.0012
EXCH	0.0138	0.008244	2.137076	0.0397
INF	-0.3277	2.3598	-2.008914	0.0523
TROPEN	0.1114	0.3086	1.836100	0.0748
POPGR	1.1172	2.761112	4.077454	0.0002
Error $_{t-1}$	-0.65	0.08	-8.13	0.0000
Constant	-0.1205	0.006	-4.638022	0.0000
R-squared	0.985125	Mean dependent var		0.1145
Adjusted R-squared	0.982575	SD dependent var		541604.9
SE of regression	71492.96	Sum squared resid		1.79E+11

Durbin-Watson stat	0.625753	Long-run variance	5.42E+09



3.5 Discussion

3.5.1 Unit Root Test Results

The Augmented Dickey-Fuller (ADF) test results for unit roots are detailed in Table 2 and Table 3. The ADF test assesses whether a series has a unit root, which would imply that the series is non-stationary. Table 2: Level Series shows that for most variables, the null hypothesis of a unit root cannot be rejected at conventional significance levels (10%, 5%, and 1%). Specifically, FDI (Foreign Direct Investment) and TROPEN (Tropical Economic Indicator) are non-stationary at intercept and trend and intercept levels. HC (Human Capital) is stationary only with a trend and intercept but not at the intercept level. EXCH (Exchange Rate) and POPGROWTH (Population Growth) are stationary at the 5% significance level with trend and intercept.

This indicates that many variables exhibit non-stationarity at their levels, but differences in their series may be required for stationary conditions. Table 3: 2nd Difference Series shows that after taking the second difference of the variables, all become stationary: FDI and HC show significant results at the 10% and 1% levels, respectively. EXCH, INFL (Inflation),

TROPEN, and POPGROWTH are stationary at the 1% level in both intercept and trend-intercept forms. The second-differenced series being stationary suggests that these variables exhibit a unit root in their levels and first differences but not in their second differences.

3.5.2 Johansen Cointegration Results

The Johansen cointegration test results, shown in Table 6, indicate the presence of long-term relationships among the variables: Trace Statistic and Maximum Eigenvalue Test both reject the null hypothesis of no cointegration at the 5% significance level for the first three hypotheses (none, at most 1, and at most 2 cointegrating equations). At the 5% level, the tests suggest two cointegrating relationships. The Normalized Cointegrating Coefficients indicate a positive long-term relationship between inequality (INEQUAL) and foreign direct investment (FDI), implying that inequality rises as FDI increases.

3.5.3 The Error Correction Model (ECM)

Table 5 presents the results of the ECM, which captures both short-term dynamics and long-term equilibrium relationships among the variables: FDI shows a significant positive coefficient (1.422683), indicating that an increase in FDI is associated with an increase in the dependent variable. HC and POPGR also exhibit significant positive impacts, suggesting that improvements in human capital and population growth contribute positively at a test size of 1%.
EXCH (Exchange Rate) shows a significant positive effect at the 5% level. INF (Inflation) and TROPEN (Tropical Economic Indicator) have significant coefficients at the 10% level or close to it, showing their relevance but less certainty than other variables. The model's R-squared value of 0.985125 and Adjusted R-squared of 0.982575 indicate a high goodness-of-fit, suggesting that the model explains a substantial portion of the variance in the dependent variable. However, the Durbin-Watson statistic of 0.625753 suggests possible autocorrelation in the residuals, which may need further investigation. The coefficient of Correction Error is -0.65, which means the variables converge to long-run equilibrium and are corrected fairly quickly, with 65% of deviation being adjusted every year.

Overall, the results provide a comprehensive view of the dynamics among the variables, highlighting the importance of second differencing for stationarity, confirming the existence of long-term relationships through cointegration, and detailing the short-term and long-term effects via the ECM.

4. Conclusion

The analysis demonstrates that many variables, including Foreign Direct Investment (FDI) and Human Capital (HC), exhibit non-stationarity at their levels but become stationary upon taking the second difference. This indicates that the variables have unit roots in their levels and first differences, requiring differencing to achieve stationarity. The Johansen cointegration tests reveal long-term relationships among the variables, specifically highlighting a positive association between inequality and FDI. The Error Correction Model (ECM) confirms significant impacts of FDI, HC, population growth, and exchange rates on the dependent variable, with a high goodness-of-fit indicating that the model effectively captures the data dynamics. However, the Durbin-Watson statistic suggests potential

autocorrelation in the residuals, which warrants further examination.

The following policy Implications can be derived from the study. The first addresses non-stationarity and differencing. The finding that most variables become stationary after a second differencing underscores the importance of appropriately transforming data to ensure reliable statistical inference. Policymakers and researchers should be mindful of the data properties and apply necessary transformations to avoid misleading conclusions. Second, leverage cointegration insights, the confirmed long-term relationship between inequality and FDI suggests that policies aimed at managing FDI should consider its broader social implications. If FDI tends to increase inequality, strategies should be developed to mitigate adverse effects on income distribution. Strategies include human capital development, where more people get educated(skilled) in terms of technical and vocational training, which would decrease income/wage inequality. Strict adherence and improvements to minimum wage law for unskilled labour are to be protected from being exploited, and lastly, channel FDI to target both ends of the labour market (reduce skill-biased employment).

The third implication is focusing on critical variables, the significant positive impacts of FDI, Human Capital, and population growth on the dependent variable, and highlighting the need for targeted policies. Investments in human capital and infrastructure to support population growth can enhance the benefits of FDI. Additionally, policies to stabilize and optimize exchange rates could further benefit the dependent variable. Fourth, monitor and Address autocorrelation: The potential autocorrelation indicated by the Durbin-Watson statistic suggests that there may be serial correlation in the residuals. Policymakers should be cautious of the limitations this might impose on the model's predictions and consider refining the model to account for autocorrelation. Lastly, given the high R-squared values, the model captures significant aspects of the data in a comprehensive policy framework. However, policymakers should include all relevant variables in the analysis to address any possible omitted variable bias and ensure robust policy recommendations. These findings should guide policymakers in crafting strategies that attract and manage FDI effectively and ensure that its benefits are broadly shared and contribute to sustainable development.

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Testing the Heterogeneous Effect of Microfinance on Multidimensional Poverty

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Abstract

The study analysed the effect of microfinance access on multidimensional poverty in Ghana using a sample of 22,052 individuals. The study relied on the 7th round of the Ghana Living Standard Survey (GLSS 7) collected by the Ghana Statistical Service (GSS) in 2016–2017. We then applied the marginal treatment effect estimation method to examine the heterogeneous treatment effect of microfinance access in Ghana. We examined the effect of microfinance access among clients using several welfare measures while testing the presence of negative and advantageous selection on the gains assumption that characterizes endogenous decisions. Our findings revealed significant differences in the returns to microfinance uptake among clients, which were driven by both observable and unobservable idiosyncratic individual characteristics.

Keywords: Ghana, Poverty; Microfinance; Marginal Treatment Effect

1 Introduction

That the welfare effect of microfinance on clients is heterogenous is not new. A flurry of research has provided evidence to such heterogeneity (van Rooyen, Stewart and de Wet, 2012; Duvendack, et al. 2011; Jakobsen, 2011; Adebowale and Lawson, 2018; Awaworyi, 2014). The source of such heterogeneity is varied, and have been ascribed to differences in observable traits both at the institutional and household levels (Meager, 2018; Ganle, Afriyie, and Segbefia, 2015). However, unobservable traits can also affect social processes and can lead to welfare heterogeneities if they are associated with the expected gain of the economic action. This is known as essential heterogeneity. Given that many common estimating techniques cannot account for its existence (Heckman and Vytlacil, 2005), testing the presence of essential heterogeneity has not been widely pursued in the literature. Is it then the case that essential heterogeneities are in fact "unessential" in the field of evaluation? On the contrary, Heckman and Vytlacil (2005) suggest that using conventional estimation tools will yield inconsistent treatment effect estimates when there is essential heterogeneity in selection decisions.

In this study, we test the existence of observed and unobserved heterogeneities in the microfinance market to explain how the welfare difference between participation and non-participation changes due to unobserved heterogeneities in product adoption. Specifically, we explore whether there are significant differences in welfare outcomes due to heterogeneities in the generalized propensity to participate using the marginal treatment effect approach. We validate the results by testing the welfare heterogeneity in several aspects: first adjusting the poverty measurement and second, by adjusting the analytical technique. It is not difficult to understand the policy importance of examining the heterogeneity in microfinance impact; particularly its importance to optimal resource allocation and poverty eradication strategy.

3 Empirical Strategy

3.1 Basic setup and notation

In this section, we attempt to provide a basic understanding for the application of the marginal treatment effect approach. Following Kamhofer et al., (2014), we begin by assuming two potential welfare outcomes for any individual, i. That is, Y_{i1} if the individual, i, accesses a microfinance service, $D_i = 1$, and Y_{i0} if the individual does not, $D_i = 0$. Thus, the observed welfare outcome for any individual will be given by:

$$Y_i = Y_{i1}D_i + Y_{i0}(1 - D_i) = Y_{i0} + D_i(Y_{i1} - Y_{i0}) = \begin{cases} Y_{i0} \ \ if \ \ D_i = 0 \\ Y_{i1} \ \ if \ \ D_i = 1 \end{cases} \tag{1}$$

Further assume that welfare outcomes are dependent on a set of observed and unobserved attributes, U_i, unique to each individual. We can therefore express outcomes for each individual as:

$$Y_0 = \omega_0(\boldsymbol{X}) + U_0$$
$$Y_1 = \omega_1(\boldsymbol{X}) + U_1 \tag{2}$$

Where $\boldsymbol{X}$ contains the vector of observable traits that influence outcomes and the $\boldsymbol{U}$'s are the unobservable attributes affecting outcomes and participation decisions. Clearly, for each individual, it is possible to experience only one outcome and never both; and the potential outcome that is observed by any researcher is

$$Y_i = Y_{i1}D_i + Y_{i0}(1 - D_i) \tag{3}$$

Where D_i which represents access to microfinance by individual i, is a binary variable taking on 1 if the individual takes up a product or zero if otherwise. Since U_0 and U_1 affect both outcomes and participation decisions, D_i is endogenous. Standard econometric solution requires the use of instrumental variable technique which relies on the success of identifying a set of variables, $Z\_$, which does not affect the welfare of the individual but strongly correlates with access to the microfinance product. In the simple case, where the treatment effect is constant or is randomly distributed over the population, the instrumental variable technique will provide consistent estimates of the average treatment effect of the product uptake ($\beta_i = Y_{i1} - Y_{i0}$). However, if there are exogenous unobserved factors that determine the potential gains individuals are likely to derive from a product uptake, then conditioned on these factors, individuals will self-select themselves into a programme. This complicates the endogeneity problem in impact assessment and the classical instrumental variable technique can only estimate a local average treatment effect given that the assumption of independence, rank and monotonicity holds. This gives rise to the issue of "essential heterogeneity" (Heckman et al. 2006) which illustrates the situation where the presence of a battery of unobserved traits influences an individual's decision to take-up a microfinance product based on knowledge of the idiosyncratic gains. In the microfinance market, essential heterogeneity is a common issue due to the presence of unobserved factors such as culture, soft skills and capabilities, network effects, access to information and economic expectation; which drives individuals who anticipate a higher gain from a product uptake to increase their demand in the microfinance market. This is the so-called sorting on gains phenomenon.

By requiring a latent index model to capture the participation decision to access a microfinance service, the marginal treatment effect capture the unanticipated characteristics affecting

participation. The latent index model is given by $D_i = 1[U^D(\mathbb{Z}) \geq V]$. Where $1[\blacksquare]$ is the indicator function which contains the observable traits $\mathbb{Z}$ and unobserved components, *V*. It is assumed that *V* is a continuous distribution function which enters the indicator function as a negative shock to the latent index determining treatment. It is therefore generally described as the unobserved resistance to, or negative preference for treatment. $\mathbb{Z}$ on the other hand, contains all variables in $\boldsymbol{X}$ as well as the instrument Z_ which are assumed to affect the participation decision. Given that *V* is an increasing distribution function, the latent index model can be rewritten as $P(\mathbb{Z}) > U_D$ where U_D represents the quantiles of V and $P(\mathbb{Z})$ represents the propensity score. This implies that

$$P(\mathbb{Z}) = P(D = 1|\mathbb{Z}) = \Phi\left(Z`\delta\right), D = 1[D^* \geq 0] = 1[P(\mathbb{Z}) \geq U_D] \tag{4}$$

Where $\Phi(\blacksquare)$ gives the cumulative distribution function of *V* which transforms $Z`\delta$ which is the latent index, into a probability.

3.2 Marginal Treatment Effect

Given the basic set up and notation of the marginal treatment effect, we proceed to provide a simple specification of the marginal treatment model as expressed in literature. In equation (5) we express MTE as the conditional difference in outcomes between accessing and not accessing microfinance; such that:

$$MTE(x, U_D) = E(Y_1 - Y_0|X = x, U_D = u) = x(\beta_1 - \beta_0) + E(U_1 - U_0|U_D = u) \tag{5}$$

Equation 5 shows that differences in outcomes can be decomposed into differences in observable characteristics $x(\beta_1 - \beta_0)$ and unobservable characteristics $E(U_1 - U_0|U_D = u)$. To estimate equation (5), the local instrumental variable, which computes the MTE as the change in the conditional expectation of *Y* with respect to the propensity score *P(Z)*, is generally used. The conditional expectation of *Y* is given as:

$$E(Y|X = x, P(Z) = p) = x\beta_0 + x(\beta_1 - \beta_0)p + pE(U_1 - U_0|U_D \leq p) \tag{6}$$

Equation (6) can be rewritten as

$$E(Y|X = x, P(Z) = p) = x\beta_0 + x(\beta_1 - \beta_0)p + k(p) \tag{7}$$

Where $k(p) = E(U_1 - U_0|U_D \leq p)$ gives the distribution of the propensity score which accounts for the observable heterogeneity along with the unobservable resistance to participation, U_D. The *MTE* can subsequently be derived from equation (7) as:

$$MTE(x, p) = \frac{\partial E(Y|X = x, P(Z) = p)}{\partial p}$$

$$= x(\beta_1 - \beta_0) + \frac{\partial k(p)}{\partial p}$$

$$= x(\beta_1 - \beta_0) + E(U_1 - U_0 | U_D = u) \quad (8)$$

The *MTE* expresses the average gain in outcomes for participants near the threshold or at the margin of participating, given a set of observed and unobserved characteristics affecting uptake decisions. In other words, *MTE* captures the gain from treatment for individuals shifted into treatment due to a marginal change in the predicted probability of treatment[1]. To implement the *MTE*, we first estimated equation (4) to obtain the predicted propensity scores of microfinance product uptake in a first-stage regression using the probit regression technique. This stipulates estimating the probability of access on a vector of independent variables which includes the instrumental variable ($Z\_$). The predicted values in the first stage regression then becomes the propensity scores. At the second stage, we then modelled the outcome variable, Y, on the estimated propensity score, $P(Z) = p$, and other explanatory variables using both parametric and semi-parametric techniques (Kamhofer et al., 2014). All estimations were clustered at the district level.

The final step in the estimation process is to find the derivative of the outcome variable with respect to $P(Z) = p$. See equation (8). According to Imbens and Angrist (1994), this removes the correlation between the instrument and any unobserved anticipated gain from the product uptake that might influence participation behaviour. Zhou, and Xie (2019) also demonstrates the superiority of the MTE over the conventional impact evaluation tools; particularly in detecting and accounting for essential heterogeneity. The desirable property which makes it a suitable analytical tool in this study is its ability to account for unobserved heterogeneity; showcasing potential resistance to participation that are likely to occur in the uptake of a microfinance product, and how this contributes to differences in welfare outcomes. The MTE also provides all the conventional estimates of treatment effects including the average treatment effect (ATE), the average treatment effect on the treated (ATT), the average treatment effect on the untreated (ATUT) as well as the marginal policy relevant treatment effect (MPRTE) by aggregating over different regions of the MTE curve (Cornelissen et al., 2018).

(a) Data source

The study relied on the most recent round of the Ghana Living Standards Survey (GLSS 7) conducted in 2016/2017 by the Ghana Statistical Service (GSS). The primary survey was conducted using two-stage random sampling techniques. Households were stratified into census-enumerated areas based on the population distribution of ten (10) regions in Ghana. Households living in each enumerated area (EAs) were then randomly sampled after randomly selecting some EAs across the ten regions in Ghana. The dataset contains the living standard information of approximately 74,000 individuals. Our analysis is based on a sub-sample of 22,052 persons. Our sub-sample consist of only individuals who are eligible for microfinance services. For the purpose of this study, an individual is defined as "eligible" to access microfinance service if the person is identified as poor, economically active and does not have a formal bank account[2]. This is because, the prime target of the microfinance market is to serve the poor and unbanked population.

[1] Further discussion on the MTE is provided by Caneiro, Heckman and Vytlacil (2010); Cornelissen, et al. (2016, 2018), Brave and Walstrum (2014), Heckman and Vytlacil (2005), Zhou, and Xie (2018) and Khandker et al. (2010).

[2] The study used the national poverty line of Ghc1760.76 to define the poverty status of individuals. Individuals who have bank account

As reported on Table A in the appendix section, 7,352 persons representing 33% of the total eligible persons had access to microfinance services. These individuals were selected and formed the treatment group, for the purpose of this work. The remaining number of eligible persons, 14,700, formed the comparison group. Figure I in the supplementary appendix section provides a pictorial illustration of the sampling activity. The summary statistics of the participants and non-participants is presented on Table A. The results show that female clients dominate the microfinance market (51%) compared to their male counterparts (49%). Access to microfinance is also predominant in rural communities as compared to the urban centres.

(d) Measurements

We followed Alkire and Foster (2011) procedure to measure the multi-dimensional poverty index (MPI) for each individual. The MPI determines the percentage of individuals in the population who are multidimensionally poor (poverty headcount, ***H***) as well as the average percentage of dimensions in which individuals are deprived (poverty severity, ***A***). According to Alkire, Conconi and Seth (2014), MPI is calculated by multiplying the poverty headcount with the severity of poverty (***H*** x ***A***); where headcount poverty, *H*, is defined as:

$$H = \frac{q}{n} \tag{9}$$

Where q represents the number of individuals who are multidimensionally poor in the population and *n* gives the total population. On the other hand, poverty severity, *A*, is defined as:

$$A = \frac{\sum_{i=1}^{n} c_i(k)}{q} \tag{10}$$

Where the numerator in equation (10) gives the weighted sum of deprivation suffered by the individual. k is the cut-off point for each indicator in each observable dimension; such that when $c_i > k$, $c_i(k) = c_i$ and the individual will be considered multidimensionally poor (Adusah-Poku and Takeuchi, 2019). The construction of the MPI involves three dimensions: education, health and living standards with each dimension comprising of various indicators. Each dimension and indicator deprivation cut-off clearly defined. The dimensions, indicators and associated cut-offs and weights used in constructing the MPI is reported on Table B in appendix. The evidence suggest that the majority of the sampled respondents are deprived in the livings standards sector and education (see Table C in the appendix section). Following Alkire et al. (2014) we used the cut-off of 33.3% such that individuals with deprivation score, c_i, equal or above this threshold are considered multidimensionally poor (deprivation)[3]. As explained earlier, it was the purpose of this paper to examine the welfare effect of microfinance access by examining its impact on multidimensional poverty using equations (7) and (8). We employed the parametric model with bootstrapped standard errors clustered at the district level with the third polynomial of the $k(p)$ as the baseline specification.

[3] A formal explanation of MPI is given by Alkire et al. (2014), Alkire and Foster (2011), Alkire and Santos (2014) as well as Dotter and Klassen (2017).

4 Empirical Results

4.1 Multidimensional poverty index

Table 1 shows the rate of multidimensional poverty including the headcount poverty and severity for the sampled data. Based on the cut-off of 33.3%, headcount poverty is estimated to be 53.1%. Poverty severity, a measure that determines the intensity of poverty was also estimated as 43.9%. This shows that on the average, individuals were deprived of 43.9% of the weighted indicators. This brings the level of multidimensional poverty to 23.3%. By increasing the poverty threshold from 33.3% to 66.6% to reflect the situation where an individual is deprived two-thirds of economic wellbeing indicators, it was identified the number of multidimensional poor persons reduces to 9.6% with MPI of 6.1%. The evidence suggests that 9.6% of the sample are extremely multidimensionally poor; deprived in at least 63.5% of the weighted indicators.

Table 1: Estimate of multidimensional Poverty Index

	Headcount (H)		**Average Intensity (A)**		**MPI (H x A)**	
	c = 0.33	*c = 0.66*	*c = 0.33*	*c = 0.66*	*c = 0.33*	*c = 0.66*
Main	0.531	0.096	0.439	0.635	0.233	0.061
Microfinance status						
Non participant	0.572	0.099	0.449	0.636	0.257	0.063
Participant	0.472	0.091	0.422	0.626	0.199	0.057
Sex of the individual						
Male	0.534	0.094	0.438	0.628	0.234	0.059
Female	0.524	0.100	0.441	0.640	0.231	0.064
Residence						
Urban	0.346	0.081	0.341	0.630	0.118	0.051
Rural	0.671	0.107	0.477	0.645	0.320	0.069
Year						
2016	0.506	0.098	0.437	0.633	0.221	0.062
2017	0.538	0.095	0.439	0.632	0.236	0.060

Source: Authors' own computations

Table 2. Probit Model on the Determinants of Microfinance Uptake

	Coefficient	**P-value**	**Marginal Effect**	**P-value**
Constant	-0.731	0.000		
Eligibility (Reference = Eligible)	-0.295	0.000	-0.075	0.000
Gender (Reference = Females)	-0.048	0.000	-0.015	0.003
Location (Reference = Rural)	-0.149	0.000	-0.048	0.000
Harvest (Reference = Yes)	-0.025	0.092	-0.008	0.092
Educational Status [Reference = None]	0.215	0.000	0.141	0.000
Employment (Ref. = Not Active)	0.125	0.000	0.034	0.000
Dwelling ownership	-0.009	0.311	-0.006	0.311
Formal Bank Availability	0.000	0.000	0.000	0.000
NHIS Card	0.260	0.000	0.052	0.000
Age of the individual	-0.008	0.000	-0.001	0.000
HH Size	0.299	0.000	0.085	0.000
Intensity of Microfinance Access (regional)	0.002	0.000	0.077	0.000
Number of economically active persons in district	0.000	0.085	0.000	0.085

Observations	22.052
Joint Significance	LR $\chi^2(21) = 4352.92^{***}$
-2Log-Likelihood	64138.926
Pseudo R-Square	0.636

Note: * p<0.05; ** p<0.1; *** p<0.01. Standard errors clustered at the district level

4.2 Treatment Effects of Microfinance Access on Clients

The analysis commenced with the estimation of the determinants of microfinance product uptake using the Probit model in equation (4). As displayed on Table 2, the Probit model estimation results largely met expectations and show that microfinance product uptake is strongly influenced by a host of household and environmental specific drivers including gender, location, educational level, dwelling characteristics, and land ownership. It is found that an individual's decision to patronize microfinance services is strongly and positively influenced by the availability of formal banks in the region as well as the regional supply of microfinance services. The probability of accessing microfinance services also tend to increase among women, people living in rural communities as well as districts with greater number of economically active persons. Figure 1 provides the resulting propensity scores from the first-stage regression. The distribution of propensity scores shows a common support which ranges from an overlaid of propensity scores for individuals who accessed microfinance (treated) and those who did not (untreated). It is obvious that individuals who accessed microfinance services have a higher propensity score than those who did not access microfinance services.

Marginal treatment effect results

We present the results of the parametric marginal treatment effect estimation in this section. A graphical analysis of the parametric MTE is presented by Figure 2 which shows how the MTE changes with respect to the unobserved resistance to microfinance access. It is evident that the MTE decreases with increasing levels of U_D. An instructive finding from the graphical analysis is that (see Figure 2); overall, participation in microfinance scheme has a negative and significant effect on multidimensional poverty. However, from the beginning, where the propensity score ranges from $0 - 0.12$ and from $0.5 - 0.73$, accessing microfinance services increases multidimensional poverty significantly. Notwithstanding, when the distribution of resistance ranges from $0.24 - 0.7$, the gains from accessing microfinance is revealed to be likely to be beneficial to those who are likely to access microfinance. The MTE also falls sharply beyond 0.8 resistance. The general pattern of the MTE curve suggests a scenario of reverse selection on gains such that individuals who are less likely to participate in the microfinance market might benefit more from a microfinance access. But this conclusion might be entirely accurate given the indication that around the U_D value of 0.24 to 0.49, the MTE curve increases with higher levels in the resistance distribution; which supports the advantageous selection on gains hypothesis where individuals who access microfinance have a higher probability of experiencing a reduction in multidimensional poverty.

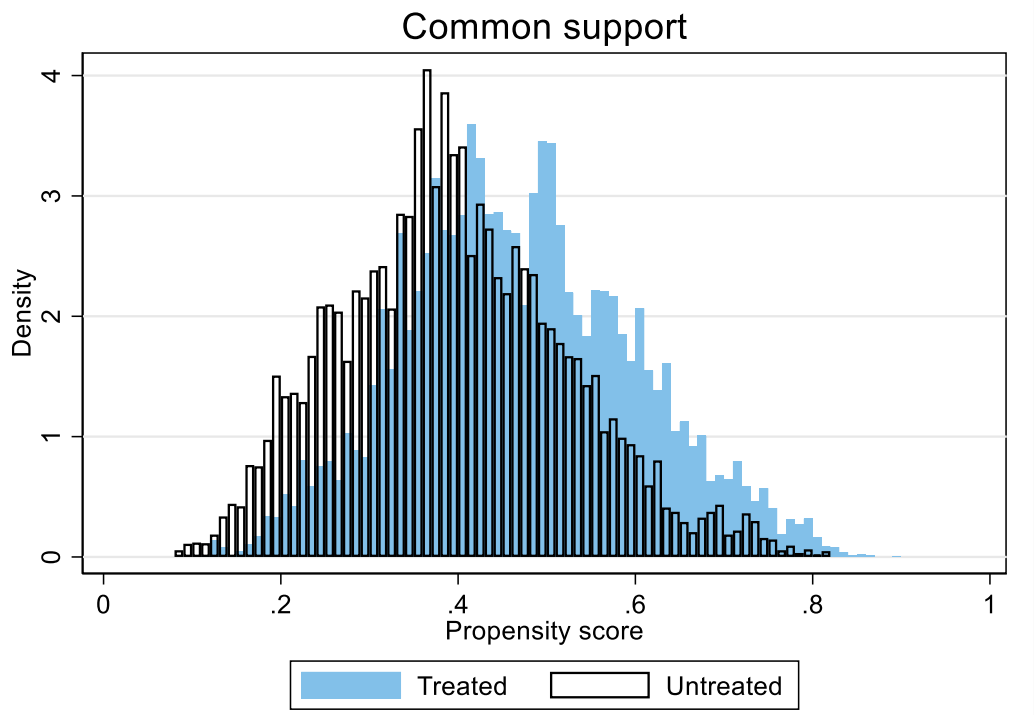


Figure 1: Common Support for MTE: Effect of Microfinance Access on MPI (Baseline Model)

Put together, the results demonstrate a heterogeneous treatment effect of microfinance access for different subpopulations of the sample based on unobserved resistance to participation. The results indicate that when access to microfinance is relatively easier, the welfare outcome of microfinance product uptake is negative. Conversely, when resistance to participation is stronger and more complex, choosing to take up a microfinance product leads to a lower net gain compared to not participating. However, for subpopulations with an average level of resistance, opting for a product uptake is more beneficial. This development is expected for individuals who meet the average requirements for microfinance product uptake. A formal test of the significance of the heterogeneous treatment effect is reported on Table 3; which shows that the essential heterogeneity in microfinance access is significant at l%. If we accept the causal implication of this result, we can deduce that the returns from using a microfinance product are not consistent across all individuals. Specifically, individuals who fall within the range of 24% to 49% on the resistance distribution (moderate resistance to participate) and those beyond 84% (high-level resistance to participate) are likely to experience a reduction in multidimensional poverty. However, there is a caveat. Among those with moderate resistance, individuals who participate in microfinance are expected to have relatively higher net gains compared to non-participants. On the other hand, in the context of high-level unobserved resistance, individuals who choose not to participate in microfinance are likely to experience higher net gains compared to those who do participate.

Effect of heterogeneity on observable characteristics

The baseline regression analysis (model 1), as presented in Table 3, is divided into three panels to examine the impact of microfinance access on deprivation. The first panel of model 1

captures the effect of the control variables on deprivation, without the treatment variable (microfinance access). It can be deduced that multidimensional poverty is significantly lower in urban communities. There is also a negative correlation between household size and deprivation, implying that larger households tend to experience higher levels of deprivation. Furthermore, the analysis reveals a positive and significant relationship between age and deprivation, indicating that older individuals are more likely to experience higher levels of deprivation. The second panel of model 1, on the other hand, account for the effect of the covariates in X in the presence of the treatment variable. This is labelled as the $\beta_1 - \beta_0$ coefficient which shows the differences in treatment effect given the observed characteristics of individuals who have access to microfinance (treated state) and those who do not have access (untreated state).

For instance, the results suggest that the gains from accessing microfinance is significantly stronger for males compared to female. We also find that the impact of an access to microfinance product on deprivation is stronger among individuals living in urban communities compared to individuals living in rural communities. This is interesting given the previous observation that deprivation is higher in rural centers compared to urban communities (see the β_0 coefficient for location in panel 1 of model 1). Also recall the Probit regression results in Table 2 which suggested that the probability of accessing microfinance is stronger for individuals living in rural areas than in urban centers. Put together, we deduced that individuals living in urban centers are averagely less likely to patronize microfinance services but those that tend to access microfinance services obtain significant benefits. This is demonstrative of reverse selection on observable gains from living in an urban center (Spanos, 2011). The implication is that, with reference to location, living in an urban center may give an individual a higher benefit from accessing microfinance services; but urban folks have a lower propensity of patronizing microfinance services.

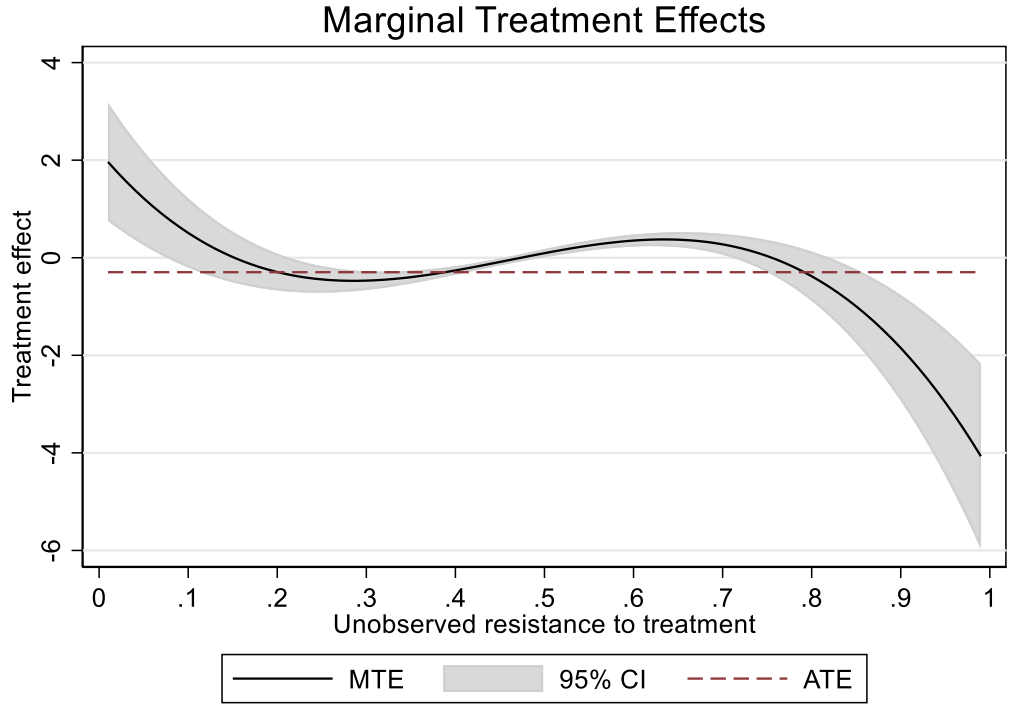


Figure 2: Marginal Treatment Effect of the impact of Microfinance access on MPI (Baseline Model)

The same conclusions hold for men; such that those who actually partake microfinance services necessarily reap lower benefit from it relative to those who do not. Again, we observe that the benefit of microfinance access is stronger among individuals who are not educated than those who are educated. This is also instructive, given the assessment that being educated increases an individual's probability of accessing microfinance services; supporting the general outlook of negative selection on gains. We obtained a related pattern of negative selection on gains among individuals living in communities with a large number of economically active persons. Particularly, the results show that gains from microfinance access decreases as the number of economically active persons in the district increases. Meanwhile, drawing lessons from the Probit regression results presented in Table 2, it is revealed that the probability of access to microfinance services increases as the number of economically active persons in a district increase. Combining this with the panel 2 results on district-level economic active persons, suggests that though the intensity of district-level economic activity correlates positively with the supply and the probability of microfinance product uptake; accessing microfinance services in a densely economically active population is more likely to engineer a higher deprivation than not accessing. Perhaps, this is because while microfinance institutions increase their activities in localities where the level of economic activities is noted to be high, the cost of borrowing demonstrated by the interest rates on loans coupled with limited business support services may strain entrepreneurial resources leading to a relatively high vulnerability to deprivation.

Table 3. MTE estimates of the effect microfinance access on multidimensional poverty

	Model 1		**Model 2**	
	Deprivation (*c = 0.33*)		**Severe Poverty (*c = 0.66*)**	
	Coefficient	***P-value***	***Coefficient***	***P-value***
	Panel 1: β_0 coefficients			
Constant	0.626	0.000	0.188	0.030
Eligibility (Reference = Eligible)	-0.088	0.000	0.057	0.035
Gender (Reference = Females)	0.019	0.119	0.202	0.000
Location (Reference = Rural)	-0.049	0.004	0.200	0.000
Harvest (Reference = No)	0.014	0.240	-0.002	0.920
Educational Status [Reference = None]	-0.018	0.293	-0.688	0.000
Employment (Ref. = Not Active)	0.022	0.167	-0.063	0.004
Dwelling ownership (Reference = Not an owner)	0.056	0.000	0.132	0.000
NHIS Card (Reference = Yes)	0.066	0.021	-0.444	0.000
Age of the individual	0.022	0.000	-0.006	0.197
HH Size	-0.048	0.001	-0.028	0.197
Number of economically active persons in district	0.000	0.281	0.001	0.000
	Panel 2: $\beta_1 - \beta_0$ coefficients			
Constant	0.066	0.665	-0.644	0.000
Eligibility (Reference = Eligible)	0.374	0.000	0.036	0.528
Gender (Reference = Females)	0.064	0.037	-0.264	0.000
Location (Reference = Rural)	0.286	0.000	-0.154	0.000
Harvest (Reference = No)	-0.047	0.128	-0.029	0.412
Educational Status [Reference = None]	-0.849	0.000	0.652	0.000
Employment (Ref. = Not Active)	-0.192	0.000	-0.085	0.065

Dwelling ownership (Reference = Not an owner)	-0.132	0.000	-0.217	0.000
NHIS Card (Reference = Yes)	-0.599	0.000	0.411	0.000
Age of the individual	-0.070	0.000	0.003	0.715
HH Size	0.149	0.000	0.061	0.118
Number of economically active persons in district	-0.002	0.000	-0.002	0.000
P_1	-21.954	0.000	-31.154	0.000
P_2	81.372	0.000	71.448	0.000
P_3	-60.464	0.000	-52.717	0.000
Test of observable heterogeneity, *p*-value		0.000		0.000
Test of essential heterogeneity, *p*-value		0.000		0.000
	Panel 3: Treatment effect estimates			
OLS	0.013	0.008	0.008	0.000
2SLS - IV	-0.588	0.000	-1.922	0.000
ATE	-0.612	0.000	-2.404	0.000
ATT	0.189	0.378	-2.528	0.000
ATUT	-1.210	0.000	-2.311	0.000
MPRTE1	-0.143	0.000	-1.700	0.000
MPRTE2	-0.132	0.001	-1.743	0.000
MPRTE3	-0.062	0.000	-1.620	0.000

Note: 1. 2SLS-IV regression welfare effect of microfinance access instrumented indicators of economic infrastructure (presence of formal bank, ICT, market centre). Sargan's Test χ^2(*P-va*lue) = 0.646 (0.420); Anderson-Rubin Wald test (*P-va*lue) = 156.02 (0.000)

2. * p<0.05; ** p<0.1; *** p<0.01. Standard errors clustered at the district level

It is also plausible that the pressure of repaying loans in a potentially competitive market, may constrain economically active individuals from investing in essential goods or opportunities such as housing, healthcare, education, etc. that contribute to improved quality of life. In contrast, we identified a pattern of advantageous selection on gains with reference to the age of the individual. First there is a negative and significant relationship between the individual's age and microfinance access (see Table 2). This indicates that younger people are more likely to access microfinance services. However, the $\beta_1 - \beta_0$ coefficient of age shows a positive and significant difference. This demonstrates that the benefits of accessing microfinance services is reduces with age. The causal implication that is suggested here is that people with observable characteristic (young age) that gives them a higher leverage in reaping superior returns actually patronize it. The same conclusion holds for household size where individuals with large households who stand to gain from accessing microfinance services actually self-select to access microfinance services.

5 Discussion and Conclusion

The findings of this study highlight the positive impact of access to microfinance services on poverty reduction and individual welfare. However, the effect of microfinance is not uniform and varies depending on individuals' observed characteristics. Interestingly, individuals who could potentially benefit more from microfinance services are less likely to access them, supporting the hypothesis of reverse or negative selection on gains. Furthermore, we observed a phenomenon known as sorting on gains, particularly when examining the impact of microfinance access on severe or abject poverty. Certain individuals with specific attributes, such as living in urban areas, having some level of education, engaging in crop cultivation, or

having national health insurance, experienced higher gains from utilizing microfinance services.

The theoretical implication of these results is that the effectiveness of microfinance can vary based on individuals' resistance levels, which may reflect their willingness or ability to participate. Individuals with moderate resistance to participation can benefit from accessing and using microfinance services, while those with high-level resistance may experience higher net gains by not participating. This understanding underscores the notion that microfinance is not a one-size-fits-all solution and that its effectiveness depends on individual circumstances and preferences. From a policy perspective, if the objective is to reduce severe poverty, a targeted microfinance intervention or scheme focusing on the urban poor, individuals in the agriculture sector, the educated, and those with health insurance can be economically effective. However, if the goal is to reduce overall poverty levels by reaching a broader population, the outreach of microfinance services needs to be comprehensive, considering the breadth, depth, and scope of the program. It is crucial to balance the credit rationing process and thoroughly assess individual contextual factors to improve the quality of product uptake. Given that individuals with a lower resistance to patronage may experience an increase in poverty rates or no change in their welfare, it is important to address the issue of adverse selection. This challenge is likely to increase with the integration of digitization in microfinance services, requiring stakeholders to reengineer the service provision mechanism and adopt a more complementary or hybrid approach to engaging clients.

Moreover, it is plausible that for commercial reasons, microfinance institutions may stick to their operational strategy when the aim is to select strategic clients who meet formal criteria; but if we should accept the causal implication of these findings then, the eventual welfare or poverty reduction outcome may not be optimal relative to what could have been. Ganle et al. (2015) found that although the effect of microfinance on poverty reduction is positive; this effect may be statistically insignificant or not homogeneous across different household units. Similar conclusions are drawn by Adjei et al. (2009), Kondo et al. (2008) and Kislat (2015). Microfinance participants might require more than financial services to move out of poverty. Given this circumstance it seems reasonable to design policies that focuses on reducing the barriers and exclusion from the microfinance market. Such policies should focus on the interests and needs of individuals who do not appear as regular clients in the microfinance markets. With the recent regulatory reforms in the microfinance sector in Ghana, the tendency for microfinance institutions to centre on relatively rich and economically viable clients is high. This is likely to reduce the social impact performance of microfinance institutions. While it is important for microfinance market to be financially sustainable and efficient, the regulator also needs to ensure that regulatory reforms are also sensitive to the social goals of microfinance institutions. Commitment to social goals will require additional monitoring, supervision and reporting of standardized social KPIs for financial inclusion and client protection in the microfinance landscape. It is therefore imperative that service providers and apex institutions explore avenues by which the vulnerability of participants are addressed by attaching capacity building programmes to service delivery. This would not only go a long way to improve the poverty reduction outcome of product uptake but contribute immensely to the attainment of the sustainable development goals. According to the findings of this study policy interventions that focuses on reducing the barriers to microfinance access engenders a positive effect on welfare particularly for individuals who seem to be indifferent between patronizing and not patronizing.

Overall, the study suggests that microfinance can effectively reduce poverty and enhance welfare, but careful consideration of individual characteristics, targeting strategies, and service delivery mechanisms is necessary to maximize the impact and ensure inclusive outcomes.

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APPENDIX

Table A. Descriptive Statistics

.	Description of variables	All Sample		With Access		Without Access	
		N	Mean	N	Mean	N	Mean
Gender	Categorical variable. Takes the value of 1 if individual is a female and 0 if male						
1. Male		11247	0.51	3602	0.49	8173	0.556
2. Female		10805	0.49	3750	0.51	6527	0.444
Educational Status	Categorical variable. Takes the value of 1 if individual has received formal education, or 0 if otherwise.						
1. None		13562	0.615	5896	0.802	11878	0.808
2. Attended school		8490	0.385	1456	0.198	2822	0.192
Dwelling	Categorical variable. Takes the value of 1 if individual is a homeowner or 0 otherwise.						
1. Not an Owner		5778	0.262	1095	0.149	1985	0.135
2. Owner		16274	0.738	6257	0.851	12716	0.865
Location	Categorical variable. Takes the value of 1 if individual resides in an urban or peri-urban community or 0 if otherwise.						
Urban		7608	0.345	1713	0.233	2073	0.141
Rural		14444	0.655	5639	0.767	12627	0.859
Livestock ownership	Categorical variable. Takes the value of 1 if the individual owns a livestock or 0 otherwise.						
No		2448	0.111	654	0.089	1470	0.1
Yes		19604	0.889	6698	0.911	13230	0.9
National Health Insurance	Categorical variable. Takes the value of 1 if individual has access to national health insurance or 0 otherwise.						
No Access		6880	0.312	1603	0.218	3749	0.255
Access		15172	0.688	5749	0.782	10952	0.745
Electricity	Categorical variable. Takes the value of 1 if individual has access to electricity or 0 otherwise						
No		8468	0.384	3257	0.443	5718	0.389
Yes		13584	0.616	4095	0.557	8982	0.611
Floor Material	Categorical. Takes the value of 1 if individual stays in a housing unit made of cement, terrazzo or tiles. 0 if the floor material is made of earth or mud						
Earth or Mud		4388	0.199	2286	0.311	2969	0.202
Not earth or mud		17664	0.801	5066	0.689	11731	0.798
Land ownership	Categorical. Takes the value of 1 if individual owns a land or 0 otherwise.						
No		6836	0.31	2014	0.274	3587	0.244
Yes		15216	0.69	5338	0.726	11113	0.756
Toilet facility	Takes the value of 1 if individual shares toilet facility with others or 0 otherwise.						
Private		6153	0.279	1875	0.255	4175	0.284
Shared		15899	0.721	5477	0.745	10525	0.716

Table B. The dimensions, indicators, deprivation thresholds and weights of Deprivation

Dimensions	Indicator	Deprived if …	Relative weight
Education and social inclusion			**33.3%**
	Years of school	Individual did not complete five years of schooling.	11.1
	Social security	Individual is not contributing to any form of social security system	11.1
	Insurance	Individual does not have any form of contributory health insurance	11.1
Health			**33.3%**
	Mortality	A member has died in the family	11.1
	Nutrition	Nutritional information on the individual shows that BMI is below 18.5	11.1
	Illness	Individual has been ill or hospitalised	11.1
Living standards			**33.3%**
	Electricity	The individual uses no electricity	4.76
	Sanitation	the individual lives in apartment with no toilet facility or uses a shared toilet facility (i.e toilet or latrine flushed without treatment to surface, river or sea)	4.76
	Water	The individual does not have access to piped water, public tap, borehole or pump, protected well, protected spring or rainwater	4.76
	Floor	The individual lives in an apartment that has dirt, sand, or dung floor	4.76
	Cooking fuel	The individual cooks with dung, wood, or carbon	4.76
	Assets	The individual does not own one of the following assets: land, mobile, radio, TV, telephone, bicycle, motorbike, refrigerator, and does not own a car or truck.	4.76
	Round trip	Access to safe water is not within a distance of 30 min' walk	4.76

Table C: Deprivations and contributions of indicators

Dimensions	Indicator	Deprived on Indicator (%)	Contribution
Education and social inclusion			**0.320**
	Years of school	3.828%	0.010
	Social security	93.842%	0.233
	Insurance	27.601%	0.078
Health			**0.221**
	Mortality	0.387%	0.001
	Nutrition	56.018%	0.159
	Illness	21.579%	0.061
Living standards			**0.458**
	Electricity	37.938%	0.045
	Sanitation	86.451%	0.095
	Water	88.680%	0.090
	Floor	11.578%	0.014
	Cooking fuel	81.303%	0.091
	Assets	46.577%	0.044
	Round trip	75.482%	0.080

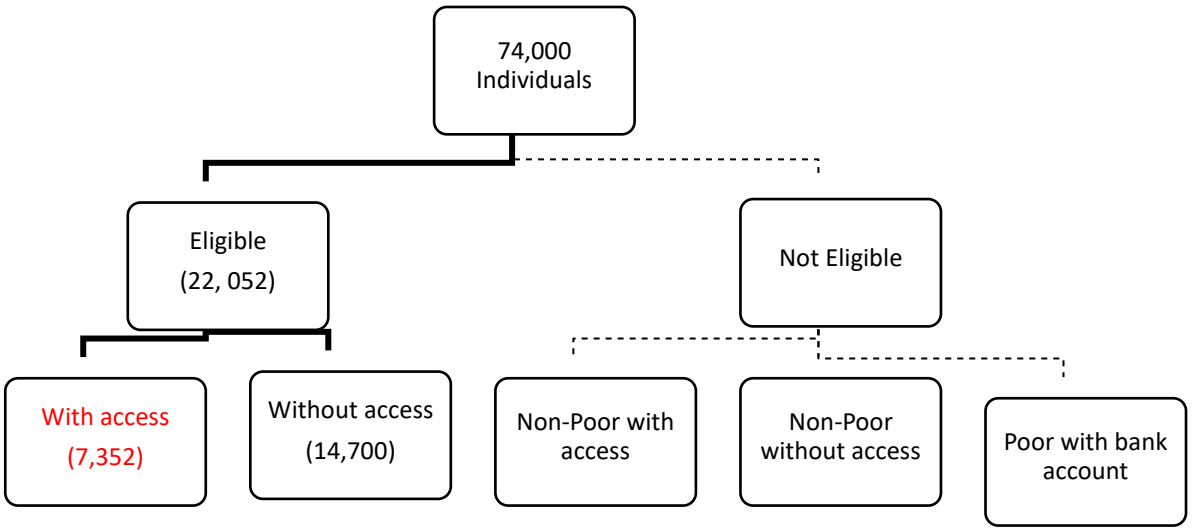


Figure I: Sampling and Identification Process

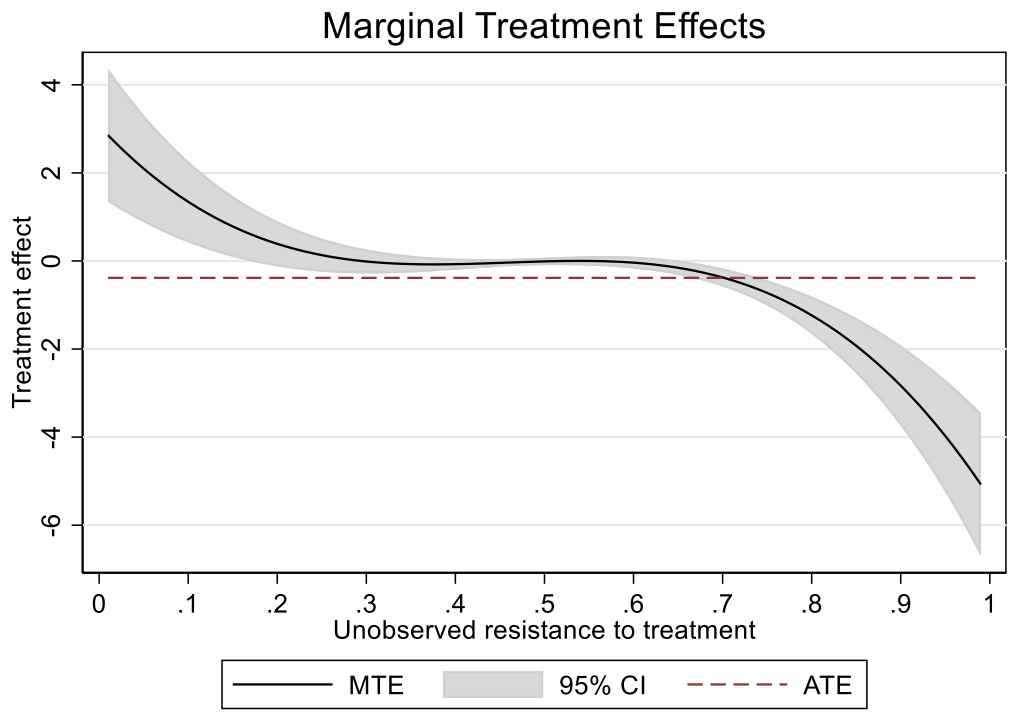


Figure II: Parametric Marginal Treatment Effect Estimate – Severe Poverty Model (cut-off = 0.66)

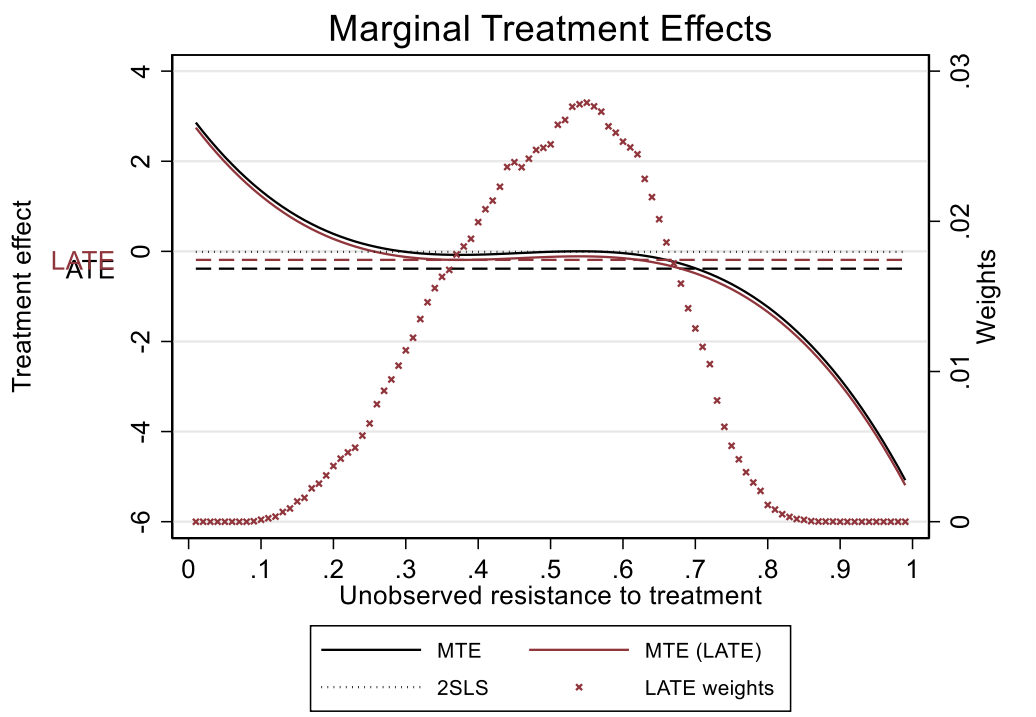


Figure III: Heterogeneity in Effect by Propensity Score – Severe Poverty Model (cut-off = 0.66)

Track 2 - Entrepreneurship, Small Business, and Informal Sector

A FRAMEWORK FOR SUSTAINABLE FARMING FOR SMALL MEDIUM AND MICRO ENTEPRESES FOR COMMERCIAL FARMING

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Abstract

The South African agricultural landscape focuses on livestock and crop farming, which includes vegetables, fruit, nuts, and grains. The catalysts of growth in this sector are well-developed commercial and emerging farmers/smallholder farmers. Most African countries are developing, and their population is expected to grow significantly. The anticipated population growth requires the agricultural sector to adjust accordingly. The South African government expects the agricultural sector to boost the country's food security and job creation. Small, medium, and micro enterprises (SMMEs) in agriculture are also expected to play a major role in growing the national income. This study aims to evaluate factors affecting SMMEs in commercial farming in the Winterveldt. Ten farm owners and five farm workers were interviewed. The researcher used a qualitative research methods approach. The findings of the study revealed that factors affecting smallholder farmers to commercialise their farming are access to credit, access to formal markets, infrastructure, high transport costs, limited working capital, high operational expenditure, and limited government support, all of which remain as the main challenges which decelerate growth for smallholder farmers in the area. The study contributes to knowledge by identifying critical problems and possible solutions which can help in policy-making decisions for SMMEs, particularly in commercial farming. The study also provides a framework for the sustainability of SMMEs in the commercial farming sector.

Keywords: SMME, agriculture, smallholder farmer, commercial farming

Introduction

Small, medium, and micro-sized enterprises (SMMEs) in South Africa are regarded as critical vessels needed to drive the national economy. The South African government estimates that about 90% of jobs will be created by small and growing enterprises in the country's economy by the year 2030 (National Planning Commission, 2012).

The Department of Small Businesses was established in 2014 with a mandate to promote and develop enabling policies and legislative environment for the growth and sustainability of SMMEs (Small Enterprise Development Agency, 2016). Moreover, the South African president established a task team in February 2022 with a directive to reduce red tape for the success of SMMEs, such as the inability of the government to pay suppliers within 30 days (Magubane, 2022). The establishment of the task team demonstrates that the government acknowledges its ineptitude in assisting SMMEs to operate successfully and contribute meaningfully towards the targets set out in the National Development Plan (NDP). However, eight months post-appointment of the task team, it is not clear what the deliverables of the task team are and what progress has been made in creating a seamless system for the benefit of SMMEs. In the ten-year review report of the South African National Developmental Plan (2030) by the Parliamentary Monitoring Group, chaired by Mr Mmoiemang of the African National Congress; concerns were raised regarding the lack of employment creation, innovation and competitiveness which are key drivers for economic growth (Parliamentary Monitoring Group, 2024. This observation is supported by the Chief Executive Officer (CEO) of the Black Business Council, who expressed that the situation has worsened in the last six months for businesses trading with the government. There is still no clarity on how the appointed task team is expected to deal with the red tape in government procurement processes (Phillip, 2022).

In South Africa, businesses in the agricultural sector are typically categorised according to size and volume. The classifications: survivalist, semi-commercial (emerging), and commercial enterprises often emerge. There is no clear distinction between small, medium, or micro-medium enterprises according to the National Small Business Act 102 of 1996. Agricultural SMMEs in South Africa are formed by individuals, groups, and government initiatives such as Land Redistribution for Agricultural Development (LRAD). These initiatives were established in democratic South Africa around 1994 (Ortmann & King, 2007). The main objective of these initiatives was to ensure that the previously disadvantaged South Africans were allowed to own and use productive land for agricultural purposes and participate in the mainstream economy. The main objective of this study was to assess the factors affecting SMME commercial farming.

Literature Review

Smallholder farmers

The term 'smallholder' is used interchangeably with 'small-scale', 'resource-poor' and occasionally 'peasant farmer' (Department of Agriculture, Forestry & Fisheries - A framework for the development of smallholder farmers through cooperative development, 2012). The Department recognises that the definition for smallholder farmers is defined in numerous ways depending on the country, context, and environment.

Categories of agriculture in South Africa are subsistence farming located in the former homelands, and large-scale farmers, who are mainly white (Van Zyl & Kirsten, 1998). These authors further

elaborate on perceptions that South Africans have about small-scale farmers, being that they are primitive, non-productive, and non-commercial.

The term ‘smallholder’ hides imbalances and class disparities created by the former government, disparities that are still prevalent to date (Cousins, 2010). Most small-scale / smallholder farms operate in areas that were part of the former homelands and are also entangled in racial undertones, as large-scale farming is associated with white farmers. In contrast, small-scale farming is associated with black farmers (Mathinya, Franke, Van De Ven & Giller, 2022). This perception may seem outdated, as homelands ceased to exist in South Africa in 1994. The reality is that many of the smallholder farms in former homelands struggle to transition to commercialisation. The term small-scale farming refers to all farmers with little commercial activity, with no racial connotations (Mathinya et al., 2022).

Under the current government, there have been many efforts and interventions put in place at public and private levels to grow the potential of smallholder farms. Glover and Jones (2019) define with slightly different attributes; they define smallholder farmers as those with access to bigger land (more than 10 hectares), with access to markets and financing, whose aim is to produce for their needs and to sell for commercial purposes and are not only located in the former homelands. This definition poses the question of why the farmers who fall into this category are classified as smallholders.

In their research, Van Zyl and Kirsten (1998) argue that smallholder farms should be defined by the potential production output instead of land size. Contrary to the argument by Van Zyl and Kirsten (1998) above, economic policies encourage farmers to increase their farm sizes. Scale is important; however, with high-value irrigated crops such as nuts, high yields can be realised even on smallholder farms (Mathinya et al., 2022). This argument is consistent with Van Zyl and Kirsten (1998), who emphasise the optimal use of the land. The call is for farmers to increase production output and efficiency, regardless of land size.

Small-scale farming can help households improve their income, however; their contribution towards household income is not measured in South Africa (Ndlovu & Masuku, 2021). Smallholder cattle farming in developing countries is identified as one of the main agricultural drivers for poverty alleviation and community development (Malusi, Falowo, Hosu & Idamokoro, 2022). Ncube (2018) explains that in the Western Cape, smallholder farmers are categorised into three; those who own two hectares of land and use leased land to increase production capacity, small livestock farmers farming in groups or individuals, and lastly the historically disadvantaged individuals (HDIs). In the Eastern Cape, production is done on land with an average size of two hectares (Mdoda, Obi, Ncovini-Manciya, Christian & Maykiso, 2022) and (von Loeper, Musango, Brent & Drimie, 2016).

Generally, smallholder farmers are regarded as those with limited resources as compared to other farmers in the sector (Department of Agriculture, 2012). A study conducted on smallholder farms in Ethiopia, Ghana, Mali, Malawi, Tanzania, and Uganda revealed that the majority of the farms are operated on land which is less than one hectare (Giller, Delaune, Silva, et al., 2021).

The Department of Small Business Development defines SMMEs according to the sector, number of employees, and annual turnover. A small enterprise in the agriculture sector has a total full-time equivalent of paid employees ranging from 11 to 50, with an annual turnover of ≤ R17 million, whereas microenterprises have a total full-time equivalent of employees ranging from 0 to 10, with

an annual turnover of ≤ R7 million (National Small Enterprise Act: Schedule 1: Amendment of 2019).

The White Paper on Agriculture (1995) recognises the importance of smallholder farms in improving national and household food security. It recognises that while operations in small-scale farms may be relatively small compared to large-scale farms, their importance in improving national and household food security is increasing. Small-scale farms are owner-managed, with a small number of employees and receiving labour assistance from family members (Matlou, Yonas & Bahta, 2018). Small-scale farmers heavily rely on family labour as an alternative to hired labour as it yields higher production levels due to work responsibilities being shared amongst family members (Hlatshwayo et al., 2021) and to save costs (Jiba et al., 2024). Smallholder crop farmers are those with land sizes of around 2 hectares. They are key to food security as they produce a third of the world's food. Leasing out machinery is an additional cost to already struggling smallholder farmers (Frost et al., 2023).

Following the relevant literature, this study recognises small-scale and smallholder farmers as the same, and the titles are used interchangeably. This study recognises smallholder farmers as an enterprise operating with 0 to 10 employees with an annual turnover of ≤ R7 million, consistent with the definition by the Ministry of Small Business Development.

Commercial Farming

Agriculture in South Africa is dual and is represented by a small number of commercial operations that are managed successfully, while many small-scale enterprises are mostly managed by struggling black producers (Department of Agriculture, Forestry & Fisheries, 2012). Khapayi and Celliers (2016), in their study, presumed that commercialisation of subsistence agriculture implied increased remuneration from agricultural activities, due to outputs from the markets.

Commercial farming is described as profit-driven, where the produce is only for sale to generate revenue. Operations are on a relatively big farm, employing high-end machine power for cultivating rather than human efforts, generally produces a single type of crop and operates all year round (Kasai & Rdhadhika, 2021). According to Kasai and Rdhadhika (2021), commercial farming is different from subsistence farming, which produces for household consumption, farming is done on a small piece of land, has low capital inputs, and mostly uses family members for labour. According to Glover & Jones (2018), commercial farms mostly prefer locations which are close to markets and infrastructure, and their presence is associated with higher income than smallholder neighbours. When a small-scale farmer intends to transition to commercial farming, they first must know their market, the type of crops suitable for their operation and the logistics that influence their production (AgriNewsNet, 2019). In their study, Van Schalkwyk (2022) indicates that the value of commercial agriculture production in South Africa amounted to R76 billion and contributed R34 billion to the national income. Failure by the South African government to integrate emerging farmers into the mainstream agricultural economy calls for more enquiries into the challenges experienced by these farmers and for the government to develop better-suited policies and strategies that will help transition emerging farmers to commercial farmers (Khapayi & Celliers, 2016).

In this study, commercial farming is defined as a profit-driven and profit-generating entity which produces mainly for sale.

Research Methodology

This study used a qualitative research approach as it aimed to study and explore factors affecting SMMEs operating commercial farms in the Winterveldt. Qualitative research recognises that knowledge is derived from experience; it explores diversity among participants and captures the description and narrations of the participants to report on the findings (Kumar, 2019).

The targeted population for the study was SMMEs operating smallholder farms for commercialisation purposes in the Winterveldt; products were either crops, livestock, or a combination of both.

The study adopted a purposive sampling, participants were selected based on experience and as theoretical categories changed during the study (Cooper & Schindler, 2014). The participants were selected based on referrals from one farmer to the next. The researchers were flexible and relied on developments as the study proceeded. Hence, purposive sampling was applied. A sample of ten willing farm owners who met the sampling criteria participated in the data collection process through semi-structured face-to-face interviews. The recommended minimum sample for a homogeneous population unique for academic staff involved with teaching and learning at Unisa is between 4 and 12 (Saunders, Lewis & Thornhill, 2016). The participants in the study had to meet specific criteria to be included in the sample: Farming operations in the Winterveldt, horticulture or livestock farming, Start-up, new, and existing farm, and Participants over the age of 18 years.

Qualitative data analysis was applied using thematic analysis, as the study sought to understand the characteristics, perceptions, and agricultural knowledge of SMMEs operating commercial smallholdings within the farms in the Winterveldt area. The data was collected and captured on Microsoft Excel and the quotations were grouped according to the themes.

Data analysis was executed simultaneously with data collection for researchers to modify research questions and collection methods where necessary; it was at this stage that themes were recognised and salient concepts identified (Mohajan, 2018). Thematic methods are used to identify repeated patterns in the data (Sundler, Lindberg, Nilsson & Palmér., 2019). The grouped quotations were then analysed using thematic analysis.

Discussion of the findings

Demographics

Table 1: Demographic profile of the farm owners

Characteristics of the participants Frequency (%)	
Gender	
Female	1 (10%)
Male	9 (90%)
Age group (range in years)	
18-35	1 (10%
36-45	4 (40%)
46-60	2 (20%)
>60 years	3 (30%)
Highest education level	
Matric	1 (10%
Diploma	2 (20%)
Bachelor's degree	2 (20%)
Honours degree	4 (40%)
Masters	1 (10%)
Farm size	
< 1 hectare	0 (0%)
1-5 hectares	2 (20%)
6-10 hectares	6 (60%)
> 10 hectares	2 (20%)
Productive area	
< 1 hectare	0 (0%)
1 Hectare	2 (20%)
1-5 hectares	6 (60%)
6-10 hectares	2 (20%)
> 10 hectares	0 (0%)
Legal ownership	
Legal owner	5 (50%)
Leased land	1 (10%)
Other (parents)	4 (40%)
Number of years in operation	
1 to 2	1 (10%)

3 to 5	4 (40%)
5 and above	5 (50%)
Type of farming	
Horticulture	6 (60%)
Livestock	0 (0%)
Horticulture and Livestock	4 (40%)
Registered with CIPC	
Registered	7 (70%)
Not registered	3 (30%)

Most owners were 36 to 45 years old, representing 40%, while 90% were male and 10% female. The findings by Sehar and Oyekale (2022) revealed that 40% of the farmers were above 60 years of age and 76.7% were male. Therefore, there is a partial congruency to the findings by Sehar and Oyekale (2022).

Most of the participants in the area have an Honours degree or equivalent. The results correlate with the findings by Matsane and Oyekale (2014), who reported that the small-scale farmers are literate mostly with high school level education and relevant experience.

Mdoda et al. (2024) cite that smallholder farmers in the Eastern Cape region have spent at least 7 years of formal education, confirming that they are literate. According to Moyo et al. (2024), the average number of years spent by smallholder farmers was 9 years and argues that educated farmers easily adapt to innovation and are likely to commercialise their business operations.

Farmers with land ranging between 6 - 10 hectares represent 60% of the participants and only two participants have land above 10 hectares. In the Eastern Cape, the average sizes of productive land are two hectares (Mdoda et al., 2022; von Loeper et al., 2016).

A study on smallholder farmers in KZN uncovered those farmers in that area had access to around 1.31 hectares of land, and most of the participants indicated that they were content with their land sizes (Maziya et al., 2024). In the OR Tambo District in the Eastern Cape, a study revealed that about 58% of the smallholder farmers had access to farming land size between 0.1 to 2 hectares, 32% had access to between 2.1 to 4 hectares while only 10% had access to land size greater than 4 hectares (Nhliziyo & Mushunje, 2024).

Thematic Analysis

Table 2: Semi-structured interviews with the farm owners

Research Question	Themes
What are the factors affecting SMMEs' commercial farming in the Winterveldt?	Theme 1: Access to credit Theme 2: Access to Markets Them 3: Government support Theme 4: Sustainable Agricultural Practices (SAP) Theme 5: High transport costs Theme 6: Soil analysis Theme7: Working capital and operating expenditure

Source: Author's work

Theme 1: Access to credit

Six participants indicated that to operate efficiently, expand their operations, diversify products, and acquire additional human resources, inputs, and assets, they need financial assistance. Their understanding is that to qualify for financial support they need to prove affordability to credit providers, which would require the submission of financial projections and cash flows which they do not have.

"Funding for small businesses like us requires things we don't have e.g., collateral. Our projects are self-funded. Using own funds can be limiting", Respondent #03.

Most small-scale farming financials go unrecorded, which may be a contributing factor to not being able to provide financial records (Ndlovu & Masuku, 2021)

Concerns raised by Participant #01 that "Plots in Winterveldt are privately owned and to qualify for credit they would be required to risk what they already own and cede these properties as collateral to credit providers." Credit institutions lean toward lending to clients who are within the economic active age (Mutero et al., 2016).

Theme 2: Access to markets

There is a stable balance between smallholder farmers who supply to the formal markets and those who supply to informal markets. The formal markets being referred to in this case are mostly the Tshwane market, Johannesburg markets, retail stores, and auctions (applicable for livestock) around Gauteng.

"A market must be secured first before working the ground. The market is something that we must work on, one must have a market before planting. I sell at Tshwane market. I used to supply Spar,

Fruit, Vege etc. The formal market has challenges in terms of quality, quantity, and continuity. If I only use a portion of the farm, I may not be able to continuously supply, whereas at the market they take any quantities. The market determines the price and agencies are not able to determine the price. They use the supply and demand policy. That's how they push the prices up and down" Participant #01.

"We don't have formal contracts. We are not able to produce crops on a large scale. We sell livestock privately as well e.g., funerals, weddings etc.", Participant #06.

The opinion of the four participants who supply to formal markets is that at a commercial level, they are coerced into being price-takers. The market determines the price of the products, farmers cannot determine the price at which to sell their produce.

"I don't plant a lot, so I don't go to market. I sell to informal markets. Prices are determined based on competition. I charge the same price for all my clients" Participant #02.

The consumer supply and demand policy takes effect, which is how the price is pushed up or down. In their study, Wegerif (2022) explains that typical complaints regarding municipal fresh produce markets are high transport costs, poor communication, and low/unreliable prices.

"We are largely price takers. At a commercial level, you become a price taker. At markets like Tshwane all depends on the supply and demand and what the market Is willing to pay on that particular day. We also have agents who look at the average price markets for that day" Participant #03.

"The challenge I have with the market is that it is unpredictable. Getting an understanding of what to produce, what quantities, and how to package as well. When you do things on a small scale you don't plant a lot of things and it affects the volume we can produce. We supply mostly to the Tshwane market and informal traders. With the market you become a price taker, you can't determine your price. We determine the price mostly in informal prices." Participant #04.

The municipal fresh produce markets are the most used and have the benefits of creating opportunities for higher-value products e.g., herbs and baby marrow etc. They accept all kinds of fresh produce and can take huge volumes in a single transaction (Wegerif, 2022). Two participants mentioned that they also use the services of agents who could negotiate better prices on their behalf. The four participants above mostly produce high-end products such as peppers, sweet peppers, cucumbers, mushrooms, etc. Two participants indicated that their choice of high-end products was first to ensure they produce what is in demand, and second to minimise the risk of their produce being stolen by the locals. For example, spinach and tomatoes are what people in the community consume daily, whereas they would not have any use for peppers, sweet peppers, cucumbers, mushrooms etc.

A fair share of participants indicated that they supply to informal markets such as street vendors, members of the community for funerals and weddings, abattoirs, churches etc., due to the inability to produce on a large scale. Market opportunities for livestock smallholder farmers include funerals, auctions, stokvels, hawkers etc. (Matlou et al., 2018). Like the participants who sell to formal markets, they do not have off-take agreements, an agreement between the buyer and seller to sell predetermined quantities to the buyer over a defined period.

Generally, smallholder farmers do not have direct contracts in place, which are legal agreements with the buyers e.g., supermarkets committing to the quantities, quality of product, frequency of

deliveries etc. (Ndlovu & Masuku, 2021). On the contrary, though, participants selling to informal markets are of the view that they determine their prices in those markets.

Theme** 3**: Government support

There is a consensus among the participants (farm owners) on the government providing support to smallholder farmers in the Winterveldt area. The support received by the owners was from either the Department of Agriculture, Land Reform and Rural Development, Tshwane Municipality, Agricultural Sector Education Training Authority (AgriSETA) and other government institutions.

The world population is expected to increase to 9.7 billion by the year 2050, which would require an increase in agricultural output in response to the growing population (Matlou et al., 2018).

"Another challenge is the finances. If the government was serious about food security, they would stop with empty promises, same as the old government did for white people in the past". Participant #01.

An insignificant number of farmers received seeds and fertilisers from extension officers (Wegerif, 2022). Government policies and programmes that were developed to transition and prepare smallholder farmers for commercial farming did not bear the intended results as they benefited mostly semi-commercial farmers (Smit, 2016). Though there seems to be support from the government, it does not seem to be on high-impact resources such as tractors, irrigation systems, boreholes, water tanks, and working capital for the efficient running of the smallholder farms.

Theme** 4**: High transport costs

All the participants indicated that they procure their inputs and other farming necessities from suppliers in Amron in Brits, Obaro in BonAccord / Roodepoort, and Pretoria North. The estimated distance from Brits to the Winterveldt and the Winterveldt to Roodepoort is around 43 kilometres. The estimated distance from the Winterveldt to Pretoria North is 30 kilometres.

"I use my transport to the market. Some of the agencies come and collect at a cost. We buy inputs from Obaro (Bon Accord 40-45 kilometres) and Amron (Brits 50-60 kilometres). With the increase in petrol and inflation, there is now scarcity in terms of availability" Participant # 01.

Four participants indicated that they also travel to Tshwane and Johannesburg markets, which is where they supply their produce. The estimated distance from the Winterveldt to Tshwane market is about 40 kilometres and 125 kilometres to City Deep (Johannesburg market). These farmers bear the high transport costs in sourcing inputs and supplying the goods to the markets.

Most of the farmers used less than a hectare for farming, which poses difficulties for transporting goods to market as they would not be able to offset transportation costs against sales proceeds (Mutero et al., 2016). The general problem for small-scale farmers is firstly, the availability of transportation and high transport costs to the markets, which has an impact on their ability to consistently deliver products (Ndlovu & Masuku, 2021). Poor road networks are a common challenge among smallholder farmers and have a direct impact on access to markets (Jiba et al., 2024).

Theme** 5**: Sustainable Agricultural Practices (SAP)

These are practices which are environmentally, economically, and socially sustainable, maximising profits, and productivity, and minimising environmental damage. This includes rotating crops and embracing diversity (planting a variety of crops), managing the use of water wisely, minimal use of chemicals to control pesticides, integrating livestock and crops, etc. (Sundberg, 2017). In certain instances, farmers in the Winterveldt have put some of the agricultural practices in place, though it can be presumed that it was a coincidence and not a conscious decision.

"We have cows and goats at home. We are in the process of de-foresting so that we can do soil analysis to start with crop farming. Though we already have the Chinese spinach planted" Participant # 08.

In certain instances, it was a conscious decision taken to implement sustainable practices.

"We grow mushrooms in a closed environment where we control the humidity and temperature. Last year I worked with an agronomist, and we had to use fertilisers. I don't like that; I prefer agroforestry. I want a blend of where we have trees and grow vegetables." #Participant 04.

The main drivers for the adoption of SAPs are access to financing, farm size, and labour resources (Mutyasira et al., 2018). The use of innovations and farming technologies can help spinach farmers improve their output (Mdoda et al., 2022).

A significant number of the participants in the area have integrated crop and livestock farming. Though there is some degree of SAP/biodiversity being applied in the Winterveldt, it seems to have happened by chance with some of the participants. It is the responsibility of the extension officers to educate the farmers about the benefits of sustainable agricultural practices.

Theme** 6**: Soil Analysis

Six participants had conducted soil analysis and are already planting based on the results of the analysis. However, one participant indicated that they had conducted the soil analysis after they had already planted. Ndlovu and Masuku (2021) argue that some of the challenges still experienced by small-scale farmers are limited access to fertile land and their constant efforts to improve soil fertility for crop development.

"We do an analysis of the soil every year to determine if the nutrients contents are still in place" Participant #03.

While a significant number of the participants claim that they have already conducted the analysis, the remaining 40% of the participants did not do the analysis. This has an impact on the quality of the produce.

Theme** 7**: Working capital and operational expenditure

Overheads such as salaries, transportation, logistics, electricity, water, maintenance, and production costs such as seeds, fertilisers, fungicides, packaging materials, lucerne, chicken feed, sawdust, etc. for animals, and replacement of tools make up the monthly expenditure for the business as described by the participants.

"We have worked out a programme on how payments should flow from the markets to avoid experiencing cashflow challenges. We have projections in place and put aside finances to run the business based on the projections. When we started, we funded the business from our pockets, the

business has not yet paid back the shareholder loans. The profits generated are used to expand the business" Participant #03.

Another participant explained that transport, fertilisers, labour, pesticides, and phone bills are their biggest costs. It takes them about three months to convert cash outflows into cash inflows/revenue and their business can finance transport costs. A study in Limpopo province established that 88.2% of the farmers' income is between R0 and R5 000 and 45.1% of the farmers generated their income from social grants and not farming activities (Elekanyani, 2017). The findings of this study also revealed that most of the farmers had an average monthly net farm income of R5 161 (Matsane & Oyekale, 2014). Some of the participants explained that they must finance transport costs, as the business is not yet able to carry this cost. To reduce operational costs, some of the participants explained that they grow their seedlings.

Conceptual Framework

Figure 1 below represents the PPE conceptual framework (Provision, Performance and Effect) visualised by the researcher as a presentation of the expected relationship between concepts.

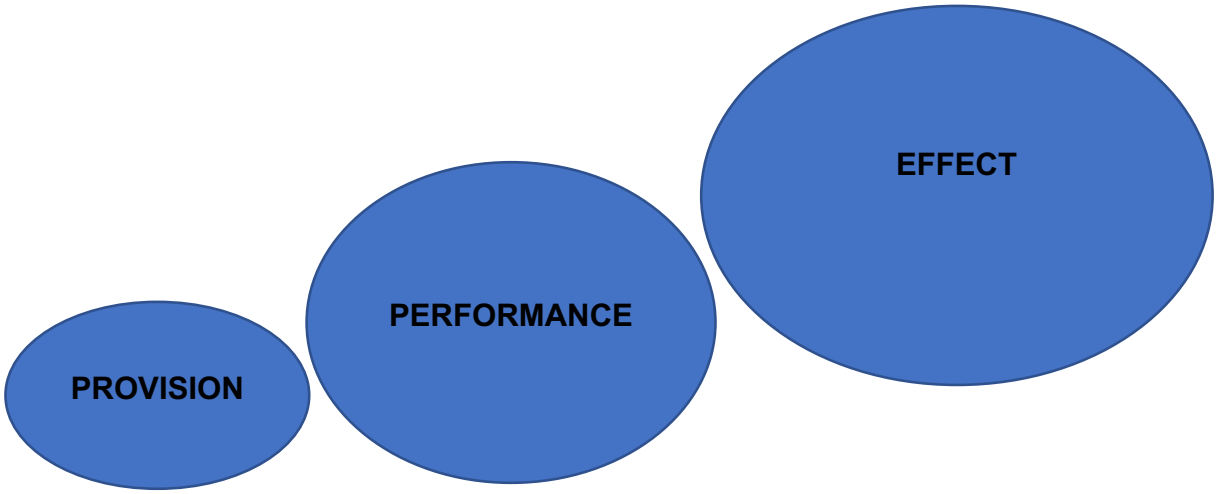


Figure 1: Conceptual Framework for Smallholder Farming

The findings of this study revealed that farms in the Winterveldt area are farmer-owned, leased from the family, or have the right of use, granted by the family. The land is an asset which is passed from one generation to the next. In this instance, the farmers are not burdened with the high costs of acquiring the land: the land is already in their hands. Notwithstanding, the findings of the study revealed that the majority are not able to produce on the entire land due to an inability to raise funds for the expansion of their operations which requires the acquisition of major assets such as irrigation systems, water tanks, boreholes, tractors etc.

The PPE model proposes that the government and its Developmental Finance Institutions (DFIs) provide programmes which support smallholder farmers with plants and equipment, where property is already in the hands of the farmers. The funding models by the said institutions should

eliminate hindrances such as collateral as a condition for funding. The programme can be blended finance, partly loan, and grants with interest at prime or less. This is a seed that the government and the DFIs should sow for start-up and existing smallholder farms. The focus for the government and its entities should be on managing the Performance of the smallholder farms post-investment. This is to ensure that the desired effect is achieved on the developmental targets. The impact should be measured on developmental targets such as job creation, maintenance of the existing jobs, youth, and women employment, production of local products etc.

Application processes should be made easier, and examples can be drawn from the Township and Rural Entrepreneurial Project (TREP) offered by the Department of Small Business, where the application process is made simpler and shorter. The requirements include submission of the business profile, proof of banking, CIPC registration, tax compliance, Financial Intelligence Centre Act (FICA) documents and quotations for the equipment required. There are no requirements for financial projects, which is a challenge for small businesses. This programme excludes primary agriculture. The government should ensure that similar offerings are extended for primary agricultural projects. This is to ensure that smallholder farmers who already own or have authority to use the land do not sit with idle land. For these farms to operate optimally and efficiently, the government should provide these factors of production from the outset.

Conclusions

Based on the opinions of the participants in the Winterveldt, it can be concluded that there is still a greater need for government support for smallholder farmers in the area to transition to commercial operations. The number of farmers operating at a commercial level in the area is still very low. This is mainly due to production being on a small scale. To increase production output, farmers need to increase their human capital to be able to utilise larger portions of their farmland effectively and efficiently. The farmers need to produce on a large scale to be able to secure off-take agreements with retailers and increase their revenues. These expansion projects would require capital injections not only for wages, but acquisition of durable equipment such as irrigation systems, boreholes, water tanks etc., and assist in covering operational expenditures. The municipality should create an enabling environment for the sustainability of the farms by investing in infrastructure development such as streetlights, tar roads, and drainage systems. Investing in infrastructure will assist in ensuring that there is business continuity during rainy seasons, and streetlights will increase visibility during the night, increasing security in the area.

Farmers in the area struggle with sourcing labour from South African citizens. The government should provide interventions in this regard, which would attract local labour, especially the youth.

The main implication of this study is that the government should review their policies concerning the funding of agricultural projects. To eliminate the risk of ceding privately owned property to the credit providers as collateral, instead, the government should provide credit guarantees to de-risk on behalf of the smallholder farmers.

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AN EXAMINATION OF THE SUPPORT OF GAUTENG PROVINCIAL TREASURY ON SMALL, MEDIUM, AND MICRO ENTERPRISE'S DEVELOPMENT IN THE CITY OF JOHANNESBURG

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Abstract

This research examines the support of Gauteng Provincial Treasury in the Small, Medium and Micro Enterprises in the city of Johannesburg. The study was conducted by means of a semi structured interview. The researcher targeted the founders/owners or directors of the SMME's that has actively participated in the GPT support programs and with the requisite knowledge to respond to interview questions. The researcher used 21 SMME's using non-probability convenience sampling method. The failure rate of Small, Medium and Micro Enterprises (SMMEs) is estimated to be between 70% and 80%. The research objectives were achieved after data was analysed and presented accordingly, and the research questions were answered thereof. The research results shows that there is still a need for SMME's development in the city of Johannesburg and other neighbouring cities. It is recommended that GPT should intensify its support for SMMEs.

Introduction

This study aims to examine the support of Gauteng Provincial Treasury (GPT) on Small, Medium, and Micro (SMME's) development within the City of Johannesburg (COJ). Cele (2015) highlighted the challenge facing many SMME's is that of financial sustainability and development. Marivate (2014) highlights SMME's as Small, Medium, and Micro Enterprises that are still developing with a revenue of less than R150 000 per year, as defined by the National Small Business Act of South Africa (South African Department of Trade and Industry, (2013). National Small Business Act of South Africa further explain the following abbreviated meaning of SMME's and the ownership scale.

A small enterprise can employ at least 50 employees, usually operates within small-scale communities. Medium scale Enterprise has a decentralized power with an additional management layer as its employees are up to a maximum of 100 or 200. A Micro Enterprise: is usually a non-formal enterprise concerning registration compliances. It operates as Spaza shop with not more than 5 people with a turnover of less than R150 000 annually.

According to Gauteng Treasury (2024), Gauteng Provincial Treasury (GPT) is a state-owned department located in Johannesburg central, with the main purpose of ensuring that financial strategic leadership is achieved and support provided. According to National Treasury Development Plan and vision, GPT has a role to play in the SMME's development within the Gauteng province and South Africa as a whole. GPT developed a Subsection of Supplier Management and Development under the main unit in provincial Supply Chain Management within the department. This sub section works in collaboration with other departmental units, other departments, and governmental entities to assist SMME's grow and become financially and operationally independent hence reducing the high unemployment rate in South Africa. The GPT has programs in place to assist SMME's development in the city of Johannesburg, such as an Enterprise and Supplier Development (ESD). The following section is categorised into a detailed background to the study, the research problem, aims of the study, literature review, and the importance of the study, research methodology, ethical considerations, limitations and conclusions.

Research Problem

The research problem is focused on the high rate of SMMEs failure in the City of Johannesburg. In the first year of operation, eight out of ten Small, Medium, and Micro Enterprises (SMMEs) fail to develop and grow to be fully operational. Roughly 80% of SMMEs in South Africa fail in their first year of operation, SEDA (2016). According to Marivate (2014), lack of entrepreneurial abilities is a defining cause of failure for small enterprises in Johannesburg. The implication of this is that employees who worked for SMMEs that fell out of business lost their jobs and their means of subsistence.

Research objectives

- Identify support of GPT in the SMME's development.
- Identify the SMME's developed from the support offered by GPT.
- To establish whether certain SMMEs need more support than others.

Abbreviated literature review

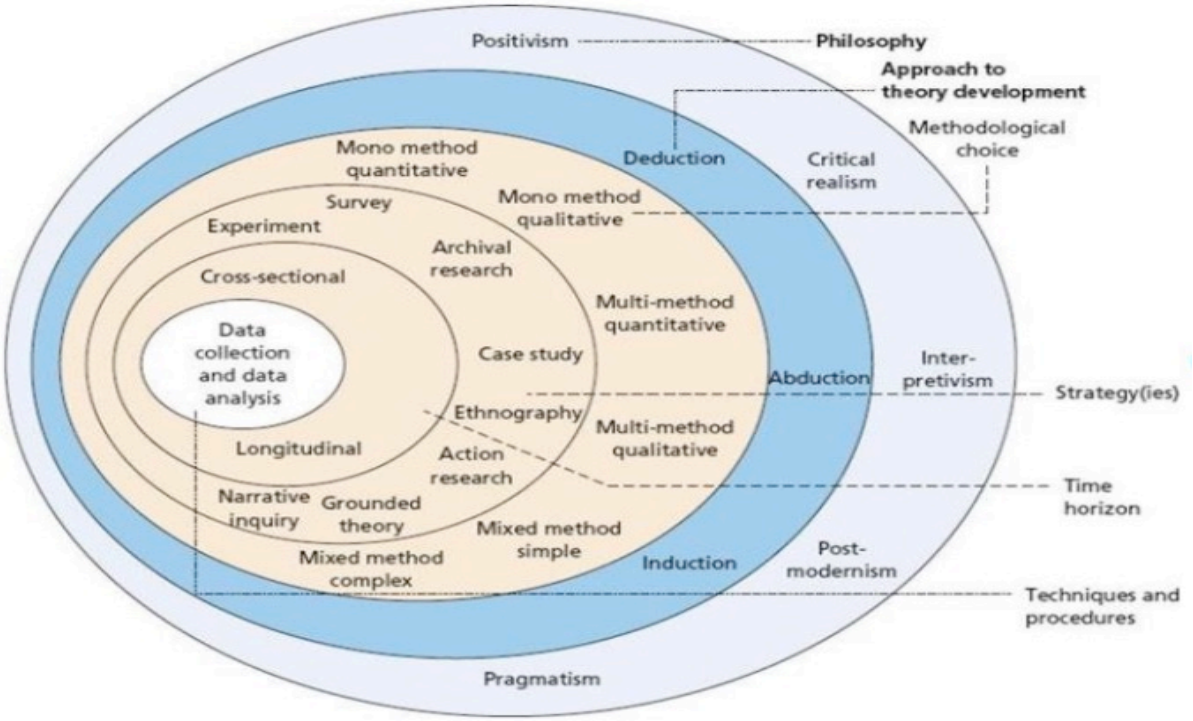
Literature review illustrates any journal articles, book chapters, literary piece, previous studies, scholar etc. that lays a theoretical foundation in relation to the current research that is related to the topic of the study. The goal of a literature review is to look at earlier research in similar disciplines Leedy & Ormrod (2015). Drawing on the relevant literature, the researcher will be

able to provide the reader with some background information regarding study questions and objectives. Chimuchek (2015), describes the SMME's sector as a global engine for economic expansion and a tool for creating jobs. Many SMME's in South Africa need government support such as access to market opportunities, lack of funding support in both private and public sector, therefor the researcher seeks to identify these support programs thereof. According to previous studies, South Africa has one of the highest rates of Small, Medium and Micro Enterprise (SMME) failure when compared to other developing countries, with a failure rate of 60% to 80% in the first and second years of operation, Leboea (2017); Mthabela (2015). These results highlight the everyday challenges and bottlenecks that small and medium-sized enterprises (SMMEs) encounter, which impact their long-term viability, therefore need all the support they can get to conquer such challenges.

Research methodology

Salie (2022) explains the method of research as the strategy for the research, where the researcher collects and analyses data. For this research Data was collected through questionnaires, survey, verbal interviews, observations. To investigate how the GPT supports the growth of SMMEs in COJ, the researcher employed a qualitative research method. To learn how the support programs and various industries cause behaviours in interactive patterns in real life experience, 21 SMMEs participated in semi-structured interviews. This research made use of the Saunders Research Onion (2019).

Figure 1.1 Research Onion



Source : Saunders ,Lewis and Thornhill, 2019

Qualitative Research

Jason and Glenwick (2016) emphasise that qualitative research provides better understanding and in-depth knowledge especially when there is consideration for the research participants who are experiencing it. Jason and Glenwick (2016) explained that in qualitative method, the researcher conduct verbal interviews on focus groups by means of phrases without numbers in the form of verbal words, picture, observing the entire sample selected. In contrast to quantitative research, the qualitative approach examines a phenomenon from a distinct perspective, which is uncommon in quantitative investigations.

For semi-structured environments, like small, medium, and micro enterprises, which were frequently not fully compliant, faced skills and training challenges in their first three years of operation, a qualitative study is appropriate. Based on differing perspectives on the context in which their businesses operated, these businesses may fail. The goal of this study is to determine if the assistance that GPT provided for the growth of SMMEs in COJ. To analysing the responses, assessing the founders'/owners' and directors' understanding of the phenomena, and verifying the setting in which it occurred, the researcher had to interview them. Qualitative research also provided a sufficient platform to gather feedback on some of the difficulties faced and the assistance needed by the SMMEs . .

Research approach

Saunders, Lewis & Thornhill (2016) highlighted that an inductive research approach is frequently associated with qualitative research. Interpretivist epistemology holds that reality and all knowledge are created through social interaction. People's interactions with their environment create them, and reality is linked to the social context, (Green ,2017). The context in which a phenomena happens is the focus of an inductive approach in research. Semi-structured qualitative surveying was the first step of the investigation. The researcher will use an inductive research approach.

Research design

Based on qualitative methodologies, the data and findings to be presented here will be a part of a wider research effort that used a pragmatic approach and a holistic system thinking approach. This study employed a semi-structured interviewing technique. A study design, according to Leedey and Ormrod (2015), is a framework or strategy used for data collection and analysis. Additionally, the research design is the study's overarching plan, Saunders et al ,2016).

The research design that was employed in this study is exploratory. When there was no information available regarding the current situation or how similar support for SMMEs or research issues has been handled in the past, "an exploratory investigation is performed" Sekaran & Bougie (2016).

Target Population

Sekaran &Bougie,(2017) described target population as the team, set of things that is targeted for the research. The researcher targeted a group of at least 21 SMME’s that received support from the GPT to be investigated in this study.

Sampling

McDaniel and Gates (2016) alluded sampling as the way of getting data from a sample of a bigger group. The outcome from the sampled data gives a conclusion based on estimations in the characteristics of the entire population. For about 21 SMMEs was selected to represent a population for this research to present the entire population. The researcher used the purposive non probability sampling method.

Selection Criteria

The researcher used secondary data sourced from Central Supplier Database to confirm the address, industry and any other common factors noted thereof.

Results and Findings

This section discusses the results and findings of the research. According to Blumberg et al. (2014), when performing observations, the researcher needs to be fully aware of the context and the observation aim. For the purposes of the study, the researcher observed the development sequence (context) that the small and microbusinesses is being assisted with. The researcher observed the similarities between three respondents, respondent 7, 8 and 9 as they were operating in the same location in less than 10km apart, being in the same industry, and the similar challenges they faced, the support programs they got from GPT.

Data results

As of Q3 2020, there were 783,410 Small, Medium, and Micro Enterprises (SMMEs) in Gauteng, which is 33.1% of the total number of SMMEs in South Africa (SEDA, 2020). Due to financial constraint and the richness that qualitative research provides, the researcher targeted at least 21 SMME's that have actively participated in GPT support program using non-probability convenience sampling method. . The targeted respondent are the founder and owner or director of the company who has been there since the company was founded as a vision bearer who has actively participated in the GPT support program and with the requisite knowledge to respond to interview questions. The founder/owner were relevant because they were able to identify the business needs, track the company's development before and after the GPT program, and be able to comment on the skills and additional support needed.

Growing Gauteng Together (GGT) (2030) vision stipulated that GPT is fostering entrepreneurship, supporting Township-based enterprises, and creating a lasting impact within Gauteng communities, and aim to create a more prosperous and inclusive future for the region. Selection of different sectors was done to ensure that the sample used were represented in the GPT support of SMMEs. A list was generated with candidates to be interviewed and the candidates were contacted telephonically to request an interview. To find trends and key lessons, the researcher in this study organized the data into manageable chunks. After each interview the researcher created some time on the same day to try to transcribe and analyse the interview. This chapter presents the analyses of the data collected through qualitative research in the form of interviews. The interviews were conducted to examine the support of Gauteng Provincial Treasury in SMME's development in the COJ.

Presentation of results

Analysis, presentation, and interpretation of the findings from the twenty-one cases that were interviewed were presented in this section The semi-structured interview method was used to get the data. After ensuring correctness through reading, the interview scripts were revised. Any missing data, such as insightful comments and other pertinent details that might be utilized to identify the pattern, was noted. Thematic identification was done via pawing, sorting, cutting, comparisons, connectors, repeating words, transitions, key words in contexts, missing information, and comparisons and contrasts. To identify a new theme, it was physically altered a couple of times. Under a particular topic, text phrases and quotations were used to report information deemed pertinent to the study, while any information deemed irrelevant was separated. With themes and subthemes, the findings were displayed in accordance with the interview guide: Tables and text forms were used to present the findings. They coded and altered the data. Some of the topics had text that was indicated in tables.

Data coding

Interview transcripts or other materials were coded as the foundation of qualitative data analysis, according to Blumberg, Donald, Cooper, Schindler (2014). Once all the data had been gathered, the researcher used coding and code creation to condense the data into manageable and comprehensible English, Welman et al (2015). According to Welman et al. (2015), codes, tags, or labels give meaning to unprocessed data or notes that were gathered during fieldwork. These codes include descriptive, interpretative, pattern, and reflective remarks, as well as marginal and updating codes. The theories in the studied literature and the concepts in the research questions will be used to construct codes. Data was coded in the form of R1 to R21, Respondent 1 as R1 relatively.

SECTION A : DEMOGRAPHIC INFORMATION

The table below indicates the demographic and sector information of the respondents sampled for the interviews:

Table 2.1: Demographic information

Demographic Information of Respondents:

Interview respondents	Industry	Years in business	Title in your company	Number of people employed	Turnover 2023	Location of the company
R1	Construction	7	Director/Owner	2	R1–R500 000	Diepkloof (COJ)
R2	Construction	4	Director/Owner	4	R1–R500 000	Diepkloof (COJ)
R3	Construction	12	Director/Owner	12	R1–R500 000	Orlando East
R4	Construction	13	Director/Owner	2	R1–R500 000	Diepkloof (COJ)
R5	Catering & events management	3	Director/Owner	2	R1–R500 000	Orlando West (COJ)
R6	Catering & events management	5	Director/Owner	2	R1–R500 000	Chiawelo (COJ)
R7	Catering & accommodation	17	Director/Owner	1	R1–R500 000	Orlando West (COJ)

R8	Catering and accommodation	16	Director/Owner	2	R1–R500 000	Orlando West (COJ)
R9	Catering and accommodation	15	Director/Owner	3	R1–R500 000	Orlando West (COJ)
R10	Catering services	3	Director/Owner	1	R1–R500 000	Diepkloof Hostel (COJ)
R11	Catering services	4	Director/Owner	1	R1–R500 000	Tembisa (COJ)
R12	Security services	9	Director/Owner	1	R1–R500 000	Pimville (COJ)
R13	Security services	6	Director/Owner	2	R1–R500 000	Dobsonville (COJ)
R14	Cleaning Services	10	Director/Owner	2	R1–R500 000	Alexandra (COJ)
R15	Cleaning Services	4	Director/Owner	1	R1–R500 000	Meadowlands (COJ)
R16	General supplies	6	Director/Owner	1	R1–R500 000	Protea North (COJ)
R17	Recycling & waste management	3	Director/Owner	1	R1–R500 000	Pimville (COJ)
R19	Recycling & Waste Management	5	Director/Owner	1	R1–R500 000	Freedom Park (COJ)
R20	Design & communication	18	Director/Owner	2	R1–R500 000	Johannesburg Central (COJ)
R21	Entertainment & production	7	Director/Owner	3	R1–R500 000	Johannesburg Central (COJ)

Source: Authors, 2025

Twenty-One SMME's that have been supported by Gauteng has been interviewed and data analysed accordingly.

In which industry is your business?

The respondents comprised Four Construction, Two Catering and Events management, Three Catering and Accommodation, two catering services, Two Security services, Two Cleaning services, One General supplies, two recycling and Waste management, One Design & communication and one from entertainment production sectors.

How long has your company been in business?

All the SMMEs were more than three years in business. Eleven out of twenty-one SMMEs have been operational for more than Five years. R5, R10 and R17 have been in business for three years. R2, R11 and R15 had four years. R6 and R19 five years. R13 and R16 for six years.

R1 and R21 for seven years. R12 only with 12 years. R14 only with 10 years. R3 only with twelve years. R4 only with thirteen years. R9 only with fifteen years. R8 only with sixteen years. R7 only with seventeen years. And R20 only with eighteen years. The researcher noted the pause and repetition of words like "…I'm not so sure, let me count…" from R13, R9 and R20. "…I'm not sure but I registered my company in the year…ok let me count to give you an exact answer…" quoted from R4,R7,R8 and R16. The researcher also noted that the respondents counted years and few months, such as R4 with thirteen years and four months but the researcher decided to conclude that R4 had thirteen years to avoid confusion.

What is your title at your company?

All the respondents were the owners and directors of the company.

How long have you been in your current position?

As the respondents were the owners of the company, therefore they have been in the same position of owning since the beginning.

How many people are employed at your company (including owners)?

This became inconclusive because the respondents couldn't give a clear answer as most of them hired contractual workers as and when needed, casual workers thereof without even registering them and owners were the employees themselves. According to the research, 91% of respondents only had the owner as an employee. In all, up to forty-Six employees were employed by responding SMMEs (21 enterprises), and up to three employees were employed by 9%. Given that, if the numbers of Seven and thirty-nine employees are assumed, the total employment of small and micro-enterprises amounted to a maximum of 4,300, this begs the question of employment potential among these businesses, SEDA (2016).

What was your company's turnover last year? +/- R

All the respondents were Micro based on the turnover between R1-R500 000. The respondents couldn't give a clear answer as to what was turnover simple because they don't compile financial statements of the business since most of them haven't had a project more than R500 000. The researcher noted the Parten on the majority of the responded when the question of turnover was posed, the laughter "…my business barely can't afford the renewal fees at CIPC, and I have to deposit something to keep the business bank account open, times are tough especially after Covid19…".

To guarantee enough representation in each category, respondents were divided into four turnover bands after being asked to provide the turnover level of their company (see Table 2 below).

Table 2.2 : Grouping size of company based on total turnover.

Medium	More than R20 000 000
Small	R1 000 001–R20 000 000
Very Small	R 500 001–R1 000 000
Micro	R1–R500 000

Source: Authors, 2025

The following research questions were formulated and serve as the foundation for this research based on the sections that came before it:

RQ1 What is your perceptions regarding the GPT programs on SMMEs of different sizes?

RQ2: What is your perceptions of the SMME's development of different industry sizes?

RQ3: What is your perceptions of the challenges faced by SMMEs of different industry sizes

RQ4: What is your perceptions of the reasons for failure of SMMEs of different industry sizes.

The research questions tested the perception of different industry sizes if the support offered by GPT developed the SMMEs. Also, to identify, the challenges encountered and means of preventing failure. The respondents perceived that support was needed for business development, and the researcher observed that different industry businesses being Micro sized despite the different number of years in operational.

Is your company in the City of Johannesburg?

All the respondents were geographically located and operating in the City of Johannesburg in different townships. Four in Diepkloof, Five in Orlando (Orlando East 1, Orlando West 4), one in Chiawelo,one in Tembisa, two in Pimville,one in Dobsonville, one in Alexandra,one in Meadowlands,one in Protea North, one in Freedom park and two in Johannesburg Central. The researcher confirmed that all the townships are under the city of Johannesburg, and the GPT support programs aimed to uplift and develop township based SMMEs that were previously disadvantaged.

The researcher also attempted to qualify the SMMEs supported based on the geographical location in the city of Johannesburg, and the three respondents were from Orlando West, while operating in the same industry. Respondent 7,Respondent 8 and Respondent 9 were from Orlando West. Then the researcher decided to use secondary data and compare the three Respondents to identify the similarities and any contract thereof. The secondary data used was the Central Supplier Database (CSD) to get more insight of data without going back to the respondents to ask follow up questions that were not on the interview guide. The POPIA Act was observed as the CSD is an online database where all the suppliers register their company details.

Table 2.3: Similarities noted from the Respondents.

	Respondent 7	Respondent 8	Respondent 9
Location of the company	The SMME operated at Orlando West, at Vilakazi street not far from responded 9	R8 was situated at Orlando West, one street behind Vilakazi street at 1.4 Kilometres.	R9 was also operating at Orlando West, at Vilakazi Street.
Industry	R7 operates as a restaurant and Bed & Breakfast	R8 operates as a bed & breakfast, also offers braai and eat	R9 operated as an outdoor restaurant and lodge
Support by GPT	The owner was supported by GPT by an assistance with registration on Central Supplier Database	The owner was supported by GPT when attending Wednesday workshop and interacted with Department of Economic Development, then scored an opportunity of the Box Shop.	The owner was assisted by GPT with CSD compliance and once hosted the Township Economy in BRICS and Forum Initiative where GPT assisted SMMEs with CSD, vendor registration and e-Invoicing compliance. GGT (2023)
Years in Business	R7 have been operating for 17 years	R8 have been operating for 16 years	R9 have been in business for 15 years
Turnover 2023	R1- R500 000	R1- R500 000	R1- R500 000
Challenges encountered	Loadsheding	Loadsheding	Load reduction
Support needed	"…if the department can assist me with a generator or sollar panels that will keep me going during load shedding…"	R8 laughed and said"…of course I support from government need money to make money…" continue laughing	R9 responded that any support is needed, and emphasized that as various departments works different functions, therefore anything the department offers will be acceptable. "…they say beggars can't be choosers…" quoted

Source: Authors, 2025

SECTION B: Financial Support

What type of support did you receive from Gauteng Provincial Treasury

Access to Finance

Only nine SMMEs have received financial support from GPT. They highlighted that they only received support in the form of soft loan and grant under the program ran by GPT in partnership with Standard bank South Africa. One received a soft loan at 0% interest, 0% initiation fee and payable at 36 months instalment the researcher posed a follow up question of how much was the loan and how far was the respondent with repayments, unfortunately the respondent was not comfortable to answer and highlighted that those follow up question was not in the survey. Eight of the respondent received a grant in the form of cash but was strictly to buy equipment that the respondent motivated as a need in the business,R5 said "…the GPT is a department of finance but the financial support we receive is very strict and minimum compared to other departments and government entities, as once granted a full financial support by Gauteng Enterprise Propeller (GEP) under department of Economic Development…". The researcher had to further continue with an interview. R10 also highlighted "…I received the financial assistance but less than expected, as I was so excited to be in GPT as a department for finance and in partnership with the bank…I really expected more but what can we say, we grateful though..." continued laughing.

Business Development Support

•Mentorship: None of the respondents have been mentored under the GPT support. But three have been in mentorship program organized by SEDA whom they knew from the GPT Wednesday's workshop.R14 responded "…I hope GPT will continue with such sessions, I learned a lot there and met who's who...even among us suppliers it's a great networking session…"

•Training and coaching: Seventeen had attended the SMME's trainings offered by GPT. Nonetheless the coaching part was not clear in the side of the respondent. R14 said "…I attended the workshop that was held in our area, community hall I mean…there were lot of departments there but I remember GPT assisted me with CSD…that thing is difficult somehow,but they do it quick and free…"sighing and sounding relieved.

Market Access and Linkages

Business Incubation : Two respondents highlighted that although this was not an incubation per se, but they were once sub-contracted in the big construction project under GPT that according to them it served as incubation under the Group Five company.

Marketing: One of the respondent highlighted that they learnt marketing strategies from the external stakeholder met at Wednesday workshop "…I took contact for Mr Mmutle from SEDA at the workshop offered by GPT…and that changed my life because I received a lot of support from SEDA including marketing strategies…" then the responded paused for the following question after highlighting a good partnership of GPT with other stakeholders have been beneficial.

Government regulations and compliance

•Barriers to entry

All the respondents have not necessarily received support regarding entry to business as they all have formally registered in terms of CIPC. There is only one responded highlighted that a

company received support of an advice and contact information from GPT employee when the company was in the deregistration process due to non-renewal at CIPC.

•Registering and engaging with SARS

Eighteen respondents agreed to have received support from South African Revenue Services (SARS) in a GPT workshop. Two of the respondents were not aware that they should have registered their business at SARS, then they were able to get information and registered thereof. The other Sixteen were registered at SARS and have a valid tax clearance certificate but on Central Supplier Database (CSD) the company tax status was non-compliant, then they had a chance to engage with SARS official in a GPT workshop and they were assisted accordingly.

•Registering and updating details on government procurement databases

National Treasury (2016) launched a Central Supplier Database (CSD), as a single source national government database that brought fairness, equality, transparency, and competition to the procurement procedures. Most SMME's need a support from GPT to register on CSD, as it requires an internet access and full compliance from other organs of state. For example, If the SMME's is not up to date with SARS registrations and VAT returns, then CSD will pick up and refer an SMME as non-compliant with SARS. All respondents received support from GPT in terms of registering on CSD (update an existing CSD profile) and government databases such as Gauteng Provincial Government (GPG vendor number) and were partially compliant to be fit to tender on procurement processes. Six of the respondents emphasized that it was difficult to be fully compliant on CSD because the tax status changes overnight that is why they have learnt that regular checkups were required on CSD business profile and GPT have trained them to manage the CSD profiles thereof.

SECTION C: SMMEs which were supported by Gauteng Provincial Treasury

What type of support your company received from GPT?

This section focuses on the type of support received".

How long did it take to get support?

The timeframe depended on the SMME support needed at a particular time and if they served the rest of the set timeframe of the program. Seventeen respondents attended a six weeks training. The other two attended Enterprise and Supplier Development Program (ESD). Two got an assistance on GPT roadshow hosted by the MEC at Nasrec randshaw. R4 said " I can't really recall because I've been all around, but I do remember that I first met GPT team in the community hall, it was a one day thing and I also attended a Wednesday workshop maybe 2 days…just that I really can't go there every week because I'm working''…asked "… infact how come are these workshops not available on weekends?...I mean we are busy during the week and taking a day off to attend…" paused a bit and remembered that the researcher cannot have answers. "…its fine, I will have to make a plan if I am on leave…"

Did you finish the support program?

This question was responded after a little pause of thought due to the various programs where others were not timed. Seventeen that attended a Six weeks training program but only Eight attended the whole consecutive six weeks. The other two respondents attended (one the first three weeks that covered an introduction of the program as well as the learning of how to fill in the tender document both section 1 and section 2). Then the other one only attended the Fifth week where there was an external stakeholder Small Enterprise Development Agency (SEDA) training the SMME's about funding opportunities, incubation programs etc. that they offer. The

two who have attended the ESD program both finished the program as it was compulsory to attend 100%. R8 responded as "No, I only attended topics that I thought were relevant to my company, as my company is specializing in Media then there was no point of me to attend the BBBEE and local content topics because they only relate to manufacturing…''. The researcher picked the sequence of similar words on Four respondents when they were reasoning regarding completion of the course, responded 1 "…I was gonna hang on if there was something tangible like a certificate." Responded 3 "…I was hoping we will get a certificate after completion, but nothing…", Responded 4 "…There is nothing to show of that i have been there every week…" Responded 7 "…I wish that attendance register we signed will serve as a database to be in an advantage during the procurement process…" The researcher sensed the discouraged SMMEs that might not have interest in attending such support program in the future.

Which industry does your company operate?

The respondents comprised four constructions, two catering and events management, three Catering and accommodation, two catering services, two security services, two cleaning services, one general supplies, two recycling and waste management, one Design & communication and one from entertainment production sectors.

In which year did your company receive support?

Two of the respondents who attended ESD program in 2023. The other Seventeen attended six weeks training mostly in between 2021 to 2024. Three of them were not sure of the straight answer because they have attended 2019,2021 and 2024 just two to three sessions and disappear. The challenge was the transport fare from Soweto to the venue based in Johannesburg CBD every Wednesday in a consecutive Six weeks.R1 said "…I attended in 2021 I remember very well because we were attending by appointment…those workshops were opened after Covid, so this social distance thing limited us from just walk in and attend conveniently so…laughed, and said the thing is I kept on sending emails for booking, and I was accepted that I can attend on the fourth attempt…that Covid took us back…"

Was the support program developed your company?

All the respondents replied as Yes and put more emphasis on the relevance of the support received as per SMME's business needs.

How many SMME's support program have you participated at GPT?

All of them respondent as two. Two of the respondents had attended the six weeks training as well as the ESD. The other Seventeen had attended the Six weeks training and other trainings offered by GPT in their township where they were on roadshows such as Qondis'ishishini Lakho, Township Economic Revitalisation etc.

What are the developments from the company list:

•Sixteen respondents are fully compliant on CSD, therefore in a better position to participate in the government procurement tender opportunities.

•One had a catering business profile sorted by an assistance from SEDA partnered with GPT, that the business got funding on buying the catering equipment such as mobile kitchen, kitchen utensils etc.

•One responded had a soft loan as a business startup capital, but the researcher felt like the respondent was struggling with repayment instalments.

•One responded was happy with the grant received for business development as the company have a business capital.

Two respondents have successfully completed an Enterprise Supplier Development training and awarded certificate of completion. Respondent 4 was on of the top achievers in the Gauteng region under the city of Johannesburg.

SECTION D: SMMEs that need more support

Which industry does your company operate?

The respondents comprised four construction, two catering and events management, three Catering and accommodation, two catering services, two security services, two cleaning services, one general supplies, two recycling and waste management, one Design & communication and one from entertainment production sectors. The researcher concluded that all four of the construction based SMMEs needed more support. The repetition of words "…construction industry is broad…"

R1"…our industry is very big, as much the work..."

R2"… this is a very broad competitive industry…'

R3 "…I'm in construction and its very tough…that is why I'm thinking of also focusing in other functions like supplying maybe…"

The researcher also took note of that the respondents were not in any specialization, but showing interest that as a broad industry one cannot limit themselves to services such as building. The respondents needed a financial support to buy capital "…looking at the non-maintenance of roads in South Africa, there are many potholes even in our local area, therefore if my company can have necessary resources such as road maintenance equipment that i can approach Johannesburg Road Agency (JRA) with a proposal to fix potholes in my area and City of Johannesburg as a whole without waiting for a big tender where there will be too much competition. Joburg Newsroom article (2023) reported that the impact of pothole damage in South Africa was substantial, with an estimated monthly cost of around R500 million. The pothole patrol initiative was initially launched in May 2021 to address the serious pothole issue in Johannesburg. Since its launch, the Pothole Patrol has repaired nearly 175,000 potholes and road defects in Johannesburg, resulting in a 26% drop in pothole-related claims compared to an increase in other areas, Nyathi (2023).

The other respondents on the catering industry followed with the need for further support. The respondents highlighted the support of Gas stoves, food warmers, solar panels as well as a 24-hour energy saver fridge and lights due to the load reduction experience that negatively affected the businesses.

How many years have you been in business?

All the SMMEs were more than three years in business. Eleven out of twenty-one SMMEs have been operational for more than Five years. R5, R10 and R17 have been in business for three years. R2, R11 and R15 had four years. R6 and R19 five years. R13 and R16 for six years. R1 and R21 for seven years. R12 only with 12 years. R14 only with 10 years. R3 only with twelve years. R4 only with thirteen years. R9 only with fifteen years. R8 only with sixteen years. R7 only with seventeen years. And R20 only with eighteen years.

Is GPT offering enough support to your company?

Thirteen out of Twenty-one respondents agreed that yes they have received enough support from GPT, but the researcher noted the repetition of words, "…it will never be enough…" and

also noted the phrase that there was always room for extra support that we cannot expect that one department can fulfil all the desired support needed as their needs varies from industry to industry.

Which support do you think is necessary for your company?

•All the respondents wanted funding in the form of 100% grant.

•Seven respondents further emphasized that even if it's not grant perse but a financial assistance such as financing a purchase order, such as one of the respondent said "… my company once got an order in one of the department but I couldn't deliver due to financial constraints…if we can be financed based on the order received it will be good…"

Which skills do you need support to keep your business running?

•Business marketing skills

Five respondents were open about that they haven't marketed their businesses, only waiting for quotations from government, don't know how to draft a request for proposal.

• Financial management skills

One of the respondents highlighted that the company once got subcontracted in the big project but couldn't manage the finances well, said in a soft tone "… well, we as black people we're not financial educated…you will think I will stick to the budget but when the money hits the bank account, we lose it…"

The research results met the objectives and answered the research questions as follows:

•Objective 1: Identify support of GPT in the SMME's development.

•Research question 1: What are the various types of support that GPT provides for SMME's development?

•Objective 2: Identify the SMME's developed from the support offered by GPT.

•Research question 2: Are the SMME's developed from the support offered by GPT in SMMEs development?

This research has identified various support programs of GPT in the SMME's development. According to the respondents there are at least two direct support programs offered by GPT and other support was offered by other stakeholders in partnership with GPT.

Recommendations for GPT

Based on the in depth interview the following were the recommendations. It's critical that the department should continue to offer support for SMMEs development so as to mitigate failure. SMMEs are lifeline to the resuscitation of the Gauteng economy and South Africa at large.

- The support should not be limited to SMMEs but also consider the Non-Profit Organisation (NPO) and Non-Profit Companies (NPC).
- The six weeks training workshop held every Wednesday should also be offered a certificate of completion clearly stating the topics covered thereof.
- The support program should be offered online (virtual) and or the venue-based workshop to be recorded and posted online in the GPT home page and social media platforms for convenience of attendance and future references.

- The GPT should have a walk-in help desk and or call centre employees to be available 24 hours a day,7 days a week, 365 days to assist the SMMEs remotely regarding any challenges, queries and support needed.
- The department should continue to work in collaboration with other departments, government entities and any other external stakeholders in assisting with developing SMMEs in the country.
- GPT should do the research on the needs of the SMMEs so that it will be easier to offer the support that is needed.
- GPT should also revisit their old database maybe five years ago to check if the SMMEs they offered support failed or developed and still in operation to date, to test the relevance of the support offered thereof.

Recommendations for SMMEs in the City of Johannesburg

- The business owners should revisit their vision that prompt them to start a business as it lays a solid foundation to the development.
- The SMMEs should not solely rely on government or GPT department for its development but also make proposals to bigger and successful companies in the same industry for mentorship programs and development.
- The SMMEs in the city of Johannesburg should expand their branches to other cities such as neighbouring city of Tshwane, and as far as to other provinces outside Gauteng to grow and develop further.
- The respondents who participated in the GPT support program should implement the strategies they learnt for business development to control the challenges and barriers that lead to failure.
- It is important for SMMEs to conduct thorough market research on the business environment and the market in which they operate. A strong business plan is built on a foundation of adequately conducted market research.

Recommendations for future studies

Future studies on the SMMEs should include the following investigations:

- The SMMEs are thought to be less knowledgeable and/or skilled in marketing and finance. Therefore, for SMMEs to overcome obstacles, there is a great demand for these talents. However, there are also unemployed graduates with specializations in marketing, law, commerce, and other fields who are needed to help support SMMEs. The likelihood that graduates' acquired talents are not being used is higher. Thus, research should be done to find out how the gap between unskilled SMMEs and unemployed graduates might be closed.
- The role of owners in the success or failure of SMMEs is unclear, particularly in Johannesburg. Consequently, a study on the role that SMMEs play in the high failure rate.
- In consideration of the high rate of failure in the first three to five years, there is a need for the study about the reason for opening a business. This might have an impact because for example, the owner inherited a company without any training and expertise, or the company was founded through peer pressure with a friend or relative because they heard that SMMEs will be funded by government.

- The study on the failed SMMEs, knowing it might be a bit tricky because the actual failed SMMEs might be shy to share experiences and challenges they faced that caused failure.

Conclusions

In conclusion, the research was about the support offered by the Gauteng Provincial Treasury in the SMMEs development in the city of Johannesburg. Twenty-one SMMEs owners were the respondents as they have actively participated in the GPT support programs. All the SMMEs were Micro scaled because they range from R1 to R500 000 revenue generated per annum. 100% of the respondents were the owners/ directors and or founders of the businesses, of which 90% of the respondents were also employees of their companies. The respondents were keen to participate in more enterprise development programs for their companies to grow and be prone to failure. The research results shows that there is still a need for SMME's development in the city of Johannesburg and other neighbouring cities. Only two respondents' data was not used due to unforeseen circumstances. Data results showed the various sectors represented. The researcher recommended further studies regarding SMMEs to breech the gap in terms of failure.

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ASSESSING THE EFFECTIVENESS OF GREEN ENTREPRENEURSHIP AS A CATALYST FOR CLIMATE RESILIENCE IN SOUTH SOUTH NIGERIA

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Abstract

This study focused on green entrepreneurship and climate change adaptation. The study examined how green innovation affects business continuity and assessed the effect of eco-friendly product design on sustainable adaptation. The study employed a survey research design. The research focused on business enterprises located in Akwa Ibom, Bayelsa, Cross River, Delta, Edo, and Rivers states in the South-South region of Nigeria, which are recognized for their diverse industrial activities, including manufacturing, agriculture, and services. The study used primary data collected directly through an administered, well-structured questionnaire. A sample size of 384 was determined, ensuring sufficient data collection for analysis and reliable inferences. The study applied a multi-stage sampling technique for sample selection. The study employed construct validity (with CR > 0.70). The study used the Cronbach test for the reliability of constructs, and the results showed alpha coefficients greater than 0.70. The study employed both descriptive and inferential statistical statistics for data analyses. Structural Equation Model was used for hypotheses testing. Findings showed that green innovation has a significant positive effect on business continuity ($\beta = 0.874$; p-value < 0.01) and that eco-friendly product design has a significant positive effect on sustainable adaptation ($\beta = 0.745$; p-value < 0.01). The study concluded that green practices are fundamental drivers of sustainability and adaptability in today's business and environmental landscapes. The study recommended that firms should prioritize green innovation by integrating sustainable practices into their strategic and operational frameworks and also focus on eco-friendly product design by investing in sustainable materials and processes that align with environmental standards.

Keywords: Green Entrepreneurship, Green Innovation, Business Continuity, Eco-Friendly Product Design, Sustainable Adaptation.

Introduction

As the world grapples with growing environmental uncertainties stemming from climate change, businesses are under increasing pressure to improve their adaptive capabilities (Iriani et al., 2024; Moraci et al., 2020). Green entrepreneurship provides a workable way to deal with this uncertainty, encouraging innovation in areas like renewable energy, resource efficiency, waste reduction, and eco-friendly product design. Germany and Denmark are leading the way in green energy entrepreneurship with large investments in wind and solar technologies. Germany's Energiewende policy, which promotes a shift to renewable energy, has stimulated innovation and economic opportunities within the sustainable energy sector (Pons-Seres de Brauwer, 2022; Yang, 2022). Similar to this, Kenyan entrepreneurs developed environmentally friendly solutions to address water scarcity and strengthen agricultural resilience, like solar-powered irrigation systems (Ministry of Agriculture, Livestock, Fisheries, and Irrigation, 2018). Green firms that concentrate on resource efficiency and waste reduction are growing in China at the same time, especially in urban regions where waste management and pollution are major issues (Lee et al., 2020). These technologies not only resolve current environmental issues but also aid in the struggle against climate change by lowering carbon footprints and encouraging sustainable growth (Durán-Romero et al., 2020).

Green entrepreneurship is becoming an essential strategy for mitigating the effects of climate change and promoting economic growth in Africa. Through creative solar projects, nations like Kenya are leaders in the field of renewable energy (Bhamidipati et al., 2021). For example, the M-KOPA initiative reduces dependency on fossil fuels by improving energy access for off-grid households (Nnafie, 2021). Similarly, to promote economic growth and environmental sustainability, South Africa's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) motivated private sector investment in wind and solar projects (Adebayo et al., 2021). In this regard, green entrepreneurship is more than just a different kind of business; it is a vital tool for climate change adaptation and the advancement of sustainable development in a number of industries.

The challenges that green entrepreneurship in South-South Nigeria face make it extremely difficult to adapt effectively to climate change. Inadequate funding and restricted access to cutting-edge technologies sometimes impede green innovation, despite its potential to promote sustainable practices, undermining long-term resilience and business continuity. Furthermore, the high production costs linked to eco-friendly product design discourage local businesses from adopting them widely, which worsens environmental degradation. Inadequate infrastructure and a dearth of government incentives also worsen the underutilization of green technologies and make it more difficult to implement ecosystem-based adaptation measures. Furthermore, low information transfer and outdated industrial practices reduce resource efficiency, which in turn reduces small and medium-sized enterprises' (SMEs) ability to adapt. Unaddressed issues will make it difficult for the region to achieve sustainable development, making ecosystems and communities more susceptible to the growing consequences of climate change.

OBJECTIVES OF THE STUDY

Thus, the specific objectives of the study was to:

i. Determine the effect of green innovation on business continuity;
ii. Assess the effect of eco-friendly product design on sustainable adaptation; and
iii. Ascertain the extent to which green technology affect ecosystem-based adaptation.

RESEARCH HYPOTHESES

The study formulated hypotheses that:

H_1: Green innovation has a significant effect on business continuity;

H_2: Eco-friendly product design has a significant effect on sustainable adaptation; and

H_3: Green technology has a significant effect on ecosystem-based adaptation.

Methodology

To achieve the study's objectives, a quantitative research approach was adopted.

Research Design

The study applied a survey research design to explore the objectives pertaining to green entrepreneurship and its effects on climate change adaptation. This design is notably suitable for gathering quantitative data from a diverse sample of respondents, facilitating the statistical analysis required to confirm the hypotheses.

Area of the Study

The study focused on SMEs located in Akwa Ibom, Bayelsa, Cross River, Delta, Edo, and Rivers states, which are recognized for their diverse industrial activities.

Sources of Data

This study used primary data collected directly through the survey. The data collection process involved administering well-structured Likert-scale questionnaires to a targeted sample population.

Population, Sample Size and Sampling Technique

With a particular focus on business owners and managers in six South-South states, the study's population comprised 220,765 enterprises. Table 1 provides a comprehensive breakdown of the population frame.

Table 1: Population Frame of the Study

State	Total
Akwa Ibom	35368
Bayelsa	15758
Cross River	25973
Delta	40210
Edo	18843
Rivers	84613
Total	220,765

Source: Small & Medium Enterprises Development Agency of Nigeria (2021)

Using the Krejcie and Morgan (1970) sample size table, a sample size of 384 was determined for this study, guaranteeing adequate data for analysis and reliable findings. The sample selection procedure employed a multi-stage sampling technique to guarantee thorough representation. The first stage is to classify respondents from particular South-South Nigerian states according to their green entrepreneurship-related activities. Participants were then further categorized based on pertinent traits related to adapting to climate change. The third phase involved conducting surveys in the designated states, using samples selected according to the size of the enterprises and their knowledge of green entrepreneurship practices. This methodical approach promotes inclusivity and permits a comprehensive examination of how green entrepreneurship affects enterprises' ability to adapt to climate change.

Reliability and Validity of the Research Instrument

Five managers from different enterprises were asked for external validation to ensure the tool accurately measures the desired variables. Construct validity was also used to triangulate this (see table 2). This thorough validation procedure is necessary to prove the accuracy and reliability of the instrument. The analysis's factor loadings demonstrated how strong these associations were; loadings greater than 0.70 were categorized as extremely significant, values over 0.30 as significant, and loadings above 0.40 as more significant (Creswell, 2003).

Table 2: Validation of Instrument

Variables	Loadings	Square of Loadings	Sum of the square loadings	AVE	Square root of AVE
Green Innovation					
GIN1	0.811	0.658	3.097	0.619	0.787
GIN2	0.763	0.582			
GIN3	0.802	0.643			
GIN4	0.773	0.598			
GIN5	0.785	0.616			
Eco-Friendly Product Design					
EPD1	0.71	0.504	3.033	0.607	0.779

EPD2	0.718	0.516			
EPD3	0.823	0.677			
EPD4	0.792	0.627			
EPD5	0.842	0.709			
Green Technology					
GTY1	0.787	0.619	3.072	0.614	0.784
GTY2	0.764	0.583			
GTY3	0.827	0.684			
GTY4	0.746	0.557			
GTY5	0.793	0.629			
Business Continuity					
BSC1	0.718	0.516	2.883	0.576	0.759
BSC2	0.728	0.530			
BSC3	0.805	0.648			
BSC4	0.729	0.531			
BSC5	0.811	0.658			
Sustainable Adaptation					
SEA1	0.788	0.621	3.137	0.627	0.792
SEA2	0.901	0.812			
SEA3	0.817	0.667			
SEA4	0.717	0.514			
SEA5	0.723	0.523			
Ecosystem-Based Adaptation					
EBA1	0.828	0.686	2.961	0.592	0.769
EBA2	0.723	0.523			
EBA3	0.749	0.561			
EBA4	0.718	0.516			
EBA5	0.822	0.676			

Source: AMOS SPSS, 2024

The study assessed the components' internal consistency using Cronbach's coefficient alpha. The reason for using this method is that it clearly shows how well the various items measure the same variable. According to Creswell (2003), reliability coefficients of 0.70 or greater are generally considered satisfactory. The results presented in Table 3 demonstrate that each variable is consistently well-measured by the items.

Table 3: Reliability Statistics of Green Entrepreneurship Variables

S/N	Variables	N of Items	Cronbach's Alpha
1	Green Innovation	5	0.762
2	Eco-Friendly Product Design	5	0.728
3	Green Technology	5	0.749
4	Business Continuity	5	0.740
5	Sustainable Adaptation	5	0.765
6	Ecosystem-Based Adaptation	5	0.712

Source: SPSS, 2024

Data Analyses Techniques

For data analysis, the study used both descriptive and inferential statistical statistics. The data were arranged in tables using the percentage approach to give a clear and succinct summary of the demographics of the respondents. The study tested the formulated hypotheses using regression weight from Structural Equation Model. The models are specified as follows:

$CCA = \beta 0 + \beta_1 GE + \varepsilon$……..…….. 1

$BSC = \beta_0 + \beta_1 GIN + \varepsilon$ ……..…….. 2

$SEA = \beta_0 + \beta_1 EPD + \varepsilon$ …… 3

$EBA = \beta_0 + \beta_1 GTY + \varepsilon$ ……...…..…. 4

Where;
GE= Green Entrepreneurship,
GIN= Green Innovation,
EPD= Eco-Friendly Product Design,
GTY= Green Technology,
CCA= Climate Change Adaptation,
BSC= Business Continuity,
SEA= Sustainable Adaptation,
EBA= Ecosystem-Based Adaptation,
β= Coefficient

ε = Error Term

Data Analyses and Results

This section analyzes the data using percentages, with the results displayed in table format. The test of hypotheses is done and presented in models and tables.

Table 4: Demographic profile of respondents

Category	Profile	Freq	Percent
Gender	Male	191	51.1
	Female	152	40.6
	Non-binary	20	5.3
	Prefer not to say	11	2.9
Age	Under 25	67	17.9
	25-30 Years	65	17.4
	31-35 Years	74	19.8
	36-40 Years	95	25.4
	41-46 Years	52	13.9
	47 and above	21	5.6

Educational Background	High School or equivalent	31	8.3
	Associate Degree	87	23.3
	Bachelor's Degree	106	28.3
	Master's Degree	128	34.2
	Doctorate	22	5.9
Experience	Less than 1 year	77	20.6
	2-4 years	80	21.4
	5-7 years	95	25.4
	8-10 years	85	22.7
	Above 10 years	37	9.9

Source: Field Survey (2024)

There were 191 (51.1%) male respondents, 152 (40.6%) female respondents, 20 (5.3%) non-binary respondents, and 11 (2.9%) respondents who did not want to reveal their gender, according to Table 4.

Of the respondents, 67 (17.9%) were younger than 25 years old, 65 (17.4%) were between 25 and 30 years old, 74 (19.8%) were between 31 and 35 years old, 95 (25.4%) were between 36 and 40 years old, 52 (13.9%) were between 41 and 46 years old, and 21 (5.6%) were older than 47. The results show that most of the individuals who responded were in the age range of 36 to 40.

31 respondents (8.3%) had a high school diploma or its equivalent, 87 respondents (23.3%) had an associate's degree, 106 respondents (28.3%) had a bachelor's degree, 128 respondents (34.2%) had a master's degree, and 22 respondents (5.9%) had a PhD. The plurality of responders (34.2%) had a master's degree.

The years of experience of the respondents are displayed in the table. The data indicates that 77 respondents (20.6%) had less than a year's experience, 80 respondents (21.4%) had two to four years' experience, 95 respondents (25.4%) had five to seven years' experience, 85 respondents (22.7%) had eight to ten years' experience, and 37 respondents (9.9%) had more than ten years' experience.

Table 5: Model Fit Summary

Fit Indices	Model	Default Model	Saturated Model	Independence Model
CMIN	NPAR	65	325	25
	CMIN	814.61	.00	12379.81
	DF	260	0	30
	P	.00		.00
	CMIN/DF	3.13		41.27
RMR, GFI	RMR	.06	.00	.51
	GFI	.85	1.00	.28
	AGFI	.82		.22
	PGFI	.68		.26
Baseline Comparisons	NFI (Delta1)	.93	1.00	.00
	RFI (rho1)	.92		.00

	IFI (Delta2)	.95	1.00	.00
	TLI (rho2)	.95		.00
	CFI	.95	1.00	.00
Parsimony-Adjusted Measures	PRATIO	.87	.00	1.00
	PNFI	.81	.00	.00
	PCFI	.83	.00	.00
NCP	NCP	554.61	.00	12079.81
	LO 90	472.30	.00	11719.18
	HI 90	644.52	.00	12446.77
FMIN	FMIN	2.18	.00	33.19
	F0	1.49	.00	32.39
	LO 90	1.27	.00	31.42
	HI 90	1.73	.00	33.37
RMSEA	RMSEA	.076		.329
	LO 90	.070		.324
	HI 90	.082		.334
	PCLOSE	.000		.000
AIC	AIC	944.61	650.00	12429.81
	BCC	954.35	698.70	12433.55
	BIC	1199.68	1925.38	12527.91
	CAIC	1264.68	2250.38	12552.91
ECVI	ECVI	2.53	1.74	33.32
	LO 90	2.31	1.74	32.36
	HI 90	2.77	1.74	34.31
	MECVI	2.56	1.87	33.33
HOELTER	HOELTER .05	137		11
	HOELTER .01	145		11

Source: Amos-IBM

Table 5 presented the model fit summary, which includes a number of indices that together evaluate the model's adequacy. The chi-square test (CMIN = 814.61, $p < .01$) shows a statistically significant difference between the model and the observed data, which is to be expected considering the chi-square test's sensitivity to sample size, which frequently yields significance even when the model fit is reasonably adequate.

It is preferable to have a relatively low Root Mean Square Residual (RMR = .06) because it indicates fewer residual differences between the observed and predicted values. This shows how well the model represents the observed data. Despite being marginally below the .90 threshold, the Goodness-of-Fit Index (GFI = .85) indicates a moderately acceptable fit, considering the model's complexity. In a similar vein, the Adjusted Goodness-of-Fit Index (AGFI = .82) falls within a respectably acceptable range for models that are moderately complex. The model's overall adequacy is further supported by the Parsimony Goodness-of-Fit Index (PGFI = .68), which shows that it strikes a fair balance between goodness-of-fit and model complexity. These baseline comparison indices demonstrate how robust the model is. Both the Relative Fit Index (RFI =.92) and the Normed Fit Index (NFI =.93) surpass the.90 criterion, indicating a significant improvement over the independence model. Three measures of fit show a

high degree of fit: the Comparative Fit Index (CFI =.95), Tucker-Lewis Index (TLI =.95), and Incremental Fit Index (IFI =.95). Together, these indices confirm that the default model is a significant improvement over the independence model and that the model's proposed linkages are in good alignment with the data.

The Parsimonious Comparative Fit Index (PCFI =.83), Parsimonious Normed Fit Index (PNFI =.81), and Parsimonious Ratio (PRATIO =.87) are examples of parsimony-adjusted metrics that show a fair trade-off between model fit and complexity. These indices further demonstrate the model's validity in striking a balance between parsimony and explanatory power, even if they are marginally lower than the baseline indices and still fall within acceptable limits.

The Non-Centrality Parameter measures the amount of departure from a perfect match (NCP = 554.61). This further supports the adequacy of the model fit because the Fit Minimum (FMIN = 2.18) and its associated value (F0 = 1.49) are low, indicating that the differences between observed and predicted data are modest. The model fits the data well since the Root Mean Square Error of Approximation (RMSEA = .076) is less than the threshold of .08.

Hypothesis one: Green innovation has a significant effect on business continuity

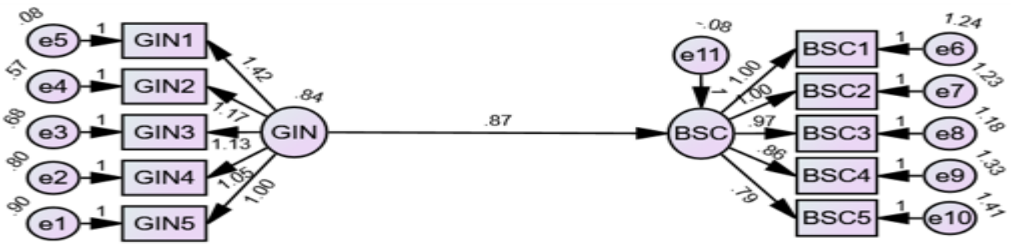


Figure 1. Structural Equation Model on Green Innovation and Business Continuity

Source: Amos-IBM

Table 6 Regression Weights

Variable			Coefficient	S.E.	C.R.	P-value
BSC	<---	GIN	.874	.078	11.219	0.000

Source: Amos-IBM

Table 6 displays the results of the regression analysis that looked at how green innovation affected business continuity. According to the regression coefficient (β = 0.874), business continuity will improve by 0.874 units for every unit increase in green innovation. This implies a robust positive relationship between business continuity and green innovation. A measure of the accuracy of the regression coefficient estimate is the standard error (S.E. = 0.078). A lower standard error suggests that the coefficient estimate is reasonably accurate.

Comparable to the t-value in conventional regression analysis, the Critical Ratio (C.R. = 11.219) is the ratio of the regression coefficient to its standard error (β/S.E.). If the C.R. value is more than ±1.96, the association is considered statistically significant. Given that the C.R. value of 11.219 is much higher than ±1.96, it validates the statistical significance of the relationship between business continuity and green innovation. The

likelihood of discovering the connection by coincidence is the p-value (p-value < 0.01). The effect of green innovation on business continuity is statistically significant because the p-value is less than 0.01.

Hypothesis Two: Eco-friendly product design has a significant effect on sustainable adaptation

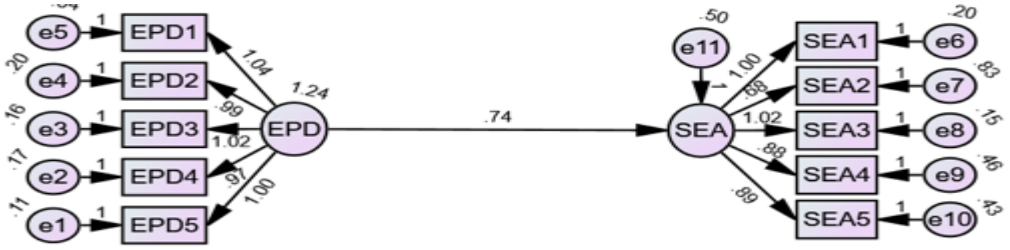


Figure 2. Structural Equation Model on Eco-Friendly Product Design and Sustainable Adaptation

Source: Amos-IBM

Table 7: Regression Weights

	Variables		Coefficient	S.E.	C.R.	P-value
SEA	<---	EPD	.745	.040	18.801	0.000

Source: Amos-IBM

Table 7 shows the results of the regression analysis looking at the effect of eco-friendly product design on sustainable adaptation. The regression coefficient (β = 0.745) demonstrates that for every one-unit improvement in eco-friendly product design, sustainable adaptation is expected to improve by 0.745 units. This points to a robust positive connection between eco-friendly product design and sustainable adaptation. The standard error (S.E. = 0.040) reflects the standard deviation of the regression coefficient, expressing the precision of the coefficient estimate. A less extensive standard error reveals a more precise estimate of the regression coefficient.

The ratio of the regression coefficient to its standard error (β/S.E.) is known as the Critical Ratio (C.R. = 18.801). Given that the C.R. value is significantly more than the ±1.96 cutoff, the association between sustainable adaptability and eco-friendly product design is statistically significant at the 95% confidence level. Given that the p-value (p-value < 0.01) is less than 0.01, the relationship is statistically significant. This suggests that eco-friendly product design has a significant effect on sustainable adaptation.

Hypothesis Three: Green technology has a significant effect on ecosystem-based adaptation

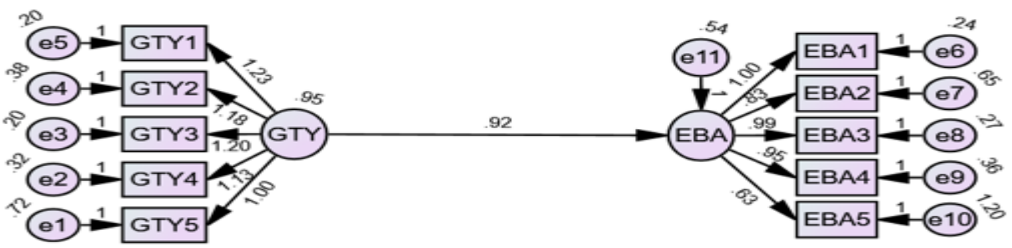


Figure 3. Structural Equation Model on Green Technology and Ecosystem-Based Adaptation

Source: Amos-IBM

Table 8: Regression Weights

Variables			Coefficient	S.E.	C.R.	P-value
EBA	<---	GTY	.920	.063	14.644	0.000

Source: Amos-IBM

Table 8 displays the results of the regression that assessed how green technology affects ecosystem-based adaptability. According to the regression coefficient (β = 0.920), ecosystem-based adaptation improves by 0.920 units for every unit increase in green technology. This demonstrates a clear and robust positive relationship between green technology and ecosystem-based adaptation, indicating that green technology developments greatly improve ecosystem-based adaptation initiatives. A measure of the variability of the regression coefficient estimate is the standard error (S.E. = 0.063). The comparatively low S.E. suggests a high level of accuracy, enhancing the dependability of the findings.

The regression coefficient to standard error (β/S.E.) ratio, or the Critical Ratio (C.R. = 14.644), is significantly higher than the critical threshold of ±1.96. At the 95% confidence level, this validates the relationship's significance. Since the p-value ($p < 0.01$) is far lower than the 0.05 cutoff, it further supports this finding. These results convincingly illustrate that the effect of green technology on ecosystem-based adaptation is statistically significant, stressing the need to integrate green technology to support sustainable adaptation strategies.

Discussion of Findings

Findings demonstrated that green innovation significantly improves business continuity. This implies that by incorporating green innovation into their operational and strategic frameworks, businesses can greatly increase their resilience and long-term survival. The current study's findings are in line with an extensive body of research that highlights how green innovation promotes organizational sustainability and resilience. Studies by Wang and Juo (2021) and Cheah et al. (2024) showed that firms that implement green innovation strategies have improved operational stability and market performance, especially during economic and environmental upheavals. Liu (2024) emphasized that green innovation initiatives lessen operational risks by improving regulatory alignment and reducing environmental liabilities. The findings of the current study, which emphasize the value of green innovation in maintaining business continuity, are consistent with those of these studies.

The findings showed that eco-friendly product design significantly improves sustainable adaptation. This implies that designing eco-friendly products is essential to improving a firm's capacity to adjust to sustainability issues and promote long-term compliance with market and environmental requirements. In sectors like manufacturing, consumer goods, and technology, where environmental responsibility is having a bigger impact on consumer choices and legal requirements, this result is especially pertinent. Studies by Munir and Watts (2024) and Sharma (2024) stressed that eco-friendly product design is essential to sustainable business practices because it

helps companies meet consumer needs for green products and achieve resource efficiency. Similarly, a study by Dharmayanti et al. (2023) emphasizes that eco-friendly design contributes to enhanced organizational resilience and innovation, which are critical for sustainable adaptation.

The study revealed that green technology significantly improves ecosystem-based adaptation. The ability of ecosystems to adjust to environmental changes and challenges can be significantly enhanced by the adoption and application of green technologies. Haque et al. (2024) illustrated that green technology promotes ecosystem-based adaptation by lowering environmental stressors and boosting natural resilience. The current study's findings are in line with their findings. Likewise, Batra (2023) emphasizes that, when in line with ecological principles, technologies like renewable energy systems and sustainable land management techniques are essential for strengthening ecosystems against the effects of climate change. Additionally, Ikram et al. (2021) found that although green technology is good for ecosystems, its effectiveness is dependent on a number of factors, including the socioeconomic context, the suitability of the technology, and the backing of policy.

Conclusion

In conclusion, the study confirms that green practices are essential for sustainability and adaptability in today's business and environmental atmospheres. The positive effects of eco-friendly product design, green innovation, and green technology highlight how important these practices are for determining the long-term viability and resilience of communities and businesses.

Recommendations

The study recommends that:

i. By incorporating sustainable practices into their operational and strategic frameworks, firms should give green innovation top priority. In a changing market, this will strengthen their resilience and guarantee long-term business continuity.
ii. Firms should prioritize eco-friendly product design by making investments in environmentally compliant materials and procedures. With this strategy, firms will be able to successfully respond to sustainability issues and satisfy the rising demand for ecologically friendly products.
iii. To improve ecosystem-based adaptation, firms should aggressively embrace green technology, which includes making investments in energy-efficient systems, renewable energy, and technologies that support sustainability and environmental resilience.

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ASSESSMENT OF SMALL MEDIUM AND MICRO ENTERPRISES IN THE FMCG SECTOR DURING COVID-19 IN GAUTENG PROVINCE OF SOUTH AFRICA: OPPORTUNITIES AND CHALLENGES

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Abstract

The purpose of the study was to assess the experiences of SMMEs in the FMCG Sector during COVID-19 in Gauteng Province of South Africa, looking at the challenges and opportunities they faced. The problem that prompted the study was that the pandemic had a severe impact on the FMCG sector, which is one of the largest employers of SMMEs in the province. A qualitative research approach was taken where data was gathered using semi-structured interviews and analysed through thematic analysis. The target population for this study were the owners of all the SMMEs operating in the FMCG sector in the Gauteng Province of South Africa that have been impacted by the COVID-19 pandemic. The study concluded that the challenges faced by SMMEs in the FMCG Sector include financial constraints, supply chain disruptions, market demand fluctuation, operational restrictions, and digital transformation. The study also concluded that the opportunities for SMMEs in the FMCG Sector include e-commerce and online sales; local and sustainable products; innovation and adaptability; supply chain localization; as well as collaboration and partnerships. The study made the following recommendations: conduct a comprehensive assessment of SMMEs' financial needs and design targeted financial assistance programs; establish a skills development and training framework for SMMEs in the FMCG sector; create a business advisory network to provide personalized guidance and support to SMMEs, Foster networking and collaboration platforms for SMMEs in the FMCG sector; and develop supportive policies and regulatory frameworks for SMMEs in the FMCG sector.

Keywords: financial constraints, market fluctuations, operational restrictions, supply chain disruptions, FMCG sector

Introduction

The COVID-19 pandemic has disrupted the global economy, and SMMEs in the FMCG sector have been significantly impacted. In Gauteng Province, SMMEs have been grappling with challenges such as reduced demand, supply chain disruptions, financial constraints, and limited access to support services (Odeku, 2021). However, there is a lack of empirical evidence on the experiences of SMMEs in the FMCG sector during COVID-19 in Gauteng Province. In Gauteng Province, which contributes 34.9% to South Africa's GDP, SMMEs play a critical role in driving economic growth and job creation (Odeku, 2021). According to Statistics South Africa, the total income generated by SMMEs in Gauteng Province in 2020 was R429.7 billion, and they employed 3.8 million people. However, the pandemic has had a severe impact on the FMCG sector, which is one of the largest employers of SMMEs in the province. According to the Gauteng Provincial Government, the sector lost an estimated 46,000 jobs between April and June 2020, and many SMMEs have been struggling to survive. Therefore, there is a need to understand the challenges and opportunities that SMMEs in the FMCG sector were facing during COVID-19 in Gauteng Province and to identify strategies that can help them to overcome the challenges and capitalise on the opportunities. However, there is a lack of empirical evidence on this topic, and previous studies have focused on the impact of COVID-19 on SMMEs in general, without specific reference to the FMCG sector in Gauteng Province.

The study will fill this gap by providing insights into the experiences of SMMEs in the FMCG sector during COVID-19 in Gauteng Province and by making recommendations that can help them to survive and thrive in the current environment. The study will contribute to the body of knowledge on SMMEs and COVID-19 in South Africa and will provide valuable insights for policymakers, business owners, and other stakeholders.

Literature Review

SMMEs in the FMCG sector faced several significant challenges during the COVID-19 pandemic. Many of these challenges were common across various industries, but they were particularly impactful in the FMCG sector due to its nature of providing essential goods that consumers need regularly (Anakpo & Mishi, 2021). Discussed below are some of the challenges that were faced by SMMEs in the FMCG sector during the pandemic:

Disruption of the Supply Chain

The implementation of lockdowns, travel restrictions, and delays in transportation networks resulted in disturbances to the supply chain (Argote et al., 2021). Small and medium-sized enterprises (SMMEs) had challenges in procuring raw materials, packaging, and ingredients, hence impacting their capacity to produce and distribute goods. Odeku (2021) contends that the epidemic has also generated difficulties in attaining access to markets. The closure of brick-and-mortar retail establishments and restrictions on market entry had an impact on the capacity of small, medium, and micro enterprises (SMMEs) to exhibit and sell their merchandise. Businesses that strongly depend on physical storefronts or marketplaces typically face a considerable barrier while transitioning to online platforms (Rakshit et al., 2021). The closing of

borders and imposition of trade restrictions have caused disruptions in the export and import operations of small, medium, and micro enterprises (SMMEs) engaged in international commerce. This has resulted in delays and uncertainty in the sourcing and distribution processes (Fabeil et al., 2020).

Decreased Consumer Demand

Amidst the pandemic, there was a notable change in consumer behaviour characterised by a decline in the number of people visiting physical shops, fewer shopping excursions, and alterations in expenditure habits (Atiku & Fields, 2020). Small, Medium, and Micro Enterprises (SMMEs) operating in the Fast-Moving Consumer Goods (FMCG) industry saw a decline in demand for discretionary products, which had a negative effect on their sales and overall income. The changing customer tastes posed an additional obstacle (Naidu, 2020). The epidemic caused a change in consumer tastes and priorities, which influenced the demand for products. Baker and Judge (2020) demonstrated that small and medium-sized enterprises (SMEs) have to promptly adapt their product offerings to match evolving customer demands.

Financial Strain

Many SMMEs faced financial difficulties due to decreased sales and revenue (Azadegan et al., 2020). These businesses often operate on thin profit margins, making it challenging to absorb sudden revenue losses and maintain operations. SMMEs struggled to secure financing and credit during the pandemic (Joshi & Sharma, 2022). Traditional lending institutions became cautious, making it harder for small businesses to access loans and capital to sustain their operations (Rakshit et al., 2021). Larger, more established companies might have been better equipped to weather the storm due to their resources and brand recognition, potentially increasing competition for SMMEs (Odeku, 2021). This might have led to loss of competitiveness of SMMEs during the pandemic.

Operational Challenges

Naidu (2020) asserts that adapting to new health and safety regulations required changes in operations, including reconfiguring workspaces, implementing hygiene protocols, and providing protective equipment for employees. As shown by Garad and Gold (2019), transitioning to e-commerce and digital sales channels posed challenges for SMMEs with limited digital infrastructure and online presence. Establishing a functional online sales platform required technical expertise and resources.

Moreover, Fabeil et al. (2020) highlights that managing staff availability and safety was a concern, especially if employees fell ill or faced challenges in commuting to work due to lockdowns and public transportation limitations. Frequent changes in regulations, lockdown levels, and health protocols also posed a challenge as they required SMMEs to stay updated and adapt their operations accordingly, which could be challenging for those with limited resources.

Research Methodology

In this study, a qualitative methodology was used. Qualitative research is a study approach that aims to investigate and comprehend individuals' experiences, perceptions, and attitudes towards a certain phenomenon (Bougie & Sekaran, 2019). Qualitative research techniques include the gathering of data via the means of observation, interviews, and focus groups (Liamputtong, 2019). The obtained data

undergoes analysis using methodologies such as content analysis, theme analysis, and discourse analysis.

This study employed a qualitative research approach to evaluate the experiences of small, medium, and micro enterprises (SMMEs) in the fast-moving consumer goods (FMCG) sector during the COVID-19 pandemic in Gauteng Province, South Africa. This approach is suitable as it enables us to thoroughly investigate and comprehend the experiences of SMMEs in the FMCG sector during this challenging time. The research aims to assess the difficulties and possibilities encountered by SMMEs throughout the pandemic, necessitating a thorough comprehension of their experiences and viewpoints.

Utilising a qualitative methodology will enable the researchers to get comprehensive and intricate data by employing techniques such as interviews and focus groups (Bougie & Sekaran, 2019). The obtained data will undergo thematic analysis, allowing the researchers to find prevalent themes and patterns within the data. This analysis will provide a comprehensive comprehension of the difficulties and possibilities encountered by SMMEs during the epidemic, as well as their corresponding actions and reactions. This technique will enable the researchers to investigate the specific circumstances in which the SMMEs function, a crucial aspect for comprehending the effects of the pandemic on their enterprises.

Data was collected through semi-structured interviews. Semi-structured interviews were conducted with 12 participants. The goal of qualitative research is not to generalise the findings to the entire population but to gain an in-depth understanding of the experiences of the participants. In this case, the researcher was interested in understanding the experiences of SMMEs in the FMCG Sector during COVID-19 in Kempton Park, Johannesburg, Gauteng Province.

Findings

Demographics

Gender

The gender distribution shows that there were 6 females (50%) and 6 males (50%). The presence of an equal number of males and females is crucial as it guarantees a more thorough and all-encompassing comprehension of the challenges faced by small, medium, and micro enterprises in the fast-moving consumer goods industry during the COVID-19 crisis. By ensuring gender parity among participants, the research is more likely to include a wide array of viewpoints, difficulties, and prospects encountered by SMMEs.

Age groups of participants

The age groups of the participants were as follows: 18-30 years (9%); 31-40 years (33%); 41-50 years (33%); and 51 years and above (25%). The diverse age groups represent different generational perspectives, experiences, and approaches to business management. Younger participants may bring a fresh and innovative outlook, potentially highlighting the use of technology and digital platforms, while those in the middle age groups may offer a combination of experience and adaptability. Older participants, on the other hand, may provide insights into long-standing industry practices and offer unique perspectives on overcoming challenges. By including participants from various age groups, the study can gain a comprehensive

understanding of how different generations of SMME owners in the FMCG sector have been affected by the pandemic, identify age-specific challenges and opportunities, and develop targeted strategies to support the resilience and growth of SMMEs across age demographics.

Highest Educational Qualification

The highest educational qualifications of the participants are as follows: Diploma (25%); Bachelors (42%); and Masters (33%). The highest educational qualifications of the participants in the study have significant implications for the research findings and the overall study. The distribution of participants with different levels of educational qualifications, including diplomas, bachelor's degrees, and master's degrees, suggests a diverse range of knowledge, skills, and expertise within the sample. This adds depth and richness to the study, as it allows for a comprehensive exploration of the experiences of SMMEs in the FMCG sector during the COVID-19 pandemic from different educational perspectives. The participants' educational qualifications can influence their understanding of the challenges and opportunities faced by SMMEs, their decision-making processes, and their ability to adapt to the changing business landscape.

Experience as an SMME owner

The experience of the participants as SMME owners is as follows: 6-10 years (25%); 11-15 years (17%); 16-20 years (33%); and 21 years and above (25%). The diverse range of experience levels among the participants offers valuable insights into the challenges and opportunities encountered by SMMEs in the FMCG sector during the COVID-19 pandemic. Participants with fewer years of experience may provide fresh perspectives and highlight the unique hurdles faced by newer businesses, while those with more extensive experience can offer a wealth of knowledge and strategies for dealing with crises and navigating uncertain times. By including participants with varying years of experience, the study can capture a comprehensive understanding of the evolving dynamics in the FMCG sector, and the findings can inform tailored recommendations for different stages of business development. Additionally, the diverse experience levels can contribute to a robust analysis of the impact of the pandemic on SMMEs' resilience, adaptability, and long-term sustainability.

Thematic Analysis

Challenges Faced by SMMEs in the FMCG Sector

The first objective of the study sought to identify the specific challenges faced by SMMEs in the FMCG sector in Gauteng Province of South Africa during the COVID-19 pandemic. Five sub-themes emerged from the findings of the study, and these are discussed below.

Financial Constraints

The financial constraints experienced by SMMEs in the FMCG sector during the pandemic were a significant challenge mentioned by the participants. The participants highlighted the impact of reduced sales and cash flow challenges on their ability to cover expenses and meet financial obligations. One participant stated:

"The pandemic caused a sharp decline in sales, leaving us struggling to pay rent and suppliers" (Participant D).

Another participant echoed this sentiment, saying:

"Our revenue dropped significantly, and we faced difficulties in accessing capital to sustain our operations" (Participant L).

These quotations illustrate the financial strain faced by SMMEs, which affected their ability to maintain business continuity and stability. These findings concur with Anakpo and Mishi (2021) who assert that financial strain was a significant challenge for SMMEs in the FMCG sector during the pandemic. Decreased sales and revenue put immense pressure on these businesses, which often operate on thin profit margins. According to Bowen et al. (2023), the difficulty in securing financing and credit exacerbated the financial challenges faced by SMMEs. Traditional lending institutions became cautious, making it harder for small businesses to access loans and capital to sustain their operations. The financial strain had the potential to impact the competitiveness of SMMEs, as larger and more established companies with greater resources and brand recognition may have been better equipped to weather the storm, increasing competition for SMMEs.

Supply Chain Disruptions

The disruptions in supply chains were another major challenge faced by SMMEs in the FMCG sector during the pandemic. The participants expressed difficulties in sourcing raw materials and products, leading to production delays and inventory shortages. One participant stated:

"The closure of international borders disrupted our supply chain, resulting in delays in receiving essential ingredients for our products" (Participant A).

Another participant added,

"We struggled to meet customer demands due to limited availability of stock, impacting our reputation and customer loyalty" (Participant C).

These quotes highlight the adverse effects of disrupted supply chains on SMMEs' ability to meet customer needs and maintain efficient operations. These findings concur with Meyer et al. (2022), who posits that SMMEs in the FMCG sector faced significant challenges due to the disruption of the supply chain during the COVID-19 pandemic. The lockdowns, travel restrictions, and disruptions in transportation networks resulted in difficulties sourcing raw materials, packaging, and ingredients, affecting their manufacturing and distribution capabilities. As Odeku (2021) noted, the closure of physical retail spaces and limitations on market access further hindered SMMEs' ability to showcase and sell their products, necessitating a shift to online platforms, which posed a significant challenge for businesses heavily reliant on physical stores or markets. Additionally, border closures and trade restrictions disrupted export and import activities, leading to delays and uncertainties in sourcing and distribution.

Market Demand Fluctuation

The research participants noted that the pandemic caused unpredictable and fluctuating market demand, posing challenges for SMMEs in the FMCG sector. The changing consumer behaviour and economic uncertainties impacted sales and revenue streams. One participant stated:

"Consumer preferences shifted rapidly during the pandemic, and it was challenging to anticipate and meet their changing demands" (Participant E).

Another participant mentioned:

"We experienced a decline in demand for non-essential products, which affected our sales and profitability" (Participant K).

These quotes underline the difficulties faced by SMMEs in adapting to changing consumer preferences and market dynamics, which hindered their ability to plan and forecast effectively. These findings are in line with Meyer et al. (2022), who noted that SMMEs in the FMCG sector faced a decline in consumer demand during the pandemic. Reduced foot traffic in stores, limited shopping trips, and changes in spending patterns resulted in lower demand for non-essential items, impacting the sales and revenue of SMMEs. The shifting consumer preferences and priorities added to the challenge, requiring SMMEs to quickly adjust their product offerings to align with the changing needs of consumers. As highlighted by Naidu (2020), understanding, and adapting to evolving consumer behaviour became crucial for SMMEs in order to maintain their market relevance and meet the changing demands of consumers.

Operational Restrictions

The findings also showed that the SMMEs encountered various operational challenges due to the restrictions imposed during the pandemic. The participants highlighted the need to comply with health and safety regulations, reduced working hours, and limitations on physical interactions. One participant shared:

"*We had to implement strict health protocols and safety measures, which increased our operational costs and reduced efficiency*" (Participant G).

Another participant mentioned: "*The restricted operating hours affected our ability to serve customers adequately and impacted our revenue*" (Participant L).

These quotations emphasize the operational difficulties faced by SMMEs in adapting to new regulations and maintaining business operations within the imposed limitations. These findings are supported by Belitski et al. (2022), who noted that SMMEs encountered operational challenges as they navigated the new health and safety regulations imposed during the pandemic. Adapting to these regulations required changes in operations, including reconfiguring workspaces, implementing hygiene protocols, and providing protective equipment for employees. Transitioning to e-commerce and digital sales channels posed challenges for SMMEs with limited digital infrastructure and online presence. Furthermore, Anakpo and Mishi (2021) noted that managing staff availability and safety became a concern, especially when employees fell ill or faced challenges in commuting to work due to lockdowns and transportation limitations. Frequent changes in regulations and health protocols also added to the operational challenges, requiring SMMEs to stay updated and adapt their operations accordingly, which could be particularly challenging for those with limited resources.

Digital Transformation

The lack of digital infrastructure and literacy emerged as a significant challenge for SMMEs in the FMCG sector during the pandemic. The participants highlighted the need for digital transformation to adapt to online sales and marketing platforms. One participant stated:

"We lacked the necessary technology and skills to quickly transition to online sales, limiting our ability to reach customers and generate revenue" (Participant I).

Another participant mentioned:

"Our limited online presence put us at a disadvantage compared to competitors who had already embraced e-commerce platforms" (Participant J).

These quotes emphasise the digital divide faced by SMMEs, hindering their ability to leverage digital channels and reach a wider customer base. These findings are also reflected in the literature. Rakshit et al. (2021) highlighted that the shift to online platforms and e-commerce became essential for businesses to adapt to the changing market dynamics and consumer behaviour. SMMEs with limited digital infrastructure and online presence faced significant challenges in establishing functional online sales platforms and leveraging digital marketing strategies. As shown by Fairlie and Fossen (2021), the need for technical expertise, resources, and investments in digital technologies posed hurdles for many SMMEs. However, digital transformation also presented opportunities for reaching a broader customer base, improving operational efficiency, and enhancing customer experiences. SMMEs that successfully embraced digital transformation were better positioned to mitigate the negative impacts of the pandemic and build resilience for the future.

Opportunities for SMMEs in the FMCG Sector

The second objective of the study sought to explore the opportunities that have emerged for SMMEs in the FMCG sector during the COVID-19 pandemic. The following sub-themes emerged from the study.

E-commerce and Online Sales

The shift in consumer behaviour towards online shopping presented opportunities for SMMEs in the FMCG sector. The participants recognised the potential of establishing or strengthening their online presence to engage with a broader customer base. One participant stated:

"The pandemic forced us to invest in an e-commerce platform, which opened up new channels for sales and expanded our reach beyond our physical store" (Participant E).

Another participant mentioned:

"Online sales allowed us to tap into new markets and attract customers who preferred the convenience of shopping from home" (Participant H).

These quotes highlight the opportunities for SMMEs to leverage e-commerce platforms and capitalise on the growing trend of online shopping. The COVID-19 pandemic accelerated the shift towards online shopping, providing an opportunity for SMMEs in the FMCG sector to tap into a larger customer base (Joshi & Sharma, 2022). SMMEs that established or enhanced their e-commerce platforms were able to cater to consumers who preferred to shop online due to safety concerns. Offering delivery and subscription services allowed SMMEs to reach customers avoiding physical stores, while subscription models provided a predictable revenue stream (Fairlie & Fossen, 2021). Some SMMEs also found new markets and opportunities for their FMCG products through online sales, particularly in regions with strong demand (Clauss et al., 2022).

Local and Sustainable Products

The pandemic increased consumer interest in supporting local businesses and sustainable products, creating opportunities for SMMEs in the FMCG sector. The participants recognized the value of promoting their unique offerings and catering to

the growing demand for locally sourced and environmentally friendly products. One participant shared:

"Consumers became more conscious of supporting local businesses during the pandemic, and our focus on locally sourced ingredients helped us attract a loyal customer base" (Participant A).

Another participant stated:

"We saw an increased demand for sustainable packaging options, which allowed us to differentiate ourselves from larger competitors" (Participant D).

These quotes highlight the opportunities for SMMEs to align with consumer preferences for local and sustainable products. During the pandemic, many consumers expressed a preference for supporting local businesses (Naidu, 2020). SMMEs producing artisanal or locally sourced FMCG products could capitalize on this sentiment by highlighting the origin and uniqueness of their offerings. Aligning with sustainability and ethical considerations in product development and communication allowed SMMEs to stand out among local customers (Ghosh et al., 2020). Establishing direct relationships with consumers, bypassing intermediaries or retailers, also presented an opportunity for increased profit margins (Fairlie & Fossen, 2021).

Innovation and Adaptability

The pandemic necessitated quick adaptation and innovation, creating opportunities for SMMEs in the FMCG sector. The participants recognized that being flexible and responsive to changing market needs allowed them to capitalize on emerging opportunities. One participant mentioned:

"We introduced new product lines that catered to the changing health and wellness trends, which helped us attract new customers and generate additional revenue" (Participant D).

Another participant shared:

"By adjusting our business model and offering contactless delivery options, we were able to meet the changing demands of customers and gain a competitive edge" (Participant I).

These quotes highlight the opportunities for SMMEs to embrace innovation and adapt their offerings to meet evolving consumer preferences. SMMEs that were adaptable and responsive to changing consumer needs found success during the pandemic (Clauss et al., 2022). For example, some FMCG producers shifted their production lines to meet the increased demand for health-related products such as hand sanitizers, immunity-boosting foods, personal care items, and hygiene products (He & Harris, 2020; Odeku, 2021). By adapting or introducing relevant products, these SMMEs were able to meet emerging trends and capitalize on consumer demand.

Supply Chain Localisation

The disruption of global supply chains presented opportunities for SMMEs to explore local sourcing and manufacturing. The participants recognised the advantages of reducing reliance on international suppliers and fostering local partnerships. One participant stated:

"The disruption in global supply chains prompted us to explore local suppliers, which not only ensured a more reliable and consistent supply but also allowed us to support other local businesses" (Participant G).

Another participant mentioned:

"By sourcing locally, we were able to provide fresher products to our customers and establish stronger relationships with local farmers and producers" (Participant K).

These quotes highlight the opportunities for SMMEs to enhance supply chain resilience and contribute to local economic development through localized sourcing.

The COVID-19 pandemic highlighted the vulnerabilities of global supply chains and the importance of localizing supply chains for SMMEs in the FMCG sector. According to Devi et al. (2020), supply chain disruptions and logistical challenges posed significant obstacles for SMMEs relying heavily on imported goods and materials. As a result, there was a growing emphasis on supply chain localization, where SMMEs sought to source inputs and raw materials locally, establish closer relationships with local suppliers, and reduce dependency on international suppliers. Localising the supply chain offered several benefits, including reduced transportation costs, increased flexibility and responsiveness, improved quality control, and enhanced sustainability by minimizing carbon footprints (Fairlie & Fossen, 2021). SMMEs that successfully localised their supply chains were able to mitigate the risks associated with global disruptions, ensure a steady flow of inputs, and maintain production continuity, ultimately enhancing their resilience and competitiveness in the FMCG sector. However, challenges such as limited local supplier networks, capacity constraints, and higher costs of local sourcing needed to be overcome through strategic planning and collaboration with stakeholders (Clauss et al., 2022).

Collaboration and Partnerships

The pandemic encouraged collaboration among SMMEs, providing opportunities for joint marketing efforts, shared resources, and collective problem-solving. The participants recognised the value of working together to navigate the challenges posed by the pandemic. One participant shared:

"We formed strategic partnerships with other SMMEs in the sector, allowing us to pool resources and reach a wider audience through joint marketing campaigns" (Participant I).

Another participant mentioned:

"*Collaborating with other businesses in our community helped us share best practices and find creative solutions to common challenges, fostering a sense of camaraderie*" (Participant K).

These quotes highlight the opportunities for SMMEs to leverage the power of collaboration and partnerships to enhance their resilience and expand their market reach. Collaborations and partnerships allowed SMMEs to expand their reach and tap into each other's customer bases (Ghosh et al., 2020). By working together, SMMEs could jointly promote products, offer bulk purchasing options or family-sized packs, and leverage each other's strengths to create value that might be difficult to achieve independently (Clauss et al., 2022; Bartlett & Morse, 2020). Collaborating with other local businesses or platforms provided opportunities for cross-promotion and mutual growth.

Conclusions

The study concluded that the challenges faced by SMMEs in the FMCG Sector include financial constraints, supply chain disruptions, market demand fluctuation, operational restrictions and digital transformation.

Based on the findings, governments and financial institutions can develop tailored financial assistance programs that provide accessible and affordable funding options, including grants, loans, and relief packages. Implementing this recommendation will benefit SMMEs by addressing their immediate financial needs, enabling them to maintain operations, invest in growth, and build resilience against future social shocks. This can be achieved by conducting surveys, interviews, and data analysis to understand the specific financial challenges faced by SMMEs in the FMCG sector.

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CATALYSING ENTREPRENEURIAL GROWTH IN AFRICA: THE ROLE OF DIGITAL TECHNOLOGIES AND INNOVATION HUBS IN DRIVING SUSTAINABLE ECONOMIC DEVELOPMENT

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Keywords: cluster theory, digital entrepreneurship, digital innovation hub, digital technologies, entrepreneurship, institutional theory, knowledge spillover, qualitative research, startup.

Introduction

Africa's economic landscape is undergoing a profound transformation, spurred by rapid technological advancements accelerated by the COVID-19 pandemic and an increasing focus on innovative entrepreneurial practices (Mhlanga, Denhere & Moloi, 2022). These shifts are occurring against a backdrop of persistent socio-economic challenges, including persistently weak growth and investment high unemployment rates, income inequality, and limited access to essential resources and services (Zeufack, Calderon, Kambou, Djiofack, Kubota, Korman, & Cantu Canales, 2020). For instance, Africa's youth unemployment rate remains alarmingly high, with 10 to 12 million young people entering the labour market annually while only 3 million formal jobs are created (Donkor, 2021). Amid these challenges, the digital economy has considerable potential to create jobs for young people (ILO, 2022) having emerged as a powerful catalyst for economic growth and development, offering solutions that enhance efficiency, expand access to markets, and foster innovation across sectors such as agriculture, healthcare, and education (Kamyshanchenko & Mkhitaryan, 2019; Miklif, Dadoosh & Neamah, 2021; Uzoamaka, Ifeoma, & Sheila, 2024).

Digital Innovation Hubs (DIHs) have positioned themselves as key enablers in this transformation (Gumbo & Moos, 2024). These hubs act as one-stop shops for digital transformation, offering entrepreneurs access to critical infrastructure such as high-speed internet, co-working spaces, and prototyping facilities (Kalpaka, Sörvik, Tasigiorgou & Rissola, 2020; Rudawska, 2022). Moreover, DIHs provide mentorship programmes, business development services, and strategic networking opportunities that connect startups with investors, policymakers, and industry leaders (Kalpaka et al. 2021). For example, the African-European Digital Innovation Bridge Network (AEDIBNet) has demonstrated how cross-border DIH collaborations can accelerate startup growth by leveraging shared expertise and resources (Crupi, Del Sarto, Di Minin, Gregori, Lepore, Marinelli & Spigarelli, 2021).

This paper explores the multifaceted role of DIHs in facilitating entrepreneurial growth, empowering startups, and fostering sustainable economic development in Africa, which is of critical importance given the continent's socio-economic challenges. Africa's high youth unemployment, unequal access to resources, and underdeveloped entrepreneurial

ecosystems necessitate innovative solutions that promote economic inclusion and sustainability. DIHs, as enablers of digital transformation, represent a unique opportunity to address these challenges by bridging the gap between traditional economic practices and emerging technologies.

The significance of this work lies in its focus on the integration of digital tools, targeted entrepreneurial training, and the creation of inclusive ecosystems that address systemic barriers to innovation. By examining the roles of DIHs, this study highlights their ability to empower marginalised groups, such as women and youth, by providing them with the resources and skills needed to succeed in the digital economy. Furthermore, DIHs contribute to building local capacities, enhancing regional collaboration, making them pivotal in achieving the United Nations Sustainable Development Goals (SDGs).

This approach is particularly important because it combines theoretical frameworks like cluster theory, institutional theory and knowledge spillover theory with empirical evidence from initiatives like the AEDIBNet phase 1 and entrepreneurs from a DIH. Unlike prior studies that focus primarily on DIHs in developed economies, this work contextualises their impact within Africa's unique socio-economic landscape, thus filling a critical gap in the literature. By linking DIHs' activities to broader themes of economic resilience and social equity, the paper not only advances understanding in the field but also provides policymakers, educators, and entrepreneurs with actionable recommendations for leveraging DIHs to drive inclusive and sustainable growth. This study is a step forward in reimagining how digital innovation can be harnessed to transform Africa's entrepreneurial ecosystems and foster long-term development.

Objectives of the research

The objective of this research article is (i) to analyse the role of digital technologies in driving entrepreneurial growth, (ii) to evaluate the impact of DIHs on startups and traditional industries, and (iii) to provide recommendations for enhancing the effectiveness of DIHs in fostering sustainable development.

Literature Review

Digital Technologies and Entrepreneurship

Digital technologies such as Artificial Intelligence (AI), Internet of Things (IoT), robotics and blockchain are reshaping industries by fostering innovation, reducing operational costs, and expanding market reach. Across Africa, startups are leveraging these tools to disrupt traditional sectors such as agriculture, healthcare, finance and education, enabling them to address challenges and create value in underserved markets (Miklif et al. 2021; Uzoamaka et al. 2024). For instance, IoT is being utilised in precision agriculture to optimise crop yields, while AI-powered solutions are improving diagnostic accuracy in healthcare (Disrupt Africa, 2023). These advancements demonstrate the transformative potential of digital technologies in driving entrepreneurial growth and creating sustainable business models tailored to Africa's socio-economic context.

DIHs emerged as a concept introduced by the European Union (EU) in 2014, designed to support the digital transformation of society and drive significant economic advancements within the EU (Asplund, Macedo & Sassanelli, 2021). Originally envisioned as a policy tool by the European Commission, DIHs aimed to accelerate the pace of digital transformation within the European economy while fostering collaborative innovation (Maurer, 2021; Zamiri, Ferreira, Sarraipa, Sassanelli, Gusmeroli & Jardim-Goncalves, 2021). The earliest iteration of DIHs appeared as

Competence Centres, which focused on developing specific technologies to enable and support digital transformation across Europe (Ujwary-Gil & Godlewska-Dzioboń, 2022). This initiative was prompted by the significant disparities in digitalisation levels among European businesses (Haukipuro, Väinämö, Virta, & Perälä-Heape, 2023), positioning DIHs as a strategic response to bridge these gaps and enhance digital adoption. By functioning as a nexus for innovation, skills development, and technological adoption, DIHs have become a critical instrument in addressing the challenges of digital transformation and enabling equitable growth in the digital economy.

In Europe, DIHs emerged from industrial policies, such as Germany's Industry 4.0 initiative and EU-wide strategies, which provided coherence and support for digitising industries (Wintjes & Vargas, 2023). In Africa, DIHs act as critical enablers of entrepreneurship, innovation, and technological advancement (Smidt & Jokonya, 2023; Friederici, 2019). Often evolving from broader innovation hubs, they serve as multifaceted ecosystems that support startups and entrepreneurs by offering services such as business incubation, skills training, mentorship, and networking opportunities (Mwantimwa, Ndege, Atela & Hall, 2021; Smidt & Jokonya, 2022). DIHs in Africa address local challenges by fostering social inclusivity, job creation, and economic growth, connecting entrepreneurs with investors, corporates, and global markets (Atiase, Kolade & Liedong, 2020; Lusweti & Omieno, 2023). While they hold significant potential, particularly in bridging the digital divide and supporting youth-driven innovation, their effectiveness is often hindered by financial constraints and limited scalability of supported startups (Mwantimwa et al. 2021; Atiase et al. 2020). As catalysts for Africa's digital transformation, DIHs are increasingly recognised for their role in advancing social and economic development across the continent (Vadratsikas, Kalemaki & Bukali, 2023), acting as dynamic innovation ecosystems and policy platforms, connecting digital innovation suppliers and demanders while promoting synergy across sectors. They typically serve multiple digital technological domains, including IoT, AI, robotics, and cybersecurity (Sarraipa, Zamiri, Marcelino-Jesus, Artifice, Jardim-Goncalves & Moalla, 2023). By encouraging the adoption of digital tools, DIHs help startups develop and deploy innovative solutions that enhance productivity and competitiveness.

The entrepreneurial landscape in Africa mirrors some of the dynamics of Europe, particularly in South Africa, where the startup ecosystem is thriving across diverse sectors. Fintech leads this ecosystem, comprising approximately 30% of the 490 monitored startups, followed by sectors like e-health, edu-tech, and agri-tech (Disrupt Africa, 2023). This diversity highlights the adaptability of African entrepreneurs in leveraging digital technologies to address unique regional challenges. As seen in Greater Paris, where startups use digital innovation to create mobile apps, IoT devices, and virtual reality products (Becker & Endenich, 2023), African entrepreneurs are similarly driving market innovation and contributing to the vibrancy of their local economies.

It is evident that digital technologies, when integrated with enabling platforms like DIHs, are pivotal in fostering entrepreneurial growth, empowering startups, and driving sustainable development. As exemplified by both European and African contexts, DIHs not only bridge the gap between technological potential and practical application but also facilitate knowledge transfer, foster inclusivity, and catalyse innovation ecosystems. These dynamics align with the overarching goal of leveraging digital tools and innovative practices to build resilient economies and equitable societies in Africa.

The parallels drawn from diverse regions further emphasise the replicable and adaptable nature of DIHs, providing a compelling argument for their strategic development across Africa to address unique socio-economic challenges and capitalise on entrepreneurial opportunities.

Role of Digital Innovation Hubs

DIHs are critical in fostering entrepreneurial growth and innovation by serving as enablers of digital transformation for startups and SMEs, through offering services that enable startups and SMEs to adopt digital technologies and drive innovation. By addressing challenges such as lack of access to advanced technologies, skills gaps, and limited funding, DIHs provide a comprehensive suite of services that foster entrepreneurial activity (Kalpaka et al. 2020; Rudawska, 2022). These hubs fulfil four primary functions: test-before-invest services, skills and training development, support for funding, and fostering ecosystems and networking (Crupi et al. 2020).

Test-Before-Invest Function

The "test-before-invest" function allows startups to access technical expertise and use advanced technologies such as AI, IoT, and robotics to prototype and test their solutions. This service minimises risks by enabling businesses to refine their products before large-scale investment, thus reducing financial risk exposure (Kalpaka et al. 2020). DIHs provide experimental spaces where entrepreneurs can validate their ideas and improve their product-market fit. For example, DIHs in Europe have been instrumental in piloting technologies that address market-specific challenges, creating a safer pathway for entrepreneurs to innovate (Rudawska, 2022).

Skills and Training Development

DIHs also address the critical issue of skills shortages by offering tailored training programmes that enhance digital and managerial capabilities (Sassanelli, Terzi, Panetto & Doumeingts, 2021). These programmes focus on equipping entrepreneurs with the skills needed to adopt and leverage advanced technologies effectively, ensuring competitiveness in the digital economy (Kalpaka et al. 2020). In Africa, DIHs have partnered with educational institutions to deliver workshops that bridge the skills gap, particularly in underserved regions, thereby fostering inclusive growth (Crupi et al. 2020).

Support for Funding and Investment

Securing funding is often a major hurdle for startups, and DIHs play a pivotal role in bridging this gap. By connecting entrepreneurs with venture capitalists, financial institutions, and government grants, DIHs increase the likelihood of startups obtaining necessary funding (Rudawska, 2022). Acting as intermediaries, these hubs validate business models and enhance investor confidence, enabling startups to scale more effectively (Kalpaka et al. 2020). Additionally, DIHs provide training in financial management, helping entrepreneurs develop strategies for sustainable growth (Crupi et al. 2020).

Ecosystem and Networking

DIHs excel in fostering collaboration among stakeholders by creating platforms for networking and knowledge exchange (Kalpaka et al. 2020). Through events, workshops, and partnerships, DIHs connect start-ups with policymakers, researchers, and industry leaders, facilitating the co-creation of innovative solutions (Rudawska, 2022). These collaborations are vital for addressing systemic challenges in entrepreneurial ecosystems, particularly in regions like Africa, where ecosystem fragmentation can hinder growth (Crupi et al. 2020).

Synergies and Strategic Importance

The interconnected functions of DIHs amplify their impact on startup development. For instance, the combination of skills training and funding support ensures that startups are not only equipped to innovate but also financially stable to scale their operations (Kalpaka et al. 2020). Furthermore, DIHs align their activities with global goals such as the United Nations Sustainable Development Goals (SDGs), supporting inclusive economic growth and environmental sustainability (Crupi et al. 2020). DIHs, therefore, provide a robust framework for supporting startups and SMEs, addressing critical challenges such as technology adoption, skills development, funding access, and ecosystem integration (Gumbo & Moos, 2024). By fulfilling their four primary functions, DIHs play a transformative role in fostering entrepreneurial growth and driving sustainable economic development (Kalpaka et al. 2020; Rudawska, 2022). Their contributions are essential in creating resilient and inclusive entrepreneurial ecosystems that can thrive in the digital age.

Theoretical Frameworks

This study is grounded in three key theoretical perspectives: Cluster Theory, Knowledge Spillover Theory, and Institutional Theory. Together, these frameworks provide a comprehensive lens to understand how DIHs catalyse entrepreneurship and drive sustainable economic development in Africa.

Cluster Theory

Cluster Theory emphasises the benefits of geographic co-location and shared resources for fostering innovation and competitiveness. Porter (1990) argues that clusters enable businesses to benefit from agglomeration economies, such as access to specialised suppliers, labour pools, and knowledge spillovers. This is a position that Porter (2003) validated by the evidence of geographical and resource-based advantages provided within a cluster. Maurer (2021) and Pratt (2021) provide empirical evidence that clusters enhance regional economic performance by driving innovation and collaboration. In the context of DIHs, clusters offer co-location which foster interaction among entrepreneurs, mentors, and investors, creating a vibrant ecosystem that enhances startup growth (Audretsch & Belitski, 2017; Spigel & Harrison, 2018). Gumbo and Moos (2024) highlight how DIHs, through their integrated networks and shared infrastructure, enable startups to collaborate with diverse stakeholders, reducing inefficiencies and increasing market competitiveness. Moreover, the physical and virtual clustering of services within DIHs allows startups to leverage collective resources to scale their innovations effectively (Kalpaka et al. 2020).

Knowledge Spillover Theory

The Knowledge Spillover Theory posits that the unintentional diffusion of knowledge within ecosystems promotes innovation and entrepreneurship. Acs, Braunerhjelm, Audretsch and Carlsson (2009) underscore that knowledge spillovers occur when information generated within a firm or institution becomes accessible to others, fostering new opportunities for innovation. Audretsch, Belitski and Caiazza (2021) emphasise the role of geographic proximity in facilitating spillovers, as physical closeness encourages interaction and information sharing. Gumbo and Moos (2024) found that DIHs play a crucial role in knowledge dissemination by connecting startups with academic institutions and industry experts, enabling entrepreneurs to access cutting-edge research and insights. Additionally, Madaleno, Nathan, Overman and Waights (2022) highlight that the presence of DIHs accelerates knowledge diffusion

through intentional workshops and mentorship programmes, amplifying the flow of knowledge and empowering entrepreneurs to adapt to rapidly changing markets.

Institutional Theory

Institutional Theory examines the role of formal and informal structures in shaping entrepreneurial behaviour. Earlier research by DiMaggio and Powell (1983) argued that institutional environments influence organisational practices, fostering homogeneity and legitimacy within ecosystems. Later, Dubey, Gunasekaran, Childe, Blome and Papadopoulos (2019) extended this idea by emphasising the role of institutions in providing rules and frameworks that guide entrepreneurship. DIHs, as institutional actors, provide structured interactions and support mechanisms that guide startups toward success (Covin & Miller, 2014). Gumbo and Moos (2024) note that DIHs enhance legitimacy by connecting startups with investors and policymakers, ensuring that entrepreneurs can navigate regulatory landscapes and gain access to critical funding. Moreover, Ujwary-Gil and Godlewska-Dzioboń (2022) found that DIHs create environments where entrepreneurs can mimic successful practices, embedding legitimacy and fostering resilience.

Integration of Theoretical Perspectives and Implications for Sustainable Development

The integration of these theoretical frameworks within the study highlights the multifaceted role of DIHs in advancing entrepreneurship. Cluster Theory explains the spatial and network dynamics, Knowledge Spillover Theory focuses on the dissemination of ideas, and Institutional Theory addresses the structural and legitimacy-building aspects. This interconnected framework reveals how DIHs simultaneously provide physical resources, foster knowledge exchange, and embed legitimacy, creating synergistic effects that enhance startup performance (Gumbo & Moos, 2024; Kalpaka et al. 2020; Rudawska, 2022).

By aligning their functions with these theories, DIHs address systemic challenges in African entrepreneurial ecosystems. For example, they mitigate geographic isolation through clustering (Porter, 1990; Porter 2003; Ujwary-Gil & Godlewska-Dzioboń, 2022), reduce knowledge asymmetries through intentional spillovers (Acs et al. 2009), and build robust institutional frameworks that enhance startup sustainability (DiMaggio & Powell, 1983; Gumbo & Moos, 2024). This alignment ensures that DIHs not only contribute to economic growth but also promote social equity and environmental well-being. These theoretical perspectives provide a robust foundation for understanding the transformative impact of DIHs on entrepreneurship. By leveraging the interplay of clustering, knowledge diffusion, and institutional support, DIHs act as catalysts for innovation and sustainable economic development in Africa.

Methodology

Research Design and Approach

This study adopts a qualitative methodology to explore the role of digital technologies and innovation hubs in driving sustainable economic development. A qualitative approach is appropriate for understanding complex social phenomena, enabling in-depth exploration of participants' experiences and perspectives (Al-Ababneh, 2020). This methodology aligns with the interpretivist paradigm, which emphasises understanding participants' lived experiences through rich, context-specific data (Creswell & Creswell, 2018; Bloomberg, 2023). By focusing on the subjective perspectives of DIH managers and entrepreneurs within a DIH, this approach captures the nuanced mechanisms through which DIHs facilitate innovation, empower startups, and contribute to sustainable economic development. This design provides rich,

context-specific data essential for understanding the multifaceted role of DIHs in Africa's economic development.

Sampling and Population

Purposive sampling was employed to select participants, focusing on two groups: DIH or Programme managers and entrepreneurs or startup founders who have engaged with DIHs within the past five years. This approach ensures the inclusion of stakeholders with relevant expertise and experience, critical for achieving the study's objectives (Cassell, 2015; Creswell & Poth, 2018) . The study sampled DIH or Programme managers under the African European Digital Innovation Bridge Network (AEDIBNet) phase 1 programme and entrepreneurs or startup founders from the Tshimologong Digital Innovation Precinct in Johannesburg. The DIH or Programme managers were chosen as they usually design and implement activities within a DIH. Some DIHs use the term DIH manager while some use the term Programme manager, but they play similar roles. Tshimologong Precinct was chosen as the only DIH under the AEDIBNet phase 1 which was in Southern Africa. This dual-sample approach allows for insights from both the architects and beneficiaries of DIH activities, providing a comprehensive understanding of the influence on entrepreneurship.

Data Collection

Data for this study were collected through semi-structured interviews, a method particularly effective for exploratory research, as it allows for flexibility while ensuring alignment with the research objectives (Cassell, 2015; Haenssgen, 2019). Semi-structured interviews enable participants to share detailed insights into their experiences and perspectives, providing rich, qualitative data. The study targeted DIH or programme managers and startup founders or entrepreneurs with direct engagement in the operations of the DIH, ensuring the relevance and depth of the data collected. To facilitate convenience and cost-effectiveness, the interviews were conducted via Zoom platform, with participants' consent, and recorded using Otter.ai for transcription accuracy. This approach ensured that the nuanced dynamics of DIH interactions with entrepreneurs were accurately captured for detailed analysis. By offering a balance between structured guidance and open-ended discussion, semi-structured interviews provided the flexibility necessary to uncover the multifaceted roles of DIHs in fostering entrepreneurial growth while maintaining focus on the study's core research questions.

Data Analysis

The study employed thematic analysis to identify, analyse, and interpret patterns within the data collected from interviews. This method involved a systematic process of transcription, coding, and categorisation, enabling the identification of key themes that align with the research objectives (Asplund, Macedo & Sassanelli, 2021; Cassell, 2015). Thematic analysis was particularly suited to this study as it allowed for the integration of diverse perspectives from DIH or programme managers and startup founders or entrepreneurs, capturing the complexity of their experiences. The process began with detailed transcription of interview recordings, ensuring accurate representation of participants' insights. Coding was then performed to organise the data into meaningful categories, followed by the development of broader themes related to the role of DIHs in entrepreneurial growth. This iterative approach ensured that the findings were rooted in participants' authentic experiences while remaining aligned with the research focus. Thematic analysis provided a nuanced understanding of the multifaceted interactions between DIHs and startups, offering valuable insights into how these hubs catalyse innovation and drive sustainable development (Haenssgen, 2019; Flick, 2019). This

rigorous analytical process ensured that the data were systematically interpreted, enhancing the reliability and depth of the study's findings.

Ethics and Trustworthiness

Ethical considerations were integral to the study and adhered to throughout all research phases. Ethical clearance was obtained from the University of Pretoria's Research Ethics Committee (Protocol Number: EMS 236/22), demonstrating compliance with institutional standards. Participants were provided with informed consent forms detailing the study's objectives, their rights, and assurances of confidentiality and anonymity. They were also informed of their right to withdraw at any time without consequences. No financial incentives were provided to avoid coercion, maintaining the authenticity of participant contributions. During data collection, interviews were conducted on Zoom platform, with participants given the option to disable video to ensure privacy and reduce bandwidth issues in areas with limited connectivity. Recordings were securely stored, and transcription was performed using Otter.ai, with participant identifiers anonymised to protect their identities. This rigorous adherence to ethical protocols ensured the study upheld the highest standards of integrity and respect for participants (Flick, 2019). Achieving trustworthiness in this study required addressing credibility, transferability, dependability, and confirmability.

Credibility

Credibility was established through member validation and checking, wherein the researcher was echoing, paraphrasing or seeking clarification on respondents' remarks. This is a method of addressing credibility preferred by Coleman (2022), Rose and Johnson (2020), and Vu (2021). This approach ensured a comprehensive understanding of the influence of DIHs on entrepreneurship. The use of digital recording platforms like Zoom, combined with transcription software like Otter.ai, further ensured that raw data could be revisited for accuracy, supporting the authenticity of the conclusions drawn, as supported by Coleman (2022).

Transferability

Transferability was achieved through detailed documentation of the research process, including descriptions of the study's context, participants, and data collection procedures. The rich, thick descriptions provided in this study allow readers to determine the relevance and applicability of the findings to their own settings (Korstjens & Moser, 2018; Stahl & King, 2020). Furthermore, the inclusion of a diverse participant base, representing various roles and functions within the DIH ecosystem, ensures the study's findings are broadly relevant to similar contexts across Africa. By explicitly outlining the limitations of the study, future researchers are provided with a clear framework for replicating the research in new settings, thereby enhancing its transferability.

Dependability

Dependability was established through a transparent and systematic approach to the research process. This included detailed documentation of each phase of the study, from the development of the interview guide to the thematic analysis of the data. A peer review process involving the researcher’s supervisor further ensured the reliability of the coding and analysis procedures, providing an additional layer of scrutiny (Coleman, 2022; Stahl & King, 2020). Regular consultation with the supervisor and feedback from participants during member checking contributed to maintaining consistency in the study's methods and interpretations. This rigorous process ensures that other researchers

can replicate the study under similar conditions, validating its reliability and dependability.

Confirmability

Confirmability in this study was achieved by minimising researcher bias and ensuring that findings were firmly grounded in participants' accounts. This was supported by maintaining a transparent audit trail, which documented the decisions made during data collection, analysis, and interpretation (Korstjens & Moser, 2018; Stahl & King, 2020) . The use of verbatim transcription via Otter.ai ensured that the data reflected participants' words without alteration, while systematic coding and analysis techniques further reinforced the objectivity of the findings. Additionally, a discussion guide was pre-tested and reviewed by an experienced researcher before data collection began, ensuring that the questions elicited relevant and unbiased responses. This comprehensive approach ensures that the study's conclusions are reflective of participants' authentic experiences and are not unduly influenced by the researcher's perspectives.

Findings and Discussion

DIHs have emerged as transformative agents in fostering entrepreneurial growth and sustainable economic development by providing essential resources, mentorship, and access to advanced technologies, They enable startups to overcome barriers to innovation and achieve rapid development. Their multifaceted roles extend beyond operational support, encompassing the empowerment of entrepreneurs through skills training, the creation of robust ecosystems through strategic networking, and the promotion of inclusive innovation for societal and environmental impact. This section delves into four key findings from the study: acceleration of startup development, empowerment through innovation, ecosystem connectivity, and sustainability and social equity. These findings highlight how DIHs catalyse these processes to drive meaningful change in Africa's entrepreneurial landscape.

Acceleration of Startup Development

DIHs significantly expedite the growth of startups by providing essential resources, mentorship, and access to advanced technologies. These hubs reduce the time-to-market for entrepreneurs, enabling them to compete effectively in rapidly evolving industries. This study found that DIHs act as incubators and accelerators, providing startups with critical tools such as prototyping facilities and technical support, which are pivotal for refining products and minimising developmental risks. Gumbo and Moos (2024) highlights that DIHs in Africa serve as central points for fostering innovation, with their structured programmes enabling startups to adopt agile methodologies and improve operational efficiency. This emphasises the role of DIHs in facilitating digital transformation and entrepreneurship through advanced technological services (Rudawska, 2022; Kalpaka et al. 2020). Furthermore, the findings support Porter’s (1990) Cluster Theory, which underscores the benefits of localised resources and networks in accelerating innovation and market entry. Which drives sustainable economic development.

Empowerment through Innovation

Empowering entrepreneurs through innovation is a core function of DIHs. This study reveals that DIHs enhance startups’ viability by offering tailored digital skills training and fostering technical expertise. These programmes are designed to equip entrepreneurs with the competencies needed to integrate advanced technologies, such

as AI and IoT, into their business operations. Moreover, DIHs connect startups to funding opportunities, including venture capital and government grants, reducing financial barriers to growth. Gumbo and Moos (2024) demonstrates that startups leveraging DIH services not only develop sustainable business models but also exhibit greater resilience in dynamic markets. Similarly, AEDIBNet (2022) reveal that skills development and funding opportunities provided by DIHs significantly increase startup scalability and market competitiveness. These insights align with Knowledge Spillover Theory, which posits that proximity to knowledge-intensive environments enhances entrepreneurial capacity and innovation. Furthermore, the emphasis on resilience aligns with findings by Kalpaka et al. (2020), which highlight the role of DIHs in mitigating startup risks and driving sustainable growth.

Ecosystem Connectivity

DIHs play a critical role in fostering ecosystem connectivity by integrating startups into broader innovation networks. This study found that DIHs facilitate strategic partnerships between entrepreneurs, industry leaders, policymakers, and academic institutions, creating an enabling environment for collaboration. Networking events, such as pitch nights and workshops, were identified as key mechanisms for connecting startups to investors and markets. Gumbo and Moos (2024) emphasises that DIHs bridge the gap between local innovation and global markets, enabling knowledge exchange and scaling opportunities. This finding is supported by Crupi et al. (2020), who note that DIHs enhance ecosystem interactions by fostering synergy between digital technology suppliers and demanders. These findings align with Institutional Theory, which underscores the importance of structured systems in creating legitimacy and fostering ecosystem resilience. Moreover, the cross-border collaboration opportunities facilitated by DIHs further strengthens ecosystem connectivity on an international scale.

Sustainability and Social Equity

Sustainability and social equity are central to the mission of many DIHs, which actively support startups addressing environmental and social challenges. This study found that DIHs provide platforms and tools that enable entrepreneurs to develop solutions aimed at underserved communities, thus promoting inclusivity. By encouraging eco-preneurship and social innovation, DIHs align entrepreneurial activity with broader sustainable development goals. Gumbo and Moos (2024) underscores that startups supported by DIHs often balance profitability with societal impact, demonstrating the role of DIHs in fostering equitable and sustainable economic development. These findings are consistent with Kalpaka et al. (2020), who emphasise that DIHs promote digital inclusion and green technologies. This study additionally found that DIHs are uniquely positioned to address socio-economic disparities by supporting innovations tailored to local challenges. These findings also reflect the alignment of DIHs' activities with the United Nations Sustainable Development Goals (SDGs), further reinforcing their role in advancing social equity through inclusive innovation.

Implications for Policy and Practice

The findings of this study highlight the pivotal role of DIHs in fostering entrepreneurial growth and driving sustainable economic development across Africa. To maximise the impact of DIHs, it is crucial to align their operations with supportive policies, tailored strategies, and regional integration efforts. This section explores actionable recommendations for policymakers, DIH managers, and stakeholders to enhance the effectiveness of DIHs. By increasing investments, developing enabling regulatory

frameworks, and fostering strategic partnerships, DIHs can better address systemic challenges faced by startups. Additionally, leveraging regional initiatives such as the African Continental Free Trade Area (AfCFTA) offers opportunities to expand market access and encourage cross-border collaboration. These implications provide a roadmap for strengthening the ecosystem surrounding DIHs, ensuring their sustainability and long-term contribution to Africa's economic transformation.

Policy Recommendations

Governments and policymakers need to prioritise increased investment in DIHs, particularly in underrepresented regions where access to digital infrastructure and resources is limited. These investments should focus on establishing new DIHs and upgrading existing ones to ensure they have the capacity to support advanced technologies such as AI, IoT, and robotics. Moreover, policies should aim to provide financial incentives, such as tax breaks or grants, to encourage private sector participation in funding and supporting DIHs. This would not only expand the geographical reach of DIHs but also enhance their ability to address the unique needs of local entrepreneurial ecosystems.

Additionally, the development of regulatory frameworks tailored to digital entrepreneurship is critical. These frameworks should include guidelines for data protection, intellectual property rights, and the ethical use of technology, ensuring that startups operate within a safe and supportive regulatory environment. Such measures would increase investor confidence and enable startups to scale their operations while protecting consumers and stakeholders. Policymakers should also consider implementing flexible policies that allow for the rapid adoption of emerging technologies, ensuring that startups within DIHs remain competitive in dynamic global markets.

Strategies for DIHs

DIHs need to continuously evolve their service offerings to provide tailored support for diverse industries. This includes creating industry-specific programmes, such as agri-tech accelerators or e-health incubators, that address the unique challenges of these sectors. By doing so, DIHs can foster innovation that is directly aligned with industry needs, enhancing the relevance and impact of their services. For example, in agriculture, DIHs can support the development of precision farming technologies, while in healthcare, they can enable the creation of telemedicine platforms. Expanding service offerings to include market intelligence and export-readiness training would further enhance the competitiveness of startups in international markets.

Strengthening partnerships with academic institutions and industry leaders is another critical strategy for DIHs. Collaborations with universities can ensure a steady pipeline of skilled graduates who are ready to engage with digital entrepreneurship. Joint research initiatives can also drive innovation by bridging the gap between academic research and practical application. Partnerships with industry leaders can provide DIHs with insights into market trends and access to advanced technologies, enabling startups to remain at the forefront of innovation. These partnerships should be formalised through public-private agreements, ensuring long-term collaboration and resource sharing.

Regional Integration

To maximise the impact of DIHs, it is essential to leverage regional integration initiatives such as the AfCFTA. By facilitating cross-border collaboration, AfCFTA

provides startups within DIHs access to larger markets and diverse customer bases. This can be achieved by establishing regional DIH networks that connect hubs across borders, enabling the sharing of best practices, resources, and technologies. Such networks can also help startups navigate the complexities of cross-border trade, including customs regulations and logistical challenges.

Moreover, regional integration efforts should focus on harmonising policies and standards related to digital entrepreneurship across member states. This would reduce regulatory fragmentation and create a cohesive environment for startups to operate seamlessly across borders. DIHs can play a pivotal role in this process by acting as intermediaries, providing startups with the support they need to comply with regional trade regulations. This alignment with regional goals would position DIHs as key drivers of Africa's economic growth and integration into global value chains.

These policy and practice implications highlight the need for coordinated efforts among governments, private sector actors, and DIHs to create an enabling environment for digital entrepreneurship. By addressing these areas, DIHs can become even more effective in catalysing entrepreneurial growth and sustainable development across Africa.

Conclusion

DIHs have emerged as transformative platforms for catalysing entrepreneurial growth and driving sustainable economic development across Africa. This study demonstrates that DIHs significantly contribute to startup acceleration by providing essential resources, technical mentorship, and access to advanced technologies, enabling entrepreneurs to reduce costs and enter markets more efficiently. The empowerment of entrepreneurs through tailored digital skills training and funding opportunities further enhances their ability to innovate, scale, and remain resilient in competitive environments. Additionally, DIHs play a critical role in fostering ecosystem connectivity by integrating startups into local and global markets, facilitating strategic partnerships, and encouraging knowledge exchange. Beyond economic gains, DIHs promote sustainability and social equity by supporting innovations that address environmental and societal challenges, aligning entrepreneurial activities with broader development goals.

The findings underscore the importance of strengthening the capacity and reach of DIHs through targeted investments, the development of supportive regulatory frameworks, and the expansion of service offerings to cater to diverse industries. Enhancing partnerships with academic institutions and industry leaders will ensure a steady flow of skills, resources, and cutting-edge research, enabling DIHs to remain at the forefront of innovation. Furthermore, leveraging regional integration initiatives, such as the AfCFTA, can amplify the impact of DIHs by creating opportunities for cross-border collaboration and access to larger markets.

DIHs are indispensable in addressing Africa's entrepreneurial and developmental challenges. Their multifaceted roles in fostering innovation, building capacity, and promoting inclusivity position them as critical drivers of sustainable growth. However, realising their full potential requires coordinated efforts from governments, private sector actors, academic institutions, and regional bodies to create an enabling environment that supports digital entrepreneurship. By aligning policy and practice with the needs of DIHs, Africa can harness their transformative power to build resilient economies and inclusive societies, paving the way for long-term prosperity.

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DETERMINANTS OF SUCCESS AND FAILURE IN AFRICA'S SME SECTOR: A SYSTEMATIC LITERATURE REVIEW AND META-ANALYSIS

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Abstract

All Western nations on this planet prioritize the promotion of the development of SMEs to generate economic growth and activities. Because of the potential SMEs offer to Western countries' economies, African countries have increased interest in SMEs' development. However, a disproportionate amount of attention has been paid to the potential of SMEs worldwide, with minimal empirical focus on SMEs in Africa. Those rare studies have been conducted in a few African countries or one single country without emphasizing the economic unity of the entire continent. This paper examines the determinants of success and failure in Africa's SME sector. A systematic literature review and meta-analysis allowed us to collect and analyze full-text publications using the PRISMA model. Findings indicate many success and failure factors with emphasis on key factors of failure such as multiple official and foreign languages, multiple currencies, adoption of Western countries' culture, tariff restrictions because of multiple borders, and dependence on Western countries' economies. Conclusions were offered.

Introduction

Small and medium-sized enterprises (SMEs) play a key role in every nation's economic growth and development from three perspectives: generating job opportunities, income and wealth creation, and poverty reduction (Balogun et al., 2016; Manzoor et al., 2021; Nanziri & Wamalwa, 2021; He et al., 2024; Avordeh et al., 2024). In addition, they play a pivotal role in reducing inequality (Nanziri & Wamalwa, 2021). Moreover, more than 50% of the global employment force is in SMEs, while more than 70% produce goods and services to satisfy the population using labour-intensive technologies (Nanziri & Wamalwa, 2021). In this sense, they assume a critical contribution through their commitment to African countries' GDP (gross domestic product). Notably, they provide more employment, leading to poverty alleviation, promoting innovation, and sustainable industrialization (Manzoor et al., 2021). The rationale behind this study comes from the background that with the fast-growing population of Africa, there is high pressure on SMEs' success (He et al., 2024). In addition, African countries are experiencing a rapid increase in their labour force, intensifying the challenge of developing the SME sector to combat unemployment (Avordeh et al., 2024). Moreover, the widespread use of mobile phones has opened up new opportunities for African SMEs (Avordeh et al., 2024).

However, in African nations, the SME sector faces numerous challenges because of the characteristics of developing countries in those societies. These challenges range from lack of capital, lack of democracy, lack of education, misinterpretation of religions, misappropriation of Western country's culture, political instability and violence, corruption, fraudulent elections, foreign languages as official languages, lack of technological infrastructure, etc. Corruption is pervasive in many African countries and poses a significant challenge to SMEs (Adomako et al., 2024). For example, corruption is used to secure government contracts and undermine the rule of law (Adomako et al., 2024). The main problem limiting the SME sector's contribution to the mainstream economy in Africa is the shortage of finance (Balogun et al., 2016). Avordeh et al. (2024) indicated that in Sub-Saharan Africa, SMEs face disruptions that lead to reduced productivity, operational inefficiencies, higher production costs, and supply chain misfunctioning. They also found that power outages are a significant challenge for SMEs, and energy

diversification is a key solution to poverty in Sub-Saharan Africa. None of the existing studies concentrated on discovering how unity in Africa can contribute to SMEs' growth. There is limited understanding of how SME outputs contribute to economic growth in African countries. Therefore, this paper received a call to answer the following research question (RQ): What factors determine success and failure in the African countries' SME sector?

A disproportionate amount of attention has been paid to the potential of SMEs worldwide, with minimal empirical focus on SMEs in Africa. Those rare studies have been conducted in a few African countries or one single country without emphasizing the economic unity of the entire continent. This paper fills this gap and examines the determinants of success and failure in Africa's SME sector.

The main contribution of this study is to provide a comprehensive platform for African countries to define policies for the economic unity of the continent. This study also contributes to the literature by showing the success and failure factors contributing to SMEs' growth in Africa. Therefore, this study is among the first to demonstrate that Europe favours union, the United States of America is built of unity, and African countries must unify at least economically to boost the SME sector growth, stability, and development in the entire continent. Moreover, this research conducted a systematic literature review and meta-analysis applying the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) model to determine key failure factors in Africa's SME sector.

The remainder of this paper is organized as follows: Section 2 outlines the related work. Section 3 discusses the methodology used in this study. Section 4 outlines the results, emphasizing the key failure factors. Section 5 focuses on conclusions.

Related Work

Numerous studies on African SMEs have been conducted, resulting in controversial responses and, in some instances, specific and incomplete answers to the phenomenon. Balogun et al. (2016) found that firm characteristics influence access to finance and recommended that SMEs in South Africa develop attractive firm attributes to stimulate lenders to invest in their businesses. SMEs dominate the informal sector in South Africa (Balogun et al., 2016). SMEs in South Africa have grown significantly, as has GDP per SME, since 2007 (Nanziri & Wamalwa, 2021). However, SMEs' contributions to the economy in that country are lower than in other emerging economies like India, China, and Mexico (Nanziri & Wamalwa, 2021).

The South African Government has set up a "National Strategy Sustainable Development" framework to combat the deficiency in SMEs' progress. However, this project failed because of a shortage of credit accessibility (Balogun et al., 2016). In South Africa, large firms have greater access to finance than SMEs (Nanziri & Wamalwa, 2021). For instance, SMEs receive about 20% of credit from Banks, while large firms receive more financing (Nanziri & Wamalwa, 2021). Sub-Saharan Africa has witnessed notable economic growth recently, with a yearly mean growth rate of 3.5% between 2010 and 2019. This growth has been primarily attributed to unstainable natural resource extractions, not SME growth (He et al., 2024). The African continent's economic growth is projected to accelerate to 4.1% in 2024, driven by robust domestic demand, increasing global trade ties, and not SME growth (He et al., 2024). These developments accompany a youthful and increasingly educated population (He et al., 2024).

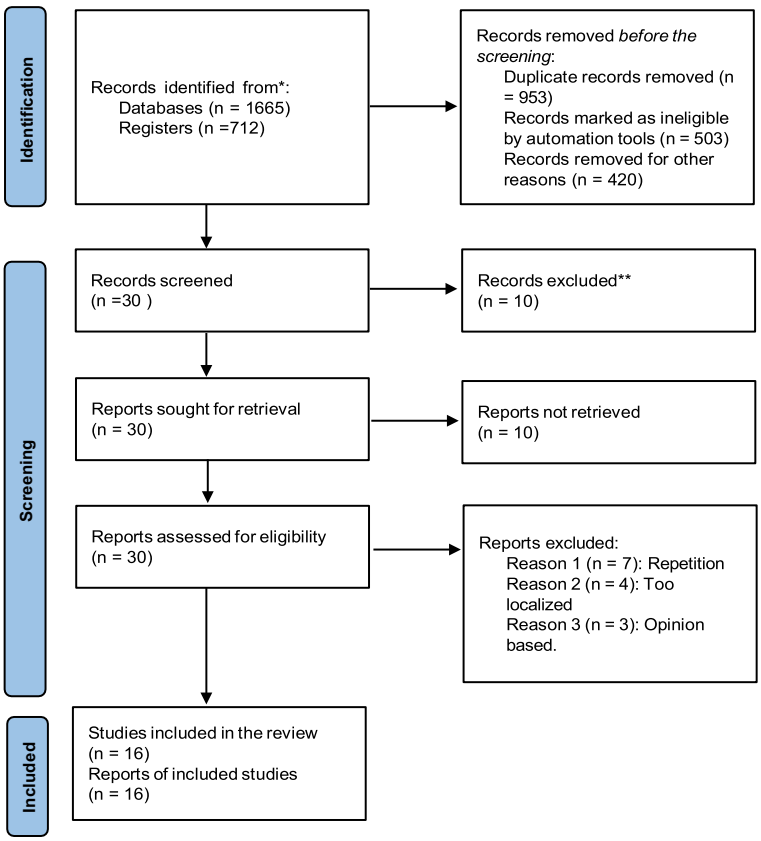
Some of those studies have been executed in a few countries or one single country without emphasizing the economic unity of the entire continent. This paper examines the determinants of success and failure in Africa's SME sector.

Methodology

This systematic literature review is based on intensive searches in databases such as Elsevier, Emerald, IGI Global, Google Scholar, Business Source Complete, etc., focusing on research that illuminates the determinants of success and failure in African countries' SME sector. We used PPRISMA - Preferred Reporting Items for Systematic Reviews and Meta-Analyses -to generate and analyze the relevant literature. PRISMA is a qualitative research analysis technique used to report the results of a systematic literature review. Additionally, it is a powerful instrument to perform textual analysis of minimal papers selected after a systematic literature review. In our study, we used it as a methodology to identify the literature themes relevant to the objective of our study. PRISMA employs keywords to identify relevant articles from the literature. It uses keywords to search in publication databases like Emerald, Elsevier, IGI Global, Business Source Complete, etc. Also, the findings are screened using exclusion/inclusion criteria. Finally, it reports the outcomes based on full-text analysis.

The figure below summarizes the stages of our methodology process with the number of references screened, retained and rejected at each stage.

Figure 1 Identification of study sources via databases



PRISMA's primary objective corresponds to the approach described in this study. The main advantage of PRISMA is that the researchers concentrate their efforts and energy on reading a small number of articles contributing directly to their study. The risk of excessively reading unrelated articles to the research objective is reduced (Hendricks & Mwapwele, 2023). Adopting PRISMA allows for identifying publications related to this study's research question and objective. The transparency of the PRISMA facilitates the analysis and processing of the full-text publications available in the literature. A sample of search criteria included the following:

A: Search mode	Find All my Search Terms and Within the Full Text of Articles
B: Results Limit	Full Text and Peer Reviewed
C: Document-type	Articles, Case Studies, Company Reports, Conference Papers, Corrected Articles, Historical Material, Industry Overviews, Journal Articles, Market Research reports, Conference Proceedings, Research Reports, and Working Papers.
D: Industry Code	Articles on Several Companies
E: Publication date	January 2000 to January 2025
F: Publication Type	Academic Journal, Database, Country Report, Government Document,
G: Language	French, English

Limitations

Though indirect through PRIMA, our systematic sampling has indeed omitted some good references. By design, this study has no intention to be exhaustive. As such, the scope of its methodological design excludes any pretension to generalisability.

Results

The factors in Table 1 were found in the systematic literature review and full-text analysis of publications related to this study's objective. Synthesizing different studies and their interpretation allowed the findings to be summarized in three dimensions: success factors, failure factors, and key failure factors.

Table 1. Determinants of Africa's SMEs' success and failure

Factors of Success	Factors of Failure	Key Factors of Failure
Natural resources	Shortage of Credit and Finance Accessibility	Multiple official languages
Fast-growing population	Power outages	Multiple currencies
Widespread use of mobile phones	Political Instability, Violence, and Fraudulent Elections	Adoption of Western countries' culture
The rapid increase in their labour force	Lack of capital	Tariff restrictions because of multiple borders
The youthful and increasingly educated population	Lack of democracy	Dependence on Western countries' economies
Entrepreneurial and technological innovation motivation of the youthful population	Lack of education	
	Misinterpretation of religions	
	Misappropriation of Western country's culture	
	Lack of technological infrastructure.	

Some studies that PRISMA does not identify suggest other success and failure factors. For example, Abdulai and Hussain (2023) found that the existence of an entrepreneurship ecosystem fostering the development of human capital, venture capital, infrastructure, and an intentional support system is likely to contribute to the success of SMEs.

Another source of factors that our systematic sampling left out is provided by the study of Chakuzira, W., Okoche, J. M. M., & Mkansi, M. (2024). The nine categories of their entrepreneurship typology contain valuable contingent factors that may lead to success or failure. The generalizability of these factors to the entire African continent, just like other factors we identify in this article, is up for an informative debate.

Conclusion

This research used a systematic literature review to determine the factors contributing to the success and failure of Africa's SMEs' growth, leading to economic prosperity.
A literature review based on SME's thematic evaluation was conducted following PRISMA guidelines. The findings consist of 6 success factors, nine failure factors, and five key factors of failure related to SMEs' contributions to Africa's sustainable development and economic and financial stability. Key failure factors include multiple official and foreign languages, multiple currencies, adoption of Western countries' culture, tariff restrictions because of multiple borders, and dependence on Western countries' economies. The continent's unity becomes crucial and indispensable for poverty reduction and industrialization.

This research is one of the first to criticize the heteroclite studies of SME problems on the continent. Instead of analyzing the problem from a micro perspective, the issues must be illustrated from a macro perspective, considering the continent as a whole and united politically and economically.

The findings of this study also have practical implications for Africa’s governments and the United Africa organization. These entities should consider the conclusion of this study in their SMEs’ growth and development policies and decisions. African governments and public organizations should adopt this research to facilitate their analysis and planning of future SME development. They can also anticipate the continent’s unemployment rate, economic recession, and financial success. African governments must streamline costs and manage tax revenues to survive inflation. Promoting SME growth is one solution because it presents Africa's many cost-saving and revenue-generating opportunities**.**

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DO TRANSNATIONAL MIGRANTS STEAL JOBS? EXPLORING NATIVE AND TRANSNATIONAL MIGRANT ARTISAN ENTREPRENEURS EMBEDDED IN GHANA

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Abstract

Purpose: This study investigates and compares the entrepreneurial activities of native and transnational migrant artisan entrepreneurs in Ghana, aiming to determine if migrant artisans displace job opportunities for their Ghanaian counterparts.
Design/Methodology/Approach: Using a qualitative approach and drawing on phenomenology, the study explores the experiences of both groups through face-to-face interviews with 20 native and 12 migrant artisan entrepreneurs.
Findings: The findings reveal that transnational migrants demonstrate notable qualities like grit, entrepreneurial alertness, innovation, customer centricity, and effective networking. Despite concerns about their impact on local artisans, the study suggests a nuanced perspective.
Originality: The study contributes to the entrepreneurship literature by offering a comparative analysis of native and migrant artisan entrepreneurship, addressing job displacement concerns, and providing insights into the dynamics of the Ghanaian artisan sub-sector.
Practical implications: The study enriches our understanding of entrepreneurial dynamics within this sub-sector and serves as a foundation for future research on informal entrepreneurship, migration, and economic development in Sub-Saharan Africa. The findings offer valuable insights for policymakers, practitioners (Artisans), and researchers aiming to foster inclusive and sustainable entrepreneurial ecosystems.

Keywords: Artisan entrepreneurship, Informal entrepreneurship, Developing economy, Qualitative study

Introduction

The emerging field of transnational entrepreneurship, situated within the broader context of migrant entrepreneurship, has gained scholarly attention due to factors like international migration and globalization (Dabić et al., 2020; Duan et al., 2021; Adom & Ackom, 2024). However, existing research predominantly focuses on migrants from developed economies, leaving a gap in understanding the nuances of migrant entrepreneurs in developing countries like Ghana (Hamid & Everett, 2021; Indarti et al., 2020; Urban et al., 2024). Recognizing the importance of transnationalism in immigrant entrepreneurship, this study explores the specific context of artisan entrepreneurship in Africa, particularly in Ghana, where artisans play a pivotal role in socio-economic development (Acheampong et al., 2022; Pret & Cogan, 2019).

Artisan entrepreneurship in Africa contributes significantly to tourism, entrepreneurial activities, and overall economic development (Acheampong et al., 2022). However, the conceptualization of artisan entrepreneurship has been largely limited to the production of cultural products, focusing on traditional crafts (Dalal, Bhattacharya, & Chattopadhyay, 2024) with some scholars viewing it as a connection between business opportunities and an individual's talent, circumstances, lifestyle and personal context (Mousa et al., 2024). This study aims to broaden this understanding by encompassing a diverse cohort of artisans. Following Tweneboah-Koduah and Adusei (2016), and Acheampong et al.(2022), this study describes artisan entrepreneurs as individuals engaged in activities such as masonry, paintings, arts, weaved cloth, carpentry, furniture works, earth work like pottery, cane work like basket, metal works, dress making, hair making, shoe or sandals making, plumbing, goldsmith, brass smith, carving, drum making, False ceiling designing and others; extending beyond the conventional tourism-focused perspective (Tweneboah-Koduah & Adusei, 2016; Bakas et al., 2019).

Artisan entrepreneurs in Africa, often involved in small-scale informal activities, in most cases acquire their skills through apprenticeship (Acheampong et al., 2022; Tweneboah-Koduah & Adusei, 2016). Despite their significant contribution to the informal sector and the economy (Gyimah, Appiah & Lussier, 2020), comprehensive studies on artisan entrepreneurship, especially involving transnational migrants, are lacking. Furthermore, in the last two decades, global migration has surged, reaching an estimated 272 million migrants worldwide according to the International Organization for Migration (IOM report, 2020). The effective integration of immigrants, particularly those engaged in transnational commercial activities like artisan entrepreneurship, has become a key concern for policymakers (Ashourizadeh et al., 2020; Naudé et al., 2017, 2021; Nkongolo-Bakenda & Chrysostome, 2020). This study, therefore underscores the need for further studies to inform policy initiatives that promote the harmonious coexistence of native and transnational migrant artisans and support the growth of artisan entrepreneurship in the region (Acheampong et al., 2022; Tweneboah-Koduah & Adusei, 2016 ; Adom & Ackom, 2024).

Artisan entrepreneurship holds immense importance for the African economy, contributing significantly to economic development (Acheampong et al., 2022; Pret & Cogan, 2019). However, tensions between native and transnational migrant artisans have emerged in some African countries, leading to grievances and, in some cases, xenophobic attacks (Mamabolo, 2015; Kotey et al., 2021b; Muñoz-Castro et al., 2019). This study focuses on the situation in Ghana, where transnational migrant artisans are perceived as a threat to their Ghanaian

counterparts, echoing similar sentiments in Nigeria and South Africa (Antwi-Boateng & Akudugu, 2020; Bosiakoh, 2020).

The study proposes that, beyond individual-level characteristics, contextual social and institutional factors within the entrepreneurial ecosystem may contribute to the success of transnational migrant artisan entrepreneurs in Ghana. The concept of dual-embeddedness in both home and host countries, along with associated social and business networks, has been suggested to provide a competitive edge to transnational migrants (Honig, 2020; Kokotsaki et al., 2014). Nevertheless, challenges like accessing resources and overcoming language barriers are expected to give native artisans business advantage over their transnational counterparts (Solano, 2020). Despite these considerations, grievances persist among native artisans who feel their jobs are being "stolen" by transnational migrant entrepreneurs (Antwi-Boateng & Akudugu, 2020).

The study aims to address the neglect of artisanal entrepreneurs in the discourse on immigrant entrepreneurship and transnationalism, particularly within the African context. It seeks to explore the skills, competences, life trajectories, and entrepreneurial experiences of both native and transnational migrant artisans in Ghana, contributing to the understanding of informal, artisan, and immigrant entrepreneurship in Africa. Specifically, the study seeks to answer the following research questions: **RQ1.** What industry norms and practices are perceived by native and transnational migrant artisan entrepreneurs to present opportunities for entrepreneurial success within their embedded context; Ghana? **RQ2.** How do native and transnational migrant artisan entrepreneurs create or exploit entrepreneurial opportunities within their embedded setting in Ghana? **RQ3.** What motivations and aspirations are pursued by native and transnational migrant artisan entrepreneurs embedded in Ghana?

This study makes modest but very important contributions; First, it addresses the question of whether transnational migrant entrepreneurs "steal jobs" and contributes to limited research on this topic in developing economies like Ghana. Second, the study broadens the theoretical application of transnationalism and migrant entrepreneurship beyond developed countries, extending empirical relevance to emerging nations. As an emerging sub-field, the study enhances our understanding of the entrepreneurial characteristics of transnational migrant entrepreneurs operating within a resource constraint context. It explores how these entrepreneurs create business opportunities and navigate industry norms in Ghana's developing economy, providing new insights into transnational practices that would influence native counterparts through knowledge transfer and entrepreneurial skills.

Moreover, the study contributes to the legitimation of artisanal entrepreneurship as a research field, recognizing its importance as a significant source of employment in Ghana's informal sector. The influence of culture and tradition on entrepreneurial practices offers fresh insights into social and human capital among entrepreneurs operating in the informal sector. Overall, the study contributes to understanding the coexistence and entrepreneurial activities of native and transnational migrant artisan entrepreneurs in a developing economy, providing recommendations for policymakers and suggesting ways for native artisans to enhance competitiveness in the job market

The organization of this paper is as follows. The subsequent section offers a concise summary of theories related to informal and artisan entrepreneurship, along with a review of existing literature examining the expressions and significance of context in entrepreneurship studies,

particularly in the involvement of transnational migrant artisan entrepreneurs. The paper then outlines the methodology used, followed by the presentation of empirical findings. The study is concluded with a discussion of the findings and their contributions.

Literature Review

Theoretical setting- The discovery and creation theory of entrepreneurship

This study is underpinned by the discovery and creation theories of entrepreneurship (Alvarez & Barney, 2011). Artisanal entrepreneurship, as defined by Acheampong et al. (2022), and Tweneboah-Koduah and Adusei (2016), centers primarily on skill acquisition through apprenticeship. However, this study argues that not all individuals possessing these acquired skills align with the categorization of entrepreneurs, as posited by both creation and discovery theories.

The Theory of Entrepreneurial Opportunity Discovery suggests that entrepreneurs aim to identify and capitalize on opportunities arising from external changes in technology, politics, or demographics. The theory assumes that these opportunities exist objectively, waiting to be discovered. Entrepreneurs, labeled as 'discovery entrepreneurs,' are thought to possess distinct attributes such as alertness, which allows them to recognize and exploit these opportunities.

On the other hand, The Theory of Entrepreneurial Opportunity Creation offers an alternative perspective. Creation theory posits that opportunities are not pre-existing but are instead generated by entrepreneurs through their actions and interactions with the market. In this view, entrepreneurs, termed 'creation entrepreneurs,' do not passively wait for external shocks but actively shape opportunities. Creation theory emphasizes a path-dependent process where small initial differences in decisions can lead to significant variations over time.

While discovery theory assumes that entrepreneurs are inherently different from non-entrepreneurs, creation theory is more flexible, suggesting that even minor differences or luck can lead individuals to form and exploit opportunities. Creation entrepreneurs may start with indistinguishable attributes but can develop significant differences over time due to the entrepreneurial path they take. Over all, discovery theory focuses on finding pre-existing opportunities resulting from external changes, while creation theory emphasizes the active role of entrepreneurs in generating opportunities through their actions and interactions

Entrepreneurship and the Informal Economy.

The informal economy, a global phenomenon, is particularly prevalent in Africa, offering opportunities to vulnerable groups such as the poorest households, women, and youth (Mahadea & Zogli, 2022). Despite its importance in economic development and employment generation, the informal sector has received less attention from mainstream entrepreneurship and management scholarship (Igwe et al., 2020; Ram et al., 2017). Global governments acknowledge that small businesses in both developed and developing economies significantly contribute to economic growth, job creation, social cohesion, and overall development (Gyimah & Lussier, 2021; Gyimah et al., 2020). In sub-Saharan Africa, the informal sector constitutes approximately 66% of the total labor force, with Ghana's informal sector employing about 86% of its workforce, contributing 42% to GDP (Mahadea & Zogli, 2022). The informal economy plays a crucial role in providing livelihoods for households, particularly in small-scale operations,

alleviating poverty and unemployment (Peprah et al., 2019; Gyimah & Lussier, 2021; Gyimah et al., 2020).

Informality in Ghana serves as a reaction and adaptive livelihood strategy for transnational migrants and urban dwellers, allowing them to exploit entrepreneurial opportunities and make a living (Akuoko et al., 2021). Informal entrepreneurial activities exhibit characteristics such as being unregulated, competitive, often relying on informal skills, family-owned, small-scale, and labor-intensive with adaptive technology (Mahadea & Zogli, 2022). These activities are often unregistered, lack social protection, and involve fewer than five employees (Igwe et al., 2020).

The informal sector's survival is influenced by both formal and informal institutional contexts, with self-employment serving as a last resort for marginalized workers seeking to evade regulatory costs or simply lack of formal employement (Ram et al., 2017). Economic survival in the informal sector is linked to strong family, neighborhood, cultural bonds, and social networks (Petersen and Charman, 2018). A significant proportion of employed individuals in Sub-Saharan Africa are engaged in vulnerable forms of employment, with many informal entrepreneurial activities categorized as 'necessity entrepreneurship,' driven by push factors rather than identified business opportunities (ILO, 2015; Igwe et al., 2020). However, debates exist regarding whether the informal sector is purely opportunity-driven or necessity-driven (Akuoko et al., 2021).

Contrary to the past perception of the informal economy as 'hidden' or 'black,' it is now recognized as a permanent and important aspect of urban life globally (Akuoko et al., 2021). The sector's continued growth and significant contribution to the GDP of developing economies, such as Ghana, highlight its importance and warrant scholarly attention. In this context, the current study focuses on informal entrepreneurship within the informal economy.

Migrants and Artisan entrepreneurship

The term "migrant" is defined in various ways, encompassing individuals who move from one place to another in search of jobs or improved welfare conditions, often crossing borders (Moffitt and Juang, 2019; Counts, 2017). The definition may also consider foreign birth, citizenship, or movement into a new country, either temporarily or long term, influenced by specific migration laws, policies, and reasons for migrating (Counts, 2017; Dabić et al., 2020). Dabić et al. (2020) emphasize that migrants generally seek opportunities, and migration is often perceived as an entrepreneurial event triggered by push and pull factors.

Migration is a global phenomenon occurring in both developed and developing economies, viewed as a process that fosters entrepreneurship (Dabić et al., 2020; Shneikat & Alrawadieh, 2019). Migrants bring skill sets, experiences, ambitions, motivations, and expectations to their host countries, where conditions may prompt them to start businesses. The challenges they face in their host countries, such as discrimination in labor markets, contribute to the necessity for migrants to become entrepreneurs (Dabić et al., 2020; Mago, 2020). Migrants are characterized by a balanced skill set acquired during their adjustment to external host country conditions, preparing them for successful entrepreneurial ventures (Mago, 2020; Huggins & Thompson, 2016; Thompson, 2009).

Migration, considered an ancient phenomenon, is prevalent in modern Africa, involving movement from developing to developed countries or within African countries seeking economic prospects (Gebresellasie, 1993; Mago, 2020). Transnational migration, common in Africa, includes movement between countries particularly in search of employment. In some African countries like South Africa, migrants face obstacles due to labor market discrimination, leading them to engage in entrepreneurship as an alternative to formal employment (Gebresellasie, 1993; Mago, 2020). The study underscores the entrepreneurial endeavors of transnational migrants in response to challenges in seeking traditional employment opportunities.

Entrepreneurial opportunity

The study addresses the evolving concept of entrepreneurial opportunity within entrepreneurship research. It acknowledges a shift from identifying individuals aspiring to become entrepreneurs toward understanding how enterprising individuals create or exploit valuable opportunities (Eckhardt & Shane, 2003; Shane, 2000). However, George et al. (2016) argue that the literature on entrepreneurial opportunity is fragmented and empirically underdeveloped, often considered ancillary.

To explore how native and transnational migrant artisans in Ghana create or exploit entrepreneurial opportunities, the study reviews the entrepreneurial opportunity literature, aiming to uncover nuances and theoretical foundations. Shane & Venkataraman (2000) define entrepreneurship as the examination of how opportunities to create future goods and services are discovered, evaluated, and exploited. George et al. (2016) conceptualize entrepreneurial opportunities as positive circumstances leading to entrepreneurial action, encompassing innovative combinations of resources. Entrepreneurial opportunities arise from changes in the operating environment, creating disequilibrium exploitable by individuals (Cohen and Winn, 2007). The study delves into the recognition and exploitation abilities of native and transnational migrant artisan entrepreneurs, exploring factors such as social and human capital, individual traits, and alertness that influence opportunity recognition.

Artisan entrepreneurship in Ghana necessitates continuous discovery and creation of opportunities, particularly for service providers. The study examines the life and business trajectories of native and transnational migrant artisans to identify influencing factors in discovering or creating business opportunities. The nature of artisan entrepreneurship particularly in Ghana emphasizes the importance of continuous opportunity scouting. The literature has explored how entrepreneurs use prior knowledge, institutional characteristics, and resource configurations to discover and exploit entrepreneurial opportunities(Canavati et al., 2021; Fairlie & Fossen, 2020; Hamid & Senik, 2020; Lundberg & Rehnfors, 2018; von Bloh et al., 2020). Additionally, studies highlight how new technologies encourage entrepreneurial ventures and value creation through innovation spillovers (Ahuja & Lampert, 2001; Audretsch et al., 2022; Delgado et al., 2010; George et al., 2016). The study investigates the strategies employed by native and transnational migrant artisans in discovering or creating opportunities.

The review identifies three implicitly held views of entrepreneurial opportunity, all considering opportunities as conditions promising profit potential. However, each view attributes different sources of change, suggesting varied strategies for opportunity discovery and exploitation. The

study proposes that the strategies adopted by artisan entrepreneurs depend on how they perceive entrepreneurial opportunities.

Methodology

The context of the study-Ghana

The context for this current study is Ghana; a developing economy. Ghana is a West African nation situated along the Gulf of Guinea on about 23.9 million hectares of land. The country shares borders with other West African countries such as Côte d'voire to the west, Togo to the east, Burkina Faso to the north, and the Atlantic Ocean to the south. The country has sixteen (16) regions, namely, Greater Accra, Eastern, Western, Western North, Oti, Volta, Ashanti, Bono, Bono East, Ahafo, Savannah, North East, Northern, Upper East, and the Upper West regions. The country has sixteen corresponding administrative regional capitals (Accra, Koforidua, Secondi Takoradi, Sewfi Wiawso, Dambai, Ho, Sunyani, Techiman, Goaso, Damango, Nalerigu, Tamale, Wa and Bolgatanga with Accra as the national capital (Ghana Statistical Services, 2021). According to a census conducted by the Ghana Statistical Service, the country is estimated to have a population of about 33.5 million people. The Greater Accra and Ashanti regions are considered the most populous regions of the country accounting for about six million inhabitants (Ghana Statistical Services, 2021).

The migration history of Ghana and to a larger extent Africa is replete with emigration episodes to developed economies like America and Europe (Awumbila & Owusu, 2014). While Ghana and the rest of Africa experienced a significant level of emigration in the time past, today, Ghana witnesses a net migration particularly from neighboring African countries (Antwi-Bosiakoh, 2009; Awumbila et al., 2017; Quartey & Bosiakoh, 2008). There is a far larger population of migrants from across the globe and particularly the West African sub-region who cross national boundaries to Ghana than the number of Ghanaians who are involved in long distance travels to other African countries (Awumbila et al., 2017; Bosiakoh, 2020). The irony though is that while some Ghanaians emigrate to America and Europe in search of greener pastures, other countries particularly neighboring west African countries see Ghana as a safe haven (Antwi Bosiakoh, 2019; Essuman-Johnson, 2006). Here, reference is made to for instance, migrants from Togo, Mali, Niger, Ivory Coast, and others like Nigeria and Liberia. In recent times, the integration of migrants into the local economy has attracted the attention of scholars and Government alike. Thus, providing justification for the current study in Ghana.

Study design

The study employed an inductive qualitative methodology (Edmondson and McManus, 2007; Eisenhardt, 1989; Mousa & Avolio, 2024) and incorporated narrative interviews as part of the study design (Elliott, 2005). This methodology facilitates an in-depth exploration of a specific phenomenon, employing creative approaches to generate and analyze empirical data. As noted by Hlady-Rispal and Jouison-Laffitte (2014), this approach serves as a valuable tool to describe, interpret, and enhance the comprehension of interconnected historical, current, or future diverse data.

The use of narrative methodology has gained prominence in entrepreneurship research (Corner et al., 2017; Singh et al., 2015), offering the capability to capture the contextual richness of the studied phenomena (Hlady-Rispal and Jouison-Laffitte, 2014). Narratives enable the

transformation of entrepreneurs' everyday experiences into meaningful stories that do not merely accept or reject 'reality' but seek to shape and imbue it with significance (Gabriel, 2000). Through the narratives of native and transnational migrant artisan entrepreneurs, this study successfully documented the sequence of events that respondents navigated while operating in Ghana's informal sector. These contextual experiences were crucial in understanding the impact on business opportunity creation and exploitation within the informal sector.
The present research was carried out in Kumasi and Sunyani in the Ashanti and Bono regions of Ghana respectively, which also serve as regional capitals and vibrant economic hubs. These cities have a cosmopolitan character, attracting a significant number of foreigners, including individuals from neighboring countries such as Togo, Côte d'Ivoire, Nigeria, Niger and others. Additionally, cities across Ghana, in general, serve as central locations for artisan activities.

Sampling procedure and sample size

To address the identified research gaps, the study employed a purposive sampling strategy in conjunction with a snowball sampling technique (Pratt, 2009; Mousa & Avolio, 2024). A total of 32 artisan entrepreneurs, aged between 25 and 50 years old, were engaged in the study, representing migrants from four (4) African countries; Togo, Nigeria, Cote Devoir, and Niger, and natives from Ghana. Twenty (20) native artisan entrepreneurs were purposively selected for the study mainly by visiting their workplaces on their sites or shops (Business locations). The selection of transnational migrant artisan participants followed a snowball approach (Patton, 1990; Pratt, 2009), with the initial identification of potential participants being based on the contact details from shops where they normally buy raw materials for their crafts. Following this, 12 individuals consented to participate in the interviews. The researcher made initial contacts with few individuals (n=3) who agreed to be part of the study who then made recommendations for others to be contacted. In some cases, respondents were visited in their homes as some of them do not have brick and mortar business locations. Following the qualitative sample size determination convention, the sample size for the current study was determined by the saturation of the data collected. As such, no new information would have been added should the sample size be increased (Adom & Ackom, 2024; Boddy, 2016). Also, worthy of note is the possible sampling bias typically associated with non-probability sampling methods.

Data Collection
Data collection for this study involved the use of semi-structured interview schedules designed to elicit detailed narratives on the migration, lived and entrepreneurial experiences of the artisan entrepreneurs. The fieldwork for data generation occurred between March 2022 and July 2022. Each interview, conducted either in English or Akan (a popular Ghanaian language) languages based on respondents' preference, lasted between 45 and 90 minutes. The narratives followed an individual course, encompassing the respondent's life journey from home country to entrepreneurship, with a focus on their migration experiences in Ghana.
Each narrative delved into the significance of professional skill development in the lives of the respondents, as well as the role of informal institutions; that is, industry norms and practices, either facilitating or constraining their entrepreneurial activities, their motivations and aspirations, and the various strategies employed to create or exploit entrepreneurial opportunities in Ghana. Respondents also shared insights into their participation in informal training or apprenticeship and the acquisition of tacit knowledge necessary for survival through compatriots

or co-ethnics. The interviews, which were recorded, were later transcribed, resulting in 142 pages of single-spaced generated data. The conversational nature of the interviews provided a profound understanding of contextual practices (Steyaert and Katz, 2004) and a comprehensive insight into how entrepreneurship is perceived and conducted by each respondent in their respective study sites (Steyaert and Bouwen, 1997). Background information, country of origin, and business types of the respondents are detailed in **Table I.**

Table 1: Summary of respondents: Native and Transnational Migrant Artisan Entrepreneurs

No.	Name of Respondent (Coded)	Type of Business	Gender of Respondent	Home Country	Level of Education
1	Kofi Amoako	P O P	Male	Ghana	JHS
2	Yaw Quansah	P O P	Male	Ghana	SHS
3	Micheal Anim	Carpentry	Male	Ghana	JHS
4	Yaya Haruna	Carpentry	Male	Ghana	JHS
5	Christian Kofi	Masonry	Male	Ghana	Degree
6	Adu Gyimah	Masonry	Male	Ghana	SHS
7	Yaw Buabeng	Tilling	Male	Ghana	Diploma
8	Eric Nyarko	Painting	Male	Ghana	JSS
9	Edem Delali	Aluminum Fabricator	Male	Ghana	SHS
10	Akurugu Aloah	Welding	Male	Ghana	MSLC
11	Forgive Akowua	Masonry	Male	Ghana	JHS
12	Ebenezer sakyi	Wall Designer	Male	Ghana	SHS
13	Blessing sogah	Stone laying	Male	Ghana	JHS
14	Kofi Obeng	Masonry	Male	Ghana	JHS
15	Agbenyo Micheal	Masonry	Male	Ghana	Degree
16	Kwame Kumah	Tilling	Male	Ghana	SHS
17	Owusu kwame	Tilling	Male	Ghana	Diploma
18	Kwabena Brother	Aluminum Fabricator	Male	Ghana	JSS
19	Kofi Yirenkyi	Welding	Male	Ghana	SHS
20	Kwame Kumah	Masonry	Male	Ghana	MSLC
21	Bismark Akoli	Masonry	Male	Togo	JHS
22	Mohamed Awudu	Painting	Male	Cote Devoir	SHS
23	Ahiagbe Enoch	Tilling	Male	Togo	JHS
24	Mawuli edem	P O P	Male	Togo	JSH
25	Selasi Agbogli	P O P	Male	Togo	BASIC
26	Prosper Hato	Stone layer	Male	Togo	JSH
27	Okonko Ike	Carpentry	Male	Nigeria	SHS
28	Christain Emeka	Masonry	Male	Nigeria	SHS
29	Owu Daniel	Masonry	Male	Niger	N/A
30	Oku Mohamed	Tilling	Male	Cote Devoir	N/A
31	Forgive Koklota	Painting	Male	Niger	JHS
32	Emeka Ekechuku	Aluminum Fabricator	Male	Nigeria	N/A

Source: Authors, 2023

Data Analysis

The data analysis process for both native and transnational migrant artisan entrepreneurs began with the reading and re-reading of interview transcripts. Afterwards, a systematic coding was undertaken with the aid of Nvivo 11. In all, about 800 codes were created. The coding process occasioned the development of seven themes for transnational migrant artisan entrepreneurs and six themes for native artisan entrepreneurs. To confirm and ensure themes were meaningful and well-grounded in the data set from the artisan entrepreneurs, they were reviewed. The review process entailed going through memos and the data set to check each interview transcript with the artisan entrepreneurs and the code extracts that were formed which form the basis of the developed themes. This review analysis process ensured validity of themes as a result of familiarity with the data sources. It again ensured that vital meanings of themes were developed. To explore deeper meanings, a number of sub-themes were developed from each theme. The purpose was to illustrate the importance of the meanings carried by these themes to the artisan entrepreneurs in their lived life trajectories and entrepreneurial experiences in Ghana by way of their perceptions.

Ethical considerations

Ethical considerations were diligently addressed throughout the research process. Prior to initiating the study, ethical approval (clearance number: HuSSREC/AP/80/VOL.1) was obtained from the research ethics committee of the involved institution; Kwame Nkrumah University of Science and Technology, Kumasi, Ghana. To ensure voluntary participation, participants were requested to sign an informed consent form. Stringent measures were implemented to safeguard confidentiality and anonymity. In this regard, pseudonyms were employed to protect participants' identities. Additionally, participants were explicitly informed about their right to withdraw from the interview at any point if they experienced any form of discomfort.

Findings and Discussions

Industry norms and practices among artisan entrepreneurs embedded in Ghana

The current study reveals the various informal industry norms and practices perceived by both native and transnational migrant artisan entrepreneurs as key drivers of entrepreneurial success within their embedded context in Ghana. The study explores the insights shared by these entrepreneurs, shedding light on their practices and how they percieve those practices to influence their entrepreneurial successes.

The findings of this research reveal a multifaceted array of informal industry norms and practices that both native and transnational migrant artisan entrepreneurs are engaged in or consider as instrumental in creating opportunities for entrepreneurial success. These informal industry norms and practices provide a framework within which these entrepreneurs operate and thrive in Ghana. Key sub-themes or issues that emerged from the data analysis include trust-based relationships, traditional norms and customs, community support, and shared cultural practices (Alonso & Bressan, 2017; Antwi-Bosiakoh & Obeng, 2021a; Huang et al., 2017; Murnieks et al., 2020; Szkudlarek & Wu, 2018).

Firstly, the importance of trust-based relationships emerges as a central element in the success of artisan entrepreneurs. Native and transnational migrant artisans highlighted the significance of establishing and maintaining trustworthy connections with customers, suppliers, and fellow artisans. Trust is viewed as a foundation for conducting business transactions, facilitating access

to resources, and expanding their clientele through word-of-mouth referrals. Both groups of entrepreneurs acknowledged that the Ghanaian society places a high premium on trust, and the ability to build such trust is considered a significant factor in gaining a competitive advantage. Some participants shared their story;

"*Because of how I do my work, I have people abroad who give me money to work on their buildings for them, I buy the materials, do the work, and send them pictures of the work I have done for them. Sometimes I send them vidoes too. And they recommend me to their friends and family members…"*

"*Some of the customers are difficult but we try to manage our relationship with them. I try to do what they want for them so that they will call me again or tell their friends and family about me. that is how I create more job opportunities. Even though I use facebook where I have pictures of my work, somes customers will still demand to see my work physically. And I sometimes take them to the sites where I have completed works there for them to see. Through that they get to trust me and give me jobs"*

Secondly, traditional norms and customs play a pivotal role in shaping the entrepreneurial landscape for particularly native artisans. These customs, often deeply embedded in Ghanaian culture, guide the conduct of business activities and interactions within their embedded community. Native artisans highlighted the importance of adhering to customary practices in customer engagement, pricing, and conflict resolution. Some native artisans had this to say;

"*When I was passing out from my apprenticeship, my master told me that people use Juju in the industry so I should be very careful in my work. He advised me not to take other artisans' job else they will cures me or use juju to attack me spiritually'*

'*If you give me a job which has been started already, I must call the one who started the job and find out why he abandoned it. He must give me the go ahead before I can continue. If I don't ask for explainantion and permission I can be cursed by him and I can fall from the roof of a building and die'*

Similarly, transnational migrant artisans emphasized the value of integrating themselves into local customs and traditions to gain acceptance and build rapport with their customers. Understanding and respecting these traditional norms were perceived as critical for achieving long-term success.

Furthermore, the study reveals that community support is an indispensable aspect of entrepreneurial success for both native and transnational migrant artisans. Within the close-knit artisan community, mutual assistance and collaborations are seen as essential for overcoming challenges and seizing opportunities. Native artisans spoke of the benefits of receiving support from experienced colleagues during peak seasons,

'*the nature of our job is such that we have low and peak seasons. There are times that one can get a lot of jobs within the same period, when that happens , you have to call other masons you know to help you finish the job within schedule'*

while transnational migrant artisans relied on the guidance and mentorship of their fellow compatriots who had established themselves in Ghana's entrepreneurial ecosystem. The sense of

solidarity and collective problem-solving fostered among the artisans strengthens their entrepreneurial pursuits.

Opportunity creation and Exploitation among artisan entrepreneurs embedded in Ghana. The findings of this study revealed a distinction between the approaches taken by these two groups, shedding light on their entrepreneurial characteristics and behaviors. The study findings indicate that transnational migrant artisan entrepreneurs can be described as creative entrepreneurs. They demonstrate an aggressive approach in forming and exploiting entrepreneurial opportunities, leveraging superior customer relationships, entrepreneurial cognition, and grit. Their proactive mindset and resourcefulness enable them to identify and seize opportunities, contributing to their entrepreneurial success. Participants narrated their stories this way;

"*I also look for new designs from the internet. Some customers are interested in new things, some of them can even make you destroy an entire work if they feel it is not nice. I also look out for the new designs that other artisans do when I go to site ".*

"I write my contact on the walls of the buildings I work on, when ever I finish the job. So that if someone comes there to see the work and he likes my work and he or she is interested, he can call me for business".

Conversely, the native artisan entrepreneurs exhibit a different pattern of behavior. They can largely be characterized as discovery entrepreneurs, driven primarily by necessity and immediate needs. Collaboration plays a significant role for them, as they often seek job opportunities through cooperative efforts. This finding aligns with the discovery and creation theories of entrepreneurship.

According to the creation theory (Journal et al., 2007; Mcmullen et al., 2007; Venkataraman, 2019), opportunities are not assumed to be objective phenomena resulting from external shocks to an industry or market. Instead, entrepreneurs actively create opportunities through their actions, reactions, and experimentation with new product or service ideas. The creation entrepreneur observes how consumers and markets respond and adjust their strategies accordingly.(Alvarez & Barney, 2011) Prior to the creation of an opportunity, its links with existing industries or markets are unknown (Journal et al., 2007).

On the other hand, the discovery theory suggests that opportunities may already exist, but individuals must possess the necessary skills and acumen to recognize and exploit them. This differentiation between entrepreneurs and non-entrepreneurs lies in their ability to perceive and act upon opportunities. Entrepreneurs who successfully discover opportunities demonstrate distinct capabilities in identifying and capitalizing on them (Journal et al., 2007; Mcmullen et al., 2007; Venkataraman, 2019). Thus, even among the native artisan entrepreneurs those with the profesional skills and the ability to identify job opportunites could be described as entreprenures in this regard.

"I started leaning mason work when I was in school, each time after school and on vacation I follow the masons for casual jobs (by-day); after completing school I deceided to learn it well and now I am on my own. It has teken me about six years to learn from when I started the by-day job".

The findings of this study contribute to our understanding of how native and transnational migrant artisan entrepreneurs navigate the entrepreneurial landscape in Ghana. The identification of creative and discovery entrepreneurship highlights the diverse strategies employed by these entrepreneurs in exploiting or creating opportunities within their embedded context.

Motivations and aspirations pursued by artisan entrepreneurs embedded in Ghana

Question three of the study investigates the diverse goals pursued by native and transnational migrant artisan entrepreneurs within the Ghanaian context. It is argued that, entrepreneurial goals; motivations and aspirations impact entrepreneurial opportunity discovery and/or exploitation (Locke & Baum, 2014; Murnieks et al., 2020). The findings shed light on the range of aspirations, motivations, and objectives that drive their entrepreneurial activities, offering insights into their individual and collective aspirations and the underlying factors.

Transnational migrant artisan entrepreneurs display a strong determination to achieve their life and entrepreneurial goals, and aspirations; which include seeking opportunities in Ghana and establishing and growing their trade. Their motivation stems from the desire to improve their socioeconomic status and create a better future for themselves and their families, the study revealed (Crawford-Garrett, 2018). These entrepreneurs often leave their home countries and migrate to Ghana in search of better economic prospects (Postigo et al., 2021). Despite facing challenges such as language barriers, cultural adaptation, and limited access to resources, they exhibit resilience and a relentless pursuit of their entrepreneurial goals. They leverage their grit to navigate unfamiliar environments, overcome adversity, and capitalize on opportunities that align with their aspirations (Angu, 2019; Laure Sandoz et al., 2021). Some participant explained it this way;

"*I came to Ghana through a friend, we were three when we came, we didn't have money to rent a room and my boss's room could not accommodate all of us, so we were living and sleeping on site. For several months we were living on site, from one site to the other until I started making some money. Even the basic tools I use for work it took some time before I purchased them. I came to Ghana empty handed, hoping for a better life someday"*

"*As I said , we stay on site and in most cases the site are far from the town like you can see, so we have to manage and cut down cost, the main cost are food and transportation. So we buy rice and other things and cook on site so that we can survive and also make some money. We need to save some money".*

In contrast, native artisan entrepreneurs, mostly driven by job necessity, exhibit a different motivational profile. The study revealed that, their entry into entrepreneurship is primarily motivated by limited options in the labour market and/or the need for livelihood (Fairlie & Fossen, 2020; Zwan et al., 2016). Their focus largely lies more in securing a source of income and meeting immediate needs rather than pursuing long-term business growth or ambitious goals. At best migrating to europe or other developed nations becomes their ultimate aspirations rather than business growth.

"*I completed senior high school, I wanted to continue my education to the tertiary level but my parents could not afford the school fees so I followed masons for 'by day' work to feed my self and also save money to further my education. But I eventually lost interest in the education.*

So I enrolled as an apprentice and learnt the mason work. If I get the opportunity I may travel outside the country to europe to work there"

"I have a university diploma, I used to follow the masons and do 'by day' work on vacations even when I was schooling. I thought after school I could get formal employment and stop the mason work but there are no jobs in the system (Ghana). I spent two years in vein chasing formal jobs. My parents don't do any meaninful work, they do subsistence farming, so I said to myself, why don't I also learn the mason work well and be on my own. You know in Ghana is who you know"

On the other hand, the entrepreneurial activities of transnational migrant artisans to a large extent were found to be primarily driven by opportunities (Puente et al., 2019; Sendra-Pons et al., 2022). Equipped with their professional skills, these entrepreneurs actively seek job opportunities in Ghana to leverage their expertise (Antwi-Boateng & Akudugu, 2020; Antwi Bosiakoh, 2020). Even when ready-made job avenues are not readily available, transnational migrant artisans proactively create opportunities using modern technologies such as Facebook and WhatsApp and unconventional methods like writing of contacts on the walls of uncompleted buildings. These platforms enable them to showcase their products or services, expand their reach, and connect with potential customers. Additionally, transnational migrant artisans emphasized the importance of building and maintaining strong customer relationships, recognizing the value of word-of-mouth advertising and business referrals (Guerola-Navarro et al., 2022).

The distinction between the goals pursued by native and transnational migrant entrepreneurs becomes evident when examining their mindsets and approaches to growth. Transnational migrant artisans demonstrate a growth-oriented mindset, constantly seeking opportunities for expansion and development (Antwi-Bosiakoh, 2019). They actively leverage technological tools and employ customer-centric strategies to enhance their business prospects. In contrast, majority of native artisan entrepreneurs often lack a growth mindset, which impacts their ability to build strong customer relationships and embrace customer-centric practices.

These differing motivations and approaches can be attributed to several factors. Native artisan entrepreneurs, operating within the constraints of limited job options, are primarily driven by the need for income generation and survival (Akuoko et al., 2021; Peprah et al., 2019). Consequently, their focus is on self-employment rather than business growth. Conversely, transnational migrant artisans arrive in Ghana with specific skill sets and intentions to seize entrepreneurial opportunities. Their mindset, shaped by their migration experiences, encourages them to actively seek and create business prospects, utilizing both traditional and modern methods (Sandoz, 2021) as indicated above.

Theoretical Implications

This study sits at the intersection of informal, transnational, and artisanal entrepreneurship, focusing on transnational migrant and native artisan entrepreneurs in Ghana. It addresses a gap in the knowledge on transnational migrant and artisanal entrepreneurship in developing nations (Bosiakoh & Obeng, 2021a; Brzozowski et al., 2017; Dabić et al., 2020; Pekkala Kerr & Kerr, 2020), particularly in Africa, contributing to the understanding of south-south migration and entrepreneurship (Bosiakoh & Obeng, 2021a).

The study expands the geographical context of transnationalism and migrant entrepreneurship to a developing country setting, which has been primarily focused on developed countries (Bosiakoh & Obeng, 2021a). Research on black African immigrant entrepreneurship in Africa is limited, making this study a significant contribution to extant literature (Afolabi et al., 2015; Chen & Fan, 2022; Mago, 2020; Naidu, 2018; Nzima et al., 2017; Rogerson, 2018; Rogerson & Mushawemhuka, 2015; Solano, 2020; Zheng & Gao, 2020).

Also, the study contributes to the legitimization of artisanal entrepreneurship as a research field, emphasizing its significance in the informal sector in Ghana and Africa (Steel, 1979; Tweneboah-Koduah & Adusei, 2016). It reveals how culture and tradition influence entrepreneurial practices, such as using co-ethnics to fill labour gaps, which is economically and pragmatically significant (Antwi Bosiakoh, 2020; Antwi Bosiakoh & Williams Tetteh, 2019).

Practical Implications

This study underscores the importance of knowledge for artisan entrepreneurs. Successful entrepreneurs must deeply understand their market and networks, socio-cultural context, and customer preferences, enabling them to make informed decisions and adapt their businesses. Investing in acquiring and applying this knowledge would enhance entrepreneurial success chances.

The study also highlights the role of cognition in the informal sector and for that matter artisan entrepreneurship. Entrepreneurial cognition involves learning about the host community's culture and market (Baron & Ensley, 2006; Middermann, 2020). Thus, artisan entrepreneurs should engage in continuous learning about market changes, innovative designs, and processes. Proactively acquiring knowledge and utilizing networking resources would contribute to their competitiveness and entrepreneurial success.

Also, collaboration and network ties emerged as crucial resources for managing peak seasons. Both native and transnational artisan entrepreneurs rely on their networks to handle peak and off periods effectively, emphasizing the importance of strong interpersonal relationships. Therefore artisans should strive to build and maintain social and human connections to provide support, knowledge sharing, and resource pooling.

Policy Implications

The promotion of entrepreneurship is crucial for addressing unemployment and stimulating economic growth in Ghana (Atarah et al., 2019; Bamfo, 2017; Bosiakoh & Obeng, 2021a; Mago, 2020). The study's findings have significant policy implications for the government and policymakers, particularly regarding youth employment, economic growth, and regional integration. Transnational migrant artisan entrepreneurs in Ghana demonstrate proactive knowledge acquisition and opportunity creation. They use technology to expand their clientele and rely on networks for business support. Policymakers should promote access to knowledge, technological advancement, and business network strengthening to support entrepreneurial success in the informal sector.

Strengthening formal institutions can help formalize Ghana's economy. The study highlights the apprehension some transnational migrant entrepreneurs face due to immigration documentation issues. Enforcing immigration laws can facilitate migrants' participation in Ghana's

entrepreneurial landscape. Measures should also be put in place to attract migrants with strong entrepreneurial skills and job creation potential.

Enhancing the competitiveness of Ghanaian artisans, both locally and globally, is essential. This can be achieved through targeted training programs and gradual formalization of the economy by interested NGOs and the Government respectively. Training in customer relations, contract management, modern equipment uses, and communication can empower artisans to build sustainable enterprises and transition to formal businesses. Formalizing the economy can standardize practices and incorporate modern technology in the informal sector.

Limitations and Suggestions for Future Research

This study offers valuable insights for policy formulation and practice. However, some limitations should be noted. These limitations do not invalidate the study but suggest areas for further research. Firstly, the qualitative methodology used (semi-structured interviews and qualitative data analysis) has inherent limitations. For example, the non-probability sampling methods (Purposive and Snowball) employed may present sampling bias. Also, the reliance on data from two cities in Ghana; that is, Kumasi and Sunyani may limit the generalizability of the findings to other contexts.

Secondly, the focus on the construction industry in Ghana, which employs many migrants with limited formal education and low capital, may introduce sector-specific characteristics. Again, all participants were male, reflecting the male-dominated nature of the construction sector in Ghana. Therefore, the study lacks a gendered perspective and may not reflect the experiences of female artisan entrepreneurs. Lastly, the study did not explore the influence of formal institutions on entrepreneurial activities, which is significant in developing countries like Ghana with comparatively weak formal institutions. These factors could either engender or hinder entrepreneurship in various ways.

Despite these limitations, the study presents several intriguing avenues for future research. Some themes identified could be explored using quantitative methods. For instance, the role of formal and informal institutions on artisan entrepreneurship within the informal sector warrants further investigation. Future studies could also address the current study's urban focus and lack of gender perspective. Studies in rural areas or comparative analyses between rural and urban settings would offer a more comprehensive understanding of artisan entrepreneurship in Ghana. Examining both male and female artisan entrepreneurs could reveal how gender influences their experiences. Suggest longitudinal studies to explore the evolution of business strategies (in a long-term

Conclusion

The study aimed to address tensions between native and transnational migrant artisan entrepreneurs in Ghana, examining whether the latter "steal" jobs from the former. Native artisans were found to emphasize collaboration, job necessity, and traditionalism, leveraging collective resources in their entrepreneurial activities but limiting growth potential (Kotey et al., 2021b; Mamabolo, 2015). In contrast, transnational migrant artisans exhibit grit, focus on customer relationships, create job opportunities for themselves, and demonstrate entrepreneurial cognition (Alvarez & Barney, 2011; Companys & McMullen, 2007). The study observed that the

informal sector, particularly the construction sub-sector of Ghana is ripe with a lot of opportunities.

However, from the view point of the creation and discovery theories of entrepreneurship, the possession of artisanal skills alone does not define an entrepreneur; an entrepreneurial mindset and opportunity identification or creation acumen are considered crucial (Venkataraman, 2019). Thus, the creation and discovery theories emphasis entrepreneurial skills that enables the creation of entrepreneurial opportunities or the identification of existing opportunities. Also, differences in goals and approaches highlight distinct mindsets and strategies. Transnational migrant artisans prioritize customer relationships, innovation, and technology use which makes them more competitive (Alvarez & Barney, 2011), challenging the notion that they "steal" jobs. Their entrepreneurial qualities contribute to success and customer attraction within the competitive informal sector (Companys & McMullen, 2007; Venkataraman, 2019).

Conflict of Interest Statement:
The authors declare that there is no conflict of interest in relation to the publication of this study. The researchers received no funding support for the current study.

Data Availability Statement
The data set associated with this current study is available upon reasonable request from the corresponding author; Justice Boateng Dankwah. Justice can be contacted via jboatengdankwah@yahoo.com or justice.dankwah@uenr.edu.gh

Author (s) Contribution Statement

Justice Boateng Dankwah contributed to the conception and design of the study. Justice wrote the introduction to the study, the literature review section, and also collected and organized the data and performed the analysis. The discussion section was also written by Justice. The review of the draft manuscript, revising it critically for intellectual content; and the final approval of the version to be published were undertaken by Bylon Abeeku Bamfo and Justice Boateng Dankwah. Both authors significantly contributed to different aspects of the research process.

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ENHANCING NIGERIAN ENTREPRENEUR DIGITAL FINANCIAL INCLUSION: A PATHWAY TO SUSTAINABLE DEVELOPMENT

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Abstract

The advent of digital financial services has transformed the global financial ecosystem, offering opportunities for economic growth, especially in developing economies. In Nigeria, digital financial inclusion for entrepreneurs is vital to achieving sustainable development. This paper explores the barriers that limit Nigerian entrepreneurs' access to digital financial services and proposes strategies to enhance inclusion. Entrepreneurs can overcome these barriers by leveraging digital innovations and strategic policy interventions, thereby contributing to economic resilience and advancing the achievement of the Sustainable Development Goals (SDGs). Through a critical analysis of existing literature and policy frameworks, the paper highlights the transformative potential of digital financial inclusion as a pathway to sustainable development. Entrepreneurs require financial tools like credit, payment systems, and savings platforms to start, grow, and sustain their businesses. Digital financial inclusion offers solutions through mobile money, digital wallets, and online credit systems that are accessible, efficient, and cost-effective. Despite these advancements, Nigerian entrepreneurs face challenges such as inadequate infrastructure, low financial literacy, bureaucratic/restrictive regulatory frameworks, and cybersecurity risks. These issues aggregate the digital divide, disproportionately affecting women and rural entrepreneurs and limiting their ability to contribute meaningfully to economic growth and poverty alleviation. This paper analyses secondary data to explore the current state of digital financial inclusion among Nigerian entrepreneurs, identify their challenges, and propose strategic pathways to enhance their inclusion. Key findings indicate that poor internet penetration, high transaction costs, and a lack of trust in digital platforms deter widespread adoption. The paper concludes by suggesting that digital financial inclusion is a cornerstone for entrepreneurial success and a critical pathway to achieving sustainable development in Nigeria.

Keywords: Economic growth, financial literacy, fintech, inclusive growth, MSMEs, SDGs

Introduction

Digital financial inclusion refers to the use of digital financial services to provide financial access to underserved and unbanked populations. Demirgüç-Kunt et al. (2022) defined Digital financial inclusion as accessing and using affordable financial products and services through digital platforms, which has emerged as a global critical driver of economic growth and development. In Nigeria, a significant portion of the population remains financially excluded, with entrepreneurs facing unique challenges in accessing financial services. This paper aims to explore the role of digital financial inclusion in enhancing the capabilities of Nigerian entrepreneurs and its potential impact on sustainable development. Fostering digital financial inclusion is particularly significant for Nigeria, Africa's largest economy, given the country's dynamic entrepreneurial ecosystem. With over 39 million micro, small, and medium-sized enterprises (MSMEs) accounting for approximately 48% of the national GDP and employing more than 80% of the workforce (National Bureau of Statistics, 2020), entrepreneurs play a pivotal role in driving economic transformation.

Despite their importance, Nigerian entrepreneurs face systemic challenges that hinder their growth and sustainability. The most critical barrier is a lack of affordable and efficient financial services. Traditional banking systems, characterized by high transaction costs, rigid loan requirements, and limited branch networks, have excluded a significant portion of the population from the financial ecosystem. This exclusion disproportionately affects rural entrepreneurs and women, further entrenching socio-economic disparities (EFInA, 2020). Nigerian entrepreneurs face significant barriers to digital financial inclusion, including inadequate digital infrastructure, limited financial literacy, and restrictive regulatory frameworks. These challenges hinder their ability to leverage digital financial services for business growth, thereby limiting broader economic development. Addressing these challenges is essential for advancing sustainable development in Nigeria, particularly in achieving Poverty alleviation, promoting Economic Growth and development, and providing Industry, Innovation, and Infrastructure.

With its large and youthful population, Nigeria presents a significant opportunity for digital financial inclusion. Despite advancements in financial technology (FinTech), many Nigerian entrepreneurs still struggle to access essential financial services. Factors such as low financial literacy, inadequate digital infrastructure, and regulatory challenges hinder the widespread adoption of digital financial services (Nkechika, 2022). Digital financial inclusion has emerged as a transformative driver of economic growth, poverty alleviation, and promoting sustainable development in emerging economies where traditional financial services are often inaccessible. It involves providing affordable and accessible financial services through digital platforms, including mobile money, digital wallets, and online banking. These services have become indispensable tools for fostering entrepreneurship, reducing socio-economic disparities, and promoting sustainable development.

Digital financial inclusion offers a promising solution to these challenges; by leveraging mobile technology, online platforms, and fintech innovations, entrepreneurs can access financial tools that enhance their ability to manage operations, secure funding, and expand into new markets. For instance, mobile money platforms such as Paga and Opay in Nigeria allow entrepreneurs to conduct seamless transactions and access microloans, while digital wallets enable secure

savings and payments. These services are particularly transformative in rural and underserved regions where traditional financial institutions are scarce (Aker and Mbiti, 2019).

Despite its potential, Nigeria's progress in digital financial inclusion has been slow and uneven. As of 2020, only 45% of Nigerian adults were financially included, with urban areas experiencing higher adoption rates than rural regions (EFInA, 2020). For entrepreneurs, the barriers to digital financial inclusion include inadequate infrastructure, high costs of digital services, low levels of digital and financial literacy, and a lack of trust in digital platforms. Furthermore, socio-cultural norms and gender biases disproportionately marginalize women entrepreneurs, restricting their access to the resources needed for business growth (World Bank, 2022). These systemic barriers hinder entrepreneurial development and impede Nigeria's progress toward achieving the Sustainable Development Goals (SDGs). Digital financial inclusion is crucial to achieving several Sustainable Development Goals (SDGs), including reducing poverty, promoting gender equality, and fostering innovation and economic growth. Addressing these barriers is, therefore, essential to unlocking the full potential of Nigerian entrepreneurs and fostering inclusive economic growth.

This study explores the role of digital financial inclusion in enhancing entrepreneurial growth and advancing sustainable development in Nigeria. The focus is on identifying the key barriers to digital financial inclusion faced by Nigerian entrepreneurs, evaluating the impact of digital financial inclusion on entrepreneurial success and resilience, analyzing the alignment of financial inclusion initiatives with Nigeria's Sustainable Development Agenda, and proposing actionable strategies to overcome systemic challenges and foster inclusive growth.

This study makes a significant contribution to the discourse on financial inclusion and sustainable development by examining the Nigerian context. It offers valuable insights for policymakers, financial institutions, fintech innovators, and development practitioners seeking to enhance entrepreneurs' access to financial services. The study aims to promote inclusive economic growth and support Nigeria's progress toward achieving the Sustainable Development Goals (SDGs) by addressing systemic challenges and proposing targeted interventions. Moreover, it underscores the transformative potential of digital financial inclusion as a pathway to reducing poverty, promoting gender equality, and fostering innovation and industrial growth.

Literature Review

Digital financial inclusion has garnered global attention as a transformative approach to fostering economic growth and reducing inequality. According to Demirgüç-Kunt et al. (2022), digital financial services encompass mobile banking, digital wallets, online payment platforms, and other technology-driven financial innovations that enable underserved populations to access affordable financial services. These services play a crucial role in promoting financial inclusion, which, in turn, supports entrepreneurship, job creation, and poverty alleviation.

Numerous studies highlight the intersection between digital financial inclusion and entrepreneurship. For instance, Beck et al. (2018) argue that financial access is a prerequisite for entrepreneurial development, as it facilitates access to credit, savings, and insurance. In sub-Saharan Africa, digital financial inclusion has been shown to enhance business performance and resilience, particularly among micro, small, and medium enterprises (MSMEs) (Aker & Mbiti, 2019). However, in Nigeria, significant gaps remain in leveraging

digital financial services for entrepreneurial growth due to systemic barriers such as inadequate infrastructure, socio-cultural factors, and policy limitations.

The nexus between digital financial inclusion and sustainable development is also well-documented. Initiatives promoting financial inclusion are directly linked to achieving several Sustainable Development Goals (SDGs) (World Bank, 2022). Despite these potential benefits, the Nigerian context presents unique challenges that require localized solutions. By synthesizing existing literature, this paper seeks to identify actionable strategies for addressing these barriers and enhancing the role of digital financial inclusion in Nigeria's entrepreneurial landscape.

Overview of Digital Financial Services

Nigeria has witnessed significant growth in digital financial services over the past decade, driven by advancements in mobile technology and the proliferation of fintech companies. As of 2021, the country boasted over 140 million mobile subscribers, with a substantial portion using mobile money services (Nigerian Communications Commission, 2022). Fintech startups, such as Paystack, Flutterwave, and Paga, have played a pivotal role in driving innovation, offering solutions that cater to individuals and businesses across the socio-economic spectrum. Despite these advancements, the country's financial inclusion rate remains suboptimal. According to the Enhancing Financial Innovation and Access (EFInA) report (2020), only 45% of Nigerian adults are financially included, with significant disparities between urban and rural areas. Entrepreneurs, particularly those in informal sectors, face significant obstacles in accessing digital financial services, which limit their ability to scale and sustain their businesses.

Entrepreneurs play a pivotal role in economic development, particularly in Nigeria, where micro, small, and medium-sized enterprises (MSMEs) contribute approximately 48% to the nation's GDP and employ over 80% of the workforce (National Bureau of Statistics, 2020). Despite their economic significance, these enterprises face barriers to growth, with limited access to credit, savings, and efficient payment systems being among the most significant challenges. Traditional banking systems often exclude entrepreneurs due to high transaction costs, stringent lending requirements, and limited geographical coverage.

Digital financial inclusion provides entrepreneurs with access to mobile money, digital wallets, and online credit platforms, offering solutions that enhance their financial capabilities. These tools enable secure transactions, improve cash flow management, and open new markets. For example, mobile payment systems enable entrepreneurs to accept digital payments, thereby reducing their reliance on cash and enhancing business efficiency (Aker & Mbiti, 2019). However, the potential of these technologies remains underutilized in Nigeria due to persistent barriers.

Conceptual Framework of Digital Financial Inclusion for Nigerian Entrepreneurs

Digital financial inclusion involves the use of technology to deliver financial services to previously underserved or unbanked populations. It includes services such as mobile money, digital payments, online lending, and digital savings. In Nigeria, these services have the potential to address significant gaps in the entrepreneurial ecosystem, especially for micro,

small, and medium enterprises (MSMEs). The country's entrepreneurial sector plays a critical role in job creation, poverty alleviation, and economic diversification. However, MSMEs face persistent challenges in accessing financial services, often limiting their growth potential. Digital financial services have undergone significant evolution, offering a range of products, including mobile banking, online payments, and digital loans. However, the adoption rate among Nigerian entrepreneurs remains low due to multiple barriers (Nkechika, 2022). By integrating digital financial tools, Nigerian entrepreneurs can overcome traditional banking barriers, such as the need for collateral, high interest rates, and geographic limitations. Through mobile wallets and digital platforms, entrepreneurs can access loans, make payments, and even save and invest—activities that can ultimately enhance their business sustainability and foster economic growth.

Global Trends in Digital Financial Inclusion

Globally, digital financial inclusion has seen significant growth, driven by the proliferation of mobile technologies and innovative fintech solutions. In sub-Saharan Africa, mobile money platforms, such as M-Pesa in Kenya, have revolutionized access to financial services, enabling millions to participate in the formal financial system. By 2021, over 70% of adults in Kenya used mobile money services, compared to less than 10% a decade earlier (World Bank, 2022). Mobile money services have expanded access to financial services, particularly in rural areas where traditional banks are scarce. The region is home to half of the world's mobile money accounts, underscoring the critical role of digital platforms in bridging financial inclusion gaps (GSMA, 2021). However, challenges such as inadequate infrastructure, low digital literacy, and restrictive regulations persist, limiting the full potential of digital financial inclusion. Addressing these barriers requires a concerted effort from governments, financial institutions, and development partners. Other successful models include India's Aadhaar-Linked Financial Services**:** The Aadhaar biometric identification system has facilitated direct benefit transfers, reducing leakages and increasing financial access for millions and China's Digital Payment Ecosystem: Platforms such as Alipay and WeChat Pay have revolutionized the financial landscape, integrating payment, lending, and investment services into a single application. These examples illustrate the transformative potential of digital financial inclusion in enhancing financial access, fostering entrepreneurship, and driving economic growth.

The Role of Digital Financial Inclusion and Financial Services in Nigerian Entrepreneurship

The Nigerian entrepreneurial landscape is diverse and dynamic, with a mix of small businesses, informal enterprises, and emerging startups. However, a common obstacle for Nigerian entrepreneurs is access to financial resources. According to the National Bureau of Statistics (2020), approximately 40% of Nigerian MSMEs cite access to finance as their primary constraint to growth. Digital financial inclusion is crucial in overcoming this barrier, offering innovative solutions to entrepreneurs, particularly those in rural areas or with limited access to traditional banking services. Digital financial services (DFS) have undergone significant evolution over the past decade, offering a range of products including mobile banking, online payments, and digital loans. These services aim to bring unserved and underserved populations into the formal financial sector. In Nigeria, the adoption of DFS has been driven by the need to address financial exclusion, which remains a significant challenge. Despite the rapid growth of the digital financial ecosystem, many Nigerians, particularly in rural areas, still face barriers to

accessing these services due to affordability and poor user experience. However, the adoption rate among Nigerian entrepreneurs remains low due to various barriers (Nkechika, 2022). The Central Bank of Nigeria (CBN) highlights that many Nigerians are hesitant to adopt digital financial services due to concerns about security and privacy

Key benefits of digital financial inclusion for Nigerian entrepreneurs include:

Access to Credit and Microfinance**:** Traditional financial institutions often reject MSME loan applications due to a lack of collateral, inadequate financial history, or high perceived risk. Digital financial platforms such as Carbon, Branch, and FairMoney have introduced accessible micro-lending services, enabling entrepreneurs to obtain short-term loans. These platforms use alternative data sources, such as mobile phone usage and social media activity, to assess creditworthiness, significantly lowering barriers to credit access (Oluwaseun & Raji, 2021).

Digital Payments and Market Integration**:** Entrepreneurs in Nigeria's informal sector typically operate in cash-based economies, which limits their ability to engage in larger-scale commercial activities or access global markets. Digital payment platforms like Paga, Opay, and Kuda Bank have revolutionized transactions for Nigerian businesses. By allowing instant, secure, and cashless payments, these platforms help entrepreneurs streamline their business operations, reduce transaction costs, and improve efficiency.

Savings and Investment**:** Digital financial services offer entrepreneurs access to previously inaccessible digital savings accounts and investment tools. Services such as Cowrywise and Rise enable users to save and invest directly from their mobile phones, promoting disciplined savings among Nigerian entrepreneurs who often face unpredictable cash flows.

Barriers to Digital Financial Inclusion for Nigerian Entrepreneurs

The Central Bank of Nigeria (CBN) reports that many Nigerians are hesitant to adopt digital financial services due to concerns about security and privacy, levels of financial literacy, lack of trust in digital platforms, and regulatory challenges. Additionally, the high cost of internet access and digital devices further exacerbates the digital divide, particularly in rural and low-income areas. Despite the evident benefits of digital financial inclusion, Nigerian entrepreneurs face numerous barriers to fully benefiting from these digital financial services. Addressing these barriers is crucial to enhancing digital financial access:

Digital Infrastructure Deficiencies: Nigeria's digital infrastructure is not uniformly distributed, particularly in rural areas. According to the National Communications Commission (2020), while urban areas are relatively well-covered, rural areas continue to face significant challenges in accessing internet and mobile networks. This infrastructure gap restricts entrepreneurs' access to digital financial services and hinders their ability to perform essential activities, such as mobile payments and digital lending.

*Low Digital Literacy and Financial Literacy***:** Digital financial inclusion relies on entrepreneurs' ability to navigate digital tools effectively. In Nigeria, digital literacy remains a significant barrier. Many entrepreneurs, particularly in rural areas, lack the necessary skills to use digital platforms for financial activities such as mobile banking, e-wallets, and online lending. Similarly, a lack of financial literacy limits entrepreneurs'

ability to make informed financial decisions, hindering their ability to effectively benefit from digital financial services (EFInA, 2020).

Regulatory and Policy Challenges: Nigeria's fintech ecosystem operates within an evolving regulatory framework, which can create uncertainty for both service providers and users. Unclear or inconsistent regulations surrounding digital financial services, such as mobile money or peer-to-peer lending, can lead to regulatory inefficiencies and a lack of trust. The Central Bank of Nigeria (CBN) has made significant strides in establishing a framework for mobile payments and digital banking. Still, policy inconsistency and gaps remain, which can hinder investment in the fintech sector (Oluwaseun & Raji, 2021).

Gender and Cultural Constraints: Women entrepreneurs in Nigeria face additional challenges regarding digital financial inclusion. In many parts of Nigeria, cultural and social norms limit women's autonomy over financial matters. Due to lower financial literacy rates and systemic biases, women are less likely to own mobile phones, engage in digital banking, or access financial resources. According to the World Bank (2022), gender disparities in financial access continue to limit women's full participation in the entrepreneurial ecosystem.

Cybersecurity and Trust Issues: Cybersecurity concerns are a critical issue in Nigeria's digital financial ecosystem. Fraud, identity theft, and hacking incidents often deter entrepreneurs from adopting digital financial services. Entrepreneurs in Nigeria may be hesitant to use online banking or digital payment systems due to the risk of financial loss, especially in a country with a high incidence of cybercrime (Central Bank of Nigeria, 2021).

The Impact of Digital Financial Inclusion on Entrepreneurial Success in Nigeria

Digital financial inclusion has a direct impact on the success and sustainability of Nigerian entrepreneurs, particularly by addressing financial exclusion and providing tools for economic resilience. Aker and Mbiti (2019) found that the adoption of mobile money in East Africa significantly improved financial resilience, enabling entrepreneurs to access liquidity during times of need. Similar benefits can be anticipated for Nigerian entrepreneurs if they overcome the barriers to digital financial inclusion.

Digital financial inclusion has the potential to significantly impact entrepreneurship in Nigeria. By providing entrepreneurs with access to financial services such as credit, savings, and insurance, DFS can help them manage risks, invest in their businesses, and drive economic growth. Studies have shown that increased access to digital financial services can lead to higher levels of entrepreneurial activity and job creation, contributing to sustainable development.

Key impacts include:

Improved Financial Management and Operational Efficiency: Digital platforms enable entrepreneurs to track their finances in real-time, facilitating better cash flow management and informed operational planning. Monitoring income and expenditure using mobile banking apps, digital wallets, and other financial tools enables entrepreneurs to make informed decisions and enhance business outcomes.

Growth and Market Expansion: Digital payment systems and e-commerce platforms allow Nigerian entrepreneurs to scale their businesses beyond traditional local markets. Entrepreneurs can access national and even global markets by utilizing platforms like Jumia, Konga, and Facebook. This broader market reach is particularly crucial in Nigeria's diverse and rapidly expanding consumer base.

Increased Access to Resilience-Building Financial Products: Digital financial services offer a range of products, including insurance, pensions, and savings accounts, that enable businesses to manage risks effectively. For example, MSMEs can use digital tools to invest in insurance products that protect against business disruptions caused by unforeseen events such as natural disasters or economic shocks.

Key Gaps in the Literature

Despite growing research on digital financial inclusion globally and in sub-Saharan Africa, significant gaps remain in the literature, particularly concerning Nigerian entrepreneurs. These gaps include:

Understanding the Full Impact of Digital Financial Tools on Business Growth: While digital financial inclusion has been shown to improve access to credit and streamline payments, studies focusing specifically on the long-term impact on the sustainability and profitability of Nigerian entrepreneurs are scarce.

Gender-Specific Financial Inclusion Barriers: In-depth studies are lacking on the gender-specific challenges Nigerian women face in accessing digital financial services. Further research is needed to explore gender-specific barriers and solutions for women entrepreneurs in the Nigerian digital financial ecosystem.

Policy and Regulatory Analysis: Further research is needed to understand the impact of regulatory frameworks on the adoption and innovation of fintech solutions in Nigeria. This includes examining how regulations can be optimized to create a conducive environment for digital financial services.

Examining successful case studies from Nigeria and other comparable economies can provide valuable insights into best practices for enhancing digital financial inclusion. For example, mobile money services in Kenya, such as M-Pesa, have been widely successful in increasing financial inclusion and can serve as a model for similar initiatives in Nigeria. Additionally, partnerships between fintech companies and traditional financial institutions can help bridge the gap between digital and conventional banking services.

Theoretical Framework

The theoretical framework explores the intersection of digital financial inclusion, entrepreneurship, and sustainable development in Nigeria. Drawing on several prominent theories, the framework highlights how digital financial services (DFS) can empower Nigerian entrepreneurs and contribute to achieving the Sustainable Development Goals (SDGs). The integration of technology and inclusive finance is a key mechanism for driving

economic growth, reducing poverty, and fostering social inclusion. Below are some of these relevant theories:

*Technology Acceptance Model (TAM)***:** This model was developed by Davis (1989), postulates that perceived ease of use and perceived usefulness are the key factors influencing the adoption of new technologies. According to this model, if Nigerian entrepreneurs perceive digital financial services as valuable and easy to use, they are more likely to adopt them.

Innovation Diffusion Theory (IDT): This was developed by Rogers (2003), who suggested that the spread of new ideas is influenced by factors such as relative advantage, compatibility with existing values, simplicity, trialability, and observability. The theory emphasizes how innovations are adopted within a social system.

*Sustainable Development Theory (SDT***):** This is defined as balancing economic growth, social inclusion, and environmental sustainability. Sustainable development is seen as a process that meets the needs of the present without compromising the ability of future generations to meet their own needs (World Commission Report, 1987)

*Entrepreneurship Theory***:** This theory stresses the role of entrepreneurs as agents of change. Entrepreneurs drive economic growth through innovation, risk-taking, and the creation of new markets (Schumpeter, 1934),

*Financial Inclusion Theory***:** This theory emphasizes the need to reduce barriers to accessing formal financial systems for underserved populations by ensuring that individuals and businesses can access affordable financial products and services (Morduch, 1999).

Results and Discussion

The study leveraged a range of secondary data sources, including government reports, financial inclusion surveys, academic publications, and industry reports, to explore the state of digital financial inclusion for Nigerian entrepreneurs. Given that digital financial services (DFS) are a relatively new and rapidly evolving sector in Nigeria, secondary data provides a valuable opportunity to examine patterns, trends, and impacts that have already been documented by authoritative organizations, ensuring a rigorous and comprehensive approach to this paper. The data sources were from multiple reputable institutions, including government agencies, international organizations, and academic studies, to ensure the data were reliable and relevant to the research objectives. The data were analysed as follows:

Government Reports

Government reports provide vital insights into the state of digital financial inclusion and the regulatory landscape in Nigeria. Reports from the Central Bank of Nigeria (CBN), the National Bureau of Statistics (NBS), and other relevant bodies will be utilized to examine the policy framework for digital financial services and their penetration in the Nigerian market. Key reports from the CBN, such as the National Financial Inclusion Strategy (CBN, 2021), provide detailed accounts of the measures taken by the government to enhance financial inclusion, including the adoption of mobile money platforms, agent banking, and digital payment systems. The NBS, on the other hand, compiles data on financial access and usage across

different demographic groups, offering valuable information on the patterns of financial exclusion in the country (NBS, 2020). The EFInA Access to Financial Services in Nigeria survey provided valuable data on the financial behaviour of Nigerian entrepreneurs. It sheds light on how businesses interact with digital financial services and highlights barriers to access (EFInA, 2020). This report was instrumental in understanding the extent to which entrepreneurs utilize digital tools for payments, savings, and credit.

Academic Literature

Academic research is another critical source of secondary data. The literature on digital financial inclusion, especially in emerging economies like Nigeria, provides valuable insights into the challenges and opportunities faced by entrepreneurs in adopting digital financial services. A review of existing academic studies helped contextualize the findings of government reports and industry data within broader theoretical frameworks. Studies by Demirgüç-Kunt et al. (2022) and Oluwaseun & Raji (2021) provide empirical evidence on the relationship between financial inclusion and entrepreneurial growth in Nigeria. These studies investigate the role of digital financial tools in improving access to capital, facilitating cash flow management, and enabling market expansion. Demirgüç-Kunt et al. (2022) provide a global perspective on financial inclusion through the World Bank's Global Findex database, highlighting trends in digital payment systems, mobile money usage, and digital banking, which are directly relevant to Nigerian entrepreneurs. Additionally, Akpan & Etukudo (2018) discuss the challenges of digital finance adoption among small-scale entrepreneurs in Nigeria, particularly in rural and underserved areas. This scholarly work helped identify barriers that may not be evident in government reports, such as cultural factors, technological limitations, and the digital divide between urban and rural populations.

Industry Reports and Surveys

Industry reports from international development organizations, consulting firms, and fintech companies contributed valuable data sources. Reports from organizations like the World Bank, the International Finance Corporation (IFC), and Fintech associations explored the landscape of digital financial services in developing economies, focusing on their impact on entrepreneurship and small and medium-sized enterprises (SMEs). The World Bank's Digital Financial Services Report (2021) provided a comprehensive overview of Nigeria's digital financial services ecosystem, focusing on mobile money, blockchain technology, and digital credit innovations. These insights help to assess the current state of digital financial services and their applicability to Nigerian entrepreneurs. Similarly, EFInA and McKinsey & Company (2020) published insights into the adoption of digital payments and mobile banking in Nigeria, offering data on usage rates, market trends, and future projections for digital financial services in the country. These reports highlight the financial exclusion rates among Nigerian entrepreneurs and provide a contextual understanding of the barriers and potential for growth in digital financial inclusion.

Data Synthesis and Triangulation

The integration of government reports, academic literature, and industry data allows for data triangulation, enhancing the reliability and validity of the research findings (Denzin, 2012). By combining quantitative statistics with qualitative insights from various sources, the study offered a more comprehensive and nuanced understanding of the factors influencing digital

financial inclusion for Nigerian entrepreneurs. For example, government reports on financial inclusion highlighted a high level of mobile money usage in urban areas. In contrast, academic literature and industry reports highlighted challenges such as internet connectivity issues, limited digital literacy, or low trust in digital payment systems in rural areas. The convergence of findings from diverse sources will allow for a more accurate portrayal of the financial inclusion landscape in Nigeria.

Key Findings

This study explored the state of digital financial inclusion among Nigerian entrepreneurs and its potential as a pathway to sustainable development. Through the analysis of secondary data from government reports, academic literature, and industry surveys, several key insights were drawn. Digital financial inclusion in Nigeria has witnessed significant progress in recent years, driven by the adoption of mobile money, mobile banking, and digital payment systems. These technological innovations have notably increased access to financial services for Nigerian entrepreneurs, particularly in urban areas, fostering greater participation in the formal economy (CBN, 2021).

However, despite these advances, considerable barriers hinder entrepreneurs' full inclusion, especially in rural and underserved regions. Issues such as limited digital literacy, inadequate infrastructure, and a lack of trust in digital platforms impede the widespread adoption of digital financial services (Akpan & Etukudo, 2018). Moreover, the gap in access between urban and rural entrepreneurs is still pronounced, with many in rural areas lacking the necessary technological tools to take advantage of digital financial solutions. These disparities underscore the need for targeted policies and interventions to ensure that the benefits of digital financial inclusion are equitably distributed.

The findings also indicate that digital financial inclusion has the potential to significantly contribute to Nigeria's sustainable development by enhancing entrepreneurial activities. Digital tools such as mobile payments, digital credit, and savings platforms can provide entrepreneurs with improved access to working capital, facilitate easier transactions, and enable better financial management (Demirgüç-Kunt et al., 2022). These benefits can ultimately lead to greater business growth, job creation, and economic resilience, supporting broader national development objectives.

Implications for Policy and Practice

This study has several important implications for policy and practice. First, the Nigerian government must continue to prioritize digital financial inclusion as part of its broader financial inclusion strategy. The Central Bank of Nigeria (CBN) and other relevant agencies should expand their focus on financial literacy programs to equip entrepreneurs, particularly those in rural and underserved areas, with the knowledge and skills needed to navigate digital financial platforms effectively (EFInA, 2020). Policy efforts should also address infrastructure challenges, such as internet connectivity and mobile network coverage, which remain significant barriers to the adoption of digital financial services. Furthermore, private sector players, including fintech companies and commercial banks, have an important role to play in fostering an inclusive digital financial ecosystem. By designing user-friendly platforms tailored to the needs of small-scale entrepreneurs, these entities can help bridge the digital divide. Additionally, creating partnerships between the government and the private sector can facilitate

the development of affordable, scalable digital solutions that cater to a broader demographic of Nigerian entrepreneurs.

Contributions to Sustainable Development

Digital financial inclusion is an essential component of sustainable development in Nigeria. By improving access to capital, enhancing business efficiency, and reducing transactional barriers, digital financial services can directly support entrepreneurship, economic growth, and sustainable development. These improvements are vital in creating a more resilient and diversified economy, fostering job creation, and supporting economic diversification away from oil dependency. Moreover, the benefits of digital financial inclusion extend beyond economic growth. The broader social impact, particularly regarding gender equality and social inclusion, cannot be overstated. Providing women entrepreneurs and other marginalized groups access to digital financial services empowers them to participate fully in the economy, thus contributing to poverty alleviation and social equity. The study highlights the potential for digital entrepreneurship to contribute to broader national development goals in terms of economic growth and fostering inclusive growth and social cohesion. Digital tools enable entrepreneurs to overcome geographical and financial barriers that have traditionally limited their opportunities for success, making digital financial inclusion a critical enabler of Nigeria's long-term, inclusive, and sustainable development.

Limitations of the Study

Despite its contributions, this study has certain limitations. The reliance on secondary data means the research depended on existing datasets, which may not capture the most recent trends or nuances in digital financial inclusion. The bias inherited from the original data collection process, such as underreporting in certain areas, could not be eliminated (Vartanian, 2011). Moreover, secondary data may not accurately reflect the diverse experiences of entrepreneurs, particularly in remote or rural areas where digital infrastructure is underdeveloped. Additionally, the study could not directly examine primary data from entrepreneurs, which could have provided more detailed insights into their experiences with digital financial services, and in-depth insights into the life experiences of Nigerian entrepreneurs could not be covered.

Conclusion

In conclusion, digital financial inclusion represents a crucial pathway for enhancing Nigeria's entrepreneurial ecosystem, with significant implications for sustainable development. While substantial progress has been made in expanding access to digital financial services, ongoing barriers to adoption, particularly in rural areas, must be addressed through targeted policies, improved infrastructure, and financial literacy initiatives. The integration of digital financial tools into the entrepreneurial practices of Nigerian businesses holds the promise of driving inclusive economic growth, job creation, and poverty alleviation while contributing to the country's broader development goals. The findings of this study underscore the importance of government action and private sector innovation in creating a more inclusive digital financial ecosystem. To realize the full potential of digital financial inclusion, it is crucial to address the remaining challenges directly and ensure that all entrepreneurs, regardless of their location or background, can participate in and benefit from the digital economy.

Recommendations for Future Research

While this study offers valuable insights into the state of digital financial inclusion among Nigerian entrepreneurs, further research is necessary to explore specific areas in greater detail. Future studies could explore the impact of gender on the adoption of digital financial services, particularly in rural areas where traditional gender roles may affect entrepreneurial opportunities. Additionally, longitudinal studies examining the long-term effects of digital financial inclusion on entrepreneurial success and sustainability would offer valuable insights into the lasting impact of digital financial tools.

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FACTORS INFLUENCING THE ADOPTION OF PAYMENT TECHNOLOGIES IN THE INFORMAL SECTOR IN SOUTH AFRICA

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Abstract

Despite South Africa's rapid advancements in digital payment technologies like QR codes, Bluetooth, and NFC, cash remains king in the informal sector, driving 96% of transactions across 1.5 million traders. This study delves into the untapped potential of digital payments by exploring the lived experiences of informal traders and their customers in Johannesburg and Cape Town through 30 semi-structured interviews. The findings reveal a sector ready for transformation, with informal traders displaying openness to e-wallets and similar innovations. Yet, the dominant barrier to adoption is technology availability in the form of absence of relevant, accessible technologies, rather than technological resistance This study highlights a profound opportunity to revolutionize the informal economy through targeted innovations, infrastructure development, and strategic collaboration, paving the way for financial inclusion at scale.

Keywords: digital payments, e-wallet, informal sector, payment technology, technological availability.

Introduction

South Africa faces significant socio-economic challenges, including high unemployment and poverty, necessitating the growth of SMMEs to drive economic development. However, SMMEs in South Africa exhibit a high failure rate, hindering entrepreneurial participation (Littlewood & Holt, 2018; Masondo, Ntando, Mkhwanazi & Goldman, 2017). This failure is attributed to various factors, including limited access to funding, inadequate entrepreneurial education, and a lack of strategic flexibility in a rapidly changing competitive landscape (Bettis & Hitt, 1995).

Industry 4.0, characterized by the convergence of digital and physical spheres, presents a potential solution. While technological advancements are evident in South Africa, their integration into the informal sector remains limited (Ntimane, 2020). By leveraging Industry 4.0 technologies, SMMEs and particularly the informal sector can overcome traditional barriers to entry, enhance their competitiveness, and contribute significantly to South Africa's economic growth (Schwab, 2017).

The informal sector plays a crucial role in job creation, accounting for 60% of employment in developing economies (International Labour Organisation, 2018; Olawale & Garwe, 2010). While advancements in mobile payment technologies like QR codes and NFC have emerged (Kalan, 2016), cash remains dominant as a method of payment in South Africa accounting for 56% of all payments (South African Reserve Bank, 2024). MasterCard (2017) further adds that 96% of transactions in South Africa's informal sector are conducted in cash. This despite consumer interest in alternative payment methods. This study aims to investigate the factors hindering the adoption of payment technologies in the informal sector, recognizing that all businesses, regardless of size or formality, require payment processing (Klapper, Miller & Hess, 2019). Fatoki (2014) emphasized the need for technology-driven solutions to enhance operations, processes, and customer experience within the informal sector in South Africa.

Literature Review

A comprehensive review of the literature pertaining to the informal sector and payment technologies, with a specific focus on the South African context was conducted. Recent literature points to the role of digital technologies in the informal sector globally, particularly in their role in empowering and formalising the sector (Garcia-Murillo and Velez-Ospina, 2017; Hamdoun, 2020; Senyo et al, 2023). Despite this, relatively little exists to establish the role of ICT and digital technologies in South Africa’s informal economy, and specifically in relation to the adoption of payment technologies by informal traders as an alternative to cash-based transactions (Mabaso, 2023; Nthando, 2022). In attempting to unpack the factors influencing the adoption of payment technologies in South Africa's informal sector, the study adopts the Critical Theory of Technology as its theoretical framework (Kirkpatrick, 2018; Matthews, 2021). By examining how social and cultural factors influence the design and adoption of technologies, this framework provides a valuable lens through which to analyse the challenges and opportunities presented by payment technologies within

the informal sector (Matthews, 2021). In so doing, a lacuna in the current literature is addressed such that this research provides a novel application of the Critical Theory of Technology to informality and the adoption technology which has to date been largely underexplored. The reviewed literature sought to provide the basis from which to explore the central argument that there is a payments technology adoption problem in the informal sector (Feenberg, 2017).

Background to the informal sector

The concept of the "informal sector" was coined by Hart (1973) to describe economic activities outside the formal sector in Ghana (Nilakusmawati & Srinadi, 2020). Initially perceived as a temporary phenomenon, the informal sector has proven to be a significant contributor to employment, particularly in Africa, where it accounts for up to 60% of total employment (International Labour Organisation, 2018; Cama, et al., 2024). This recognition underscores the importance of understanding and supporting the informal sector as a crucial component of economic development.

The informal economy has been a subject of diverse theoretical perspectives. Modernization theory views it as a temporary phase of underdevelopment, shrinking with economic growth (Morris, 2019; Williams & Kedir, 2018). However, its persistence in developed economies challenges this view (Jackson, 2015). Neo-Marxism argues that the informal sector is a product of capitalist strategies to reduce costs (Ramsuraj, 2020; Williams, 2017). Neoliberalism attributes it to excessive state regulation (Jackson, 2015; Rogan & Skinner, 2017; Williams, 2017). This, together with an understanding of space that was rich in opportunities supported the notion that individual entrepreneurs exercised choice in starting enterprises in the informal economy rather than the informal sector being seen as haven of survivalist economic activity and place of last resort for individuals with limited options (Habib, 2005; Venter, 2012; Williams & Nadin, 2010). These theories, while distinct, offer complementary insights into the complex relationship between the informal economy and economic development (Huang, Xue & Wang, 2020).

The informal sector operates within a unique and intricate environment, often misunderstood by many (Seetharaman, Cunha & Effah, 2019). This environment is characterized by features like the ease of access to informal credit markets, which operate without regulation or subsidies (Rothenberg et al., 2016). Fourie (2018) emphasizes the importance of simplicity in any interventions aimed at the informal sector. Despite its competitive and labour-intensive nature (Rogan & Skinner, 2017), the informal sector presents significant opportunities for technological advancements. However, challenges such as limited access to basic infrastructure, including electricity, and insufficient computer access hinder the effective integration of technology within this sector (Bhattacharya, 2019; Seetharaman et al., 2019).

Gershuny (1987) emphasizes that the distinction between formal and informal sectors extends beyond the presence of formal rules. The informal sector operates within a unique and challenging environment, often lacking stable workspaces and consistent access to resources like electricity (Seetharaman et al., 2019). While Klapper et al. (2019) recognizes the potential of existing technologies to benefit the informal sector, Donnelly, Simmons, Armstrong and Fearne (2015) argues that a significant challenge lies in the development of generic solutions that fail to address the specific needs and constraints of this sector. DeVries (2018) supports this view, highlighting the incompatibility of many current solutions that are primarily designed for the formal

economy, with the realities of the informal sector. Charman and Petersen (2015) suggest that a more effective approach involves developing tailored solutions specifically for the informal sector, while leveraging existing technologies from the formal sector to streamline the development process and avoid unnecessary reinvention.

The informal sector plays a crucial role in the South African economy, providing employment and income for millions (Durokifa, 2024). However, factors like poverty, limited access to resources, and complex formalization processes contribute to its prevalence (Arendse, 2014; Durofika, 2024; Tshuma & Jari, 2013). While the informal sector offers opportunities, it often faces neglect from both businesses and the government (Fatoki, 2014).

Poverty, a significant driver of the informal sector, has deep roots in South African society (Etim & Daramola, 2020). Limited access to education further exacerbates this issue. While basic education is accessible, challenges such as inadequate infrastructure, overcrowding, and limited parental support contribute to poor educational outcomes (Mahadew, 2024; Modisaotsile, 2012). This can lead to early school leaving and increased reliance on the informal sector for income.

Furthermore, the high cost of higher education poses significant barriers to upward mobility (Murtin, 2013). Limited access to funding, coupled with the ongoing financial burdens associated with tertiary education, contributes to high dropout rates and perpetuates the cycle of poverty. The complexities of formalization also deter individuals from entering the formal economy. Overly burdensome regulations and bureaucratic processes create significant obstacles for entrepreneurs (Mulibana & Rena, 2021; Owoseni & Ahwireng-Obeng, 2024). This discourages formalization and reinforces the reliance on the informal sector.

Payment technologies in the informal sector

Trade has evolved significantly, from the ancient barter system to modern digital payments (Sukoharsono & Gaffikin, 2019). While digital payments have revolutionized transactions in many sectors, their adoption within the informal sector remains low (MasterCard, 2017). This sector, characterized by its dynamic nature, often involves high-volume, low-value transactions in fast-paced environments (Fatoki, 2014). The reliance on cash transactions within the informal sector can be attributed to factors such as the transient nature of customer interactions and the lack of readily available and affordable digital payment solutions specifically designed for this unique context (Bhattacharya, 2019).

This disparity in technological adoption highlights the need for innovative solutions that address the specific needs and constraints of the informal sector, bridging the gap between traditional cash-based transactions and the evolving digital landscape. While George (2012) highlights advancements in quicker, simpler, and more efficient payment methods, cash remains dominant, raising questions about technology adoption. Chang (2014) observes that technological progress has removed geographic barriers, facilitating seamless payments, yet Bhattacharya (2019) stresses the need to identify sustainable technologies suitable for the informal sector's unique context. Ntimane (2020) and Fatoki (2014) emphasize that solutions must address customer needs and be seamless to ensure adoption, as trust and usability are critical factors. Education and stakeholder engagement are vital for overcoming resistance, given the sensitive nature of money and trust-related concerns (Bhattacharya, 2019).

Several technologies can serve the informal sector. Duncombe (2011) categorizes these into mobile browser-based payments, in-app mobile payments, mobile or wireless card readers, and contactless mobile payments. Mobile browser-based payments, pioneered by platforms like PayPal, have revolutionized e-commerce but remain underutilized in the informal sector (Schrauwers, 2020). In-app mobile payments leverage the growing use of apps for a seamless user experience (Kalan, 2016). Mobile card readers, while initially expensive and reliant on banks, have evolved with affordable, accessible hardware solutions. However, exclusion persists due to regulatory and cost barriers (Schalekamp, McLaren & Behrens, 2017). Contactless mobile payments, enabled by technologies like NFC and Bluetooth, offer low-cost, user-friendly solutions that require minimal infrastructure (Seetharaman et al., 2019).

While these technologies have transformed small businesses, their adoption in South Africa's informal sector remains low. facing several challenges. MasterCard (2017) identifies the lack of access to formal banking tools as a significant barrier, as most payment technologies require merchants to have bank accounts. Additionally, Pankomera and van Greunen (2019) highlight a lack of awareness and understanding of available options, which stems from inadequate marketing, communication, and training. Kalan (2016) questions whether informal traders are even aware of mobile payment solutions. Cost is another major obstacle; Thomas, Jain and Angus (2013) argue that the fees associated with digital payments reduce profits for informal traders, making cash a preferred option. Seetharaman et al. (2019) emphasize that existing payment solutions often fail to meet the informal sector’s need for simplicity, cost-effectiveness, and zero transactional or monthly fees, as also noted by Fatoki (2014).

Schalekamp, McLaren, and Behrens (2017) suggest that while technological tools exist to build effective solutions for the informal sector, complexity remains a barrier. Bhattacharya (2019) and Sparks and Barnett (2010) argue that even simple and convenient solutions for formal businesses may appear too complex for informal traders, leading to the persistence of traditional methods. DeVries (2018) stresses the importance of tailoring solutions specifically for the informal sector. Ntimane (2020) highlights Capitec Bank as an example of how collaboration between technology providers and the informal market can create simplified solutions for traditionally unbanked consumers.

Awareness and communication are critical to technology adoption. Heiman, Ferguson, and Zilberman (2020) note that low awareness hinders adoption, while Pankomera and van Greunen (2019) criticize technology providers for insufficient marketing efforts. Slade, Williams, Dwivedi and Piercy (2015) suggest that technology companies, often led by technical experts, need to prioritize marketing and education. Huang et al. (2020) emphasize the importance of fostering positive perceptions of innovation through education to overcome resistance to change, as also noted by Maduku, Mpinganjira, and Duh (2016).

Methods

This research utilised an interpretivist paradigm, recognizing the subjective nature of individual experiences within the informal sector (Merriam & Tisdell, 2015). A qualitative case study design was adopted to explore the factors influencing payment technology adoption within this context (Crick, 2021). Data was collected through semi-structured interviews with 30 participants. This decision was based on the observation that response saturation occurred within this range as subsequent

interviews produced repetitive data and offered no novel perspectives (Laumann, 2018). These consisted of 20 informal traders and 10 customers in Johannesburg and Cape Town, which were selected due to their status as major economic hubs in South Africa (World Bank, 2018).

This research employed semi-structured interviews, guided by an open-ended question schedule, to facilitate in-depth personal discussions with informal traders and their customers, aligning with the qualitative approach's need for understanding their thinking, rationale, and context (Merriam & Tisdell, 2015). Interviews were conducted in English, isiXhosa, isiZulu, and Sesotho, with 73% of participants choosing English. Purposive sampling was utilized to select participants who could provide rich insights into the research phenomenon (Etikan, Musa & Alkassim, 2016).

Data analysis followed a thematic analysis approach, involving six key steps as outlined by Braun and Clarke (2006). The adoption of thematic analysis allowed for a deeper exploration of the data by examining underlying ideas, assumptions, and conceptualizations (Merriam & Tisdell, 2015). This approach facilitated the identification of rich and nuanced themes within the data. Trustworthiness of the research was ensured through Guba's (1981) well-established criteria of credibility, transferability, dependability and confirmability. Ethical considerations were paramount throughout the research process, ensuring participant anonymity, confidentiality, and informed consent.

Findings and discussion

The findings of this study are presented in this section. Table 1 provides an overview of the demographics of the participants. Respondents were equally split between Cape Town and Johannesburg. Of those who participated in the interviews, 60% were male and 40% were female. This largely conforms to a recent report which suggest that between 2009 and 2023 men were more likely to run informal businesses than women (StatsSA, 2025). A further 77% claimed to have bank accounts while 23% didn't. This is in sharp contrast to StatsSa's (2025) report by which suggested that 74% of informal businesses did not have bank accounts in 2023 suggesting a level of financial sophistication amongst the respondents who agreed to participate in the research.

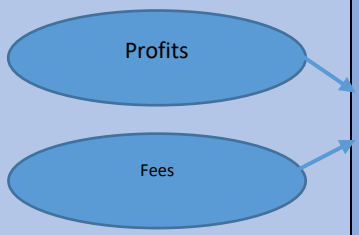
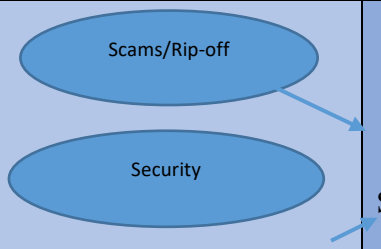
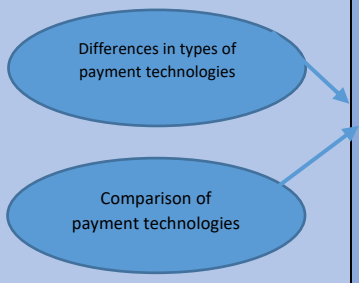
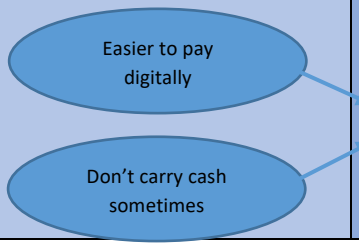
Table 1 - Demographics of research participants

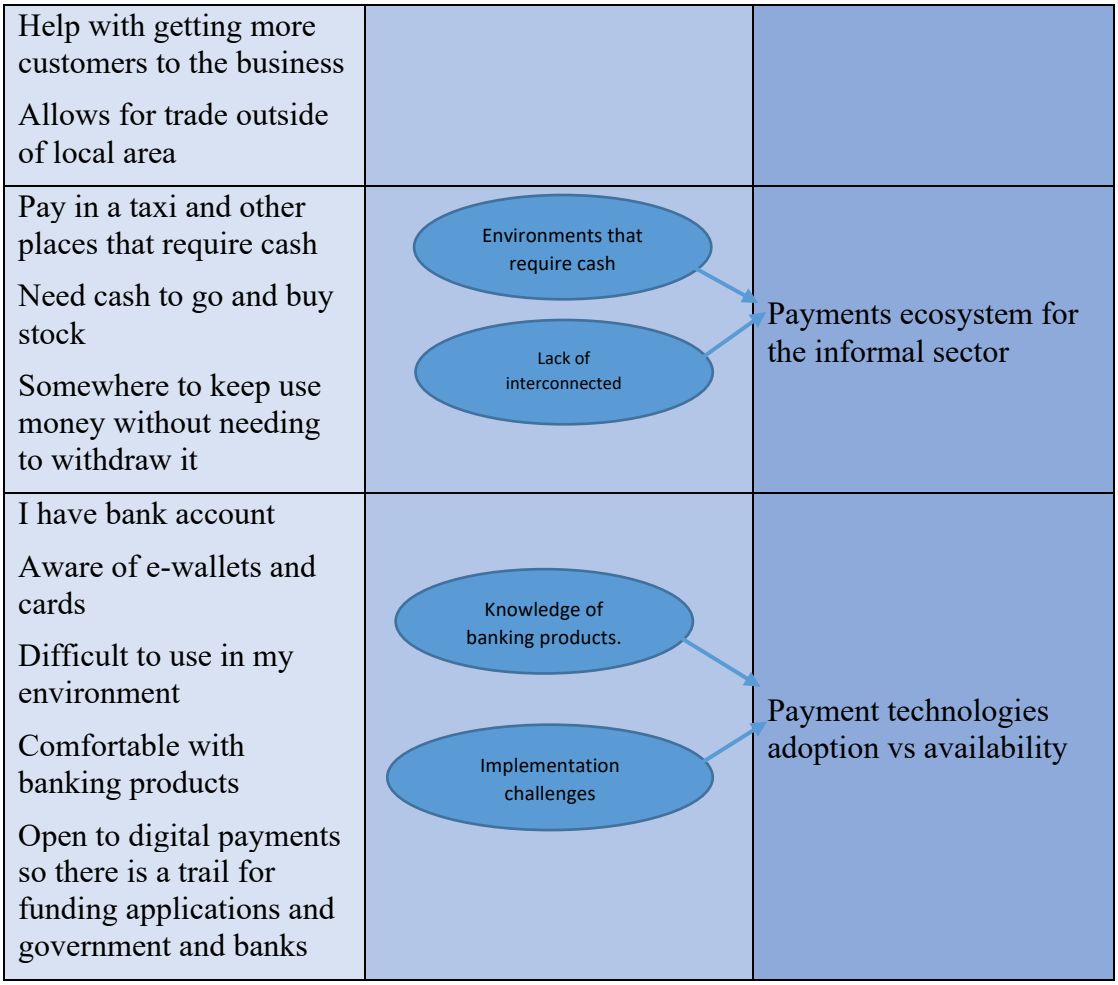
Variable	**City**		**Gender**		**Bank Account**	
	Johannesburg	Cape Town	Male	Females	Yes	No
Informal traders	10	10	5	5	13	7
Customers	5	5	13	7	10	0
Total	**15**	**15**	**18**	**12**	**23**	**7**

Source: Ntando (2022, p. 49)

Table 2 below provides a summary of the emerging themes. Each of these are explored thereafter.

Table 2 - Data structure

First order themes	Second order Themes	Theme
Small business with low margins Cash doesn't have transaction costs Card machines are expensive High cost of transactions Withdrawal fees are high		Costs associated with digital and mobile payments in relation to cash
Get robbed Reversal of payments from wallet Fraud at banks Card cloning and skimming Not safe to use cash at small businesses		Safety concerns
e-wallets are easy Card machines are slow for this environment Signal issues with card payments Mobile payments are more convenient than card payments Only need a phone number for mobile payments		Mobile payments vs card payments
Lose customers due to customers not carrying cash Don't like to carry cash Can allow for informal traders to qualify for credit		Convenience of payment technologies



Source: Ntando (2022, p. 52)

Theme 1: Costs associated with digital and mobile payments in relation to cash

This section delves into the costs associated with digital payments, highlighting contrasting perspectives between informal traders and their customers. While traders perceive digital payment solutions as costly and potentially detrimental to their small profit margins (Kirkpatrick, 2018; Bhattacharya, 2019; Matthews, 2021), they also acknowledge their potential benefits (MasterCard, 2017). Table 3 contains interview excerpts to support the abovementioned findings.

Table 3 – Theme 1 interview excerpts

"With digital and technological payments there are charges that you pay for when you transfer money but it's easier with cash."
"…because it's a small business because for credit cards, swiping machines come with a cost, so it means that if you're swiping, I have to have an extra charge fee for swiping."
"It will boost my business because I have a lot of customers who want to use a speed point because they don't carry cash."
"I am very open to having other digital payments because it will have a good impact on my business."

Source: Ntando (2022)

In contrast, customers placed less emphasis on the cost associated with digital payments, prioritizing convenience and safety. They highlighted the reduced risk of carrying cash and the convenience of cashless transactions.

These findings suggest that while the cost of digital payment solutions remains a concern for informal traders, the potential benefits of these technologies, such as increased customer satisfaction and reduced security risks, warrant further exploration and consideration.

This analysis underscores the need for innovative and affordable payment solutions tailored to the specific needs and constraints of the informal sector. This aligns with the critical theory of technology, which emphasizes the importance of considering the social and economic context in the design and development of technologies (Feenberg, 2017). By addressing the cost barriers and developing more inclusive and affordable payment solutions, it is possible to encourage greater adoption of digital payments within the informal sector.

Theme 2: Safety concerns

Safety concerns emerged as a significant theme for both informal traders and customers. Traders expressed concerns about the safety of carrying and storing cash, citing the risk of robbery (Fatoki, 2014). However, concerns also extended to digital payment methods, with fears of scams and fraud related to e-wallets (Mulibana & Rena, 2021). This finding challenges the assumption that informal traders are resistant to technology, highlighting their awareness of both the risks and benefits of different payment options.

Customers also expressed concerns about carrying cash due to the risk of theft and robbery (Rogan & Skinner, 2017). While open to digital payment methods, concerns regarding card skimming and the security of personal banking information were prevalent (MasterCard, 2017). This suggests a preference for mobile payment solutions that minimize the risk to personal bank accounts, such as e-wallets, which were perceived as relatively safer options. These findings underscore the need for payment solutions that address the specific safety concerns of both informal traders and their customers within the South African context. Table 4 provides evidence that bears testimony to the findings presented under this theme.

Table 4 – Theme 2 interview excerpts

“I would say cash payments also has it’s disadvantages as well as digital payments because you might pay me R200 and as soon as I walk away, someone might come and rob me and I might get scammed via digital payments.”
“Because with the e-wallet, if you do not go and take out the money on time the pin changes which means you have to get another pin and sometimes people forget the pin. It’s easier but it’s also a problem.”
“Cash is good but to be honest it is very dangerous because people can follow you and steal all of the money.”
“We don’t carry cash on us a lot because we might get robbed so we just swipe with our cards when we buy.”

Source: Ntando (2022)

Theme 3: Mobile payments vs card payments

The choice of preferred payment technology differed between Johannesburg and Cape Town. Cape Town participants favoured and already used mobile payment solutions like e-wallets (FNB), despite concerns about potential reversals (Slade et al., 2015). These solutions, while convenient, may not be optimally designed for the needs of informal businesses (Schalekamp et al., 2017).

In contrast, Johannesburg participants preferred card payments, particularly NFC-enabled tap-and-go solutions, emphasizing speed and customer safety. However, customer concerns regarding potential fraud and scams associated with card payments within the informal sector emerged (Maduku et al., 2016).

These findings highlight a divergence in preferred payment methods and underscore the need for solutions that address the specific needs and concerns of both informal traders and their customers in different contexts. The desire for quick and secure transactions is evident in both locations, indicating a need for innovative payment solutions that are both user-friendly and adaptable to the unique challenges of the informal sector. Table 5 contains interview excerpts in support of the above claims.

Table 5 – Theme 3 interview excerpts

"Interviewer: Currently, what other methods of payment besides cash do you currently accept in your business? Interviewee: E-wallet of course."
"Because I use cash to go and buy my stock. I can also do e-wallet but for now I prefer cash because it hasn't been long since I started my business"
"…because there is a lot of criminal activities and using mobile payments might be dangerous on the streets. It's better in big markets like Shoprite."
"I would still prefer cash because it depends what kind of shop it is and you wouldn't know if they are scamming you or not."

Source: Ntando (2022)

Theme 4: Convenience of payment technologies

Both informal traders and customers expressed a strong preference for convenient payment methods beyond cash (Schalekamp et al., 2017). Traders highlighted the loss of potential customers due to the lack of alternative payment options, as many individuals now prefer cashless transactions (Slade et al., 2015). Customers echoed this sentiment, emphasizing the convenience of digital payments, particularly when they are unable to carry cash (Rogan & Skinner, 2017).

Furthermore, participants recognized the potential benefits of digital payments beyond convenience. Traders highlighted the ability to track transactions, potentially improving access to funding from banks and other financial institutions (Fatoki, 2014). Participants also acknowledged the potential for improved savings through the use of digital wallets and bank accounts (Klapper et al., 2015; Schalekamp et al., 2017). Table 6 contains interview excerpts in support of the above claims.

Table 6 – Theme 4 interview excerpts

"Sometimes when we accept the digital cards as a payment, we're looking to get money to other banks just to help us to grow so it's also good for that and at the same time it's also good to get funds from the government if they see that we have bank accounts and we bank all the money."
"You see my brother, most of the times when you have put some money in the bank, you can save, and you can also learn not to misuse money. It's just easier to save when the money is being sent to your account, even if you want to buy something using a card, it is easier, you just swipe for whatever you are getting, even though there are charges, it is much easier if you are using a card."

Source: Ntando (2022)

Theme 5: Payments ecosystem for the informal sector

This research identified a critical need for an ecosystem that enables seamless digital payments throughout the informal sector supply chain (MasterCard, 2017). Informal traders often rely heavily on cash transactions, primarily due to the need for cash to purchase stock from wholesalers who exclusively accept cash payments (DeVries, 2018). This creates a significant barrier to the adoption of digital payment methods by informal traders.

The research revealed a strong desire among both traders and customers for a digital payment ecosystem that integrates seamlessly with their existing supply chains. This would allow traders to receive digital payments from customers and subsequently use those funds to purchase stock from wholesalers without the need for cash withdrawals (Klapper et al., 2019). Such an ecosystem would not only enhance convenience and security for both traders and customers but also contribute to the overall efficiency and growth of the informal sector (Rogan & Skinner, 2017). Table 7 contains quotes from the research participants that support the abovementioned claims.

Table 7 – Theme 5 interview excerpts

"I think I would be able to accept digital payments if they didn't only accept cash where I buy my stock."
"Yes, I would you accept other payments if I could use the money without having to withdraw it to buy stock?"

Source: Ntando (2022)

Theme 6: Payment technologies adoption vs availability

This theme challenges the assumption that low payment technology adoption in the informal sector stems solely from trader resistance. Instead, it highlights a critical gap: the lack of suitable and accessible technologies designed specifically for this context (Bhattacharya, 2019). Table 8 below contains interview excerpts in support of the above claims.

Table 8 – Theme 6 interview excerpts

"They have done a good part of it because it caters for all the markets and all the LSMs which shows that even though you don't have a lot of money you're able to use the payment products but it's not user friendly for people who sell on the streets."
"I think the banks are doing enough to advertise to us small business owners, but the speed points can only be given to big businesses because they are expensive and only, they can afford them."

Source: Ntando (2022)

While informal traders demonstrate awareness of available payment technologies (e.g., POS machines, e-wallets), their adoption remains limited. This study reveals several key barriers which include high costs - The cost of acquiring and operating POS machines is prohibitive for many informal traders with low profit margins (Matthews, 2021). Design limitations was also identified as a barrier in the sense that existing solutions, such as e-wallets, often exhibit design flaws that increase vulnerability to fraud and theft within the informal sector (Kirkpatrick, 2020). Lastly, bureaucratic hurdles were identified as a barrier because accessing and utilizing payment technologies often involves cumbersome paperwork and bureaucratic processes, deterring informal traders from adopting these solutions (Mulibana and Rena, 2021).

These findings emphasize the need for innovative payment solutions that are specifically tailored to the unique needs and constraints of the informal sector. This requires a shift from a "one-size-fits-all" approach to a more nuanced approach that considers the specific context and challenges faced by informal traders.

Discussion

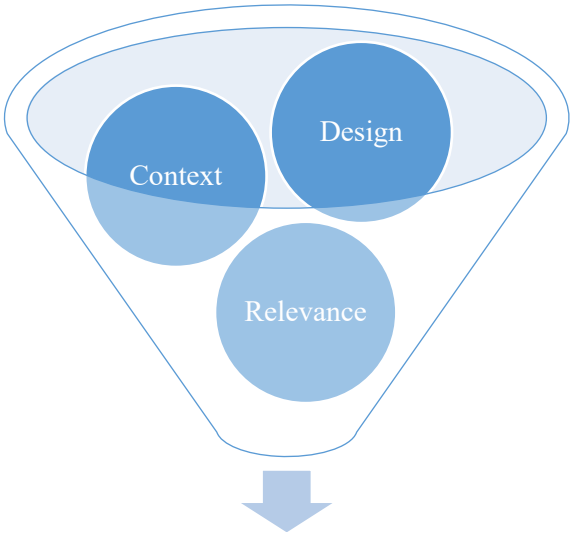
This research dismantles the long-held, yet fundamentally flawed, assumption that the stunted adoption of digital payment technologies within the informal sector stems primarily from inherent trader resistance. Instead, it unveils a critical and often overlooked chasm: the profound deficit of contextually tailored and readily accessible technological solutions (Bhattacharya, 2019). Empirical investigations demonstrate that while informal traders possess a functional awareness of available payment platforms, their adoption is severely curtailed by a confluence of systemic barriers. These include:

- Prohibitive Financial Burdens - Transaction fees that erode already meagre profit margins, coupled with the exorbitant costs of necessary equipment like dedicated smartphones or POS devices and ongoing data charges, pose insurmountable economic obstacles.
- Design-Induced Vulnerabilities: Existing technologies often exhibit critical design flaws that exacerbate susceptibility to fraud and theft.
- Insidious Bureaucratic Impediments: Cumbersome registration processes and stringent documentation requirements create formidable operational hurdles.

This study introduces the paradigm-shifting concept of "technological availability", which emphasizes that genuine adoption hinges not merely on the existence of technology, but on its relevance, accessibility, and contextual suitability. The prevailing "one-size-fits-all" approach, wherein technologies designed for formal sectors are indiscriminately imposed upon the informal sector, demonstrably fails to address the sector's unique operational realities.

The findings advocate for a transformative recalibration of research and development priorities. Rather than fixating solely on adoption rates, a concerted effort must be directed towards the design and implementation of bespoke technological solutions. This necessitates a granular, ethnographic understanding of the informal sector's specific operational context, needs, and constraints. Future research should prioritize collaborative design methodologies, actively incorporating the direct input of informal traders to ensure the development of truly effective and sustainable payment solutions. This will not only facilitate economic inclusion but also empower informal traders, transcending the limitations of ill-fitting, externally imposed technologies.

Figure 1 - Technological availability model



Source: Ntando (2022 p.72)

Conclusion

This research delivers a potent contribution to South African business management and technology, transcending mere knowledge generation to address critical socio-economic challenges, notably unemployment, and inform pivotal educational policy. By equipping management of payment technology firms, banks, and other stakeholders with actionable recommendations, it catalyses a tangible reduction in the informal sector’s cash-dependent transactions.

Theoretically, the study anchors itself within the technology-in-developing-economies discourse, introducing the transformative “technological availability” model. This model, a paradigm shift, mandates that successful technology adoption hinges on

contextual relevance and bespoke design. This framework, a robust analytical tool, compels stakeholders to prioritize the informal sector's nuanced needs and constraints during technology development and deployment. This rigor fosters an inclusive, technology-enabled environment, not just in South Africa, but across comparable developing economies, driving sustainable economic empowerment.

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FINANCIAL MANAGEMENT PRACTICES AND BUSINESS MODELS SYNERGY THAT FUEL BUSINESS SUSTAINABILITY

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Abstract

The study examined the synergy between financial management practices and sustainable business models among 376 SMEs that operate in Gauteng, South Africa, using a quantitative descriptive cross-sectional research design guided by Babbie (2020). Data used for the research was collected using a structured questionnaire. The study adopted statistical and quantitative methods, such as cross-tabulation, to analyse trends and provide insights into the relationship between financial practices and sustainable business outcomes among SMEs in Gauteng. It was found that over 60% of respondents were facing moderate to severe challenges in cash flow management, bookkeeping, and financial reporting. The majority depended on internal funds and retained earnings to finance operations. Poor record-keeping and lack of access to external financing remain critical hurdles, compounded by a lack of skilled personnel, such as bookkeepers. More often than not, financial management is undertaken by either unqualified employees or business owners. Only 30% of SMEs follow structured business plans, which compromises long-term strategic alignment. Based on the analysis, the three dominant financial management challenges factors are financial management practices, business strategy, and financial literacy. Pearson Chi-Square tests demonstrate that demographic variables such as race, age, education, and geographic location significantly influence these three factors. Financial literacy programs as emphasized by Sälzer and Roczen (2018), are recommended to improve decision-making, access to financing, and alignment with sustainable growth goals.

Keywords: business models, SMEs, financial management, sustainability, synergy

Introduction

Gauteng is the economic hub of South Africa and, with the highest concentration of SMEs contributes most to employment and economic growth. This research seeks to explore the synergy between financial management practices and business strategy models in pursuit of long-term sustainability for SMEs in Gauteng, which is the economic hub of South Africa. There have been useful contributions to understanding the role of financial management in SME sustainability within the broader African context including South Africa. As pointed out by Aladejebi and Oladimeji (2019), poor record-keeping and a lack of proper financial documentation are common among SMEs, mostly because of their inability to raise external finance. Bushe (2019) points out that among the top causes of failure in SMEs are poor cash flow management, inadequate budgeting, and failure to maintain proper financial records. Sound financial management practices are therefore very essential in growing and enhancing the resilience of SMEs (Ahmed et al., 2020; Musah, 2017). However, challenges such as inadequate access to finance and poor record keeping continue to be the hurdles to sustainability, more so in resource-constrained environments, as noted by Aladejebi and Oladimeji (2019) and Bushe (2019).

Sustainability, underlined by Cantele and Zardini (2018), is not only about the generation of profit but also about achieving long-term strategic goals and answering the call to action of the economic, social, and environmental challenges. Equally important to long-term competitiveness and sustainability are strategic business practices such as customer relationship management and innovation, explored by Masocha (2019) and Khan and Rahman (2018). In their study, Fernandez-Olmos and Ramirez-Aleson (2017) discovered that SMEs with a clear strategic direction and good financial management practices were the ones that succeeded in the competitive and resource-scarce environments. Linden (2017) underlines that SMEs with formal business plans and a clear long-term strategy are better prepared to respond to financial challenges and sustain growth.

Literature Review

Positive and strong links between financial management practices and SMEs' sustainability have been reported by some studies (Ahmed, Shehab & Elhag, 2020; Cantele & Zardini, 2018). Some of the key financial management practices identified with achieving long-term strategic objectives and ensuring the growth and sustainability of SMEs are budgeting, cash flow management, investment planning, financial reporting, risk management, and capital budgeting (Linden, 2017; Musah, 2017). According to the study of Ahmed et al. (2020), SMEs are significantly influenced in their sustainability by financial management practices; these set or help a business to set financial goals, manage cash flows, and evaluate risks. They lead to better decision-making and improved access to finance for improved competitiveness and long-term viability. However, several other studies have argued that financial management practices may not, in all cases, so strongly affect SME performance. RoA & Kumar (2015), Lim & Poh (2009) and Gul & Le Blanc (2017) argue that the influence of financial management practices on financial performance may not be direct. Notwithstanding these varying opinions, Musah, Gakpetor & Pomaa (2018) provide support for the role of financial management in enhancing working capital management and, generally, financial performance. They used quantitative capital budgeting and working capital techniques to examine various aspects of the financial

practices of SMEs and found that SMEs that used discounted cash flow methods to manage inventory and debtors performed better in managing their working capital. Similarly, studies by Aladejebi & Oladimeji (2019) and Bushe (2019) have highlighted the importance of proper financial record-keeping and bookkeeping practices in facilitating access to financing. Aladejebi & Oladimeji (2019) argued that poor record-keeping and ineffective financial management systems are some of the major hindrances to accessing finance, in that SMEs cannot provide reliable financial information to financial institutions.

These findings are in line with the observation by Bushe (2019), where he noticed that a sound financial management approach influences business goals positively and helps to secure external financing. The role of working capital management in securing SME sustainability was also highlighted by Pais & Gama (2015) for Portugal and Musah (2017) for Ghana. Both studies established a significant relationship between working capital management and SME sustainability. Moreover, Sälzer & Roczen, 2018, ascertained the fact that financial literacy is a pre-requisite for making an adequate financial decision and for the survival of an enterprise. Their study showed that financial decision-making supported by feasible financial systems and business strategies enables the growth and sustainability of SMEs, particularly under the availability of external monetary aid. Alberti, Ferrario, and Pizzurno (2018) considered the case of Italy in their study and found that SMEs characterized by better financial management practices are more resilient to economic challenges. Their results also underlined the importance of implementing appropriate financial systems for the long-term sustainability of the business.

Similarly, Kulathunga & Ye (2019) found a positive relationship between financial management practices and the financial, operational, and market sustainability of SMEs, particularly in areas such as financial planning, analysis, and cash flow management. Musah (2017) and Mutua (2015) also found that SMEs with proper bookkeeping practices had improved growth and financial performance. On the contrary, bad accounting practices, as revealed by Sibanda & Manda (2016), tend to seriously impair the decision-making potential of SMEs and thereby bar their growth. They opined that SMEs normally do not maintain adequate accounting records, which is injurious to their ability to meet tax obligations, secure funding, and make informed decisions. The role of qualified financial managers in supporting SME sustainability was highlighted by Ardichvili & Dirani (2017), who found that skilled financial management is crucial for organisational effectiveness and long-term sustainability. This is supported by the work of Li et al. (2018), who emphasized that effective business strategy practices are critical for SME survival, especially in high-risk environments. Masocha (2019) further explored business strategy practices in South Africa and found customer segmentation, value proposition, and resource-based control as key to SME sustainability. Similarly, Khan & Rahman (2018) found that business strategy practices such as product diversification and customer relationship management have a significant effect on the sustainability of SMEs in Bangladesh. On the other hand, Fernandez-Olmos & Ramirez-Aleson (2017) and Mabula & Ping (2018) claimed that business strategy practices should be supplemented by proper actions to tackle challenges, both internal and external, that affect SME growth. This means business strategies need to evolve to remain applicable and relevant in promoting long-term sustainability.

There is much appreciation for the role played by international aid to African nations as a significant source of funds for their ongoing developmental projects. Access to such funds has promoted economic development and reduced poverty levels in the recipient countries. However, the question remains of whether donor aid could be a sustainable development tool for Africa.

Debate still rages on concerning the effectiveness of aid on Africa's sustainable development. However, despite the concept being dwelt on severely by some scholars, researchers, and policymakers, among others, international aid and sustainable development still needs some level of engagement by different stakeholders spanning from the academic to the business world. Findings from the literature review indicated no major influence of international aid on countries' economic growth (GDP) as evidenced in Ethiopia (Farah et al., 2018) amidst the growing criticism of the negative effects of international aid to Africa. It is argued that the emphasis is on the efficient and effective mobilization and use of resources to grow out of dependence on aid rather than a rejection of aid (Ghana Beyond Aid Charter and Strategy Document, Government of Ghana, 2019).

Some authors have found that foreign aid has contributed immensely to recipient countries' economic growth and poverty reduction only when the funds have been channelled to developmental projects and social amenities such as education and health (Anetor, Esho & Verhoef, 2020). For international agencies to continue providing aid, literature has indicated that the channelled funds should be properly accounted for to have transparency in their usage (Anetor, Esho & Verhoef, 2020). However, in recent times, there has been a growing donor fatigue and this calls for recipient countries to devise strategies for self-financial independence through undertaking entrepreneurial activities by SMEs. Furthermore, governments should strengthen their institutional frameworks that attract FDI for productive entrepreneurship versus unproductive entrepreneurship (Baumol, 1990). For domestic investors, governments should enact policies that support and promote entrepreneurship such as microfinance but not at the detriment of operational efficiency and sustainability of banks and MFIs as financiers. Credit rationing could be used to finance productive entrepreneurship with good-quality projects (Trovato & Alfo, 2006; Douhan & Henrekson, 2010).

Research Methodology

This research study adopted a quantitative descriptive cross-sectional research design to examine the influence of financial management practices on the sustainability of SMEs in Gauteng, South Africa, informed by the work of Babbie, 2020. A total of 376 SMEs were targeted with a structured questionnaire where data was collected to capture the critical dimensions of financial management practices and alignment of the business model. The statistical tools of descriptive statistics and cross-tabulation were used to analyse data to develop trends and relationships of variables. Key indicators considered were the percentage of SMEs showing appropriate financial management practices and viable business models, which give insights of value to inform and enhance the resilience and growth of SMEs.

Results

The sample size was 376 SMEs whose profiles were spread across three areas of Johannesburg at 49.7%, Tshwane at 32.7%, and Ekurhuleni at 17.6%. Most respondents were Black at 60.4%, followed by Indian at 13%, Coloured at 13.6%, and White at 12%. Asian representation was almost negligible at 0.03%. The highest qualifications of respondents included: post-matric qualification with the highest being Certificate 22.3%, University Degrees 21%, and Diplomas 20.7%; 2.9% had Postgraduate Degrees while none had completed only primary school.

Challenges faced by SMEs in financial management.

More than 71% of the respondents reported major to very severe challenges regarding cash flow management, showing clear liquidity problems. 67% of the respondents reported major to very severe working capital challenges, which implies their inability to maintain funds needed for daily operations. About 59% of the respondents reported significant challenges in financial management systems. 47% and 46% of the respondents face major and severe financial reporting and book-keeping difficulties, respectively. More than 60% of respondents reported challenges with workforce skills and the ability to manage financial operations efficiently.

Operational and management practices of SMEs

Only 28.5% of the respondents are sticking to a structured business plan to a very large extent, 35.1% of the respondents do it up to some extent while a small 3.2% do not adhere to the structured business plan. Approximately 21.3% of owners prepare their business plan whereas 24.7% do not. Only 1.3% rely on qualified employees, 30.1% make some use of qualified employees to some extent, and 13.3% do not rely on qualified employees at all. 18.6% depend to a very large extent on private consultants, 24.2% to some extent, and quite a high portion of 27.7% do not depend at all.

Dependence on various persons in recording financial records in SMEs

The highest proportion of 37.8% of the respondents depends on the owner to a moderate extent, 22% to a very large extent, and 16.8% do not depend on the owner at all. The majority depends on employees to a very large extent 28.5%, followed by a moderate extent 27.7%, and only 3.7% do not utilise employees for this role. A majority of 34.6% of SMEs do not use a bookkeeper, while 27.1% depend on a bookkeeper to a large extent, and very few 1.6% to a very large extent. 33.5% of SMEs do not use accountants at all, 16% rely to a very large extent, and only 5.1% reported an average extent of reliance.

Keeping financial records among SMEs

A considerable number of respondents, 42.8% keep proper financial records 32.7% do not maintain financial records, while 24.5% estimate their financial position without maintaining formal financial records.

SME's funding sources and trends

The majority of respondents, 63.3% rely heavily on internal funds or retained earnings to finance their operations, 30.9% to a large extent, and 32.4% to a very large extent. Only 11.4% use internal funds minimally or not at all. A moderate 31.9% and 30.3% to a large or very large extent use loans from financial institutions. 23.4% do not use the source of finance at all. About 29.3% of respondents rely on loans from family or friends to a large or very large extent while 50% make use of this source to a minimal extent.

Barriers to accessing bank finance among SMEs

Application procedures that are too complicated are a barrier to obtaining bank finance to a very large extent for 12.8% of the respondents and to a large extent for 5.1%. Only 1.9% report no difficulty with application processes. Concurrently, 12.8 % cited high interest rates as one of the very significant barriers, 5.1% perceive this issue to be large, and a minimal 1.9 % report no

issues with it. 10.1 % cite insufficient cash-flow being as a significant barrier, while 5.9 % consider this to a very great extent. Only 3.7 % report not having any problems with this. For 9%, the barrier is poor credit record to a large extent and for 5.3% to a very large extent. 6.1% do not find an issue with credit records in their way. 14.1% of the respondents consider lack of financial documentation as a major barrier to bank finance, while 2.1% and 5.1% report the said issue to a large and no extent, respectively.

Table 1: Financial management challenges of SME's (n=376)

Factors	**KMO Test**	**Bartlett's test of Sphericity & Reliability Approx. Chi Square**	**df**	**sig**	**Cronbach's Alpha**	**Determinant**
Financial Management	.853	344.967	16	.002	0.887	0.056
Business Strategy	.843	170.838	3	.000	0.907	0.287
Financial literacy	.791	575.613	21	.001	0.878	.0008

Table 1 shows the statistical tests and reliability analysis for three factors for financial management challenges. The factors were financial management, business strategy, and financial literacy. The data indicate suitability for factor analysis based on the Kaiser-Meyer-Olkin (KMO) test range from 0 to 1 value closer to 1, and Bartlett's Test of Sphericity at less than 0.05 significance level. The reliability of all factors is good to excellent based on Cronbach's Alpha reliability of a scale. Financial Literacy shows a potential issue with multicollinearity due to its very small determinant value.

Table 2: Demographic and geographic factors associated with financial management challenges of SMEs (n=376)

Chi -Square Tests	Value	DF	P-value
Age			
Pearson Chi-Square	438,776a	16	<,001
Likelihood Ratio	394.369	16	<,001
Linear-by-Linear Association	45.885	1	<,001
a 8 cells (32,0%) have expected count less than 5. The minimum expected count is ,05.			
Race			
Pearson Chi-Square	78,390a	16	<,001
Likelihood Ratio	77.571	16	<,001
Linear-by-Linear Association	1.827	1	0.176
Number of Valid Cases	376		
a 8 cells (32,0%) have expected count less than 5. The minimum expected count is ,05.			
Educational Level			
Pearson Chi-Square	580,095a	24	<,001
Likelihood Ratio	502.551	24	<,001
Linear-by-Linear Association	4.966	1	0.026
Number of Valid Cases	376		
a 15 cells (42,9%) have expected count less than 5. The minimum expected count is ,09.			
Gauteng Region			
Pearson Chi-Square	38,684a	8	<,001
Likelihood Ratio	44.293	8	<,001
Linear-by-Linear Association	0		
Number of Valid Cases	376		
a 1 cells (6,7%) have expected count less than 5. The minimum expected count is 2,98.			

Table 2 shows demographic and geographic factors associated with financial management challenges obtained from Pearson Chi-Square tests. P-values < 0.001 demonstrate that demographic variables (age, race, educational level, and regional location (Gauteng) have

measurable impacts on financial management challenges. Age and educational level show significant linear trends, while race and region do not. Demographic factors like age and education may need to be prioritized when addressing financial management challenges, given their stronger trends and relationships.

Discussion of the results

Findings from the study have shown that SMEs are facing significant financial management challenges, with over 60% reporting moderate to severe cash flow, bookkeeping, and financial reporting difficulties. These challenges the ability to make informed decisions and gain access to external financing. Complex application processes, high-interest rates, and lack of financial documentation were identified as major impediments to obtaining bank finance, which stifles growth and sustainability in SMEs. Poor credit records and insufficient cash flow further worsen the challenges. Most SMEs depend on internal funds and retained earnings to finance their operations, with a limited number of external loans due to a lack of access to financial institutions and other alternative sources of funds. Although some SMEs keep organised financial records, a significant percentage do not maintain formal records and instead use estimates. This practice affects their ability to present proper financial positions to creditors. Another limitation is a lack of skilled personnel such as bookkeepers and accountants, while owners or other unqualified employees usually take over financial management. This impacts operational efficiency and strategic planning. Less than 30% follow a business plan, and therefore their activities are closely aligned with operational activities in pursuit of long-term strategic goals. Variations observed in the challenge of financial management and access to finance across locations, age, and education level of SME owners suggest there is a scope for intervention actions at a targeted level. The critical areas of financial management practices, such as budgeting, cash flow management, and investment planning, are very significant for SME sustainability. According to Ahmed et al. (2020), effective financial management improves decision-making and access to capital and helps SMEs align their operation with sustainability goals. On their part, Alberti et al. (2018) and Musah et al. (2018) state that businesses with a strong financial system are resilient with better growth over the long term. However, a study by Mutua (2015) and Sibanda and Manda (2016) note that poor bookkeeping and financial reporting have been constant challenges inhibiting the potential of SMEs in accessing financing and managing their resources with efficiency.

This means financial literacy would help SMEs overcome obstacles and grab opportunities. According to Sälzer & Roczen (2018), the higher the level of an enterprise's financial literacy, the better placed it will be to seek outside funding and improve sustainability. On the other hand, Chowdhury (2017) and Aladejebi & Oladimeji (2019) report that unsatisfactory financial systems and poor record-keeping impede SMEs from accessing loans and maintaining financial stability.

Another area of strategic business practices that impacts SME sustainability is customer relationship management and resource-based planning. In the case of Khan & Rahman (2018) and Masocha (2019), firms with adapted strategies such as product diversification and cost management were found to survive and possibly thrive in a competitive market. However, as Fernandez-Olmos & Ramirez-Aleson (2017) warn, strong internal systems must accompany such strategies for sustainability.

Integration of financial management practices with sustainable business models is transformative for SMEs. Botes & de Lange (2018) and Le Roux & de Klerk (2019) highlight that frameworks such as the circular economy and subscription models help SMEs to reduce costs, gain efficiency, and deal with environmental and social challenges. By embedding sustainability into their financial strategies, SMEs can ensure long-term resilience and meet stakeholders' expectations (Porter & Kramer, 2011).

Conclusions

This study depicts the financial management challenges facing SMEs in Gauteng and highlights the important roles played by financial management practices, business strategy, and financial literacy in sustaining SME growth and competitiveness. Furthermore, the findings show that demographic variables such as age, race, educational level, and regional location measurably influence these challenges. This only enhances the call for focused interventions in these challenges and for the navigation of financial hurdles toward the achievement of sustainable growth objectives by SMEs. Sälzer and Roczen (2018) recommended strengthening financial literacy programs for SME owners and managers to improve decision-making processes and to access financing with intent toward direct support for enterprise growth and sustainability.

Aladejebi and Oladimeji (2019) suggest the adoption of strong bookkeeping practices to minimise the challenges of financial management. Strong financial reporting systems improve resource allocation, build trust with financial institutions, and improve access to credit.

Musah et al. (2018) and Bushe (2019) indicated that tailoring the solution in financial management should address the demographic variables. Providing targeted support to SMEs from underserved regions or those owners with lower educational backgrounds can significantly reduce financial management barriers. Botes and de Lange (2018) call for using sustainable business models by incorporating sustainability into financial management practices. The application of circular economy principles helps in gaining efficiency in operations and enhancing long-term profitability, placing SMEs on the path to resilience and success.

This paper shows the importance of aligning financial management practices given sustainability objectives to achieve success for SMEs. Effective financial management is not only a driver of profitability but also a catalyst for environmental and social responsibility, ensuring long-term growth and competitiveness, as noted by Ahmed et al. (2020) and Alberti et al. (2018).

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LEVERAGING ADVANCED DIGITAL SUPPLY CHAINS TO STRENGTHEN DIGITAL MARKET LINKAGES TO IMPROVE SMALL AND MEDIUM ENTERPRISES IN THE MANUFACTURING AND LOGISTIC SECTOR

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Abstract

This study examines the transformative potential of digital supply chain (DSC) adoption for Small and Medium Enterprises (SMEs) in South Africa's manufacturing and logistic sector, focusing on its role in enhancing access to local and international markets. Despite the promise of DSCs to boost competitiveness, streamline operations, and reduce costs, their uptake among South African SMEs remains limited and underexplored. This research bridges this gap by assessing the current extent of DSC implementation, finding critical barriers to adoption, and evaluating its effects on SME competitiveness and market reach. Drawing on an extensive literature review, the study highlights key challenges, including resource limitations, integration complexities, and cybersecurity risks, which impede digital transformation. The findings underscore that DSC adoption can significantly improve operational efficiency, visibility, and data-driven decision-making, thereby strengthening SMEs' market positioning. This research proposes actionable strategies and a conceptual framework to address adoption barriers, enhance digital capabilities, and foster SME growth within South Africa's manufacturing and logistic sector. By addressing four pivotal research questions – concerning adoption levels, challenges, impacts, and mitigation strategies – this study contributes to both the existing literature and practical policy development, offering a foundation for future empirical validation and broader economic advancement.

Keywords: access to markets, dynamic capabilities, digital supply chain market linkages, small and medium enterprises

Introduction

The manufacturing and logistics sector in South Africa, contributing 13% to the country's GDP, faces significant challenges that hinder its growth and competitiveness (Statistics South Africa, 2024; Alexandro and Basrowi, 2024). While digital market linkages offer potential solutions for Small and Medium Enterprises (SMEs) to enhance their competitiveness and access new markets, the adoption and implementation of these technologies remain underexplored in the South African context (Business Tech Africa, 2025; Shulz 2021). Digital supply chains, a crucial component of these market linkages, have the potential to streamline operations, reduce costs, and improve efficiency for SMEs in the manufacturing and logistics sector (Rustina et al., 2024). However, the extent to which South African SMEs are leveraging these technologies, and the specific challenges they face in implementation, is not well understood.

This research aims to investigate the current state of digital supply chain adoption among South African SMEs in the manufacturing and logistics industry, identify the barriers to implementation, and assess the potential impact of these technologies on SMEs' competitiveness and market access. By examining these issues, this study seeks to contribute to the development of strategies that can enhance the digital capabilities of South African SMEs, ultimately strengthening their position in both domestic and global markets.

Research Methodology

This study deals with a systematic review of the literature sources to establish the concepts and theories of the challenges and benefits SMEs in the manufacturing and logistics sector face when implementing digital supply chains to access local and international markets.

The research methodology is guided by the Research Onion model (Saunders et al., 2020), providing a structured framework for the study’s design. At its outermost layer, the research adopts an ontological philosophy, suitable for analysing a framework that improves digital supply chains to strengthen digital market linkages to improve SMEs' access to local and international markets. The inner layer employs an interpretivist epistemology, ideal for understanding the complex, context-specific challenges faced by SMEs, as it allows for the interpretation of findings and recommendations from existing literature and theories. A deductive approach is utilised, beginning with established theories on digital supply chains and market linkages, then progressing toward specific observations and a conceptual framework through the literature survey.

The research strategy is a qualitative approach, specifically a comprehensive literature survey. This strategy allows for an in-depth exploration of existing research on SMEs’ access to markets, digital supply chains, and market linkages.

The study adopts a mono-method qualitative choice, focusing solely on the comprehensive literature survey as the primary data collection method.

The research follows a cross-sectional time horizon, providing a snapshot of the current state of knowledge regarding SMEs’ access to markets and related challenges.

Data was collected by gathering relevant academic journals, policy documents, and reports from knowledge institutions. The analysis was conducted through thematic analysis, identifying key themes and patterns in the literature related to SMEs’ market access challenges relating to digital

supply chains and market linkages. This was followed by conceptual analyses and framework building.

The search strategy was designed to identify literature pertinent to digital supply chain adoption, SMEs, and the South African manufacturing and logistics context. Keywords were iteratively developed based on the research questions and included combinations such as "digital supply chain," "SMEs," "South Africa," "manufacturing sector," "logistics sector," "market access," "digital transformation," "Industry 4.0," "barriers to adoption," and "competitiveness." Boolean operators (for example, AND, OR) were used to refine searches (for example, "digital supply chain AND SMEs AND South Africa"). Initial searches were supplemented by snowballing techniques, tracing references from key studies to identify additional relevant sources.

Literature was selected based on explicit inclusion and exclusion criteria to ensure relevance and quality. The inclusion criteria included:

i. Studies addressing digital supply chain technologies (e.g., IoT, big data analytics, AI) and their application to supply chain management.

ii. Research focusing on SMEs, particularly in the manufacturing and logistics sectors.

iii. Publications with a geographic focus on South Africa or emerging economies where findings could be contextually relevant to South Africa (for example, BRICS).

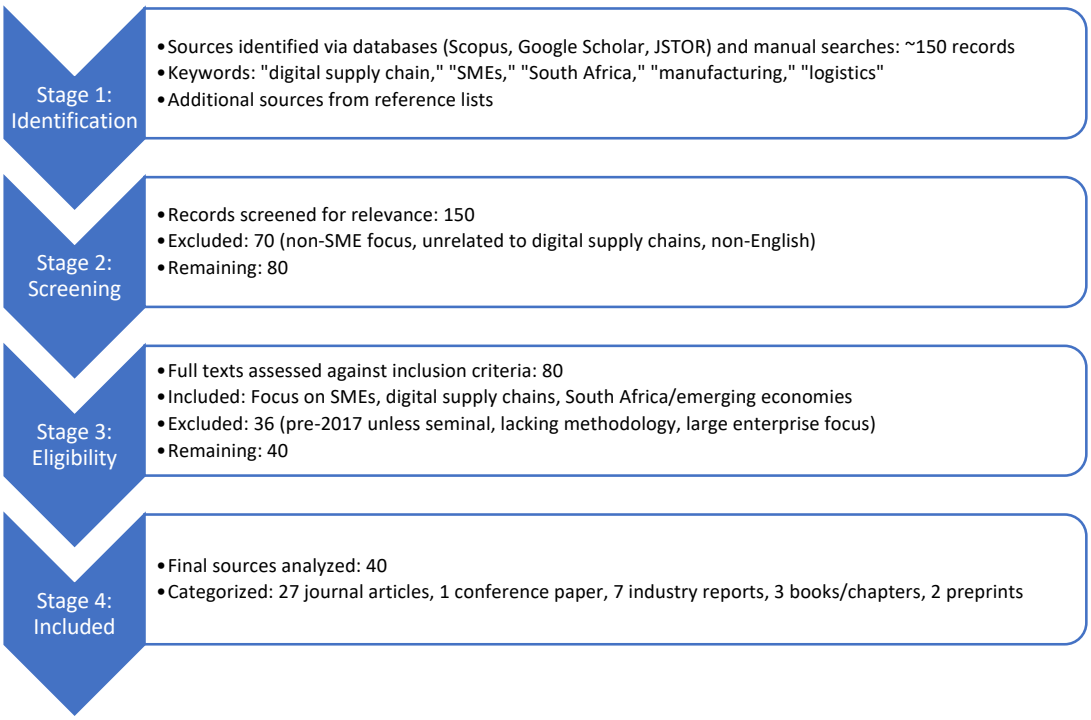
iv. Peer-reviewed journal articles, conference proceedings, policy documents, or reputable industry reports.

v. Literature published between 2017 and 2024.

vi. Articles written in English.

Approximately 150 sources were initially identified using databases (Scopus, Google Scholar, JSTOR) with keywords from the research questions and key references. Titles and abstracts were screened, excluding 70 sources irrelevant to SMEs or digital supply chains, leaving 80 for full-text review. Full texts were evaluated against inclusion criteria (SMEs, digital supply chains, South Africa focus, post-2017 unless seminal), excluding 36, resulting in 40 eligible sources. The final 40 sources were analysed, forming the basis for the thematic analysis and conceptual framework.

Figure 1: Flow Diagram of the Literature Selection Process



Data analysis involved thematic analysis, as outlined by Saunders et al. (2020). Selected literature was coded to identify key themes and patterns related to SMEs' digital supply chain adoption, challenges, impacts, and strategies. Themes were derived deductively from the research questions and iteratively refined through conceptual analysis, culminating in the development of the conceptual framework. This process ensured alignment with the study's objectives and theoretical foundations.

Literature Review

Digital supply chains represent a transformative approach to supply chain management, leveraging advanced technologies to enhance efficiency, visibility, and decision-making capabilities (Gunasekaran et al., 2017). A digital supply chain can be defined as a supply chain whose foundation is built on web-enabled capabilities, fully capitalising on connectivity, system integration, and the information-producing capabilities of smart components (Frank et al., 2024). These digital frameworks facilitate real-time data exchange and collaboration among supply chain partners, enabling more responsive and agile operations (Zhao et al., 2023).

The integration of technologies such as the Internet of Things (IoT), big data analytics, and artificial intelligence within digital supply chains allows for improved tracking of goods, enhanced forecasting accuracy, and better inventory management (Bongomin et al., 2022). This technological advancement not only streamlines processes but also reduces operational costs and leads to increased customer satisfaction through timely deliveries and personalised services (Tukamuhabwa et al., 2021). Furthermore, the shift towards digital supply chains is essential for

SMEs seeking to remain competitive in an increasingly globalised market, as it provides them with the tools necessary to adapt quickly to changing consumer demands and market conditions (Al Koliby et al., 2024).

The current state of digital supply chain adoption

The adoption of digital supply chains among South African SMEs in the manufacturing and logistics sector is in a nascent stage, with significant potential for growth (Barnes & Sachs, 2023). While larger enterprises have made strides in implementing these technologies, many SMEs lag due to various constraints such as limited resources, lack of technical expertise, and insufficient awareness of the benefits (Telukdariea et al., 2024). This digital divide creates a competitive disadvantage for smaller firms in an increasingly globalised market (Ngo, Pham, and Nguyen, 2024).

Despite the challenges, there is a growing recognition among South African SMEs of the transformative potential of digital supply chains (Ademola et al., 2023). Early adopters have reported improvements in operational efficiency, cost reduction, and market reach (das Nair & Nontenja, 2023). However, the overall adoption rate remains low, with many SMEs still relying on traditional, manual processes (Kallmuenzer et al., 2024). This situation underscores the need for targeted interventions to accelerate digital transformation in the sector, potentially through government initiatives, industry partnerships, and educational programs (Kallmuenzer et al., 2024).

Challenges in implementing digital supply chain technologies

Resource Constraints

SMEs often face limitations in terms of technical expertise and human capital required to implement and maintain digital supply chain technologies (OECD, 2023). The initial investment in digital infrastructure and training can be significant for smaller enterprises, presenting a substantial barrier to adoption (Takawira & Pooe, 2024; WEF, 2023).

Dixit et al. (2024) conducted a study to identify and prioritize strategies for overcoming digital supply chain (DSC) implementation barriers. Through an extensive literature review and expert discussions, they identified 25 DSC barriers and 17 DSC strategies. The research utilised a case study in the automotive industry in India. The findings revealed that the most significant barriers to DSC implementation were the absence of urgency for supply chain digitalisation, lack of proper innovation strategies, and inadequate leadership for digital transformation. The top-ranked strategies to overcome these barriers included determined top management commitment to digitalisation, planning and coordination for implementing digital technologies, and adequate management of investment for the comprehensive digitalized business. The study provides valuable insights for practitioners to effectively plan and implement DSC strategies phase-wise, considering resource constraints.

Complexity of Integration

Integrating digital technologies into existing supply chain processes can be complex, especially for SMEs with limited IT capabilities (He et al., 2024). This complexity arises from the need to

implement and manage various innovative technologies such as big data analytics, cloud computing, and the Internet of Things (Deral et al., 2024).

Ngo, Pham, and Nguyen (2024) conducted a comparative study examining the drivers of digital supply chain transformation in SMEs and large enterprises, with a focus on COVID-19 disruption risk. The research employed a mixed-methods approach, combining a comprehensive literature review with empirical data collected through surveys and semi-structured interviews with supply chain managers from Vietnamese SMEs and large enterprises. The study identified key drivers of digital transformation, including the need for enhanced visibility, agility, and resilience in supply chains. The findings revealed that while both SMEs and large enterprises recognised the importance of digital transformation, they faced different challenges in implementation. Large enterprises generally had more resources and capabilities to invest in digital technologies, while SMEs often struggled with limited financial and technical resources. The COVID-19 pandemic was found to be a significant catalyst for accelerating digital transformation efforts across both types of organisations, highlighting the critical role of risk management in driving supply chain digitalisation.

Cybersecurity Concerns

As SMEs increase their digital presence through supply chain digitisation, they become more vulnerable to cyber threats (Bigliardi et al., 2022). Protecting sensitive data and ensuring the security of digital supply chain systems is a critical challenge, requiring SMEs to implement robust cybersecurity measures (Supply Chain Management Review 2023).

Sahoo et al. (2023) conducted a comprehensive literature review on digital transformation and Industry 4.0 in supply chain management for SMEs. The study examined the evolution of supply chain management (SCM) concepts from traditional to digital approaches, focusing on the fundamental principles of digital transformation in SCM and its impact on SMEs. The authors employed a systematic analysis of existing literature and case studies to synthesise key methodologies, challenges, and opportunities. Their findings highlight the importance of tailored approaches for SMEs, including technology adoption roadmaps, pilot projects, workforce upskilling, and cybersecurity measures. The research emphasised the critical role of future studies in developing standardised frameworks and best practices to empower SMEs in leveraging the transformative potential of digital technologies within their supply chains. Additionally, the paper discussed digital transformation initiatives, their impact on SCM performance, and their role in improving supply chain resilience, while also exploring obstacles and future trends relevant to practitioners and researchers.

Impact on competitiveness and market access

Enhanced Visibility and Decision-Making

Digital supply chains provide SMEs with comprehensive, real-time visibility into inventory, shipments, and operational workflows (Reynolds, 2024). This heightened transparency enables informed decision-making and swift adjustments to emerging challenges (Haleem et al., 2021).

The editorial by Ageron, Bentahar, and Gunasekaran (2020) provides a comprehensive overview of the challenges and future directions in digital supply chain management. Through a critical analysis of existing literature and emerging trends, the authors identify key areas of focus for future

research and practice. They emphasised the transformative potential of technologies such as big data analytics, cloud computing, and the Internet of Things in reshaping supply chain operations. The paper highlights the need for new theoretical frameworks to understand the strategic, organizational, and human aspects of digital supply chains. The authors outline several advantages of digital supply chains, including enhanced agility, improved integration of activities, more effective intelligent optimisation, increased transparency, and holistic decision-making capabilities. They also stress the importance of developing robust performance measurement systems for information technologies within digital supply chains to ensure efficient and accurate information exchange.

Improved Operational Efficiency

The integration of advanced technologies such as Internet of Things (IoT) devices and artificial intelligence (AI) allows SMEs to monitor and analyse supply chain data in real-time, facilitating proactive problem-solving and risk mitigation (Rane et al., 2024). The automation of routine tasks reduces manual errors and speeds up processes, freeing up resources for strategic activities (Kaur, 2019).

Mkhize et al. (2024) conducted a systematic literature review to evaluate the impact of cloud computing on SME performance. The study employed a comprehensive search strategy across multiple databases, focusing on articles published between 2013 and 2023. The authors used a customised Cochrane's Risk of Bias tool adapted for mixed-method studies to assess the quality of included papers. The review process involved five distinct bias domains for evaluation, with studies classified into risk levels based on assessment. The findings highlight key benefits of cloud computing for SMEs, including cost savings, scalability, and enhanced operational efficiency. The study also identified critical predictors of cloud adoption and assessed their impact on SME performance. The authors noted research gaps in the literature and guided future research to enhance cloud adoption in SMEs. This systematic review offers a comprehensive understanding of the current state of cloud computing research in the context of SME performance.

Data-Driven Insights

Advanced analytics and big data technologies in digital supply chains offer valuable insights into customer behavior, demand patterns, and operational inefficiencies (Hasan & Ojala., 2024). This capability allows SMEs to make more informed decisions and optimise their operations, leading to improved forecasting accuracy, reduced costs, and enhanced customer satisfaction (Hosen et al., 2024).

Strategies for overcoming barriers and enhancing digital capabilities

Leadership and Commitment

Determined top management commitment to digitalisation is crucial for the successful implementation of digital supply chains (Tiwari et al., 2024). Planning and coordination for implementing digital technologies, along with adequate management of investment for comprehensive digitalized business, are essential strategies (Bhuiyan et al., 2024).

Tailored Approaches for SMEs
Developing tailored approaches for SMEs, including technology adoption roadmaps, pilot projects, workforce upskilling, and cybersecurity measures, can help overcome implementation barriers (Carvalho et al., 2024). Standardised frameworks and best practices should be developed to empower SMEs in leveraging the transformative potential of digital technologies (Martínez-Peláez, 2024).

Collaboration and Support
Providing more detailed information about local value chains, access to technological resources, business training, and flexible financing solutions can help SMEs overcome challenges in accessing and implementing digital supply chain technologies (Bhuiyan et al., 2024).

Discussions

The conceptual framework was developed deductively from the literature review findings, integrating thematic insights into a structured model to guide the understanding of digital supply chain adoption among South African SMEs in the manufacturing and logistics sector. The process involved:

Step 1: Theme Mapping
The four main themes from the literature review were mapped as framework components:

(1) Digital Supply Chain Adoption,

(2) Challenges to Adoption,

(3) Impact on Competitiveness and Market Access, and

(4) Strategies for Overcoming Barriers. This mapping was guided by the research questions and thematic analysis outcomes.

Step 2: Literature Grounding
Each component was anchored in key studies:

Adoption: Defined by technologies like IoT and AI (Gunasekaran et al., 2017; Zhao et al., 2023), reflecting the "Current State" theme.

Challenges: Drawn from resource, integration, and cybersecurity barriers (OECD, 2023; He et al., 2024; Bigliardi et al., 2023), consolidating the "Challenges" theme.

Impact: Linked to visibility, efficiency, and insights (Ageron et al., 2020; Mkhize et al., 2024), mirroring the "Impact" theme.

Strategies: Based on leadership, tailored approaches, and collaboration (Tiwari et al., 2024; Carvalho et al., 2024), synthesizing the "Strategies" theme.

Step 3: Integration
Components were sequenced into a process model (Figure 1), illustrating how adoption (input) faces challenges (barriers), yields impacts (outcomes), and requires strategies (enablers) to enhance SME market access. This structure was validated against theoretical frameworks (e.g., Dubey et al., 2017) and empirical findings (e.g., das Nair & Nontenja, 2023).

Step 4: Refinement
The framework was refined to ensure clarity and applicability to South African SMEs, emphasizing context-specific challenges for example, load shedding (PWC, 2024) and solutions for example, local collaboration (Bhuiyan et al., 2024).

Framework Components

The components of the framework include:

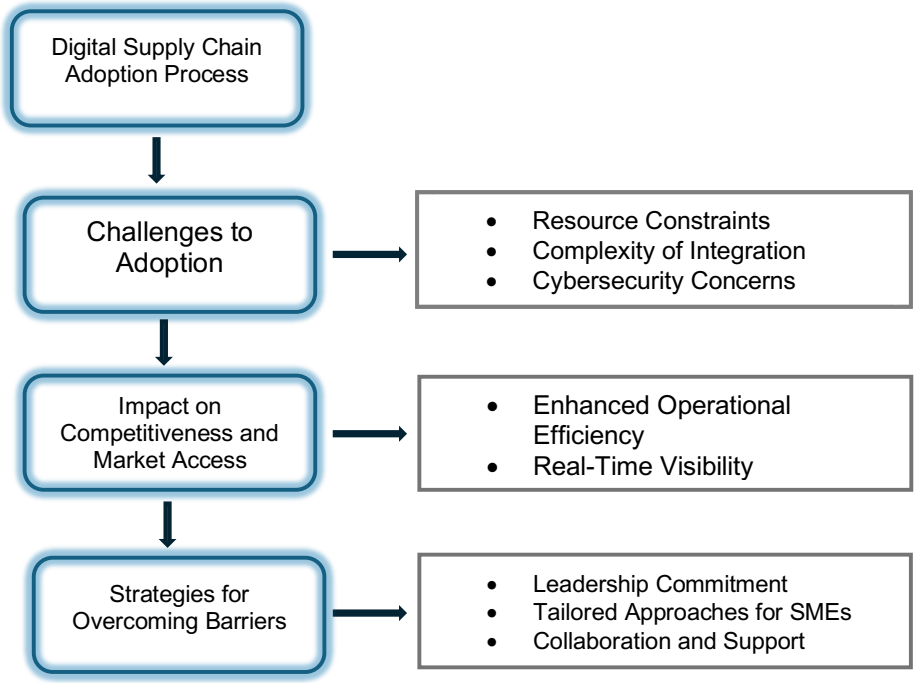
Digital Supply Chain Adoption
This component involves the integration of advanced technologies such as IoT, big data analytics, and AI into supply chain operations. It is crucial for enhancing efficiency, visibility, and decision-making capabilities within SMEs (Dubey et al., 2017; Zhao et al., 2023).

Challenges to Adoption
SMEs face several barriers to implementing digital supply chains, including resource constraints, complexity of integration, and cybersecurity concerns (OECD, 2023; Bigliardi et al., 2023). Addressing these challenges is essential for successful digital transformation.

Impact on Competitiveness and Market Access
The adoption of digital supply chains can significantly improve SMEs' competitiveness by enhancing operational efficiency, providing real-time visibility, and offering data-driven insights (Ageron et al., 2020; Mkhize et al., 2024). These benefits enable SMEs to better access both local and international markets.

Strategies for Overcoming Barriers
Effective strategies include strong leadership commitment, tailored approaches for SMEs, and collaboration with external stakeholders (Tiwari et al., 2024; Carvalho et al., 2024). These strategies help mitigate barriers and facilitate successful digital supply chain implementation.

Figure 2: Digital Supply Chain Adoption Process Conceptual Framework



The conceptual framework provides a structured approach to understanding the dynamics of digital supply chain adoption among SMEs in the manufacturing and logistics sector. By addressing challenges and leveraging strategic interventions, SMEs can enhance their competitiveness and improve access to both local and international markets. This framework serves as a foundation for further research and practical applications aimed at supporting SMEs in their digital transformation journey.

Conclusions

The adoption of digital supply chains presents a significant opportunity for South African SMEs in the manufacturing and logistics sector to enhance their competitiveness and access to both local and international markets. However, the research reveals that the current state of adoption is still in its initial stages, with many SMEs facing substantial challenges in implementing these technologies.

The primary barriers to adoption include resource constraints, complexity of integration, and cybersecurity concerns. Despite these challenges, the potential benefits of digital supply chains are considerable, including enhanced visibility and decision-making capabilities, improved operational efficiency, and access to data-driven insights.

To overcome these barriers and capitalise on the benefits of digital supply chains, a multi-faceted approach is required. This includes strong leadership commitment, the development of tailored strategies for SMEs, and increased collaboration and support from various stakeholders. By addressing these challenges and leveraging the benefits of digital supply chains, South African SMEs in the manufacturing and logistics sector can enhance their competitiveness, improve market access, and contribute to the growth of the sector and the overall economy.

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SUSTAINABLE DEVELOPMENT AND MICROFINANCE FOR SMALL AND MEDIUM ENTERPRISES: THE FOCUS FOR AFRICA?

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Abstract

This study has systematically reviewed existing literature to investigate the contribution of microfinance institutions and small and medium enterprises (SMEs) to Africa's sustainable development while taking into account the trade-off of all the systems (economic, social and environmental) using the Systems theory, to derive implications for policymakers from the insights. SMEs lack finance for their growth and expansion, and they require financial support from lenders such as banks and microfinance institutions to promote economic growth in Africa. SMEs also face other constraints such as lack of collateral security, financial illiteracy, lack of business and entrepreneurial skills, and negative perceptions by the financials that lead to credit rationing, among other factors. It is recommended that governments in developing countries in Africa should craft and implement financing policies that support SMEs in their contribution to sustainable economic development while at the same time addressing social challenges faced by their population in reducing poverty and other social ills.

Keywords: Microfinance, Small medium enterprises, Sustainable development,

Introduction

Poverty has largely remained an unsolved problem in developing countries, including Africa (Arandia and Hepp, 2020), emanating from unemployment in Sub-Saharan Africa (Dey, 2012). Microfinance has emerged as a key development tool to reduce poverty in Africa (Agbloyor, Asongu, Muriu and Yawson, 2022), and a long-desired development tool to eradicate poverty and social marginalisation (Arandia and Hepp, 2020).

For microfinance and SMEs to be effective, they should lead to African countries' sustainable development by promoting their economic growth, using a yardstick of Gross Domestic Product (GDP) and reduction of poverty as Sustainable Development Goal (SDG) number 1. To achieve 17 SDGs by 2030, all countries are called upon to take cognisance of achieving their national development plans within the stipulated timeframe (Moyer & Hedden, 2020). Despite heavily relying on foreign aid, Moyer and Hedden's (2020) research results have identified 26 most vulnerable countries (MVCs) from Sub-Saharan Africa that have failed to achieve any of the target indicators. The track into the future could be the required policy interventions in areas of microfinance and SMEs through entrepreneurship to promote sustainable development to achieve the SDGs within the given timelines. The invested funds from microfinance by SMEs sustain African economies over the long term, and this increases their financial independence, and a good example of such a model is the Grameen Bank of Bangladesh (Yunus & Jolis, 1999).

Evidence from existing literature suggests that microfinance and small and medium enterprises (SMEs) development have positive impacts on sustainable development, in areas of monthly sales (turnover), asset accumulation, capital stock and employment creation, particularly in Sub-Saharan Africa and Asia, with particular interest on (Hameed, Azeem, Ali, Nadeem & Amjad, 2017; Alhassan, Nwagbara, eds, 2021, pp. 4). From the United Nations General Assembly's 2015 sustainable development goals (SDGs), SDG 8.2 together with SDGs 8.3 and 9.3 in Africa concentrate on labour-intensive sectors and affordable financial support for SMEs respectively (Brixiová, Kangoye & Yogo, 2020). In order to create jobs for poverty reduction, Ethiopia has given priority to these development strategies (NPC, 2016; WBG, 2018).

African SMEs need to be empowered financially through microfinance in order to build sustainable businesses and be engines of sustainable development. This investment in entrepreneurship boosts economic growth and employment creation (Arko-Achemfuor, 2017; Chliova, Brinckmann & Rosenbusch, 2015; Haugh & Talwar, 2016; Roundy, 2017; Campanella & Serino, 2019; Chigudu, 2018), where jobs provide income that raises the standard of living, economic and financial independence and improve consumption possibilities of the general populace (Mchilo, 2017). Given the informality of most African businesses, microfinance institutions (MFIs) have been highly relevant to many developing and emerging market economies, through the provision of appropriate and affordable financial support to SMEs (Watambwa & Shilongo, 2021). The owners of these SMEs need access to financial support in the form of credit (micro-loans), micro-savings and insurance from both formal and informal sources for start-ups, business expansion, sustainability, and viability (Quaye, Abrokwah, Sarbah & Osei, 2014; Samson, Olubunmi & Adekunle, 2013; Cole & Sokolyk, 2016; Mngadi, 2016; Cull & Morduch, 2018).

However, Africa's entrepreneurship ecosystem faces funding constraints, lack of business skills, poor market access, and lack of operating space (Gebreyesus & Adewale, 2015; Endris & Kassegn, 2022), unfavourable business environments, inadequate access to finance and high levels of informality (ITC, 2019). The challenges such as lack of access to finance, weak entrepreneurial attitudes, government policies, regulations and practices for entrepreneurs, and training are the main constraints to SME development in sub-Saharan Africa (Achtenhagen & Brundin, 2016; Herrington & Coduras, 2019). In agreement with these findings, literature has further argued that the sustained success of SMEs depends on local conditions, such as public services, good corporate law and access to finance (EDFI, 2016; Endris & Kassegn, 2022). These constraining factors on the African SMEs' development have made them shift their core focus of business growth and development to personal financial survival, leading to funds diversion (IFC, 2020b). These challenges SMEs face in accessing finance have made Africa have the lowest active borrowers compared to the rest of the world (Agbloyor, et al., 2022).

Literature Review

The review of prior literature was done from reliable research articles, institutional reports, and policy documents, and in this paper, the definitions of the working variables were looked at, which are sustainable development, microfinance and small and medium enterprises. Further reviewed literature shall dwell on the impacts of microfinance for the achievement of sustainable development and SME development in Africa. The gaps in literature shall be under the discussion section.

Sustainable Development

In simpler terms, sustainable development means "development that can be continued indefinitely or for the implicit period of concern" (Lele, 1991, p. 167). Generally, these are economic sustainability practices that support economic growth in a way that does not impact negatively on the social, economic, and environmental aspects of the communities involved (Doane & MacGilivray, 2001). From an economic point of view, sustainable development is defined as "economic development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs" (Bossel, 1999, p. 2). From a broader view, sustainable development is defined as "the kind of human activity that nourishes and perpetuates the historical fulfilment of the whole community of life on earth" (Bossel, 1999, p. 2).

Besides solely pursuing economic growth, sustainable development is about embracing the concept of inclusive growth, which looks at broader aspects of economy, social and environment. This has led literature to look at SD, which is premised on two sustainable development paths strong and weak sustainability (Shi, Han,Yang & Gao, 2019). Strong sustainability has been the most acceptable and is a nature-based view, that argues that economic growth which comes from production (GDP) and consumption, which are collectively referred to as manufactured capital, require input from the irreplaceable natural capital (environment). This type of sustainable development is mostly concentrated on short-term comprehensive goals that are achievable within fifteen (15) years, according to Shi et al. (2019). Weak sustainability (ecological sustainability) is a human-centred view, that states that natural capital can be replaced by manufactured capital. Therefore, it requires that

production should increase in the process of economic development, regardless of environmental degradation (natural capital), and still, it is sustainable. It is a development model that is more psychologically and cognitively acceptable to contemporary people, as it depends on an individual's understanding of the level of development at any particular point in time (Shi et al., 2019).

Sustainability is a dynamic concept as societies and their environments change, technologies and cultures change, and values and aspirations change. To allow and sustain such changes requires that sustainable development includes a cultural dimension to it for it to be sustainable (Bossel, 1999). According to the preface to the Universal Declaration on Culture Diversity, culture is defined as: "the set of distinctive spiritual material, intellectual and emotional features of society or a social group, and that it encompasses in addition to art and literature, lifestyles, ways of living together, value systems, traditions and beliefs".

From the foregoing discussion above, SD is better defined, understood and evaluated when all the systems in a human society coexist mutually, leading to the systems theory in the section below, as the underlying theory in explaining SD.

Systems theory

Human society and the natural environment are complex adaptive systems, where the former is embedded in the latter, as they coexist and mutually interact. For systems to be viable in human society, sustainability must be treated as an explicit goal of humankind that exists within coexisting systems, hence the need to embrace change and evolution in those systems (Bossel, 1999). Given the dynamism and complexity of the human societal system, its component systems, and the resource and environmental system on which they depend, the system theory has been adopted to explain sustainable development in this paper. The whole process of sustainable development has been seen to exist and achieved in a recursive relationship: systems depend on other systems that depend on yet another set of systems, and so on. As a summary of the application of the systems theory on sustainable development, Barbier (1987, pp.104) stated that "The general objective of sustainable economic development, then, is to maximise the goals across all these systems through an adaptive process of trade-offs" as illustrated by the intersection of the economic, social and environmental systems in the Venn diagram of Figure 1 below.

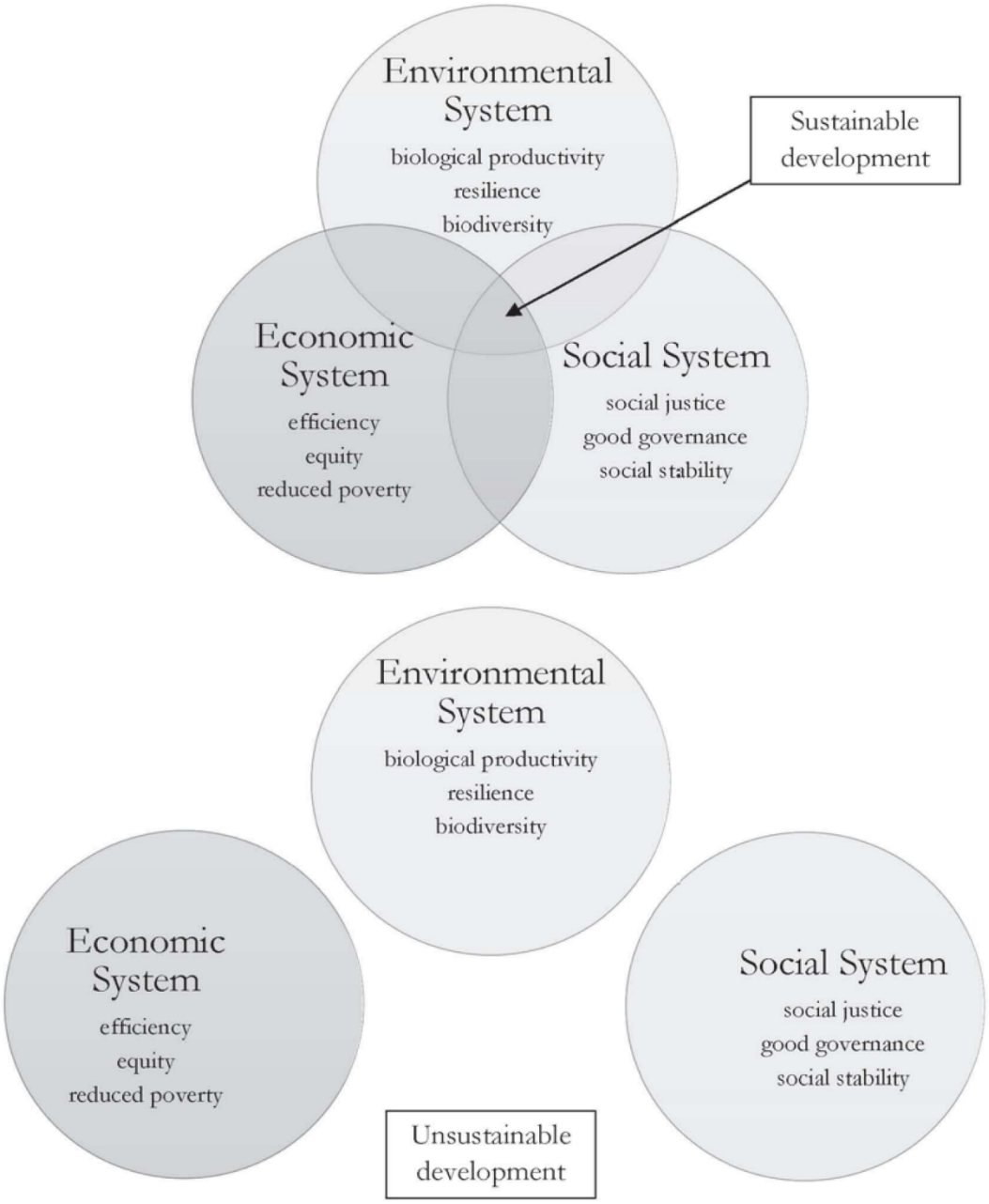


Figure 1: The Systems Approach to Sustainability (Adapted from Barbier, 1987)

According to Barbier and Burgess (2017), the systems approach better depicts the achievement of goals of sustainable development at the intersection, where all the systems (economic, social and environmental or ecological, are interlinked. As the countries strive to achieve economic growth/development and poverty reduction from the economic front, their impacts should not be taken for granted on the social aspects of SD, such as social justice, good governance and social stability and environmental depletion or degradation (biological productivity, biodiversity and ecological resilience), having in mind the welfare of future generations (Barbier & Burgess, 2021).

Microfinance

Historically, microfinance evolved and developed from the term ‘microcredit’, with its existence dating back many centuries ago (Hussain, Mahmood & Scott, 2019). Microcredit has evolved over the years through the provision of small loans only to the poor (Christen, Rosenberg & Jayadeva, 2004), and was later replaced by the modern-day term, microfinance, in the mid-1990s, with an extension in the provision of additional services such as savings, insurance, remittances and non-financial services such as financial literacy training and skills development programmes (Dhungana, 2017; Ukpong & Acha, 2019). From the needs point of view, microfinance has been defined based on five basic micro-financial needs, which are remittances/money transfers, money payments/payment services (making payments and receiving money), savings (saving money for future needs), credit/loans (borrowing to improve circumstances or increase productive capacity) and insurance (insuring against life emergencies such as loss, damage, illness, or death) (Quaye et al., 2014; Karki, Dhungana & Budhathoki, 2021; Shipalana, 2017). Generally, microfinance is the provision of financial services to the unbanked and under-banked households and small to medium enterprises, that lack access to conventional banking and related services (Christen et al., 2004). The primary and significant aim of microfinance is that of poverty eradication especially in developing countries, through the provision of micro-loans, micro-savings, and insurance to the previously disadvantaged, marginalised and financially excluded communities, and SMEs (Mngadi, 2016; Rachmawati, 2017).

Economically, Shah, Rahman, and Khan (2019) took microfinance as a developmental tool or strategy where MFIs and strategic business units of banks, financially support the SMEs. Lorenzi (2016) defined microfinance as a general term that describes financial services availed to low-income individuals or to those who do not have access to typical banking services. Hence, microfinance is a sustainable provision of appropriate and affordable financial support to SMEs owned by vulnerable, financially, and socially excluded women, youths, and disabled, shunned by conventional financiers, such as banks (Machingambi, 2020; Brixiová, Kangoye & Yogo, 2020).

Positive impacts of microfinance and SMEs

SMEs, despite being smaller in size, have come out as a major source of economic growth, innovation and job creation to potentially achieve most of the sustainable development goals globally (ITC, 2019). SMEs have provided a substantial collective contribution to the national economy, have contributed more than 50% of most African GDP and on average, they have contributed 60% of employment to Africa’s job market (Muiruri, 2017, White, 2018).

It has been noted in the literature that there is a large concentration of SMEs in sub-Saharan Africa, with their contribution to SDG 8, that is centred on “promoting sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all” standing at 83% (IFC, 2017). However, literature has shown that SME development and contribution have been hindered by lack of funding, market access, regulatory issues, skills shortages, inadequate infrastructure and an unstable regulatory environment, as reiterated by Wangu Ngari

(2023) in Zambia. As far as job creation is concerned, SMEs have contributed two-thirds of all formal jobs in developing countries and 80% in low-income countries (Muriithi, 2017; Ussif and Salifu, 2020). Evidence has shown that SMEs have contributed over 49% of the increase in the labour force in five Sub-Saharan countries (Botswana, Kenya, Malawi, Swaziland and Zimbabwe). On the same note, SMEs account for about 80% of employment growth in Tanzania (Diao, Kweka & McMillan, 2018).

Small and Medium Enterprises

In this paper, SMEs, despite their size, are a tool to achieve most of the sustainable development goals in Africa (Endris & Kassegn, 2022). SMEs have different definitions, which are based on the intended use of the data (Chivasa, 2014). In Zimbabwe, SMEs are defined based on their turnover and assets (SMEAZ, 2018). Specifically, the Small Enterprise Association of Zimbabwe (SMEAZ) defines small enterprises as those having a turnover of less than $240 000 (USD) or assets valued at less than $100 000 (USD). The association also defines medium enterprises as entities whose turnover and value of assets are above the thresholds for small enterprises but are less than $1 million (USD) each. The Ministry of SMEs and Cooperative Development defines these entities as all enterprises that are not categorised as large companies, regardless of their registration status (Chivasa, 2014). According to the Ministry of Small and Medium Enterprises and Cooperative Development (2014) under the ambit of the Government of Zimbabwe, a small enterprise is classified and defined using the number of employees as the size category “as a registered business entity with not over 50 employees and the medium enterprise as a registered business entity with employees between 75 and 100”. For this paper, the employment definition has been adopted since unlike assets and turnover, this is not affected by inflation (Zvirikuzhe, 2022).

STRATEGIES FOR SUSTAINABLE DEVELOPMENT IN AFRICA

In the subsequent sections below, business strategies and innovative solutions have been identified from the reviewed literature to support African SMEs and microfinance to work as tools for the achievement of sustainable development and poverty reduction.

Entrepreneurship

Entrepreneurship is a catalyst for societal transformation, a fuel for global sustainable development and poverty alleviation (Hall, Daneke & Lenox, 2010; Wiklund, Davidsson, Audretsch & Karlsson, 2011; Phillips, 2006; Haugh & Talwar, 2016; Roundy, 2017; Campanella & Serino, 2019). In agreement with this assertion, Devine and Kiggundu (2016) took entrepreneurship as a cure for Africa’s problems, which include unemployment, inequality, low productivity, disconnect from global value chains, etc. Its implementation requires that African entrepreneurs, whether women or men, take centre stage and be at the forefront of solving the continent’s social and economic challenges through the creation of wealth for themselves and their communities (Kim & Jin, 2022). According to Schumpeter (1934: p. 66), “entrepreneurial activities can consist of the: (1) introduction of a new good (or a new quality of a good); (2) introduction of a new method of production; (3) opening of a

new market; (4) conquest of a new source of supply of raw materials or semi-manufactured goods; and (5) implementation of a new organizational form".

To be financially independent, individual African governments should embark on developmental and economic reforms using domestic resources. Entrepreneurs, whether domestic or foreign, are risk-takers, opportunists and innovators (Frederick & Kuratko, 2009; Carlen, 2016), and through financial support and endowment, there is a new capacity to create wealth (Zietlow, 2001; Drucker, 1985). In agreement, Hall et al. (2010) recognised entrepreneurship as a major conduit for sustainable products and processes, and the newly created ventures are a route to addressing many social and environmental concerns. To support this position, Derera, Croce, Phiri, and O'Neill (2020) argued that small businesses need to be empowered through entrepreneurship, ownership, and access to factors of production such as property assets and finance, among other things. To this end, the international development community such as the World Bank, has prioritised access to capital at the top of the list especially when formulating financing policies in both developed and developing countries (Ashamu, 2014; Omondi & Jagongo, 2018).

The United Nation's Sustainable Development SEED initiative has identified these alternative entrepreneurship strategies as sustainable and critical for improving incomes, strengthening livelihoods, and tackling marginalisation and poverty on the African continent while conserving natural resources and ecosystems (SEED & IISD, 2009). Holt and Littlehood (2015) called for engagement in entrepreneurial ventures or any form of trading activity, to raise funds for operations and become financially independent and empowered.

Financially self-sustainable MFIs

MFIs need to be financially sufficient and stable to achieve their twin objectives of social performance (social motive) and profit maximisation (economic motive), otherwise, there is going to be social drift according to Mia and Lee (2017). Taking from the preceding discussion, the future development of entrepreneurship can be enhanced through the existence of an efficient and effective microfinance system to build sustained economic growth (Alalade, Amusa & Odekunle, 2013; Audu, Abubakar & Baba, 2021). To this end, banks and microfinance institutions as formal sources of microfinance products and services act as catalysts for entrepreneurship development targeting SMEs that usually operate in the informal sector of both developed and developing economies (Alalade, et al., 2013; Chliova, Brinckmann & Rosenbusch, 2015). However, Agbloyor, et al. (2022) came up with an opposing position where they enunciated that despite African MFIs being financially self-sustainable, they have been found to have the lowest financial-self sustainable (FSS) ratio globally. In support of this position, Babajide, Lawal, Asaleye, Okafor and Osuma (2020) argued that financial stability in sub-Saharan Africa enhances entrepreneurial development which ultimately leads to improved economic growth and accelerated achievement of SDGs.

Embracing technological and infrastructural innovations

For African SMEs to make a meaningful contribution to sustainable development and employment creation, there is a need for adequate infrastructure. Literature has found that 88% of SDG 9 can be achieved, which is that of "build resilient infrastructure,

promote inclusive and sustainable industrialisation and foster innovation" for SMEs to be relevant in the growth of African economies (ITC, 2019; Endris & Kassegn, 2022). For the creation of new opportunities, SME development, growth and expansion, they should embrace technological and digital innovations, through using information and communication technologies (ICTs). Opportunities have been created for SMEs to access safe, secure, and affordable finance from MFIs through high mobile phone penetration in rural and urban areas of Africa (Amankwah-Amoah, Osabutey & Egbetokun, 2018). SMEs also need adequate workstations to work from and access to water and electricity.

Favourable business and regulatory environment (support service programs)

The creation and existence of such an environment by government is crucial for the growth and development of SMEs in areas of sales, employment and capital asset formation (Hailu, 2016; Yimesgen, 2019). The government's support extends to MFIs in areas of ease of licensing by the respective authorities to boost competition to avoid unscrupulous private investors and reduce interest rates for affordable funding to SMEs, as their recipients. To formalise their businesses, SMEs need easy and cheaper access to licences from local authorities and other regulatory bodies. Ethiopia has recorded success in the ease of obtaining licenses by SMEs compared with other Sub-Saharan African regions (Endris & Kassegn, 2022). However, such support systems are not sufficient for the development of SMEs (Hailu, 2016).

Discussion

From the reviewed literature, it has been found that entrepreneurship development through SMEs is key to Africa's sustainable development and prosperity (Abisuga-Oyekunle, Patra & Muchie, 2020; Mutisya, 2024). Existing reviewed literature has found that for this mandate to be achieved, there is a need to avail resources by financiers, such as banks and MFIs, to SMEs to indulge themselves in different entrepreneurial activities to end poverty in all its forms everywhere. It was further found that entrepreneurship support in African SMEs promotes inclusive and sustainable economic growth, employment creation and reduced inequality (social marginalisation) within and among countries (Endris & Kassegn, 2022; Bosma, Hill, Ionescu-Somers, Donna Kelley & Tarnawa, 2020; Lin & Koh, 2019).

African governments should not undermine the contribution of SMEs to their development agenda and can be a conduit of escape from foreign aid when taken advantage of, positioning the continent as innovative and competitive (Muriithi, 2017). As vital economic triggers, African governments should develop favourable policies for SME development by improving their operations and profitability and include them in their development agenda for their economies to be self-sufficient and dependent to avoid their reliance on aid (Mamman, Kanu, Alharbi & Baydoun, 2015; Mutisya, 2024). This paper's contribution to literature suggests that Africa's transformation should be aid-free and empower the next generation of African SMEs by giving them the tools, the funding, the training, and the networks to build sustainable businesses that create jobs and drive economic growth, through a joint stakeholder approach, with private and public partnerships in place. This initiative needs an appropriate legal framework, business infrastructure, continual power and water supply and accessible financial supply from both formal and informal sources, such as banks, MFIs and rotating schemes (Muriithi, 2017). Evidence has shown that SMEs and microfinance have contributed to the achievement of sustainable

development in Ethiopia and other Sub-Saharan African countries (Endris & Kassegn, 2022).

For the achievement of sustainable development in Africa and reducing poverty through increasing financial access to the vulnerable poor SMEs, there is a need to develop and implement sustainable microfinancing models, that run hand in hand with a vibrant and stable financial system, composed of financially self-sufficient MFIs, appropriate regulatory and business environments (Rambu Atahau, Apriani Dorkas, Huruta, Andrian Dolfriandra & Lee, Cheng-Wen, 2020).

From the preceding discussion, some literature has found that SMEs together with microfinance contribute to economies' sustainable development and raising the standard of living through job creation (Alalade, et al., 2013; Chliova, Brinckmann & Rosenbusch, 2015; Endris & Kassegn, 2022; Mutisya, 2024). Other authors have found some militating situations that work against the achievement of such development goals. Such challenges have been identified as lack of financial support from the financiers, lack of business training/skills, poor market access and lack of operating space, weak entrepreneurial attitudes, funds diversion from investment to consumption (Gebreyesus & Adewale, 2015; Chigudu, 2018; Herrington & Coduras, 2019; IFC, 2020b), unfavourable business and weaker regulatory environments/policies, and high levels of informality (ITC, 2019).

In Kenya, SMEs' contribution to the country's sustainable development is limited due to their informality, and Mutisya (2024) suggested comprehensive policy measures by the key stakeholders, that help in overcoming the various challenges they face. In Ghana, the major hindrance to SME growth, expansion and functioning has been the constrained access to finance where nearly half of the developing world's SMEs have been affected (Nyanzu & Quaidoo, 2017). African SMEs have continued to face challenges in lacking collateral security (Dai, Ivanov, & Cole, 2017; Chigudu, 2018; Tshabalala, 2019), financial illiteracy (Matamanda, 2018), high interest rates among others (Rahman, Rahman & Belas, 2017), and these work against accessing financial support for their business needs.

Despite the challenges SMEs face in accessing the necessary and required finance for their development and growth, to meaningfully contribute to Africa's sustainable development and poverty reduction, some literature has found strategies that can be indulged in, such as entrepreneurship, MFIs, supportive regulatory frameworks and policies (Kim & Jin, 2022). From the reviewed literature, it has been noticed that there is an orientation drift in MFIs' mandate from social to financial motive, called mission drift (Mia & Lee, 2017; Navin & Sinha, 2021). In agreement with this contention, Arandia and Hepp (2020) further reiterated that during the last four decades, funding institutions such as banks and MFIs, as private investors, have transformed microfinance into a profitable business venture rather than serving the poor.

The question still remains "Has sustainable development achieved in Africa" and "How can sustainable development be achieved". According to Lele (2005), these questions remain unanswered, and it has just become the watchword for international aid agencies, the jargon for development planners, the theme of conferences and learned papers and a slogan of development and environmental activists. More concentration on defining sustainable development is on GDP while neglecting the social, environmental (ecological) and cultural aspects of sustainable development. The generation of wealth, prosperity and economic growth (GDP) involves the depletion and environmental degradation of a nation's resources, hence making

development unsustainable. Once such systems are neglected, then sustainable development is not complete, as long as there is no intersection of all the systems of human society, hence the gap. In agreement with this finding, Shi et al. (2019) posited that SD is complete to achieve poverty alleviation and promoting economic growth, when society's survival does not cause a cost in damaging the ecological environment. The time is now for environmentalists and development activists and come together to tackle the myriad of problems Africa is facing under the banner of sustainable development (Lele, 1991, pp.184). Although the strong sustainability path has been taken as an accepted concept of SD, Shi et al. (2019) further found some misinterpretations of SD theory concerning the struggle between strong and weak sustainable development paths and the confusion of the concept of intra-generational and inter-generational justice.

A further gap in the literature is on the timeframe needed for the achievement of targets and goals of sustainable development, where in most cases, it is short term, usually fifteen years, the example of the UN SDGs of 2015, which should be achievable by 2030. For systems to be viable for achievement of the overall sustainable development in all its forms, the focus should be long term to cater to future generations. More needs to be done to come up with a proper timeframe for SD's achievement. Shi et al (2019) noticed slowness on the pace and progress to achieve the sustainable development targets by 2030, culminated by funding constraints in most African countries.

Still more needs to be done by different stakeholders to ensure that microfinance and SMEs in Africa are used as conduits for the continent's sustainable development and poverty reduction, where Sinkovics, Sinkovics and Archie-Acheampong (2021) suggested a multi-stakeholder approach. According to Agbloyor et al. (2022), there is still inconclusive evidence on the impact of microfinance on improving welfare in the continent. Literature has further shown that in Ethiopian SMEs have impacted positively on the country's sustainable development goals, despite facing challenges of accessing finance, electricity, and trade regulation, and these worked against the development of the sector (Endris & Kassegn, 2022).

This paper suggests that African governments develop a robust monitoring and evaluation framework to track the progress of their entrepreneurs (SMEs) and measure their impact on their communities and economies, as far as sustainable development and poverty reduction are concerned. This position is being supported by the review from Endris and Kassegn (2022) that advocates for the development of a comprehensive policy to counter existing challenges of the SME sector while embarking on the sector's impact evaluation research on the achievement of a country's sustainable development goals.

Conclusions

There is still confusion and misinterpretations on what sustainable development is and how it can be achieved. To completely achieve the expected goals of sustainable development, the trade-off of economic, social and environmental systems should be attained, according to the systems theory adopted in this paper. To counteract the plagued poverty and backwardness in Africa, governments should financially support and promote SMEs through microfinance programs and entrepreneurial interventions to boost their economic growth and thereby solve their socio-economic challenges that continue to plague its citizens, including among other things unemployment,

education (literacy), health (diseases), hunger and poverty, as these have continued to be a common global concern. Across the African continent, countries have increasingly embarked on both domestic and international entrepreneurship in SMEs through access to funding and resources, mentorship, coaching, and training, to catalyse their entrepreneurial activities to further job creation, poverty alleviation and inclusive economic empowerment. This has created an interest in policymakers, academics, and other scholars to research improving the effectiveness of this gesture to promote economic growth and reduce poverty in African countries for the achievement of sustainable development.

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THE IMPACT OF FINANCIAL LITERACY ON SMALL MEDIUM AND MICRO ENTERPRISES DEVELOPMENT IN THE MUSINA LOCAL MUNICIPALITY

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Abstract

Financial literacy is a challenge to the success of SMMEs. The study aims to address challenges that negatively impact the financial competency of SMMEs. Subsequently, a framework was developed to equip SMMEs to become competitive in their respective industries. The goal is to address South Africa's triple challenges of poverty, unemployment, and inequality. The study adopted a quantitative research method. Data was collected through a self-design survey questionnaire. The questionnaire was distributed to 100 SMMEs in Limpopo in the Musina district municipality. The findings of this study revealed that the SMMEs in Musina have challenges with financial literacy, thus influencing the overall success of the industries and it is affecting their ability to access markets. The SMMEs in Musina are not benefiting from the catalyst projects that have been implemented in their municipality as they are not at the level at which they can compete with big companies. The findings of the study are expected to confirm the influence of financial literacy on SMMEs. As a result, for SMMEs to thrive, they should invest in financial literacy which will aid their financial capabilities for better sustainability and competitiveness than large companies. The findings are expected to benefit future researchers and SMMEs to look at the industry not only for personal sustenance but to move to a global perspective and impact nations as South Africa has resources, especially in Agriculture and Mining that can allow them to supply internationally and investigate the role of innovativeness in this sector.

Keywords: Competitiveness, Financial Literacy, SMMEs and Success

Introduction

Small businesses in South Africa play a key role in driving job creation, technology, and skills transfer. In addition, the country is characterised by a high rate of unemployment, especially amongst the African population youth, and women.

Scholars such as Lings (2014) argue that the business failure rate of South African SMMEs is very high. Despite the number of policy interventions to address the challenges, SMMEs are still experiencing a high failure rate (Zhou et al., 2024).

Bushe (2019) highlights that based on the 2012 Global Entrepreneurship Monitor (GEM), South Africa's SMME survival rate is below global standards. Bushe (2019 further argues that even though SMMEs are globally viewed as a much-needed remedy to address economic development challenges such as job creation, poverty reduction, and inequality, “research on the causes and consequences of small business failure is negligible in the world's developing and underdeveloped countries, and South Africa is no exception.

However, Zhang et al. (2022) indicate that small businesses, on the other hand, are in financial difficulty due to severe financial challenges, incomplete financial information, and limited capital. SMMEs are regularly omitted from traditional networks (Wang & Yang, 2016; Wong et al., 2016). Financial challenges affect the successful operation and management of SMMEs. Meeting this challenge requires models and solutions to improve financial performance. Supply chain finance was identified as one of the solutions to these SMEs' financial hardships to increase financial efficiency, reduce financing costs, and create value across the supply chain (Gelsomino et al. 2016; Polak et al., 2012; Xu et al., 2018).

SMMEs in Musina have a challenge with financial literacy. Financial literacy influences their success, and their ability to access markets. Musina's SMMEs are not economically benefiting from the catalyst projects implemented in their municipality because they are not at the level at which they can compete with big companies.

Literature Review

Financial literacy Definition

Koltaro et al. (2019) argue that financial literacy has evolving implications. Financial literacy addresses the knowledge and cognitive skills necessary to manage finances and make effective decisions about financial matters. People can make informed decisions about how to use and manage their money. Small businesses need financial literacy to assess their company's financial position and make financial decisions.

Swiecka et al. (2019), the International Financial Literacy Network defines financial literacy as a “mixture of awareness, knowledge, skills, and attitudes necessary to make well-informed financial decisions and ultimately achieve personal well-being” (Atkinson and Messy, 2012). This definition was endorsed by the G20 principles of State and Governments (G20, 2012).

Financial literacy importance

As highlighted above there is an evolving significance of financial literacy (Korutaro et al. 2019), an individual can make an informed decision regarding the use and manage their money. SMMEs

need financial literacy to assess their company's financial position and make informed financial decisions. In addition, financial literacy could help businesses meet the challenges of today's cutting-edge credit markets. Financial literacy equips entrepreneurs to manage risks through strategies, such as holding financial reserves, differentiating their investment portfolio, and purchasing insurance. Inadequate financial literacy has been identified as one of the main obstacles to the sustainable development of SMMEs.

Challenges of lack of financial literacy

Raposo and Kehmann (2018) maintain that the financial crisis has significantly reduced both equity and debt inflows to SMMEs. Recent research highlights the need for entrepreneurial financial inclusion. Policy debates have focused on SMME growth and financial inclusion in most developing markets (Ayyagari et al., 2017).

Dhanah (2016) reports that SMME contractors underestimate and fail to estimate the capital required to complete their projects. This underestimation of capital affects the completion and success of the projects. At the same time, Majama and Magang (2017) state that failing to estimate the capital amount contributes to the business's financial capacity, and underestimating guarantees affect the project's completion. Low financial literacy affects entrepreneurial organisations, and Kotze and Smith (2021) subsequently concluded that low financial literacy is a major reason for the failure of SMMEs. Many challenges hinder the success of the SMMEs sector; lack of proper competencies to run a business, lack of financial support, lack of technical features and poor management skills (Mazibuko, 2021).

Financial Literacy and the Competitiveness of the SMMEs Education

Buchdadi et al. (2020) state that good financial literacy can minimise financial risks posed by businesses. This is because a financial risk attitude enables entrepreneurs to be aware of the opportunities and hazards that are associated with their business and financial decisions. Attitudes toward financial risk also influence a company's financial decisions (Garling et al., 2009) and operational risks can also be avoided.

Usama and Yusoff (2019) define business performance as the ability to achieve set goals. Business performance is therefore defined as a business’s ability to achieve planned results as measured against its intended outputs. This includes results related to financial performance, market performance and shareholder returns. Richard et al. (2009) add that business performance is also the ability of a firm to meet or exceed predetermined targets or targets agreed upon by investors over a period by a company.

Furthermore, Matewos (2016) highlighted that financial education is equally important not only for the interests of individuals and businesses but also for the health of financial service providers and the financial system. Menike (2018) found that financial literacy, financial behaviour, and financial management positively impact firm performance, while financial attitudes do not show a statistically significant relationship with SMMES performance. Furthermore, it discloses that the chances of them following their parents’ life experiences and lessons are high. The discoveries give practical implications for the government, other establishments, and of course SMME owners by stressing the significance of facilitating SMME owners’ financial education with hopes of bettering the owner’s performance as business leaders in the country.

Financial Literacy of SMMEs and Access to Markets

Financial literacy is recognised as an important knowledge resource for financial decision-making, but insufficient attention has been paid to how financial literacy affects SME sustainability. SMMEs make a significant contribution to economic development through wealth distribution, job creation, technological progress, poverty alleviation and innovation. A strong SMME sector is essential for establishing a solid industrial sector in the economy but cannot find information and ability to identify opportunities (Ye & Kulathunga, 2019).

Usama and Yusoff (2019) found that entrepreneurs operate in a dynamic environment, and as financial markets become more competitive and financial portfolios become more complex, entrepreneurs become vulnerable to information asymmetries. This is because the complexity of financial markets does not match the corresponding growth in entrepreneurial financial literacy (Barte, 2012). At the microeconomic level, small businesses are the pillar of many economies, and when entrepreneurs lack the financial literacy to run a successful business, the entire economy is at risk (Dahmen & Rodriguez, 2014).

According to Drever et al. (2015), cognitive skills and knowledge are necessary for financial literacy, along with specific behaviours, desirable attitudes, and external support factors. Well-functioning SMMEs are essential to stable and sustained economic growth. Rapid economic development and high profitability in emerging countries enable SMMEs to become more competitive in both domestic and global markets. The SMME sector is of great importance to developing countries with the potential for the development of this sector. Several characteristics of developing economies, such as economic turmoil, volatile exchange rates, immature information infrastructure, rising transaction costs, political instability, high inequality, and increased unilateralism in trade pose further threats to sustainability.

Financial Literacy and the Operations of the SMMEs

Ayandibu and Houghton (2017) state that job opportunities are created by SMMEs which lead to innovation and economic growth. SMMEs in emerging markets face a variety of challenges, including a lack of access to bank loans and limited financial and capital resources.

Dai (2021) states that financial literacy is an individual's ability to understand and take advantage of financial challenges. Behavioural finance is related to how humans behave in a financial determination. Furthermore, finance is the science and art of managing money. Good SMMEs to financial will make a business that will continue. The most important thing is that SMMES have good business continuity. Business can continue if the financial aspects are recorded.

Dai (2021) recommended that there are several challenges related to financial attitude, namely that entrepreneurs do not have financial plans, this is due to a lack of understanding of finance. Most entrepreneurs do not have financial statements, and because they are not expecting financial statements, they think they are complicated, and some have a behaviour of not saving money. They still combined personal finances and business finances, therefore there is no visible advantage. The other challenge is managing finances, and confusing financial management. Managers are generally decision-makers and play a key role in the decision-making processes related to the acquisition, allocation, and use of economic resources. For them to succeed, they need key skills like analysing, managing, and writing about the financial conditions of the company. SMMEs across the country are of great interest to development economists, entrepreneurs, governments, venture capital firms, financial institutions, NGOs, etc (Eniola & Entebang, 2014).

Fatoki (2021) concluded that the SME sector accounts for 98.50% of all occupations in all companies. One of the reasons for the low contribution of SMMEs to job creation in South Africa is their high turnover rate and this is because when small businesses fail, jobs are lost. High turnover rates among SMMEs imply the sector's ability to create jobs, reduce poverty and income inequality, and make a significant contribution to economic growth in many countries. About 70% of SMMEs go bankrupt within two years (Bushe, 2019). It affects the employment contribution every year. South Africa's SME sector stands out internationally in terms of employment and contribution to GDP. SME growth is hampered by many factors, including lack of managerial skills, regulation, and lack of access to external funding. Most SMEs are managed by owners and their success or failure depends on the resources available to their owners. This includes financial literacy. It measures how well a person can understand and use personal finance.

Menike (2018) outlines that financial literacy is a part that needs acquaintance, ability, attitude, and experience, with aims to challenge the survival of the company, profit, and sales maximisation, taking a specific market share, minimising staff turnovers, and internal conflicts, and maximising wealth (Jacobs, 2001). The decision-making of a business requires balanced and prefaced available data which suggests that the manager of the business and individual must have a sensible degree of knowledge related to the available data to make good decisions. Financial literacy is termed as the understanding and knowledge of the financial principles needed to make informed financial decisions and products which impact one's financial well-being (Basu, 2005). It comprises the capability to make knowledgeable verdicts and operative decisions concerning financial substances (Worthington, 2005). SMMEs with inadequate capital investment, and who may need financial and managerial support to effectively manage their business, are influenced by managerial factors, which delay their performance in terms of quality of work, tender preparation and estimation, completion of projects on time (Kulemeka et al., 2015).

Research Methodology

A quantitative research method was used in this study. Quantitative research generally seeks to understand a problem from the perspective of many respondents. This study was conducted using a descriptive research survey design. Designing a descriptive survey is an appropriate way to influence financial literacy on the development of SMMEs in Musina City in a social context. The study population consisted only of SMMEs currently engaged in this sector. Simple random selection is a selection mode that can select small groups or individuals who are likely to be knowledgeable and informed about the phenomenon of interest and select cases without the need or desire to generalise to all such cases.

Data was collected through a self-design questionnaire, and the questionnaire was distributed to 100 respondents to complete. The Musina Beitbridge Business Chamber is a consortium of different business forums that are housed in the MBBC, it consists of all business industries, and it consists of all racial groups. The questionnaires were distributed to all members who were present in the study meeting. The non-random method was used to ensure all members are given equal opportunity to participate. The findings will add value to all groups of businesses, the report would be used by any SMMEs that are situated in the Vhembe district municipality and the Limpopo province. Descriptive data analysis was used to determine the level of final literacy for the SMMEs.

Results

Demographic information

The questionnaire survey was distributed to 100 SMMEs in Musina district municipality. This group completed and returned a total of 78 questionnaire surveys. Using this data, a response rate of 78% was achieved. This is excellent given that a response rate of at least 35% for most online surveys is considered acceptable in theory (Nazarian, 2013).

Gender of respondents 55% are male and 45% are female. This is an indication that the majority of male respondents dominated than female counterparts.

The distribution of respondents' age diverse between 18-20 years (10%), 21- 30 years (15%), 31-40 years (25%), 41-50 (30%) years, 51-60 years (10%), and 61 years and more (10%).

In terms of work experience of respondents: 0-5 years (5%), 6 -10 years (20%), 11 -15 years (15%), 16-20 years (25%), 21-25 years (20%) 26 -30 years (5%), and more than 30 years (10%).

In terms of the highest level of education of the respondents: Grade 12 (10%), Diploma (15%), Degree (35%), Honours (25%), Masters (10%) and PhD (5%). The study concluded that participants had qualified to manage small business enterprises.

In terms of the type of industry of the respondents: most respondents (41%) stated that their establishments' primary business is construction, followed by Mining (20%), Agriculture (16%), Occupational Health Safety (OHS)at 9%, Tourism (7%), Retail (5%) and Finance (2%). The small percentage in finance concurs with the lack of financial literacy in the SMMEs shown by 2% of the industry respondents.

In terms of nationality: most respondents (82%) stated that they are South African and the rest which is 14% are from other nationalities. This reveals that other nationalities are penetrating the SMME industry in South Africa.

In terms of business location: most respondents (66%) work from home and 34% have work offices. This reveals that the majority of business locations are home which poses a challenge to business operations because of personal factors that can affect day-to-day management of finances.

Descriptive statistics

This section affords a comprehensive data analysis based on respondents' evaluations of the impact of financial literacy on the SMMEs. Respondents' perceptions were rated on a 5-point Likert scale ranging from 'strongly agree' to 'strongly disagree'. Ratings between 1 and 2. indicated positive perceptions, while ratings of 3 indicated neutral or mild perceptions (as evaluated by mean and mode). The mode is the most common value in a distribution (Bryman, 2012). The mode was shown to reveal the score point that occurs the most on each attribute. Ratings of the mean below 3, revealed positive perceptions of SMMEs on their financial literacy.

The standard deviation was used to determine how far respondents' perceptions deviated from the mean value. Bryman (2012) defines the Coefficient of Variation (CV) as the proportion of the standard deviation to the mean. A CV greater than or equal to one indicates that the data are not reliable, whereas a CV less than one can be considered low, and that the data are reliable.

Skewness and kurtosis, on the other hand, have been utilised to determine the distribution form. According to Hair, Black, Babin, and Anderson (2010), the perfect distribution that is normal has a lop-sidedness of zero and a kurtosis of approximately 3. Furthermore, data is only suitable for analysis if the measure of the distributions of the measured variables are not very skewed (less than 1) and the level of kurtosis is not excessive (less than 3) (Hair, et al; 2010).

Table 1: Descriptive statistics of the impact of financial literacy on SMMEs

	Strongly agree	Agree	Nuetral	Disagre	Strongly Disagree	N	Mean	Median	Mode	Standard Deviation	CV	Kurtosis	Skewness
Sec B-Q1	36%	41%	20%	2%	0%	78	1.89	2	2	0.813	0.431	-0.550	0.487
Sec B - Q2	45%	34%	20%	0%	0%	78	1.75	2	1	0.781	0.446	0.781	0.479
Sec B - Q3	45%	36%	16%	2%	0%	78	1.75	2	1	0.811	0.463	0.811	0.772
Sec B - Q4	39%	27%	34%	0%	0%	78	1.95	2	1	0.861	0.441	0.861	0.090
Sec B - Q5	34%	41%	20%	2%	2%	78	2.00	2	2	1.012	0.506	1.012	0.090
Sec B-Q6	39%	36%	25%	0%	0%	78	1.86	2	1	0.795	0.427	1.012	1.012
Sec B-Q7	16%	23%	25%	14%	23%	78	3.05	3	3	1.397	0.459	1.397	0.076
Sec B-Q8	41%	43%	11%	0%	5%	78	1.84	2	2	0.963	0.523	0.963	1.642
Sec B-Q9	43%	39%	14%	0%	5%	78	1.84	2	1	0.987	0.536	0.987	1.550
Sec B-Q10	34%	45%	18%	0%	2%	78	1.91	2	2	0.858	0.449	0.858	1.107
Sec B-Q11	36%	32%	27%	5%	0%	78	2.00	2	1	0.915	0.457	0.915	0.382
Sec B-Q12	36%	39%	23%	2%	0%	78	1.93	2	2	0.900	0.466	0.900	0.942
Sec B-Q13	41%	36%	23%	0%	0%	78	1.82	2	1	0.786	0.432	0.786	0.339
Sec B-Q14	48%	32%	16%	0%	5%	78	1.82	2	1	1.018	0.560	1.018	1.492
Sec B-Q15	50%	30%	16%	2%	2%	78	1.77	1.5	1	0.961	0.542	0.961	1.306
Sec B-Q16	57%	32%	11%	0%	0%	78	1.56	1	1	0.700	0.450	0.700	0.874
							1.92	2.0		0.910	0.474		

Perception of SMMEs on financial literacy

Table 1 depicts the perception of SMMEs regarding their financial literacy. According to the results, a lack of financial literacy impacts the development of SMMEs negatively.

Financial literacy involves real behaviour changes regarding financial matters that impact the development of SMMEs negatively in Musina. According to Table 1, overall respondents believe that financial literacy within the SMMEs sector in Musina is extremely low, with an average mean score of 1.92 out of a possible maximum score of 5. According to the results, 77% of the respondents agree that lack of financial literacy impacts development negatively, and 20% are indifferent about the impact.

This means that respondents agree that financial literacy has a critical role in competitiveness and can improve access to markets for SMMEs as explained by strongly agree of 45% and 39% respectively and agree opinion of 36% and 27%. They believe that financial literacy can assist in the operations of the SMMEs with a frequency score of 39% strongly agree and 36% agree. Overall SMMEs in Musina believe that financial literacy has a significant impact on their performance and development, and it is a key to competitiveness and sustainability for their organisations.

Perception of SMMEs on Financial Management

As also shown in Table 1 the perception of SMMEs regarding their financial management. According to the results, a lack of financial management impacts the SMMEs negatively. The result as shown in secB-Q2 79% agree that lack of financial management impacts their business negatively, as revealed by the overall percentage of strongly agree to agree.

SMMEs believe that bookkeeping should be done annually, which is 39% strongly agreeing. Furthermore, SMMEs agree that the level of skills and capabilities affects the acquisition of funds and that having a separate business account is good for managing and controlling the business and both strongly agree opinion of 36%. 50% of SMMEs strongly agree that having systems and programs in place for managing the business is key for accountability, 30% agree, and 16% are indifferent about it. This means that SMMEs perceive that financial management is crucial for managing their business and to be successful.

When it comes to collateral the SMMEs are not well informed. They believe that collateral security is a challenge for SMMEs qualifying for funding as revealed by frequency percentage of 16% strongly agreeing, 23% strongly disagreeing and 25% neutral. They further agree that acquiring funding is a challenge for SMMEs as reflected by 87% of combined opinions on strongly agree and agree.

Perception of SMMEs on training and development in financial management

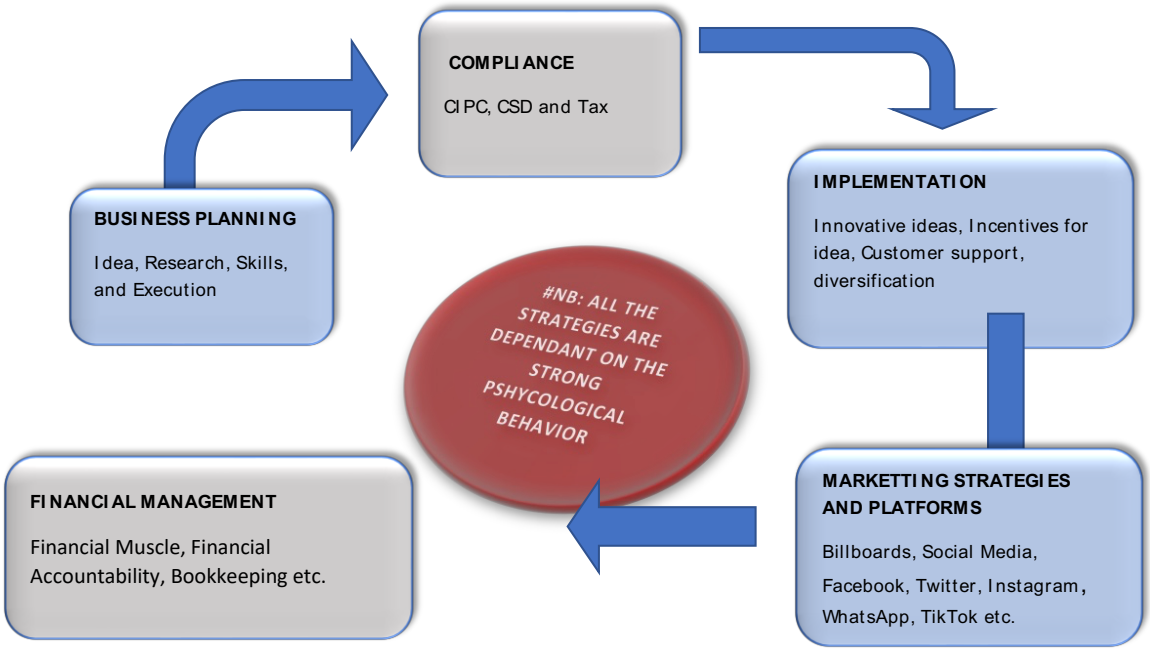
The result in Table 1 reveals that training and development play a key role in success in the SMME industry, and that financial literacy is perceived as a tool for improvement. SMMEs believe that business workshops and training add value to the business. The combined frequency of strongly agree to agree is 92% and the SMMEs believe that attending the financial literacy and financial management courses regularly is mandatory for the success of their businesses as confirmed by the combined frequency from strongly agree to agree of 79%. 77% of combined frequency strongly agree and believe that business workshops and training add value to the business. There were no responses for strongly disagreed or disagreed and only 5% strongly disagreed that attending the financial literacy and financial management courses regularly is mandatory for the success of their businesses.

SMMEs believe that competency is key for competing with large firms in the industries as confirmed by 57% strongly agree, 32% agree,11% neutral and none strongly disagreeing or disagreeing.

Financial Literacy Framework for SMMEs

The financial literacy framework is developed as a roadmap to SMMEs contributions, it will be a tool to guide the SMMEs on the approach and principles of managing a business.

Figure 1: Financial literacy framework for SMMEs



A financial literacy framework is designed to assist in closing the gap in financial literacy in an area. The five tiers of the framework provide SMMEs with a roadmap to follow in running their businesses.

The first tier is financial literacy planning which outlines how the planning should be conducted and which component is key in the planning phase.

The second tier is compliance whereby key issues such as the compliance of SMMEs with South African law, should be addressed. The third tier focuses on the implementation phase. It outlines the day-to-day business operations. Furthermore, it highlights the incentives for innovative ideas. We are in the 4IR, there is no business that will be competent without incorporating innovation and technology.

The fourth tier is marketing. Market research should never be underestimated, many successful businesses enjoy its longevity due to consistent market research. SMMEs need to understand their target market, their customer's needs and the strategies that work for their type of business. Other factors include the issue of social media. Social media drives the economy, businesspeople use this platform to share information and make connections.

The fifth tier is financial management, it assists in the acquiring and managing of funds. This tier is critical for the SMMEs to make financial decisions.

In this value chain, the five tiers are influenced by the principle of entrepreneurs' behaviour. By focusing on this principle and implementing them masterfully, businesses can design and manage service encounters to maximise customer satisfaction. Entrepreneurs thinking compromises

personal qualities such as motivation, initiative attitude, responsibility, creativity, sociability, and stress tolerance.

SMMEs have the potential to increase growth through innovation and competitiveness, and ultimately create job opportunities for the local communities. The development of SMMEs has the potential to poise the three challenges that the economy encounters: eradication of poverty, increased unemployment, and inequality distribution in South Africa.

Conclusions

SMMEs fail to furnish the financier with adequate collateral, and the financier expects collateral to equate to the size of the loan requested. In South Africa, collateral is a paramount requisite for funding agencies when assessing funding applications. Financial literacy is recognised as an important knowledge asset for financial decision-making, but insufficient attention has been paid to how financial literacy affects SMMEs sustainability. SMMEs make a significant contribution to economic development through wealth distribution, job creation, technological progress, poverty alleviation and innovation. It concludes that financial literacy impacts everything from day-to-day long-term financial decisions, affecting individuals and the whole society. Low levels of financial literacy across the country result in ineffective spending and financial planning, and high borrowing and debt management. This low level of financial literacy around the world, and its far-reaching impact, calls for urgent action. The results show that financial literacy affects not only the decisions people make for themselves but also society.

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Track 3 - Organizational Behavior, Human Resource Management, and Business Strategy

EXPLORING THE EFFECT OF LEADER ETHNIC OBLIGATIONS ON EMPLOYEE SATISFACTION AND FLOURISHING: INSIGHTS FROM A DEVELOPING COUNTRY

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Abstract

Research shows that leader ethnic obligations significantly shape workplace behaviour, affecting employee satisfaction and flourishing. However, limited studies explore when and how these obligations influence workforce inclusion, leadership decisions, and organizational equity. Drawing on Ethnos Oblige Theory and Identity Salience Theory, this study examines the effects of leader ethnic obligations (generosity and representation) on employee outcomes, with centralization and preferential treatment as mediators and identity salience as a moderator. Using three-wave survey data from 219 leaders and 644 subordinates in Ghana's transport and logistics sector, we tested a multilevel model in STATA. Results indicate that generosity and representation predict centralization, which subsequently drives preferential treatment. Moreover, identity salience strengthens these relationships**,** reinforcing in-group favouritism in leadership decisions. This study contributes to discussions on inclusive leadership, workplace fairness, and digital workforce transformation**,** highlighting how culturally embedded leadership practices impact employee well-being and HR policies. Findings provide practical insights into balancing ethnic obligations with merit-based workforce development, promoting equitable career growth and sustainable leadership in diverse workplaces.

Keywords: ***Ethnic Obligation, Leadership Inclusion, Preferential Treatment, Identity Salience, Employee Flourishing, Satisfaction***

Introduction

Cultural diversity is a defining feature of modern organizations, requiring leadership approaches that balance inclusivity and cultural expectations (Hofstede, 2001; Stahl et al., 2016). While inclusive leadership is known to promote equity and effectiveness (van Knippenberg et al., 2004; Randel et al., 2018), the role of ethnic obligations in leadership remains underexplored, particularly in non-Western contexts where leaders must navigate communal responsibilities alongside professional duties (Zoogah, 2016). Ethnic obligations refer to socio-cultural expectations tied to ethnic identity, influencing decision-making, resource allocation, and interpersonal relationships in workplaces (Zoogah & Zoogah, 2020). In developing economies like Ghana, leaders are expected to fulfill ethnic obligations beyond their formal roles, fostering trust and solidarity but also contributing to in-group favoritism and exclusionary practices (Triandis, 2001; Haslam et al., 2003). While these obligations provide social stability, they pose challenges in resource-limited environments with institutional instability (Acemoglu & Robinson, 2012).

Leadership research has traditionally relied on Western models (Gelfand et al., 2007; House et al., 2004), which often overlook how ethnic identity shapes workplace dynamics in collectivist societies (Triandis, 1995). Ethnic obligations influence centralization in leadership, affecting decisions on hiring, promotions, and resource distribution (Mintzberg, 1983; Hogg & Terry, 2000). This study seeks to bridge the theoretical gap by examining how ethnic obligations shape leadership and employee experiences in multicultural workplaces (Nkomo, 2011). The transport and logistics sector provides an ideal context for exploring these dynamics due to its diverse workforce, reliance on trust-based networks, and informal agreements (Hickman & Silver, 2020). Leaders in this sector must balance efficiency with communal expectations, navigating regulatory uncertainties and infrastructural challenges while ensuring fair workforce management.

Our study investigates:

1. *How ethnic obligations influence employee satisfaction and flourishing in culturally diverse, resource-constrained workplaces.*
2. *The mediating role of centralization and preferential treatment in shaping workplace outcomes.*
3. *How identity salience moderates the relationship between ethnic obligations and workplace dynamics.*

By integrating Ethnos Oblige Theory (Zoogah & Zoogah, 2020) and Social Identity Theory (Tajfel & Turner, 1979), this study develops a culturally informed leadership framework. Ethnic obligation is expected to reinforce hierarchical decision-making models, while identity salience moderate's in-group favouritism (Hogg et al., 2012; Ashforth & Mael, 1989). Findings will contribute to culturally responsive leadership strategies, offering practical insights into equity, inclusion, and leadership effectiveness in developing economies (Gelfand et al., 2017). This research bridges the cultural and leadership gap, providing both theoretical advancements and practical solutions for managing diverse workplaces.

Literature review

Ethnic Obligations in Leadership

Ethnic obligations refer to the socio-cultural duties placed on leaders based on their ethnic identity and communal ties. These obligations are particularly significant in collectivist societies, where leadership is not solely defined by formal job roles but extends to kinship and community responsibilities (Zoogah & Zoogah, 2020). Research indicates that ethnic obligations influence leadership styles, decision-making processes, and organizational behavior, often leading to in-group favoritism and the prioritization of ethnic ties over merit-based considerations (Aycan et al., 2000; Triandis, 2001). While ethnic loyalty strengthens trust within groups, it can also result in exclusionary practices such as nepotism, limiting opportunities for out-group employees (Haslam et al., 2003). The tension between ethnic obligations and professional ethics underscores the need for culturally adaptive leadership frameworks that balance communal expectations with organizational fairness (Zoogah & Peng, 2019). Leaders in multi-ethnic organizations must navigate the pressures of ethnic loyalty while ensuring fair and meritocratic decision-making structures.

Employee Satisfaction

Employee satisfaction, defined as an individual's overall attitude toward their job (Locke, 1976; Judge et al., 2001), is influenced by leadership style, workplace relationships, and organizational justice (Spector, 1997). In multi-ethnic workplaces, ethnic obligations can create disparities in satisfaction. While in-group members may benefit from preferential treatment, out-group employees often experience dissatisfaction due to perceived favouritism and bias (Nishii, 2013). Research suggests that fairness perceptions distributive, procedural, and interactional mediate the relationship between leadership behaviours and employee satisfaction (Colquitt et al., 2001). In collectivist cultures, the expectation of ethnic preference complicates efforts to maintain organizational justice (Triandis, 1995).

Employee Flourishing

Employee flourishing refers to thriving in the workplace, encompassing psychological well-being, engagement, and professional growth (Diener et al., 2010; Seligman, 2011). Supportive and inclusive leadership fosters a sense of belonging and purpose, enhancing workplace well-being (Spreitzer & Porath, 2012). However, when leaders prioritize ethnic obligations over workplace equity, workplace divisions may arise, limiting opportunities for non-favored employees (Haslam et al., 2003). Research in the transport and logistics sector highlights the importance of balancing efficiency with cultural sensitivity to ensure inclusive policies and equitable leadership approaches (Gelfand et al., 2017).

Centralization in Leadership

Centralization refers to the extent to which decision-making authority is concentrated at the top levels of an organization (Mintzberg, 1983). Highly centralized organizations amplify the influence of ethnic obligations on workplace policies, as leaders with strong ethnic loyalty may consolidate authority to control hiring, promotions, and resource distribution (Zoogah et al., 2020). While centralization can enhance efficiency, it may also reinforce favoritism and reduce transparency (Hogg & Terry, 2000). In contrast, decentralized leadership models, emphasizing

participatory decision-making, mitigate the adverse effects of ethnic obligations by fostering inclusivity and procedural fairness (House et al., 2004).

Preferential Treatment

Preferential treatment involves granting advantages to individuals based on ethnicity or kinship rather than merit (Nkomo, 2011). While this can enhance job satisfaction for in-group members, it may reduce trust and morale among employees who perceive bias in leadership decisions (Triandis, 2001; Nishii, 2013). In sectors such as transport and logistics, ethnic networks influence workforce management, impacting operational efficiency and organizational cohesion (Rodrigue, 2020). Leaders who over-rely on ethnic ties in decision-making risk workplace conflicts and reduced employee engagement (Haslam et al., 2003).

Identity Salience

Identity salience refers to the extent to which ethnic identity is central to an individual's self-concept and behaviour (Ashforth & Mael, 1989). Social Identity Theory suggests that individuals with high ethnic identity salience are more likely to engage in in-group favouritism and exclusionary practices (Tajfel & Turner, 1979). Leaders with strong ethnic identification reinforce ethnic obligations in hiring, promotions, and workplace interactions (Hogg et al., 2012). Research suggests that identity salience moderates the impact of ethnic obligations on workplace satisfaction and flourishing, with highly salient individuals perceiving favouritism as a cultural norm while others experience dissatisfaction (Ekeh, 1975).

Theoretical Background

Social Identity Theory and Ethnos Oblige Theory

Social Identity Theory (Tajfel & Turner, 1979) provides a foundation for understanding how ethnic obligations shape leadership and employee relations. This theory posits that individuals derive part of their self-concept from group memberships, leading to in-group favoritism and out-group bias. In the workplace, social identity affects team cohesion, decision-making, and perceptions of fairness (Hogg & Terry, 2000). Employees with strong ethnic identification may expect preferential treatment from leaders of their own ethnic group, reinforcing ethnic obligations in decision-making processes (Haslam et al., 2003).

Ethnos Oblige Theory (Zoogah, 2016) expands on this by explaining how ethnic-based moral and social obligations influence workplace behaviors. Leaders often feel a duty to support and provide resources to in-group members, shaping workplace dynamics through preferential hiring, promotions, and mentorship. While this fosters in-group solidarity, it may also lead to workplace inequities and conflicts. Zoogah and Swanzy-Krah (2024) found that ethnic obligation promotes ethical solidarity within in-groups but can justify nepotism, raising concerns about fairness and meritocracy.

A key organizational consequence of ethnic obligation is centralization, the degree to which decision-making is concentrated at the top levels of an organization (Mintzberg, 1983). Leaders who experience strong ethnic obligation may consolidate decision-making power to ensure that in-group members receive preferential access to resources, job opportunities, and career advancements (Zoogah & Peng, 2019). Empirical studies suggest that in-group favouritism in collectivist cultures is associated with greater centralization, as leaders attempt to exert control

over recruitment, promotions, and resource distribution (Haslam et al., 2003). Given that generosity and representation are mechanisms through which ethnic obligation operates, the following hypothesis is proposed:

H1: Ethnic obligation (generosity and representation) positively predicts centralization.

Centralization is often associated with greater discretionary power in decision-making, particularly in organizations where hierarchy and ethnic loyalty shape workplace interactions (Hogg & Terry, 2000). When leaders consolidate authority, they gain the capacity to allocate rewards and opportunities selectively, reinforcing preferential treatment for in-group members. Research has shown that centralized structures create an environment where leaders and managers have significant autonomy in hiring, promotions, and resource distribution (Zoogah & Krah, 2024). This autonomy allows for subtle yet impactful favouritism, often justified under the premise of maintaining team cohesion and organizational harmony (Zoogah, 2016). Thus, the following hypothesis is proposed:

H2: Centralization predicts preferential treatment.

Employee flourishing refers to an individual's well-being, job satisfaction, and overall sense of fulfillment in the workplace (Diener et al., 2010). Preferential treatment, though often perceived negatively in meritocratic cultures, can have positive effects on in-group members, as it enhances their job security, career progression, and workplace belonging (Zoogah & Swanzy-Krah, 2024). Employees who benefit from preferential treatment may experience higher psychological safety, organizational support, and access to career development opportunities, all of which contribute to workplace flourishing (Haslam et al., 2003). However, this effect may be unevenly distributed, as out-group members may perceive preferential treatment as unfair, leading to potential workplace tensions. Based on this reasoning, the following hypothesis is proposed:

H3: Preferential treatment positively influences employee flourishing.

Identity salience refers to the extent to which an individual's ethnic identity is central to their self-concept and decision-making processes (Tajfel & Turner, 1979). Individuals with high identity salience are more likely to prioritize in-group considerations in leadership roles, reinforcing the effects of ethnic obligation on centralization (Hogg & Terry, 2000). Leaders who strongly identify with their ethnic group may perceive centralized control as necessary to protect in-group interests, whereas those with lower identity salience may be less influenced by ethnic loyalty in their decision-making (Zoogah, 2016). Studies have shown that ethnic identity moderates leadership behaviours, influencing how resources and opportunities are distributed across different employee groups (Zoogah & Peng, 2019). Thus, the following hypothesis is proposed:

H4: Identity salience moderates the effect of generosity and representation on centralization.

Ethnic obligation is expected to indirectly influence employee outcomes through the sequential mediating effects of centralization and preferential treatment. Employees who benefit from preferential treatment often experience higher job satisfaction, lower turnover intentions, and greater organizational commitment (Haslam et al., 2003). However, this effect is facilitated by the degree of centralization within the organization, which determines how leaders exercise

control over decision-making processes (Hogg & Terry, 2000). Thus, the final hypothesis is proposed:

H5: Centralization and preferential treatment mediate the relationship between ethnic obligation and employee outcomes.

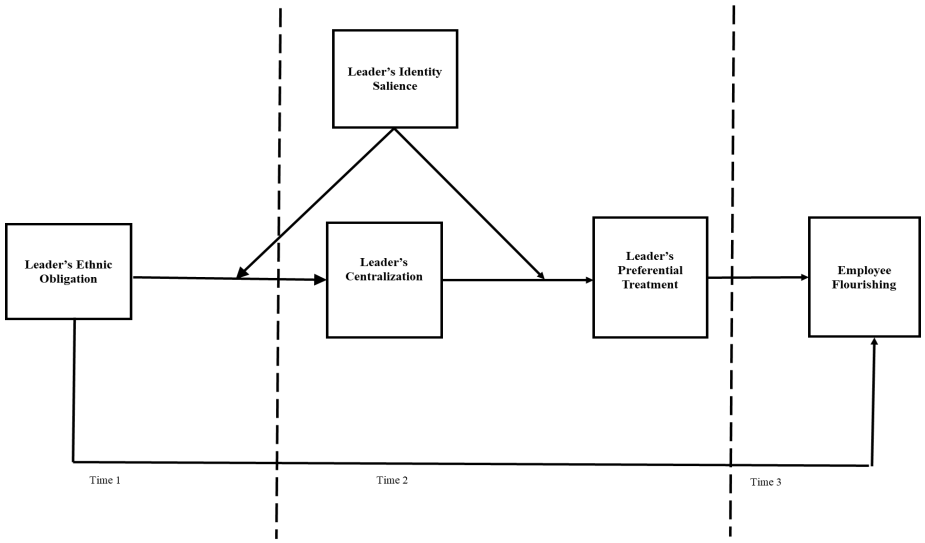


Figure 1 Conceptual Mode

Methodology

The study employs a quantitative research design using a multilevel survey method to examine the relationship between ethnic obligation, social identity, and workplace outcomes**.** Given the hierarchical nature of organizations, this approach allows for analysing both individual and organizational influences on employee behaviour. The research focuses on transport and logistics organizations in Ghana**,** selected due to their diverse workforce, hierarchical structure, and reliance on interpersonal relationships for efficiency. To ensure representative sampling**,** a three-stage stratified sampling technique was used. First, employees were categorized by organizational level (managerial, supervisory, and operational). Second, ethnic diversity was considered to capture variations in ethnic obligation and social identity. Finally, random selection ensured unbiased participant inclusion. A total of 657 structured questionnaires were distributed, with 644 valid responses, yielding a response rate of 63.99%**,** which is considered satisfactory for research on sensitive workplace topics. The study provides valuable insights into how ethnic obligations and social identity affect leadership decisions, workplace interactions, and employee experiences**,** contributing to HR policies and diversity management.

Measures

Leader's representation was measured using a 3-item scale adapted from Zoogah and Zoogah (2020), rated on a 7-point Likert scale. CFA results showed factor loadings above 0.71, AVE 0.565, CR 0.795, and CA 0.846, ensuring reliability and validity. Generosity was also assessed with a 3-item scale, showing factor loadings above 0.66, AVE 0.502, CR 0.751, and CA 0.747. Leader's centralization was evaluated using a 3-item scale, with CFA results confirming factor loadings above 0.76, AVE 0.602, CR 0.771, and CA 0.826. Preferential treatment was measured with a 4-item scale (Blader et al., 2014) on a 5-point Likert scale, with CFA loadings above 0.58, AVE 0.548, CR 0.827, and CA 0.864, confirming validity. Identity salience was assessed using a 3-item scale adapted from Callero (1985), with factor loadings above 0.76, AVE 0.602, CR 0.771, and CA 0.826. Employee flourishing was measured using a 4-item scale (Diener et al., 2010), with factor loadings above 0.95, AVE 0.959, CR 0.990, and CA 0.989, indicating excellent reliability. Employee satisfaction was assessed using a single-item measure adapted from Ronald & Fekken (1987), with AVE 0.402, CR 0.651, and CA 0.726, demonstrating adequate reliability.

Control Variables

In this study, we controlled for gender, marital status, age, educational level, job tenure, department, and type of organization to account for their potential effects on employee flourishing and organizational satisfaction. Gender differences influence workplace outcomes due to varying expectations and socialization (Eagly & Carli, 2003), while marital status is linked to higher job satisfaction and commitment due to additional support systems (Clark, 1997). Age impacts job satisfaction, with older employees typically experiencing greater stability and satisfaction (Ng & Feldman, 2010). Educational level affects performance and job fit, with higher education often leading to better opportunities (Ng & Feldman, 2009). Job tenure contributes to job satisfaction through accumulated knowledge and security (Ng & Feldman, 2010). Departmental differences and organizational type also shape employee attitudes due to distinct work environments and cultures (Herzberg et al., 1959; Schein, 1990). These control variables were essential in isolating the effects of the primary study variables, ensuring a more accurate analysis of the relationships between ethnic obligation, social identity, and workplace outcomes.

Analytic Approach

The study employed the multilevel analytical technique, also known as hierarchical linear modelling (HLM)**,** to address the nested data structure, where employees are embedded within organizations. This method is crucial for accounting for non-independence of observations within clusters, ensuring more reliable estimates (Raudenbush & Bryk, 2002). HLM allows for the simultaneous examination of individual-level and group-level effects**,** making it well-suited for organizational research with hierarchical data structures (Hox, 2010). The analysis started with an unconditional (null) model to estimate the intraclass correlation coefficient (ICC)**,** identifying variance at different levels. Next, a random coefficients model assessed individual-level predictors, followed by a means-as-outcomes model to examine group-level effects. Finally, an intercepts-and-slopes-as-outcomes model explored cross-level interactions, analysing how relationships between lower-level predictors and outcomes varied across higher-level predictors (Snijders & Bosker, 2012). This approach provided a comprehensive understanding of individual and organizational influences, ensuring that the hierarchical nature of the data was properly accounted for in the analysis.

Results

Preliminary Results

First, the intercept-only model (see Table 1) was significant for both employee flourishing (Coef. = 5.01; Robust Standard Error (RSE) = 0.11; z = 45.97, p < .001; 95% Confidence Interval = 4.80 to 5.23) and organizational satisfaction (Coef. = 2.63; RSE = 0.08; z = 34.33, p < .001; 95% Confidence Interval = 2.48 to 2.78). These results suggest that 12% of the variation in employee flourishing and 16% of the variation in organizational satisfaction can be attributed to factors at the leader level. Given that this is a two-level model, the remaining variation 88% and 84%, respectively, for employee flourishing and organizational satisfaction is due to factors at the follower level. These intra-class correlation coefficients (ICCs) justify the use of multi-level analysis (Raudenbush & Bryk, 2002; Chen, Weng, & Huang, 2018).

Second, the results of the random coefficient model, focusing on follower-level predictors (e.g., follower gender), revealed a consistent negative pattern for followers' tribe relative to Akan, which served as the reference category for employee flourishing (see Table 1b). For organizational satisfaction, followers' tribe showed a positive relationship pattern.

Third, the means-as-outcomes model (see Table 1c), which examines leader-level predictors (e.g., leader marital status), indicated that leader gender was negative for employee flourishing (z = -3.23) and positive for organizational satisfaction (z = 3.73). This suggests that male employees are less likely to flourish when their leader is female but are more satisfied in such scenarios, and vice versa. Furthermore, there was a negative but statistically insignificant relationship among the leader's tribe (see Table 1d). Beyond the controls, there was no significant direct relationship between ethnic obligation and employee flourishing or organizational satisfaction. The intercept was not significant for flourishing (coef. = 2.62, SE = 3.01, z = 0.87, ns) but was significant and positive for organizational satisfaction (coef. = 4.31, SE = 2.12, z = 2.03, p < 0.05), aligning with the conceptual model (see Figure 1).

Table 1(A) Multilevel Results (a) intercept-only model (b) Intercept controls, (c) Leader controls, and (d) Follower controls

(A)	**Employee Flourishing**				
Fixed Intercept	**Coef.**	**RSE**	**z**	**LCI**	**UCI**
Intercept	5.01	0.11	45.97***	4.80	5.23
Random-effects Parameters	Est.	RSE		LCI	UCI
Leader_CODE: Identity					
sd(_cons)	0.80	0.17		0.52	1.23
sd(Residual)	2.21	0.06		2.10	2.33
Intra-class Correlation	*ICC*	*SE*		*LCI*	*UCI*
Leader	12%	0.05		0.05	0.25
Follower	88%				
Fixed Effects	**Organizational Satisfaction**				
	Coef.	**RSE**	**z**	**LCI**	**UCI**
Intercept	2.63	0.08	34.33***	2.48	2.78
Random-effects Parameters	***Est.***	***RSE***		***LCI***	***UCI***
Leader_CODE: Identity					
sd(_cons)	0.64	0.11		0.46	0.90
sd(Residual)	1.45	0.04		1.37	1.53
Intraclass Correlation					
Leader	16%	0.05		0.09	0.29
Follower	84%				

* ‡p < .10. **p < .01. ***p < .00

Table 1(B)

	Employee Flourishing					Organizational Satisfaction				
Fixed Effects	***Coef.***	***SE***	***Z***	***95% CI***		***Coef.***	***SE***	***z***	***95% CI***	
Intercept	5.75	0.43	13.46***	4.91	6.58	2.04	0.29	6.98***	1.47	2.61
Leaders Life Satisfaction	-0.24	0.20	-1.21	-0.64	0.15	0.16	0.14	1.15	-0.11	0.43
Leaders Gender	-0.80	0.25	-3.23**	-1.28	-0.31	0.63	0.17	3.73***	0.30	0.96
Age 30-39	1.98	1.71	1.16	-1.36	5.32	-1.33	1.16	-1.15	-3.61	0.94
Age 40-49	0.07	0.29	0.24	-0.50	0.65	0.05	0.20	0.25	-0.35	0.45
Age 50 plus	0.41	0.26	1.62	-0.09	0.91	-0.25	0.18	-1.44	-0.60	0.09
Random-effects Parameters	***Est.***	***SE.***		***95% CI***		***Est.***	***SE.***		***95% CI***	
Leader'sCODE: Identity										
sd(_cons)	0.63	0.20		0.34	1.16	0.50	0.12		0.31	0.81
sd(Residual)	2.22	0.08		2.08	2.37	1.46	0.05		1.37	1.57
ICC										
Leader level	0.07					0.10				
Follower level	0.93					0.90				

Table 1 (C)

	Coef.	Std. Err.	z	*95% CI*		Coef.	Std. Err.	z	*95% CI*	
Intercept	5.02	0.29	17.26***	4.45	5.59	2.57	0.20	12.59	2.17	2.96
Ahanta	1.61	0.96	1.68	-0.27	3.49	-1.01	0.66	-1.54	-2.30	0.28
Akuapem	1.54	1.71	0.90	-1.80	4.89	-1.57	1.16	-1.34	-3.85	0.72
Akyem	1.13	0.77	1.47	-0.38	2.64	-0.67	0.53	-1.26	-1.70	0.37
Asante	0.79	1.01	0.78	-1.20	2.78	-0.57	0.69	-0.82	-1.92	0.79
Bono	0.08	0.34	0.22	-0.59	0.74	0.06	0.24	0.27	-0.40	0.53
Dagati	-0.88	1.00	-0.89	-2.84	1.07	0.93	0.72	1.29	-0.48	2.35
Dagomba	-0.62	0.72	-0.87	-2.03	0.78	0.54	0.49	1.10	-0.42	1.50
Ewe	1.29	1.71	0.76	-2.05	4.64	-1.07	1.16	-0.91	-3.35	1.22
Fafra	0.26	0.83	0.32	-1.37	1.89	-0.19	0.59	-0.32	-1.34	0.97
Fante	-0.80	0.48	-1.69	-1.73	0.13	0.56	0.33	1.69	-0.09	1.21
Ga	-0.12	0.85	-0.14	-1.79	1.55	-0.13	0.59	-0.22	-1.28	1.02
Ga-Adangbe	0.26	0.43	0.61	-0.58	1.11	-0.15	0.30	-0.51	-0.74	0.44
Gonja	1.81	1.39	1.30	-0.91	4.52	-0.89	0.94	-0.94	-2.73	0.96
Gurene	-0.28	0.45	-0.62	-1.15	0.60	0.26	0.31	0.82	-0.36	0.87
Gurunsi	-0.94	0.44	-2.16*	-1.80	-0.09	0.75	0.30	2.47	0.15	1.34
Hausa	1.98	2.30	0.86	-2.54	6.50	-1.57	1.55	-1.01	-4.60	1.47
Konkomba	1.35	1.71	0.79	-1.99	4.70	-1.57	1.16	-1.34	-3.85	0.72
Mamprusi	-1.02	1.71	-0.60	-4.37	2.32	0.43	1.16	0.37	-1.85	2.72
Mole	1.22	0.69	1.76	-0.14	2.57	-0.74	0.48	-1.53	-1.68	0.21
Navorongo	-0.10	1.45	-0.07	-2.95	2.74	0.10	1.00	0.10	-1.87	2.07
Nzema	0.63	1.13	0.56	-1.58	2.83	-0.29	0.70	-0.41	-1.67	1.08
Random-effects Parameters	***Est.***	***SE.***		***95% CI***		***Est.***	***SE.***		***95% CI***	
Leader's_CODE: Identity										
sd(_cons)	0.65	0.18		0.38	1.12	0.52	0.11		0.34	0.80
sd(Residual)	2.19	0.07		2.05	2.34	1.44	0.05		1.35	1.54
ICC										
Leader level	0.08					0.12				

Follower level	0.92	0.88

Table 1(D)

	Coef.	Std. Err.	Z	*95% CI*		Coef.	Std. Err.	z	*95% CI*	
Intercept	6.35	0.29	22.01***	5.78	6.91	1.70	0.20	8.46***	1.31	2.10
Ahanta	1.89	1.91	0.99	-1.86	5.65	-1.57	1.31	-1.19	-4.14	1.01
Akuapem	-0.20	0.69	-0.3	-1.55	1.14	0.00	0.48	-0.01	-0.94	0.93
Akyem	-0.65	0.62	-1.05	-1.87	0.57	0.42	0.43	0.97	-0.43	1.27
Asante	0.39	1.05	0.37	-1.68	2.45	-0.32	0.73	-0.44	-1.76	1.11
Bono	-0.48	0.33	-1.48	-1.12	0.16	0.44	0.23	1.93	-0.01	0.88
Dagati	-3.43	0.49	-7.07***	-4.39	-2.48	2.25	0.33	6.76***	1.60	2.91
Dagomba	-2.04	1.23	-1.66	-4.46	0.37	1.28	0.86	1.48	-0.41	2.97
Ewe	-0.07	0.71	-0.1	-1.46	1.32	-0.04	0.49	-0.08	-1.00	0.92
Fafra	-2.66	0.37	-7.21***	-3.39	-1.94	1.81	0.26	7.09***	1.31	2.31
Fante	-3.86	0.48	-8.02***	-4.81	-2.92	2.59	0.33	7.86***	1.94	3.23
Ga	0.24	0.41	0.59	-0.57	1.06	-0.01	0.29	-0.04	-0.58	0.55
Ga-Adangbe	-1.00	0.39	-2.56**	-1.76	-0.23	0.84	0.27	3.12**	0.31	1.37
Gonja	-4.44	0.98	-4.53***	-6.37	-2.52	3.06	0.67	4.6***	1.76	4.37
Wala	-3.04	0.36	-8.47***	-3.74	-2.33	1.96	0.25	7.94***	1.48	2.44
Sisala	-3.74	0.87	-4.3***	-5.45	-2.04	1.54	0.59	2.6**	0.38	2.71
Hausa	-2.23	0.94	-2.36*	-4.08	-0.37	1.22	0.66	1.86	-0.07	2.51
Konkomba	-4.37	1.28	-3.41**	-6.88	-1.86	3.13	0.87	3.61***	1.43	4.82
Mamprusi	-4.09	0.46	-8.85***	-5.00	-3.19	2.80	0.32	8.87***	2.18	3.42
Mole	0.41	0.65	0.63	-0.86	1.69	-0.15	0.45	-0.33	-1.04	0.74
Navorongo	-1.12	0.85	-1.31	-2.78	0.55	0.95	0.59	1.62	-0.20	2.09
Nzema	-2.71	0.72	-3.77***	-4.12	-1.30	1.73	0.48	3.63***	0.80	2.66
Random-effects Parameters	***Est.***	***SE.***		***95% CI***		***Est.***	***SE.***		***95% CI***	
Leader'sCODE: Identity										
sd(_cons)	0.99	0.14		0.75	1.30	0.75	0.09		0.59	0.95
sd(Residual)	1.69	0.06		1.57	1.82	1.14	0.04		1.06	1.22
ICC										
Leader level	0.25					0.30				
Follower level	0.75					0.70				

Hierarchical Linear Model Results

The hierarchical linear modelling (HLM) approach revealed that generosity predicts centralization (forethought) positively and strongly (Coef. = 0.44, RSE = 0.07; Z = 6.26, $p < 0.01$) (see Table 2a), and leader's representation also predicts centralization positively and strongly (Coef. = 0.50, RSE = 0.07; Z = 8.45, $p < 0.01$) (see Table 2b). Centralization (forethought) in turn predicts preferential treatment positively and strongly (Coef. = 0.36, RSE = 0.08; Z = 4.28, $p < 0.001$), suggesting that as a leader's generosity, representation, and preferential treatment increase, centralization (forethought) also increases (see Table 2c).

Table 2 (A): HLM Main Effects

	Employee Flourishing					Organizational Satisfaction				
Fixed Effects	***Coef.***	***SE***	***z***	***(95% CI)***		***Coef.***	***SE***	***Z***	***(95% CI)***	
Intercept	2.62	3.01	0.87	-3.29	8.53	4.31	2.12	2.03*	0.15	8.47
Generosity	-0.63	0.41	-1.51	-1.44	0.18	0.45	0.29	1.55	-0.12	1.03
Representation	0.64	0.47	1.35	-0.28	1.56	-0.45	0.34	-1.33	-1.10	0.21
Centralization (Forethought)	-0.44	0.44	-1.00	-1.29	0.42	0.31	0.31	0.99	-0.30	0.91
Preferential Treatment (Fairness)	0.39	0.25	1.55	-0.10	0.88	-0.34	0.18	-1.9ǂ	-0.68	0.01
Identity Salience	-0.17	0.36	-0.48	-0.88	0.54	-0.01	0.26	-0.04	-0.52	0.50
Random-effects Parameters	**Est.**	**SE**		***(95% CI)***		**Est.**	**SE**		***(95% CI)***	
Leader's_CODE: Identity										
sd(_cons)	0.64	0.22		0.33	1.25	0.56	0.12		0.37	0.87
sd(Residual)	2.23	0.08		2.08	2.39	1.46	0.05		1.36	1.56
ICC										
Leader level	0.08					0.13				
Follower level	0.92					0.87				

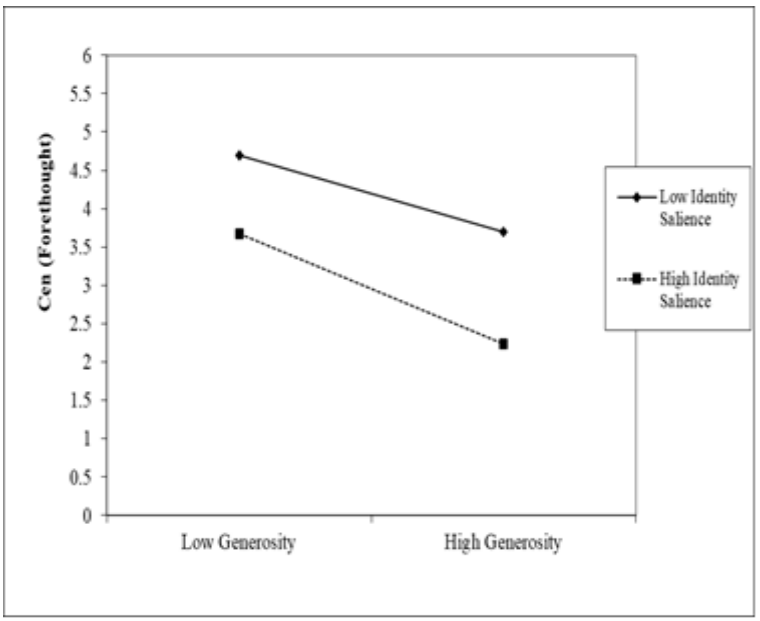
ǂ $p < 0.10$

Table 2(B) (Generosity)

	Model 1				Model 2				Model 3			
	Leader Centralization (Forethought)				Leader Centralization (Forethought)				Leader Centralization (Forethought)			
	Coef.	***RSE***	***t***	***β***	***Coef.***	***RSE***	***t***	***β***	***Coef.***	***RSE***	***t***	***β***
Intercept	6.34	0.05	133.85***	.	6.28	0.04	146.65***	.	6.24	0.05	128.21***	.
Leader's Life Satisfaction	-0.02	0.02	-0.92	-0.04	0.04	0.02	1.97*	0.06	0.04	0.02	2.08*	0.06
Leader's Gender	0.04	0.03	1.18	0.05	0.05	0.03	1.87ǂ	0.07	0.05	0.03	2.00*	0.07
Age 30 to 39	-0.07	0.02	-2.74**	-0.10	-0.08	0.03	-2.75**	-0.13	-0.04	0.04	-0.98	-0.06
Age 40 to 49	-0.03	0.02	-1.36	-0.05	-0.05	0.03	-1.50	-0.08	0.00	0.04	0.05	0.00
Age 50plus	-0.05	0.04	-1.44	-0.07	-0.05	0.04	-1.27	-0.07	0.00	0.05	-0.02	0.00
Leader's Years Worked	0.07	0.02	4.14***	0.16	0.05	0.01	3.77***	0.12	0.05	0.01	3.4**	0.11
Leader's generosity					0.33	0.03	9.64***	0.36	0.33	0.04	9.07***	0.35
Leader's identity Salience					0.30	0.03	10.69***	0.38	0.30	0.03	10.71***	0.37
Leader's generosity x Leader's identity Salience									-0.18	0.08	-2.19*	-0.07
F	6.189*				72.32***				67.76***			
Df	5, 637				7, 635				8, 634			
ΔF					184.25***				5.22*			
Δdf					2, 635				1, 634			
R^2	0.03				0.39				0.39			
ΔR^2					0.36				0.01			

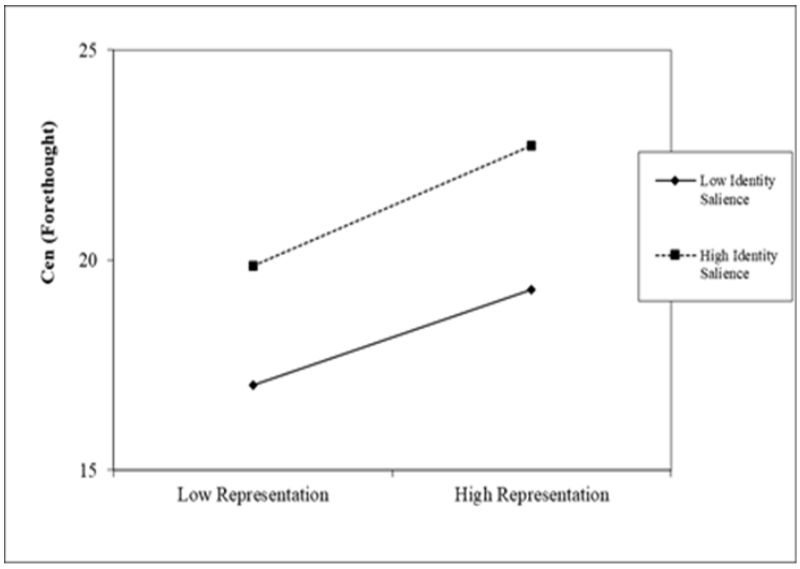
Moderating Effect of Leader's Identity Salience

The results indicated significant interactions between indicators of ethnic obligation, consistent with the expectation that identity salience moderates the ethnic obligation-centralization relationship. When identity salience is high, the effect of ethnic obligation (generosity and representation) on preferential treatment is stronger for employees in the leader's tribe than for those outside it. Identity salience showed a positive and significant interaction with generosity on centralization (Coef. = -0.18, BSE = 0.08, t = 2.19, $p < .0001$) and with representation on centralization to preferential treatment (Coef. = 0.25, BSE = 0.10, t = 2.46, $p < .0001$), supporting hypotheses H4a and H4b. Figures 2 and 3 illustrate that at high levels of identity salience, the positive effects of ethnic obligation are amplified, supporting H5.



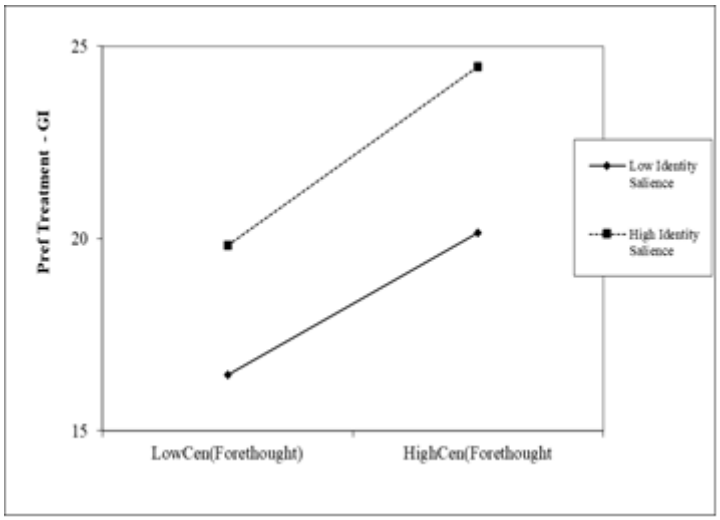
Notes: Cen=centralization

Figure 2: Moderating effect of identity salience in the relationship between Generosity and Centralization(forethought)



Notes: Cen=centralization

Figure 3: Moderating effect of identity salience in the relationship between representation and Centralization (forethought)



Notes: Pref=preferential

Figure 4: Moderating effect of identity salience in the relationship between Centralization (forethought) and preferential treatment.

Cross-Level Interactions

The intercepts-and-slopes-as-outcomes model did not reveal significant cross-level interactions. However, some leader-level factors mediated the relationship between ethnic obligation and employee flourishing and organizational satisfaction. Centralization (forethought) did not mediate the relationship between generosity and employee flourishing (Coef. = -0.07, SE = 0.38, Z = -0.17) or organizational satisfaction (Coef. = -0.53, SE = 0.27, Z = 1.92). However, centralization (forethought) mediated the relationship between representation and both employee flourishing and organizational satisfaction (see Table 3a and 3b).

Table 3 (A) Interactions (Leader Preferential Treatment)

	Model 1				Model 2				Model 3			
	Leader Preferential Treatment				Leader Preferential Treatment				Leader Preferential Treatment			
	Coef.	***RSE***	***t***	***β***	***Coef.***	***RSE***	***t***	***B***	***Coef.***	***RSE***	***t***	***β***
Intercept	3.16	0.06	52.86***	.	2.89	0.07	44.18***	.	2.83	0.07	38.79***	.
Leader's life satisfaction	0.03	0.03	0.98	0.04	0.06	0.03	2.02*	0.07	0.05	0.03	1.75ǂ	0.06
Leader's Gender	0.00	0.04	-0.07	0.00	0.05	0.04	1.08	0.05	0.05	0.04	1.07	0.05
Age 30 to 39	0.12	0.04	3.49**	0.14	0.37	0.04	8.22***	0.40	0.44	0.05	8.35***	0.48
Age 40 to 49	0.12	0.03	3.79***	0.15	0.32	0.04	9.07***	0.40	0.38	0.04	9.75***	0.47
Age 50plus	0.29	0.04	7.49***	0.31	0.51	0.04	11.97***	0.54	0.56	0.05	12.25***	0.60
Leader's Years Worked	0.06	0.02	2.93**	0.10	0.04	0.02	2.35*	0.07	0.04	0.02	2.19*	0.07
Leader's centralization					0.24	0.04	5.39***	0.25	0.25	0.05	5.57***	0.26
Leader's identity salience					0.16	0.05	3.54***	0.15	0.17	0.05	3.49**	0.16
Leader's centralization x Leader's identity salience									0.22	0.09	2.38*	0.09
F	11.26***				24.832***				23.349***			
Df	5, 637				7, 635				8, 634			
ΔF					44.89***				5.71***			
Δdf					2, 635				1, 634			
R^2	0.06				0.17				0.18			
ΔR^2					0.12				0.01			

Table 3 (B) Interactions (Leader Preferential Treatment)

	Model 1				Model 2				Model 3			
	Leader Preferential Treatment				Leader Preferential Treatment				Leader Preferential Treatment			
	Coef.	***RSE***	***t***	***β***	***Coef.***	***RSE***	***t***	***β***	***Coef.***	***RSE***	***t***	***β***
Intercept	3.16	0.06	52.86***	.	3.09	0.06	53.75***	.	3.09	0.06	53.54***	.
Leaders' life satisfaction	0.03	0.03	0.98	0.04	0.05	0.03	1.67	0.06	0.05	0.03	1.88	0.07
Leader's Gender	0.00	0.04	-0.07	0.00	-0.01	0.04	-0.35	-0.01	-0.01	0.04	-0.31	-0.01
Age 30 to 39	0.12	0.04	3.49**	0.14	0.23	0.04	6.18***	0.26	0.23	0.04	6***	0.25
Age 40 to 49	0.12	0.03	3.79***	0.15	0.20	0.03	6.07***	0.25	0.18	0.03	5.24***	0.23
Age 50plus	0.29	0.04	7.49***	0.31	0.40	0.04	10.03***	0.42	0.37	0.04	8.94***	0.40
Leader's Years Worked	0.06	0.02	2.93**	0.10	0.03	0.02	1.30	0.04	0.02	0.02	1.05	0.03
Leader's centralization					0.35	0.05	6.42***	0.26	0.37	0.06	6.71***	0.28
Leader's identity salience					0.16	0.04	3.91***	0.15	0.16	0.04	3.79***	0.15
cg leader's centralization x Leader's identity salience									0.37	0.13	2.98**	0.11
F	6.19***				72.32***				67.76***			
Df	5, 637				7, 635				8, 634			
ΔF					48.55***				9.40***			
Δdf					2, 635				1, 634			
R^2	0.06				0.18				0.19			
ΔR^2					0.13				0.012			

Table 3(C) Interactions (Representation)

	Model 1				Model 2				Model 3			
	Leader Centralization (Forethought)				Leader Centralization (Forethought)				Leader Centralization (Forethought)			
	Coef.	***RSE***	***t***	***β***	***Coef.***	***RSE***	***t***	***β***	***Coef.***	***RSE***	***t***	***β***
Intercept	6.34	0.05	133.85***	.	6.17	0.04	143.2***	.	6.19	0.04	144.46***	.
Leader's Life Satisfaction	-0.02	0.02	-0.92	-0.04	0.02	0.02	0.88	0.03	0.02	0.02	0.82	0.03
Leader's Gender	0.04	0.03	1.18	0.05	0.05	0.03	1.77ǂ	0.07	0.06	0.03	2.05*	0.08
Age 30 to 39	-0.07	0.02	-2.74**	-0.10	0.07	0.03	2.82**	0.10	0.05	0.03	2.12*	0.08
Age 40 to 49	-0.03	0.02	-1.36	-0.05	0.09	0.02	3.72***	0.15	0.07	0.03	2.67**	0.12
Age 50plus	-0.05	0.04	-1.44	-0.07	0.10	0.03	3.03**	0.14	0.07	0.03	2.23*	0.11
Leader's Years Worked	0.07	0.02	4.14***	0.16	0.05	0.02	3.01**	0.10	0.04	0.02	2.88**	0.10
Leader's representation					0.22	0.03	6.61***	0.22	0.21	0.03	6.27***	0.21
Leader's identity Salience					0.36	0.03	11.92***	0.45	0.37	0.03	12.85***	0.46
Leader's representation x Leader's identity Salience									0.25	0.10	2.46*	0.09
F	6.19***				57.90***				48.63***			
Df	5, 637				7, 635				8, 634			
ΔF					136.48***				7.02**			
Δdf					2, 635				1, 634			
R^2	0.03				0.32				0.33			
ΔR^2					0.29				0.02			

Table 4 (A) HLM mediation effect via Preferential treatment

		Employee Flourishing				
Equation 1		**Coef.**	**SE**	**z**	**95% CI**	
	Intercept	6.77	2.25	3.01**	2.36	11.18
	Forethought	-0.27	0.35	-0.780	-0.96	0.41
	Random-effects Parameters	Est.	SE		**95% CI**	
	Ldr_CODE: Identity					
	sd(_cons)	0.8211	0.1770		0.5382	1.2529
	sd(Residual)	2.2089	0.0763		2.0642	2.3637
		Preferential Treatment Fairness				
Equation 2		**Coef.**	**SE**	**t**	**95% CI**	
	Intercept	1.422	0.624	2.28*	0.19	2.65
	Forethought	0.497	0.097	5.1***	0.31	0.69
	F(1, 216)	26.04***				
	R^2_{within}	-				
	$R^2_{between}$	11%				
	$R^2_{overall}$	13%				
		Employee Flourishing				
Equation 3		**Coef.**	**Std. Err.**	**z**	**95% CI**	
	Intercept	6.34	2.24	2.84**	1.96	10.72
	Preferential Treatment (Fairness)	0.40	0.22	1.76‡	-0.04	0.84
	Forethought	-0.49	0.37	-1.33	-1.21	0.23
	Random-effects Parameters	Est.	SE		**95% CI**	
	Ldr_CODE: Identity					
	sd(_cons)	0.78	0.19		0.49	1.25
	sd(Residual)	2.22	0.08		2.07	2.37

Table 4(B)

Equation 1	**Organizational Satisfaction**				
	Coef.	**SE**	**z**	**95% CI**	
Intercept	2.01	1.57	1.28	-1.07	5.09
Forethought	0.10	0.25	0.39	-0.38	0.58
Random-effects Parameters	Est.	SE		**95% CI**	
Leader's _CODE: Identity					
sd(_cons)	0.65	0.11		0.47	0.91
sd(Residual)	1.45	0.05		1.35	1.55
Equation 2	Preferential Treatment Fairness				
	Coef.	**SE**	**z**	**95% CI**	
Intercept	1.42	0.62	2.28*	0.19	2.65
Forethought	0.50	0.10	5.1***	0.31	0.69
F(1, 216)	26.04***				
R^2_{within}	-				
$R^2_{between}$	11%				
$R^2_{overall}$	13%				
Equation 3	Organizational Satisfaction				
	Coef.	**Std. Err.**	**z**	**95% CI**	
Intercept	2.37	1.56	1.52	-0.69	5.43
Preferential Treatment (Fairness)	-0.32	0.16	2.04*	-0.63	-0.01
Forethought	0.27	0.26	1.05	-0.23	0.77
Random-effects Parameters	**Est.**	**SE**		**95% CI**	
Ldr_CODE: Identity					
sd(_cons)	0.63	0.12		0.44	0.90
sd(Residual)	1.45	0.05		1.36	1.56

Table 5 (A) HLM mediation effect via Centralization (Forethought)

Equation 1

	Employee Flourishing				
	Coef.	SE	z	95% CI	
Intercept	6.15	2.17	2.84	1.900	10.400
Generosity	-0.18	0.34	-0.52	-0.836	0.484
Random-effects Parameters	Estimate	Std. Err.		[95% Conf.	Interval]
Leader's_CODE: Identity					
sd(_cons)	0.83	0.18		0.54	1.26
sd(Residual)	2.21	0.08		2.06	2.36
Equation 2					
	Centralization (Forethought)				
Forethought	**Coef.**	**SE**	**t**	**95% CI**	
Intercept	3.20	0.38	8.44***	2.45	3.95
Generosity	0.50	0.06	8.45***	0.38	0.61
F(1, 216)	71.4***				
R^2_{within}	-				
$R^2_{between}$	0.25				
$R^2_{overall}$	0.23				
Equation 3					
	Employee Flourishing				
	Coef.	**SE**	**Z**	**95% CI**	
_cons	6.99	2.58	2.71*	1.94	12.04
Centralization (forethought)	-0.24	0.40	-0.60	-1.03	0.55
Generosity	-0.07	0.38	-0.17	-0.82	0.69
Random-effects Parameters	Estimate	Std. Err.		[95% Conf.	Interval]
Leader's_CODE: Identity					
sd(_cons)	0.83	0.18		0.55	1.26
sd(Residual)	2.21	0.08		2.06	2.36

[

Table 5 (B) Organisational Satisfaction

Equation 1						
	Coef.	*Std. Err*	*z*	*P>|z|*	*[95% Conf. Interval]*	
Representation _cons	-.4255218 5.394018	.2588042 1.680899	-1.64 3.21	0.100 0.001	-.9327688 2.099516	.0817251 8.688519
Random-effects Parameters	Estimate	Std. Err.		[95% Conf.	Interval]	
Leader's_CODE: Identity						
sd(_cons)	.6218239	.1195631		.4265796	.906431	
sd(Residual)	1.456502	0518595		1.358325	1.561775	
Equation 2						
Centralization (forethought)	Coef.	Std. Err	z	P>|z|	[95% Conf. Interval]	
Representation	**.4434037**	.0708342	6.26	0.000	.3037889	.5830185
_cons	3.51464	4616693	7.61	0.000	2.604687	4.424594
Equation 3						

Table 5 (C) Follower/Employee Flourishing

Equation 1

	Coef.	**Std. Err**	**z**	**P>|z|**	**[95% Conf. Interval]**	
Leader's Representation	.6240683	.3651124	1.71	0.087	-.0915388	1.339675
_cons	.9590157	2.369421	0.40	0.686	-3.684963	5.602995
Random-effects Parameters	Estimate	Std. Err.		[95% Conf.	Interval]	
Ldr_CODE: Identity						
sd(_cons)	.7533486	.2004295		.4472317	1.268993	
sd(Residual)	2.221719	.0788399		2.072447	2.381743	

Equation 2

	Coef.	Std. Err	z	P>|z|	[95% Conf. Interval]	
Representation	.4434037	.0708342	6.26	0.000	.3037889	.5830185
_cons	3.51464	4616693	7.61	0.000	2.604687	4.424594
_cons	3.51464	4616693	7.61	0.000	2.604687	4.424594

Equation 3

	Coef.	Std. Err	z	P>|z|	[95% Conf. Interval]	
Centralization (forethought)	-.5489322	.3682393	-1.49	0.136	-1.270668	.1728036
Leader's Representation	.8330169	.3896126	2.14	0.033	.0693903	1.596644
_cons	3.114019	2.773273	1.12	0.261	-2.321495	8.549533
Random-effects Parameters	Estimate	Std. Err.		[95% Conf.	Interval]	
Ldr_CODE: Identity						
sd(_cons)	.7457239	.1988397		.442195	1.257599	
sd(Residual)	2.221281	.0783505		2.072905	2.380278	

Conclusion

This study offers a significant theoretical contribution by deepening and extending the Ethnos Oblige Theory (Zoogah, 2016) and Social Identity Theory (Tajfel & Turner, 1979), while also integrating insights from Identity Salience Theory (Hogg & Terry, 2000). Specifically, it expands the Ethnos Oblige Theory by empirically demonstrating that ethnic obligation expressed through acts of generosity and representation shapes not only interpersonal relations but also structural outcomes in organizations, notably centralization of authority and preferential treatment in decision-making. Unlike prior research that focused on reciprocal favouritism (Zoogah & Peng, 2019), this study reveals that leaders consolidate power and favour in-group members not merely for personal benefit, but as a culturally rooted response to ethnic responsibilities. This finding challenges dominant Western notions of centralization as a bureaucratic tool, reframing it as a socially motivated leadership response in the African context.

It also enriches Social Identity Theory by showing how ethnic group affiliations influence both leadership behaviours and organizational structures. Ethnic identification does not only affect leader–follower dynamics but extends to institutional practices such as resource allocation, access to opportunities, and representation, reinforcing preferential treatment rooted in identity-based group loyalty.

Further, Identity Salience Theory is introduced to explain variations in leaders' responses. Leaders with high ethnic identity salience are more likely to reinforce centralized power structures and ethnic-based decision-making, highlighting the interaction between personal identity strength and organizational behaviours.

In sum, the study uniquely contributes by identifying centralization and preferential treatment as twin mediating mechanisms through which ethnic obligation influences workplace structures. It offers a culturally grounded reinterpretation of organizational behaviour, expanding the scope of HRM theory by revealing how ethnic loyalty drives both power consolidation and selective inclusion in African workplaces.

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FLEXIBLE WORK ARRANGEMENTS AND WORK-LIFE BALANCE. ASSESSING THE MODERATING ROLES OF ROLE SALIENCE AND PERSONALISED MOBILE ELECTRONIC DEVICES.

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Abstract

Underpinned by the boundary management and social role theories, this paper examined the interacting roles of Role Salience (RS) and the use of Personalised Mobile Electronic Devices (PMED's) on the relationship between Flexible Work Arrangements (FWA) and Work-Life Balance (WLB). Descriptive, quantitative approaches were employed in obtaining data from 325 formal sector workers. It was revealed that, FWAs had a negative and insignificant effect on WLB. Homecare role salience and PMEDs did not moderate the relationship between FWAs and WLB, but occupational salience, specifically, Occupational Role Reward Value (ORRV) and Occupational Role Commitment (ORC) moderated the direct relationship. Practically, this research advances the need for organisations to shift attention to employees' usage of WLB policies and not only their provision. Also, the findings provide empirical evidence for the need to rethink what constitutes "balance", which slightly dissents from the traditional definitions and assumptions of WLB.

Keywords: Flexible Work Arrangements, Work-Life Balance, Role salience, PMEDs,

Introduction

The concept of Work Life Balance has become a major focus for organisations and scholarship in the past few decades. For organisations, WLB is a means to improving employee wellbeing (Shirmohammadi, Au & Beigi, 2022), performance (Burk, Mausolf & Oakleaf, 2022) and reduced stress and burnout (Mulyani et al., 2021). For researchers, work life conflict offers considerable theoretical reasons for low employee performance, employee engagement, career advancement, thriving (Zhou, Li & Li, 2023; McGinley & Martinez, 2018) among others. The importance of portable communication devices to promoting flexible working and WLB has not been underestimated in the existing literature (Ninaus, Diehl & Terlutter, 2021). These devices offer ubiquitous services that promote engaging in multiple roles while at one location.

Due to the limitation of innate resources in attending to all of life's expectations and demands, individuals tend to focus on specific roles in either of the two main domains and channel most of these resources there as a coping mechanism. This is where the concept of role salience comes into question. Defined as the extent of significance and attention individuals ascribe to various roles in their lives (Yucel & Laß, 2024), role salience holds significant importance in understanding the dynamics of the flexible working-WLB relationship. However, the extent to which role salience influences WLB has received little research attention.

Regardless of plethora of studies conducted on work life balance, some important research gaps still exist, limiting our understanding of some important intricacies of the concept. Firstly, although FWAs have been highly adopted in Western nations (Bjarntoft et al., 2020; OECD, 2016), the concept is still gaining traction in developing countries (Ansong & Boateng, 2018), hence scholars have called for more studies in this context (Asiedu-Appiah & Zoogah, 2019). This is important because, the developing worlds, including Africa, possess peculiar social, economic and cultural characteristics that can influence the uptake of WLB interventions. Some of these factors include traditional gender roles (as opposed to egalitarian roles in most developed worlds) and low technology use proficiency.

Secondly, most studies conducted on the interactions between flexible working and WLB have considered the moderating and mediating roles of flexibility ideals and family support cultures (Erden Bayazit & Bayazit, 2019), work life conflict (Suifan, Abdallah & Diab, 2016), support and resilience (Gupta & Srivastava, 2020) and gender (Chen, Zhang, Sanders & Xu, 2018). As much as these studies are beneficial to theory and practice, the extent to which individuals internalize the relevance of work, family or personal life roles is equally imperative.

In view of these gaps, this study generally sought to test the effect that FWAs have on the attainment of WLB, conditioned by the interacting effects of role salience (occupational role reward value, occupational role commitment and homecare role reward value) and the use of PMEDs. The terminologies, "family life", "personal life" and "non-work" are used interchangeably in this paper. This study relied on primary quantitative data from employees in varied industries in Ghana. With the aid of hierarchical regression analysis, it was found that, only occupational role salience (juxtaposed with the dimensions of role salience) moderated the relationship between flexible work arrangements and work life balance.

This study offers considerable theoretical and practical contributions. One of the main theoretical contributions of this study is the assessment of various dimensions of role salience as boundary

conditions on the flexible working-WLB relationship. Practically, the knowledge on how the dimensions buffer the flexible working-WLB relationship is important for organisations and human resource managers to identify the roles which hold significant meanings to employees and focus on improving their needs in those domains. Such a study reduces ambiguity and increases targeted organisational interventions. Also, this study discusses and analyses modern phenomena and work trends that affect large proportions of modern-day employees globally (i.e. Generations X, Y and Z workers) (StatCan, 2019 cited in Mahmoud et al., 2020).

Theoretical Underpinnings

Boundary Management Theory

Extant research has proven and justified the existence of psychological, behavioural and structural boundaries (Kossek et al., 2021) that separate the work and non-work domains (Ollier-Malaterre, Jacobs & Rothbard, 2019; Cingiene, 2024) and the increasing rate of fluidity of these boundaries (Šmite et al., 2023). The boundary management theory helps explains the permeability of the boundaries (Reissner, Izak, & Hislop 2021). FWAs and PMEDs have been argued to be two of the many factors that ease or constrain this permeability (Farivar et al., 2024; Johnston et al., 2022). It is argued that, the availability of FWAs (usually permitted by the organisation), allows individuals to work outside the confines of the physical structure of the organisation.

The adoption of the boundary management theory to explain the association of FWAs, PMEDs and WLB is consistent with the views of Chen et al. (2009). According to them, three factors account for the extent to which people manage their boundaries; the flexibility, permeability and the contrast in role identities. Flexible work arrangements encourage work flexibility (the degree to which roles are not tied to specific schedules and places) and reduces inflexibility (where activities are clearly tied to either work or family spheres).

Social Role Theory

The social role theory has its root from the gender role theory, which sought to understand the development of gendered belief systems and how these beliefs impact the behaviours, values and role engagements of others (Shanine, Eddleston & Combs, 2019). Overtime, the frontiers of this theory have been extended to also consider the motivations of individuals to engage in particular roles (Milia & Jiang, 2024). It has been advanced the performance of certain roles is inspired by a set of needs, guided by a variable set of cognitive structures (which includes self-images and reference groups) (Audia and Greve, 2021). The social role theory is relied on in this study to clarify the position of role salience in the model. We opine that, social role theory lends insight into how male and female roles are socially constructed and the degree to which both genders internalize and engage in socially-constructed roles (either family or work) which are important to them to satisfy a self-image (Hogan, 1982) or the expectations of society.

Literature Review and Hypotheses

Flexible Work Arrangements and Work-Life Balance

Davis (2015) defined work flexibility as work arrangements that alter the time and/or place where work is completed, designed to accommodate the needs of the employee and organisation. Broadly, work flexibility has been segregated into three aspects, which are; location, time and schedule flexibility (Kossek & Thompson, 2016). Virkebau and Hazak (2017) observe that,

flextime is observed to be a preserve of some category of employees, mainly, top managers, consultants and employees with highly specialized skills.

Considered as one of the seminal definitions, Emslie and Hunt (2009) define work–life balance is the satisfaction and good functioning at work and at home, with minimum circumstances of role conflict. The outcomes of WLB have been generally argued to benefit organisations (Larasati & Hasanati, 2019), the individual (Perrigino, Dunford & Wilson, 2018) and the society (Nyemba-Mudenda & Chigona, 2019). Some of the benefits of WLB include; improved performance of workers, high employee retention, enhancement of firm image (Burk, Mausolf & Oakleaf, 2022), reduced stress (Oludayo & Omonijo, 2020), high employee commitment, (Oyewobi et al., 2022), etc.

On the other end, Nwabgara (2021), contends that poorly institutionalized WLB practices can reflect in poor employee well-being, rise in employee complaints and grievances, low levels of motivation and enthusiasm, increased work-family conflicts and poor employee performance. Fazili and Khan (2017) explain that, the advancements in communication technologies coupled with their increasing use is a major cause of the blurring boundaries between work and family life.

According to Kelliher, Richardson and Boiarintseva (2019), there is substantial research supporting the positive relationship between the provision of flexible workplace arrangements and satisfactory work-life balance. Flexible work systems are used as positive capability spanning resources (Chung & Van der Lippe, 2020) to help employees to navigate between their work and family roles. Premised on the boundary management theory, it is advanced that, the distinct psychological and structural boundaries between work and non-work domains are infiltrated and blurred by virtue of the adoption of FWAs. This is because FWAs allow for individuals to work remotely and engage in multiple tasks remotely. It is hypothesised that;

H_1: Flexible Work Arrangements have a positive and significant relationship with WLB.

Moderating Effect of Role Salience/Occupational Role Reward Value, Occupational Role Commitment and Homecare Role Reward Value

Role salience is grossly defined as a person's "internalized beliefs and attitudes about the personal relevance of a role, the standards for the performance of the role, and the manner in which personal resources are committed to the performance of the role" (Raheem & Rafique, 2019). There are two basic types of saliences; occupational and non-occupational (Anteby, Chan & DiBenigno, 2016). Individuals who are highly career driven incline to commit most of their time to work, hence are described as work salient and persons who place premium on satisfaction in their personal lives than work life are said to be non-work salient (Gaise, 2020).

In line with the significant role of modern technology in easing work, Long and Richter (2019) add that "It is now relatively easy to work anywhere and anytime, but this has placed the onus on mobile (or flexible) workers to set up their own work environment for comfort and ease". Salim and Haque (2015) posit that, with the rife in ubiquitous technology, everyday activities are strongly tied to the internet and the use of gadgets such as smartphones, tablets and laptops. These gadgets have been bundled together and termed Personalised Mobile Electronic Devices (PMEDs) in this study

It has been established that, FWAs such as flextime and flexspace are organisational interventions which directly or indirectly help to ensure that, employees are able to achieve WLB by reducing work life conflicts (Kim & Gong, 2017; Sirgy & Lee, 2018). Inherently, the role which provides the most satisfaction is engaged in more, while other roles are not entirely neglected. Hence, the individual achieves a sense of personal satisfaction and the rewards and resources from one domain are used to support the other (Bansal & Agarwal, 2020), limiting the occurrences of WLC. It is also argued that, although FWAs may be provided by an organisation, WLB may not be achieved because, the individual does not perceive a particular role(s) in a particular domain to be salient or important to him or her. Hence, the extent to which FWAs positively or negatively impact WLB can be influenced by the extent of salience placed on a particular role(s). It is therefore postulated that;

H_{2a}: Occupational Role Reward Value negatively moderates the relationship between Flexible Work Arrangements Work Life Balance.

H_{2b}: Occupational Role Commitment negatively moderates the relationship between Flexible Work Arrangements and Work Life Balance.

H_{2c}: Homecare Role Reward Value positively moderates the relationship between Flexible Work Arrangements and Work Life Balance.

Moderating Role of PMEDs

PMEDs have been found to be the leading cause of the increasingly blurring boundaries between work life and family or personal life (Sitompul, 2024) and their effects on WLB can be positive and negative. Positively, such devices ease the task of working outside the workplace and on another end, performing some family roles while at work, such as communicating with those at home through voice and video calls, surveillance, etc (Pauleen et al., 2015). The disadvantages of PMEDs also emerge when physical and social connection especially with family, suffers (Villadsen, 2017) due to the inordinate use of PMEDs in work activities while at home. Nam (2014) emphasises that, due to the convenience that comes with using PMEDs, conflicts are likely to arise in relationships when one partner perceives no problem with managing private affairs from the workplace and the other prefers a strict separation between their private and public lives. Makinson et al. (2012) also discovered that, WLB was only negatively influenced when the usage of PMEDs exceeded three hours of usage on days off from work. We assert that the extent to which FWAs will positively impact WLB (or cause WLC) is dependent on the role (i.e. professional or family) that is important to the employee. It is therefore hypothesised that;

H_3: PMEDs positively and significantly moderate the relationship between FWAs and WLB, such that at high levels of PMEDs use, FWAs will significantly help achieve WLB.

Figure 1: Conceptual Framework Showing the Hypothesised Relationships Between FWAs, Role Salience, PMEDs and WLB.

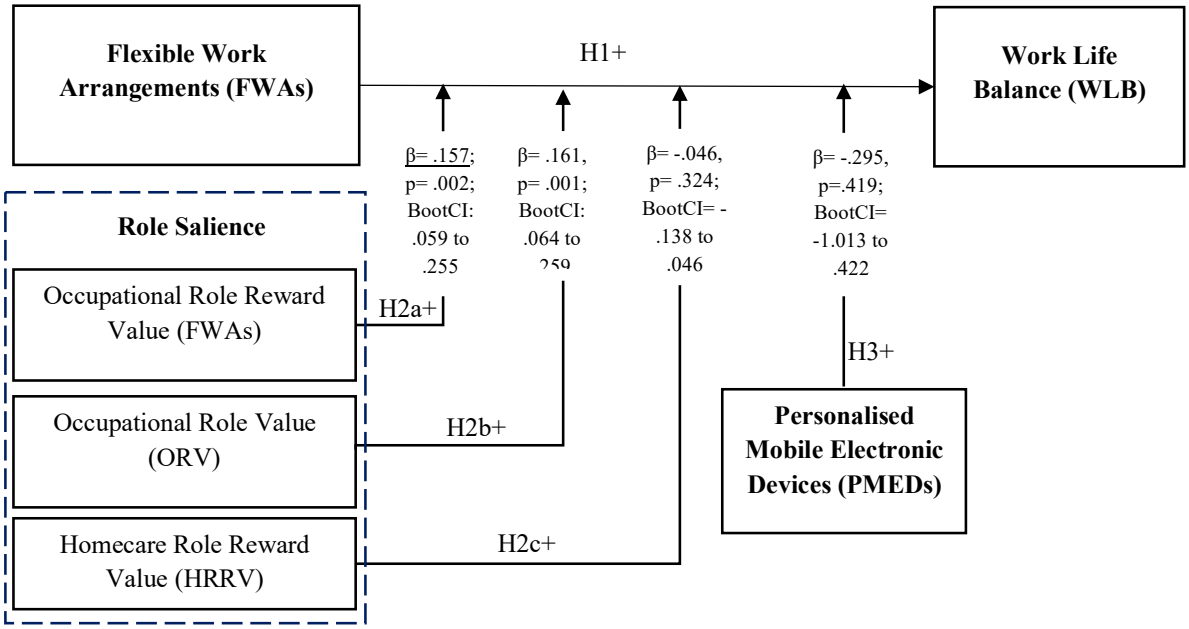


Figure 1 shows the hypothesised relationships between FWAs, ORRV, ORC and HRRV, PMEDs and WLB. H1 indicates the postulated positive relationship between FWAs and WLB. H2a, H2b and H2c show the positive relationships between ORRV, ORC and HRRV and WLB. H3 shows the moderating effect of PMEDs. The results of the moderation analyses of role salience (ORRV, ORC and HRRV) as well as PMEDs on the relationship between FWAs and WLB are indicated on their respective paths.

Methods

This research employed a cross-sectional approach and. data was collected in 2021 from white-colour workers in varied industries. Both online questionnaires and self-administered structured questionnaires were employed in obtaining primary data from 325 middle and top-level employees from 6 different industries in Ghana -a developing country, over a 5-month period. The industries include the educational, banking, services, manufacturing, engineering and science and technology industries. The reason for considering many industries was to ensure generalizability of the results. Ghana was an appropriate context for this study because, as a fast-growing economy, the once traditional social structure is fast-tilting to an egalitarian nation. More women, than some 30 years ago, are taking up more formal jobs and breadwinning-supportive roles. Purposefully, middle and top managers were targeted because this category of employees have been found to be provided with and use more FWAs and PMEDs in their line of work (Parry & Battista, 2019; Bélanger, 1999).

Measures

Role salience - a 3-dimension, 15-item scale was adapted from Amatea, Cross, Clark and Bobby (1986). Some items in this scale included; “I expect my job/career to give me more real satisfaction than anything else I do” and “I expect to devote whatever time and energy it takes to move up in my job/career field”. The Cronbach alpha reliability for ORRV, ORC and HRRV were .827, .894 and .880 respectively.

Work-Life Balance - a 15-item scale adopted from Harris (2014). Examples of items include; “I struggle with trying to juggle both my work and non-work responsibilities” and “My job makes it difficult to maintain the kinds of personal life I would like”. The Cronbach alpha reliability was .881.

PMEDs was measured categorically. The measure simply included a question on whether the respondent used PMEDs and a list containing PMEDs which are frequently used.

Flexible Work Arrangements - a 4-item scale adopted from Goguen (2017). Some of the items included; “I have the freedom to change the times that I begin and end each workday due to my personal preferences/needs” and “I have the freedom to change the location where I conduct my work each day”. Cronbach alpha was .838. The Statistical Package for Social Sciences (version 23) was used for analysing the data, with the aid of AMOS and PROCESS Macro.

Results and Discussions

Confirmatory Factor Analysis

Internal consistency among the observed variables was tested using Cronbach Alpha. As evident in Table 1 and Table 2, the reliability co-efficient for the variables ranged between 0.637 and 0.94.

Table 1: CFA Results for Flexible Work Arrangements and Work-Life Balance

Construct/Measures	Loadings	T-Value
Flexible Job Arrangements (FWAs) (CR =0.876**; AVE =** 0.542**; CA = 0.838)**		
I have the freedom to change the times that I begin and end each workday.	.696	12.420
I have the freedom to change the location where I complete my work.	.722	13.794
I have the freedom to choose the location where I complete my work.	.822	11.968
I have the freedom to choose when and where I work	.775	Fixed
WORK-LIFE BALANCE (WLB) (CR = 0.874; AVE = 0.500; CA = 0.881)		
I struggle with trying to juggle both my work and non-work responsibilities	.702	11.036
I am unable to relax at home because I am preoccupied with work.	.766	11.866
I often have to make difficult choices between my work and my personal life.	.680	10.633
I have to put aspects of my personal life “on hold” because of my work.	.735	11.412
I often neglect my personal life needs because of the demands of my work.	.732	11.435
I come home from work too tired to do things I would like to do.	.637	12.883
My job makes it difficult to maintain the kinds of personal life I would like.	.687	Fixed

Source: Data from field work (2020).

A second order confirmatory analysis was run for the latent variable of role salience which was considered as a multi-dimensional construct in this study. Table 2 below presents the standardised regression weights for the exogenous variable of role salience.

A second order confirmatory analysis was run for the latent variable of role salience which was considered as a multi-dimensional construct in this study. Table 2 below presents the standardised regression weights for the exogenous variable of role salience.

Table 2. CFA Results for Role Salience

Construct	Indicators	Weight	T-Value	CR	AVE	CA
Organisational Role Reward Value	Interesting Career.	.634	Fixed	0.864	0.520	0.827
	Real Satisfaction.	.553	11.013			
	Occupational Achievement.	.870	12.284			
	Successful Career.	.827	11.924			
Occupational Role Commitment	Sacrifices to advance in career.	.676	Fixed	0.909	0.627	0.894
	Devotion of time and effort in career.	.897	14.511			
	Skill Development.	.926	14.851			
Homecare Role Reward Value	Having a home to be proud of.	.798	Fixed	0.898	0.601	0.880
	Having a comfortable and peaceful home.	.960	19.368			
	Having a well-run home.	.839	17.463			
	Having an aesthetically nice home.	.611	11.614			

Source: Data from field work (2020)

After running the model fit analysis, three indicators proved fit in measuring the exogenous variable of role salience. These indicators included; Organisational Role Reward Value (ORRV), Occupational Role Commitment (ORC) and Homecare Role Reward Value (HRRV).

Table 3: CFA Model Fit Indices

CFA Model	CMIN/DF	P-V	GFI	CFI	RMSEA	SRMR	NNFI
1st Order model (Flexible Work Arrangements)	2.613	.073	.992	.994	.071	.052	.990
1st Order model (Work-Life Balance)	1.881	.032	.981	.990	.052	.107	.978
2nd Order model (Role Salience)	1.439	.027	.968	.992	.037	.106	.976

Source: Data from field work (2020).

The demographic information showed that, the majority of participants were males (55.4%) and most participants were between the ages of 25 and 35 years (66.4%). Also, the largest proportion of respondents had a bachelor's degree (59.7%) at the time of conducting the study and many of them had worked between 2 to 5 years in their respective organisations. Most of the respondents were unmarried (including the widowed) (48.9%) and more than half (68.6%) indicated that they had dependents.

Table 4: Correlation Table

Constructs	1	2	3	4	5	6	7	8
1. WLB	1							
2. ORRV	-.053	1						
3. ORC	-.045	.722**	1					
4. HRRV	.311**	.355**	.401**	1				
5. FWAs	-.041	.030	-.007	.041	1			
6. Age	-.009	-.031	-.014	-.122*	.123*	1		
7. Education level	.089	-.020	.007	.119*	-.077	-.061	1	
8 Marital status	.029	.139*	.076	.088	-.180**	-.396**	.081	1

*** Correlation is significant at 0.01* *** Correlation significant at 0.05 level*

Source: Data from field work (2020).

This correlation table (Table 4) shows the correlations between the main variables in the study. Inclusive in this analysis were the control variables (i.e. the ages, education level and marital status of respondents).

The correlation analysis showed positive and significant associations among the variables as shown in Table 4. For instance, homecare role reward value (HRRV) has a positive and substantial association with WLB, given B= .331 and p< .01. This can be interpreted as, an increase in the benefits that an individual accrues from engaging in family or domestic duties tends to increase their ability to balance work and domestic demands. The results from the regression analysis

between these two constructs (B= .398, p < .01) further clarify that a change in HRRV is likely to cause a 39.8% variation/increase in WLB, and this effect is statistically significant.

Table 5: Relationship Between FWAs and WLB

Direct Effect	Beta	S. E	T	P-value
FWAs → WLB	-.044	1.492	-.743	.458
R	***R-square***	***F-statistics***	***P-value***	
.041	.002	.552	.458	

Source: Data from field work (2020).

The first objective sought to ascertain the extent of effect that FWAs have on WLB. Table 5 presents the results of the linear regression test conducted to achieve this objective.

The first objective sought to examine the relationship between FWAs and WLB. Given the regression values (B= -.044; t-value= -.743; p-value =.4.58) presented in Table 5, it can be explained that, FWAs can account for 44% reduction in WLB. The findings further showed that, although FWAs can have a negative effect on WLB, the effect is statistically negligible, as indicated by the p-value of .458.

Table 6: Moderation of ORRV, ORC and HRRV and PMEDs

Direct Effect	Beta	S. E	T	P	Bootstrapping	
					Lower CI	Upper CI
Dependent Variable: WORK-LIFE BALANCE						
(FWAs*ORRV)	.157	.050	3.147	.002	.059	.255
R	.205					
R-square	.042					
F statistics	1.994					
P	.056					
Dependent Variable: WORK-LIFE BALANCE						
(FWAs*ORC)	.161	.050	3.258	.001	.064	.259
R	.209					
R-square	.044					
F statistics	2.068					
P	.047					
Dependent Variable: WORK-LIFE BALANCE						
(FWAs*HRRV)	-.046	.047	-.987	.324	-.138	.046
R	.326					
R-square	.106					

F statistics	5.391
P	.000

Source: Data from field work (2020).

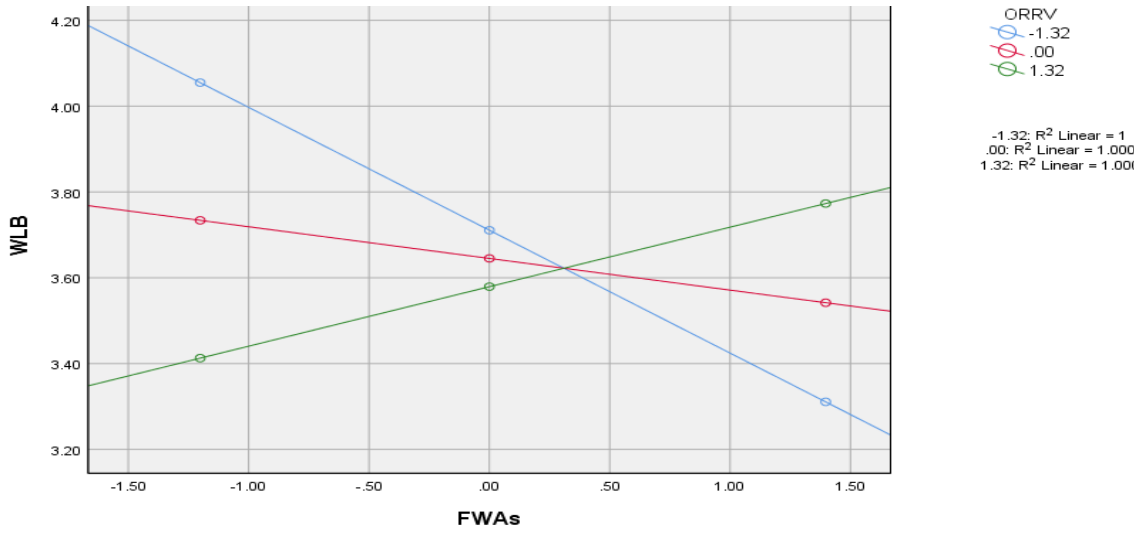
Table 6 shows the results of the moderation test to examine the interacting effects of ORRV, ORC and HRRV (which are dimensions of role salience) as well as PMEDs on the relationship between FWAs and WLB.

Moderating Role of Role Salience (ORRV, ORC and HRRV)

The results of the moderation test (see Table 6) show that, Occupational Role Reward Value and Occupational Role Commitment moderate the relationship between FWAs and WLB.

This is evidenced by the linear regression estimates obtained for ORRV (B= .157, and p-value of .002 (i.e. p<.05). Similarly, the moderating effect of ORC in the relationship between FWAs and WLB, was established given (B= .161; p-value = .001 and t-statistic =3.258).

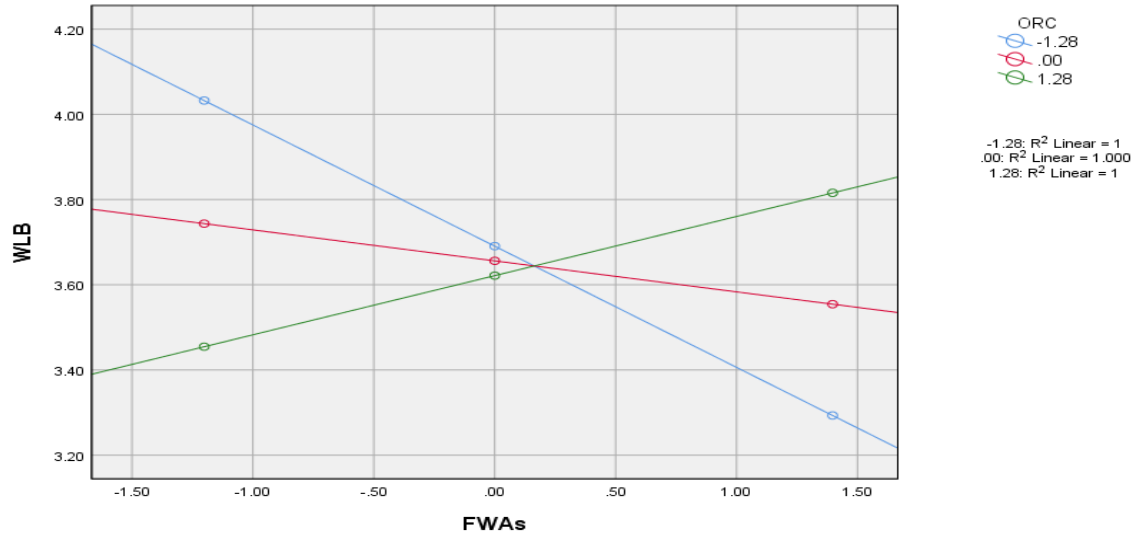
Figure 2: Interaction Slope for the Moderation of Occupational Role Reward Value



Source: Data from field work (2020).

In the case of the moderation of HRRV, it was found that, this dimension of role salience was not a significant moderator. The estimates obtained for this relationship are as follows; (B= -.046; t-value = -.987; p-value= .324). Following these results, it was concluded that, role salience (in this case, occupational salience) was as a significant moderator in the relationship between FWAs and WLB.

Figure 3: Interaction Slope for the Moderation of Occupational Role Commitment



Source: Data from field work (2020).

Figures 2 and 3 present the interaction slopes for the two significant moderation results in this study thus, for ORRV and ORC respectively.

In this study, the moderation of PMEDs in the relationship between Flexible Work Arrangements and Work-Life Balance was also ascertained. The results of this test (see Table 6) showed no moderative effect of PMEDs given the results (B= -.295, t-value = -.810 and p-value= .419).

Discussion

The relationship between FWAs and WLB has been largely studied by scholars. Though the results have generally been somewhat contradictory, researchers have usually found positive relationships between FWAs and WLB (Rawashdeh, Almasarweh & Jaber, 2016; Brosch & Binnewies, 2018). However, similar to the findings made in this study, some scholars have also established negative relationships between the two constructs (Dizaho et al., 2017; Wilson, 2009). The primary argument advanced for such a relationship is that, FWAs have the tendency to create work and family conflicts (Young & Schieman, 2018; Kim et al., 2019) and may not entirely benefit the employee positively. Although it may come across as counterintuitive, FWAs can motivate employees to take up more roles at home due to the flexibility to dash in-and-out of "work". With time, they may tend to engage more in family roles at the expense of firm work time (Chung & Van der Lippe, 2018).

Also, by working-from-home (telecommuting), it is possible for attention to be shared and most likely biased towards occupational duties (Bjarntoft et al., 2020). This is also likely to cause "absentmindedness" at home (Hollanda, 2019), resulting in domestic conflicts.

As the main finding from this study, it was found that under high levels of occupational role salience (i.e., ORRV and ORC), FWAs are likely to increase WLC. A possible explanation for this

finding can be linked to the social context of the research area. Ghana is known to possess a highly collectivist national culture (Boateng, Dzandu & Tang, 2016) and having time for the family is pertinent. Therefore, a person's core focus on occupational duties can cause conflicts in their personal lives. In addressing this, Greenhaus and Powell (2006) and Chan et al. (2016) suggest Work Life Enrichment – where rewards from one's occupation should be made available help to defray costs and satisfy some needs in family or personal life.

The results of the study showed that, PMEDs did not significantly moderate the relationship between FWAs and WLB. This outcome suggests that, as much as FWAs may result in a decrease in WLB, this effect has little to do with the use of personal mobile communication devices such as mobile phones, laptops and tablets.

Theoretical Implications

Theoretically, it can be advanced that FWAs have the tendency to result in work-life imbalances or WLC. This implication does not seek to suggest that FWAs are counterproductive however, the extent of their usage at the expense of roles in the family or personal domain can be a source of conflict (Makinson et al., 2012). This further necessitates the need for balance in the use of FWAs and PMEDs. need for proper integration while segmenting the boundaries between work and family/personal life is thus highlighted. Also, this study highlights the importance that occupation plays in the lives of employees.

Practical Implications

Practically, the findings of the study imply that in order to promote work-life balance, organisations ought to provide employees with FWAs and support their continuous exploitation. Additionally, FWAs should be properly managed so that they do not contribute to WLC. Furthermore, the relevance of occupation to employees can inform and guide organisations in their work life interventions. Although employees find their jobs salient as compared to other roles, care firm should be measured in promoting employees' tendency to work while at home because this is likely to result in conflict in non-work domains. Ultimately, the negative effects of these conflicts can reflect in employee performance and wellbeing.

Conclusion

Based on the findings of this study, it is concluded that, FWAs do not always ensure WLB but can also be a source of work-life conflict. Also, greater participation in occupational role salience has the tendency to promote WLB. Also, although PMEDs are generally perceived to address work and non-work demands simultaneously, such devices also have the potency to cause work life conflicts.

Limitations and Areas for Further Research

Regardless of the contributions of this study, some limitation, which do not directly affect the findings of the study were encountered. This study considered the single case of a developing country, limiting generalization. The need for inter-country analysis is exacerbated by the assertion that national culture has the tendency to affect the adoption of FWAs and its impacts on WLB (Conradie & de Klerk, 2019). Additionally, WLB and PMEDs use can be characterised by different personal experiences, hence future studies adopt mixed research methods to improve the

knowledge in this area. It is also possible that the consideration of unmarried individuals adversely influenced the results because family demands are highly experienced by married individuals. Future studies can therefore consider only married employees.

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INTEGRATING ARTIFICIAL INTELLIGENCE INTO BUSINESS STRATEGY: CHALLENGES AND OPPORTUNITIES FOR AFRICA

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Abstract

Artificial Intelligence (AI) is one of the most transformative global technologies, promising to redefine industries and economies. This article examines the integration of AI into African business strategies using the proposed AI Integration Framework (AIIF), which identifies challenges such as infrastructure gaps, skills shortages, and ethical considerations while leveraging opportunities like innovation and market expansion. The research aligns with Sustainable Development Goals (SDGs) 8 and 9, focusing on economic growth, decent work, industry innovation, and infrastructure enhancement. The methodology involves a theoretical synthesis using literature analysis and conceptual modeling. Findings indicate that successful AI integration depends on infrastructure readiness, organizational alignment, and ecosystem engagement, among others. This study offers actionable insights for African policymakers, businesses, and researchers to harness AI's potential for sustainable and inclusive growth.

Keywords: AI integration framework, artificial intelligence, business strategy, digital transformation in Africa, sustainable development goals.

Introduction

Artificial Intelligence (AI) has emerged as a cornerstone of technological transformation, radically altering how industries function and grow. Globally, AI has demonstrated its capacity to enhance productivity, drive innovation, and provide strategic decision-making insights that can reshape markets. From automating processes in manufacturing to enabling predictive analytics in healthcare, AI is driving a new era of operational efficiency and customer satisfaction (Mdladla et al., 2024). In Africa, this technology represents an unparalleled opportunity for socioeconomic transformation, particularly given the continent's pressing need for scalable and adaptable solutions to address challenges like limited infrastructure, fragmented markets, and resource constraints.

The promise of AI in Africa extends beyond individual enterprises; it is viewed as a critical enabler for achieving broader developmental goals. AI-powered systems are being utilized in sectors ranging from agriculture to healthcare and finance, improving access, accuracy, and efficiency while unlocking new market opportunities (Kshetri & Kshetri, 2024). For instance, AI-powered platforms have been leveraged to optimize crop yields in agriculture and streamline fraud detection in financial services, thereby fostering innovation and resilience in industries across the continent (Nzama et al., 2024).

Despite these developments, Africa faces unique barriers to fully embracing AI. Challenges such as the digital infrastructure deficit, low levels of technical skills, and ethical concerns regarding data usage limit the adoption of this technology. Many businesses struggle to align AI integration with their strategic goals due to resource constraints and a lack of theoretical frameworks tailored to the African context (Moharrak et al., 2024). This dual reality—a continent teeming with AI potential yet hampered by systemic challenges—necessitates a structured approach to AI adoption.

Africa's adoption of AI in business strategy faces a confluence of structural and operational hurdles. Infrastructure gaps, such as unreliable electricity and insufficient internet connectivity, hinder seamless integration of AI systems. Furthermore, data availability—a cornerstone of AI success—is often limited due to fragmented systems and low digital penetration rates (Mdladla et al., 2024). Businesses also contend with human capital deficiencies, including a dearth of expertise in AI-specific domains, which constrains their ability to implement and sustain AI projects (Okoye et al., 2024). Ethical and regulatory issues, such as concerns about data privacy, algorithmic bias, and accountability, further complicate AI deployment (Agu et al., 2022).

Given these challenges, African businesses risk being left behind in the global AI revolution if solutions are not devised to address these systemic issues. The lack of a comprehensive theoretical framework that accommodates Africa's unique socioeconomic and infrastructural realities exacerbates these barriers. Such a framework is crucial to facilitate AI adoption and foster economic growth while ensuring ethical considerations are met.

This study aims to establish the AI Integration Framework (AIIF) as a practical model for guiding African businesses in adopting artificial intelligence effectively. It emphasizes the importance of evaluating and enhancing infrastructure readiness to support AI deployment while aligning AI initiatives with organizational objectives and operational capabilities. The framework also highlights the need for developing human capital by building a skilled workforce capable of supporting and sustaining AI technologies. Furthermore, it addresses ethical and regulatory considerations, proposing policies to mitigate risks such as data misuse and

algorithmic bias. Finally, the framework advocates for fostering innovation ecosystems through partnerships among businesses, research institutions, and governments. These objectives align with SDGs 8 and 9 to promote sustainable and inclusive growth.

The study's significance lies in its focus on contextualizing AI adoption strategies to address Africa's unique challenges. Unlike existing research, which often generalizes global trends, this study highlights Africa-specific conditions and provides actionable insights for stakeholders (Kuzmina et al., 2024). The AIIF offers both theoretical and practical contributions, bridging gaps in academic research and equipping policymakers and businesses with the tools needed to harness AI effectively. The research employs a theoretical synthesis of literature and conceptual modeling, drawing from best practices globally while adapting them to the African context. This approach ensures that the study is grounded in evidence while providing innovative solutions tailored to Africa's needs (Moharrak et al., 2024).

Theoretical Framework

Artificial Intelligence (AI) refers to technologies such as machine learning, natural language processing, and robotics that simulate human intelligence to perform tasks like problem-solving, decision-making, and pattern recognition. In business, AI technologies are used to automate processes, enhance decision-making, and create value through innovation (Chen et al., 2021). The integration of AI into business strategy focuses on leveraging these technologies to improve organizational efficiency, enhance customer experiences, and drive sustainable growth (Mdladla et al., 2024).

The Sustainable Development Goals (SDGs) 8 and 9 provide a guiding framework, emphasizing economic growth through decent work (SDG 8) and industrial innovation alongside resilient infrastructure (SDG 9). AI's role aligns directly with these goals by enabling smarter business practices and fostering industrial advancements (Caner & Bhatti, 2020).

The existing theoretical foundations for AI adoption and integration in business strategies are rooted in several key theories that provide insights into organizational readiness and technological adoption. The Technology-Organization-Environment (TOE) framework highlights how technological capability, organizational preparedness, and external environmental factors drive AI adoption, making it a useful model for aligning AI implementation with African business conditions (Shonhe, 2024). The Dynamic Capabilities Theory emphasizes the importance of agility, innovation, and reconfiguration of resources to respond to environmental shifts, which is critical for businesses adopting AI in dynamic African markets (Huang & Rust, 2020). Additionally, the Diffusion of Innovation (DOI) theory explores how new technologies spread through organizations, highlighting factors such as perceived usefulness, compatibility, and ease of use, which are essential for addressing AI adoption barriers in African contexts (Osasona et al., 2024). Together, these frameworks offer a robust theoretical foundation for understanding and improving AI integration in business strategies, particularly in addressing regional challenges and opportunities.

Proposed Theory – AI Integration Framework (AIIF)

The AI Integration Framework (AIIF) provides a comprehensive conceptual model designed to guide African businesses in adopting artificial intelligence strategically while addressing the unique challenges they face. This framework highlights the critical importance of infrastructure

readiness, as the availability of digital infrastructure—such as internet connectivity, reliable electricity, and robust data systems—forms the foundation for effective AI deployment. Without these essentials, the full potential of AI cannot be realized, especially in regions where such infrastructure remains limited (Bag et al., 2021).

Another key component of the framework is organizational alignment, which ensures that AI strategies are tightly integrated with business objectives and operational processes. This alignment is vital for achieving efficiencies and competitive advantages while ensuring that AI technologies address specific organizational needs (Caner & Bhatti, 2020). The framework also emphasizes the development of human capital, recognizing that the success of AI adoption depends significantly on a workforce equipped with the necessary skills and competencies to implement, manage, and maintain AI systems effectively. In Africa, where skill shortages in AI-related fields are prevalent, targeted training and education programs are essential to support this transition (Shonhe, 2024).

The AIIF also addresses ethical and regulatory considerations, which are critical for fostering trust and ensuring compliance. Data privacy, algorithmic fairness, and the broader ethical deployment of AI are increasingly important issues, particularly in regions where regulatory frameworks may be underdeveloped or inconsistently enforced. By focusing on these considerations, the framework helps organizations navigate potential risks while building a foundation for responsible AI use (Brand, 2022). Furthermore, the framework advocates for engagement within the broader innovation ecosystem. This involves fostering collaborations among businesses, research institutions, governments, and international stakeholders to drive innovation and ensure the sustainable deployment of AI technologies (Chen et al., 2021).

By integrating these components, the AI Integration Framework provides a strategic roadmap for African businesses to effectively adopt and utilize AI technologies. It not only addresses the immediate technical and operational challenges but also aligns with long-term objectives such as economic growth and innovation, contributing to broader sustainable development goals. This framework ensures that AI adoption is not just about technological advancement but also about fostering inclusive, ethical, and strategic growth in the unique African context.

The AI Integration Framework (AIIF) operates under two fundamental assumptions that guide its application in African business contexts. The first assumption is that effective AI integration requires a holistic approach, which encompasses aligning technological adoption with organizational readiness and responding to external environmental factors. This perspective acknowledges that successful implementation of AI extends beyond acquiring technology to include a supportive infrastructure, a skilled workforce, and a conducive regulatory environment (Mdladla et al., 2024). The second assumption is that strategic AI adoption can significantly contribute to achieving Sustainable Development Goals (SDGs) 8 and 9 by driving economic growth, fostering innovation, and building resilient infrastructures. By integrating these goals into the framework, the AIIF emphasizes the dual focus on immediate organizational benefits and long-term sustainable development, ensuring that AI adoption is both impactful and aligned with broader societal objectives (Caner & Bhatti, 2020).

Literature Review

Artificial Intelligence (AI) is transforming industries worldwide, becoming a cornerstone of strategic decision-making and operational efficiency. Developed regions such as the United States and Europe lead the adoption of AI technologies in areas like predictive analytics, customer relationship management, and supply chain optimization. These advancements are underpinned by robust digital infrastructures, high levels of technical expertise, and well-established regulatory frameworks (Osasona et al., 2024). In the United States, for example, AI tools have been widely implemented in supply chain management, enabling companies to improve inventory management, reduce lead times, and enhance demand forecasting (Daraojimba et al., 2024).

Emerging markets, particularly in Asia, demonstrate a growing focus on AI applications tailored to local challenges, such as healthcare delivery and agricultural efficiency. Countries in this region leverage AI to address resource constraints, improve accessibility, and enable cost-effective solutions. These efforts underscore the capacity of AI to enable developing economies to leapfrog traditional development pathways (Mdladla et al., 2024).

AI in African Industries: Opportunities

Africa represents a significant opportunity for the integration of Artificial Intelligence (AI) into its industries, with transformative potential across agriculture, healthcare, and finance. The continent's unique challenges and resource constraints have made it a fertile ground for AI technologies to drive innovation and foster sustainable development. This section examines the opportunities AI offers in these critical sectors, supported by recent advancements and academic insights.

AI technologies have emerged as vital tools in addressing Africa's agricultural challenges, particularly food security and resource inefficiency. Predictive modeling powered by AI analyzes historical weather and yield data to guide farmers on optimal planting and harvesting schedules, significantly improving productivity. Soil analysis technologies driven by AI also evaluate nutrient levels and recommend precise interventions to enhance fertility and reduce waste (Akintuyi, 2024).

Additionally, AI-driven pest management systems monitor crop conditions and detect potential pest outbreaks, enabling early and effective responses. These innovations are particularly beneficial in regions like East Africa, where smallholder farmers dominate and resources are limited (Gikunda, 2024). Through precision farming, AI enhances both yield quality and quantity, helping to combat Africa's persistent food insecurity while improving livelihoods.

AI's role in healthcare across Africa is transformative, particularly in improving diagnostics and treatment delivery in resource-constrained environments. Machine learning algorithms have been developed to analyze medical images, such as X-rays and MRIs, for early disease detection, including conditions like tuberculosis and cancer. These systems offer rapid and accurate diagnostics, even in rural areas with limited access to specialized healthcare professionals (Balogun et al., 2023).

AI also contributes to public health by predicting disease outbreaks through real-time analysis of epidemiological data. Early warning systems for diseases like malaria and cholera have enabled timely interventions, reducing mortality and enhancing public health outcomes. Furthermore, AI-powered virtual assistants and chatbots have revolutionized patient engagement by providing

24/7 medical support and guidance, bridging the gap in healthcare access for underserved populations (Hlongwane et al., 2024).

In the financial sector, AI has been pivotal in driving financial inclusion across Africa by addressing the gaps left by traditional banking systems. AI-based credit scoring models analyze alternative data sources, such as mobile usage and transactional behavior, to assess creditworthiness. This innovation has enabled banks and fintech companies to extend credit to individuals and small businesses previously excluded from formal financial systems (Adewumi et al., 2024).

Digital lending platforms leverage AI to automate loan processing and fraud detection, significantly reducing operational costs and improving security. These platforms are particularly impactful in rural areas, where access to traditional banking infrastructure is limited. AI-driven solutions thus facilitate economic participation, contributing to poverty alleviation and economic resilience (Agu et al., 2022).

AI in African Industries: Challenges

While Africa holds immense potential for the integration of Artificial Intelligence (AI), several challenges hinder its widespread adoption across industries. These challenges stem from infrastructural limitations, skill shortages, and regulatory gaps, all of which require urgent and coordinated attention to unlock AI's transformative potential.

One of the most significant barriers to AI adoption in Africa is the lack of reliable digital infrastructure. Inconsistent internet connectivity and frequent electricity outages disrupt the seamless operation of AI systems, particularly in rural areas where infrastructure is underdeveloped. For example, many regions still face significant gaps in broadband penetration, which limits the ability to deploy cloud-based AI solutions essential for data-intensive applications (Kuzmina et al., 2024). Additionally, the high cost of energy in Africa exacerbates these challenges, making the operation of AI systems unaffordable for many small and medium-sized enterprises (Nzama et al., 2024).

Infrastructural limitations also impede the collection and processing of quality data, which is fundamental for the effectiveness of AI applications. The fragmented nature of data collection systems in many African countries makes it difficult to create reliable datasets that AI systems can use for training and predictions. These infrastructural deficits collectively create a challenging environment for the large-scale deployment of AI technologies.

The lack of skilled professionals in AI-related fields such as machine learning, data science, and robotics presents another critical hurdle for African industries. The continent suffers from a talent gap that limits its ability to develop, implement, and sustain AI solutions. Universities and technical institutes often lack the resources and expertise to provide advanced AI-related education, which exacerbates the problem (Mdladla et al., 2024).

Moreover, the brain drain phenomenon, where highly skilled professionals migrate to developed countries for better opportunities, further depletes the local talent pool. This has created a situation where many African businesses rely on external expertise for AI projects, which increases costs and limits the localization of AI solutions (Shonhe, 2024).

The lack of comprehensive regulatory frameworks governing AI deployment in Africa raises significant ethical and operational concerns. Key issues such as data privacy, algorithmic bias, and accountability remain inadequately addressed in many countries. For instance, weak data

protection laws expose users to potential misuse of personal information, eroding trust in AI technologies (Gwagwa et al., 2020).

Algorithmic bias presents another ethical dilemma, as poorly trained AI models can perpetuate inequalities, particularly in sensitive applications like credit scoring or job recruitment. Without robust oversight, such biases can exacerbate social inequalities rather than alleviate them. Additionally, the absence of accountability mechanisms makes it difficult to address errors or unintended consequences arising from AI usage, further deterring businesses from adopting these technologies (Shao et al., 2023).

Existing Strategies for AI Integration

Efforts to integrate Artificial Intelligence (AI) into African industries have gained momentum through a combination of collaborative partnerships, mobile technology applications, and educational initiatives. These strategies address the unique challenges of infrastructure deficits, skill shortages, and limited regulatory frameworks.

Collaborative partnerships between governments, global technology firms, and local universities have proven pivotal in promoting AI adoption in Africa. These partnerships facilitate access to advanced technological resources and provide skill development programs tailored to local needs. For instance, joint initiatives like the African AI Hub have enabled training in machine learning and data analytics, equipping a new generation of professionals with the skills to develop and implement AI technologies (Mdladla et al., 2024). Additionally, technology companies such as Google and IBM have established AI research labs in Africa, fostering innovation ecosystems that align with regional challenges and opportunities (Osasona et al., 2024).

These partnerships not only enhance local technical expertise but also promote cross-sector collaboration, essential for creating sustainable AI ecosystems. Governments have also prioritized partnerships to align national AI strategies with broader developmental goals, as seen in initiatives supporting AI-driven education and healthcare programs.

Mobile technologies have emerged as transformative tools in overcoming infrastructural limitations, enabling scalable and cost-effective AI solutions. Mobile-based applications in agriculture, for instance, utilize AI to monitor crop health, manage pests, and optimize farming practices even in remote areas. These applications have significantly enhanced productivity and sustainability, particularly for smallholder farmers in East Africa (Linda et al., 2024). Similarly, mobile technologies in healthcare have supported AI-driven diagnostic tools and virtual health assistants, improving access to medical services in underserved communities (Balogun et al., 2023).

These innovations highlight the potential of mobile platforms to bypass traditional infrastructure challenges, making AI technologies accessible to diverse populations. Moreover, mobile integration demonstrates the feasibility of scaling AI applications across sectors with minimal dependency on physical infrastructure.

Educational institutions have begun incorporating AI-focused curricula to bridge the skill gap in the workforce. Universities across Africa have introduced programs in artificial intelligence, machine learning, and data science, ensuring a steady supply of professionals capable of driving AI innovation. Programs such as the Data Science Academy in South Africa and similar institutions elsewhere provide targeted training that aligns with industry needs (Njoroge, 2024).

Government-backed initiatives have also played a role in fostering workforce development. For example, national AI strategies in countries like Nigeria and Kenya emphasize capacity building through public-private partnerships, creating opportunities for hands-on training and mentorship in emerging technologies (Shonhe, 2024). These efforts are crucial in ensuring that the local workforce is prepared to manage and sustain AI deployments.

While existing research highlights the transformative potential of AI, it often lacks a focus on the unique socio-economic and infrastructural realities of African countries. Most studies concentrate on isolated case studies or replicate global best practices without adapting them to local contexts. This gap emphasizes the need for frameworks like the AI Integration Framework (AIIF), which is designed to address Africa-specific challenges while maximizing opportunities (Osasona et al., 2024).

Findings

The integration of Artificial Intelligence (AI) into various African industries reveals transformative potential and practical applications, particularly in agriculture, manufacturing, finance, and education. These findings highlight both the achievements and the ongoing challenges of AI deployment on the continent.

In agriculture, AI has played a crucial role in improving productivity and addressing food security. Technologies like predictive modeling for crop yields, soil quality analysis, and pest control systems have significantly enhanced agricultural practices. These innovations not only optimize resource use but also empower smallholder farmers with affordable, scalable tools tailored to their unique needs. For example, AI-powered platforms provide actionable insights on weather patterns and planting schedules, helping to mitigate risks and improve yields (Akintuyi, 2024). Such advancements are particularly impactful in East Africa, where precision farming has improved agricultural sustainability (Gikunda, 2024).

The manufacturing sector has also benefited from AI's ability to enhance productivity and operational efficiency. By automating processes and enabling predictive maintenance, AI technologies have reduced production downtime and minimized maintenance costs. In resource-constrained settings, such as West Africa, these systems have streamlined operations and ensured better alignment with market demands (Nzama et al., 2024). Additionally, AI applications in quality control have allowed manufacturers to achieve higher accuracy in detecting defects and ensuring product compliance with international standards (Manu et al., 2024).

In the financial sector, AI is driving unprecedented advancements in financial inclusion and security. AI-based credit scoring models and digital lending platforms are enabling financial institutions to extend services to underbanked populations, promoting economic participation. These tools rely on alternative data, such as mobile usage patterns, to assess creditworthiness, particularly for rural and low-income communities (Adewumi et al., 2024). Moreover, AI's capabilities in fraud detection and risk assessment have strengthened the resilience of financial systems, reducing vulnerabilities to illicit activities (Agu et al., 2022).

AI is also transforming education by bridging gaps in access and quality. AI-powered platforms enable personalized learning experiences and adaptive assessments, addressing diverse educational needs across the continent. Virtual tutoring systems and automated administrative tools have supported teachers and students alike, enhancing learning outcomes and operational

efficiency. These technologies are particularly significant in remote areas, where traditional educational resources are limited (Hlongwane et al., 2024). AI-driven innovations in education not only promote inclusivity but also prepare a skilled workforce for the growing demands of digital economies.

Despite these successes, ethical and regulatory challenges persist, underscoring the need for responsible AI deployment. Issues such as data privacy, algorithmic bias, and the absence of robust regulatory frameworks pose significant barriers to trust and adoption. Effective governance structures and ethical guidelines are essential to addressing these concerns and ensuring that AI benefits are equitably distributed (Shao et al., 2023).

These findings collectively demonstrate the transformative potential of AI in African industries while emphasizing the need for strategic interventions to overcome persistent barriers and optimize its impact. Let me know if you need further expansion or specific focus on this section.

Discussion

The updated findings strongly emphasize the transformative potential of Artificial Intelligence (AI) in addressing systemic challenges, improving efficiency, and fostering innovation across African industries. The AI Integration Framework (AIIF) serves as a comprehensive model to capitalize on these opportunities while navigating the unique barriers faced by the continent. For instance, AI applications in agriculture have demonstrated their capacity to enhance productivity through precision farming, predictive analytics, and pest control, addressing the critical issue of food security while optimizing resource utilization (Akintuyi, 2024). Similarly, the adoption of AI in manufacturing has been instrumental in improving operational efficiency through predictive maintenance and automation, particularly in regions with infrastructural challenges such as West Africa (Nzama et al., 2024).

Compared to global AI adoption frameworks, the AIIF is uniquely designed to tackle Africa-specific obstacles, such as unreliable digital infrastructure and limited regulatory frameworks. While global models often assume advanced digital ecosystems and robust governance structures, the AIIF emphasizes foundational development, such as enhancing infrastructure readiness and human capital development. This tailored approach ensures that AI adoption strategies are grounded in the continent's socio-economic realities and are actionable within its resource constraints (Mdladla et al., 2024).

The AIIF's integration of ethical and regulatory considerations aligns with global best practices while addressing region-specific needs. For example, the framework prioritizes data privacy, algorithmic fairness, and accountability, which are particularly crucial given the fragmented and underdeveloped legal frameworks in many African countries. By fostering trust and inclusivity, the framework encourages responsible AI deployment, ensuring that its benefits are distributed equitably across populations (Shao et al., 2023).

Emerging trends in AI integration reveal the increasing significance of complementary technologies such as the Internet of Things (IoT) and big data analytics in amplifying AI's impact. These technologies enhance AI capabilities by improving data availability and processing, which are essential for addressing complex challenges in sectors like healthcare and education (Ajaj et al., 2024). To fully realize these advancements, policymakers and business

leaders must invest in innovation ecosystems, infrastructure, and region-specific regulatory frameworks that support the ethical and efficient deployment of AI technologies.

Despite these advancements, challenges persist in scaling AI applications and addressing disparities in adoption across African regions. For instance, regulatory fragmentation and the lack of alignment between government policies and industry needs often limit the scalability and sustainability of AI-driven initiatives. Addressing these issues requires a coordinated effort involving stakeholders at the local, national, and international levels to develop adaptive frameworks that facilitate AI adoption while mitigating risks (Njoroge, 2024).

The AI Integration Framework offers a robust strategy for leveraging AI in African industries. By aligning with Sustainable Development Goals (SDGs) 8 and 9, the framework ensures that AI adoption contributes to economic growth, decent work, and industrial innovation. It bridges the gap between Africa's unique challenges and its global aspirations, reinforcing the continent's position as an emerging hub for digital transformation and innovation. This discussion underscores the importance of strategic, inclusive, and ethical AI integration for unlocking Africa's full potential in the digital age.

Implications

Theoretical Implications

The AI Integration Framework (AIIF) significantly enhances the theoretical understanding of AI adoption by adapting global frameworks like the Technology-Organization-Environment (TOE) framework and the Diffusion of Innovation (DOI) theory to Africa's unique business landscape. Unlike existing models, the AIIF incorporates region-specific barriers such as infrastructural deficits, limited digital penetration, and fragmented regulatory environments, which are often overlooked in global studies (Mdladla et al., 2024). The framework advances the literature by emphasizing the integration of ethical considerations and the importance of innovation ecosystems, thus providing a more holistic approach to AI adoption. Furthermore, by aligning with Sustainable Development Goals (SDGs) 8 and 9, the AIIF ensures that theoretical contributions are actionable and tied to measurable outcomes like economic growth, job creation, and industrial innovation.

Practical Implications

The AIIF offers a structured, actionable guide for African businesses and policymakers to integrate AI technologies effectively. For governments, the framework highlights the need to prioritize investments in digital infrastructure such as reliable internet connectivity and energy systems. These foundational investments are crucial for creating an enabling environment where AI can thrive (Kuzmina et al., 2024). Policymakers must also focus on developing comprehensive AI governance frameworks that address data privacy, algorithmic accountability, and fairness to foster trust and inclusivity in AI applications (Shao et al., 2023).

For businesses, the AIIF emphasizes aligning AI technologies with strategic objectives and operational capacities. Companies can leverage AI to optimize supply chains, improve customer engagement, and foster innovation in product development (Nzama et al., 2024). Additionally, businesses are encouraged to invest in workforce development through targeted training programs that build expertise in AI-related fields, such as data analytics, machine learning, and

natural language processing. Such initiatives will equip employees with the skills necessary to sustain and scale AI implementations (Shonhe, 2024).

Collaboration is a critical pillar of the framework's practical implications. Businesses, academic institutions, and governments must foster partnerships to build innovation ecosystems that support the localized development and deployment of AI technologies. For example, universities can serve as hubs for research and training, while businesses provide practical applications and commercialization pathways (Bag et al., 2021). This collaborative approach will also attract global technology companies, creating opportunities for knowledge transfer and investment.

The societal impact of AI adoption in Africa is vast, with the potential to reduce inequalities and improve access to essential services. AI technologies can address disparities in healthcare delivery, education, and financial services by making these services more accessible and affordable. For instance, AI-powered diagnostic tools can enhance healthcare in underserved areas by providing accurate and timely medical insights, while AI-driven learning platforms can offer personalized education to students in remote regions (Hlongwane et al., 2024).

However, the social implications also require careful management to ensure inclusivity. Policymakers and businesses must address the digital divide by implementing initiatives that provide marginalized communities with access to AI technologies and the skills needed to use them effectively. Public-private partnerships could play a pivotal role in providing affordable devices, internet connectivity, and digital literacy programs to bridge this gap (Njoroge, 2024).

Furthermore, the ethical deployment of AI must be prioritized to prevent unintended consequences such as algorithmic bias or the exclusion of vulnerable groups. Building trust in AI systems through transparent governance and participatory policymaking will be essential to ensuring that the benefits of AI adoption are equitably distributed.

Implications for Future Research: The AIIF lays the groundwork for further empirical studies on AI adoption in Africa. Future research should focus on sector-specific applications of AI to identify best practices and barriers unique to industries such as agriculture, finance, and manufacturing. Additionally, longitudinal studies are needed to evaluate the long-term impact of AI on economic growth, job creation, and social inclusion. Exploring the interplay between AI and complementary technologies like big data and IoT will also provide deeper insights into maximizing the potential of AI in Africa (Ajaj et al., 2024).

Conclusion

The integration of Artificial Intelligence (AI) into African industries represents a critical opportunity to address systemic challenges and foster innovation, positioning the continent as a significant player in the global digital economy. The findings of this study underscore the transformative potential of AI in agriculture, manufacturing, finance, and education, where it has enhanced productivity, inclusivity, and operational efficiency. The AI Integration Framework (AIIF) provides a strategic roadmap to overcome unique regional challenges, such as infrastructural deficits, skill shortages, and fragmented regulatory frameworks, while aligning with Sustainable Development Goals (SDGs) 8 and 9 to promote economic growth and industrial innovation. The study highlights the necessity of coordinated efforts among policymakers, businesses, and academic institutions to implement AI effectively. By investing in infrastructure, developing human capital, and fostering innovation ecosystems, Africa can address barriers to AI

adoption and create a foundation for sustainable growth. Furthermore, prioritizing ethical considerations and robust governance frameworks will ensure AI technologies are deployed inclusively and responsibly.

Future research should focus on empirically validating the AIIF across various sectors and exploring AI's broader socio-economic impacts, such as addressing inequality and improving access to essential services. By harnessing AI strategically and collaboratively, Africa can transform its industries and realize its potential as a global hub for innovation and digital transformation.

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INTERPERSONAL CONFLICT MANAGEMENT IN THE WORKPLACE: IMPLICATION FOR EMPLOYEE MORALE AND TURNOVER INTENTION

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Abstract

Interpersonal conflict is among the most pervasive phenomena in organizational settings and significantly influences the well-being of employees and subsequent organizational outcomes. This conceptual paper combines the Conservation of Resources (COR) theory and Affective Events Theory (AET) theoretical perspectives in a comprehensive framework to describe how interpersonal conflict influences emotional exhaustion and turnover intentions. The framework views interpersonal conflict as a dynamic, resource-depleting process that gradually undermines the psychological resources of employees. The main mediating mechanism between conflict and turnover intentions is emotional exhaustion, which captures the cumulative emotional and cognitive strain associated with prolonged conflict. The model also places emotional intelligence (EI) in a moderating role, allowing individuals to manage their feelings, interpersonal tensions, and, therefore, the negative impact of interpersonal conflict. This paper synthesizes COR and AET into a dual-process perspective that captures both the resource-based and emotional dynamics, thus advancing the theoretical understanding of the cumulative and heterogeneous nature of conflict experiences. The study addresses practical implications of interventions to improve EI, prevent resource depletion and eventual emotional exhaustion. It also calls for directions in terms of future research, calling on these to be empirically validated and contextually explored. The contribution of this framework to the organizational behavior literature is immense, enriching it with actionable insight in developing healthier and more resilient workplaces.

Introduction

Interpersonal conflict has been one of the most pervasive and complex phenomena within organizational settings, significantly impacting employee outcomes, team dynamics, and overall organizational effectiveness. According to Jehn & Mannix (2001) and Chua & Jin (2019), interpersonal conflict is perceived incompatibilities and disagreements among individuals, embodying emotional, cognitive, and behavioral dimensions that permeate workplace relationships. Although there has been considerable research into its dysfunctional consequences, such as drain on productivity and impairment of relations in the workplace, how interpersonal conflict is translated into essential employee outcomes, such as intent to leave and morale, has remained under-investigated (Hom et al., 2017). This must be addressed as organizations increasingly struggle to maintain their workforce in turbulent post-pandemic job markets when talent retention has become pivotal (Franczak et al., 2023).

Theoretical developments suggest that interpersonal conflict does not act in isolation but interacts dynamically with individual psychological traits and workplace environments, requiring a more sophisticated conceptual framework. (Curseu et al., 2012). In particular, emotional intelligence (EI), the ability to perceive, understand, and manage emotions, has recently been considered a critical moderator for lessening the adverse effects of conflict (Marcel & Cowen, 2024; Wong & Law, 2017). At the same time, emotional exhaustion, or the chronic state of psychological depletion, mediates the relationship between interpersonal conflict and outcomes such as turnover intentions (Lin et al., 2019; Hobfoll, 1989). While theoretically necessary, prior literature has not explained the interactions among these constructs well. In light of the above observations, the present study has tried to fill the gap by integrating COR theory and AET to develop a comprehensive conceptual model that links interpersonal conflict, emotional intelligence, emotional exhaustion, and employee turnover intentions.

The Conservation of Resources theory also states that individuals are more inclined to strive to achieve, maintain, and retain their resources. However, resource loss is seen as much more psychologically powerful than resource gain (Hobfoll, 1989). Such a theoretical framework will provide an important basis upon which this interpersonal conflict functions like a process that depletes one's resources by eroding an employee's emotional and cognitive reserve (Halbesleben et al., 2014). For example, long-term interpersonal tensions at work can undermine one's psychological resilience, creating a resource loss spiral that worsens the emotional strain (Hobfoll et al., 2018). Meanwhile, Affective Events Theory supports COR through the emphasis on emotional mechanisms that underlie workplace experiences (Rothbard & Wilk, 2011). AET postulates that discrete events in the workplace, including interpersonal conflicts, elicit discrete emotional reactions that inform employees' cognitive appraisals and behavioural outcomes (Rothbard & Wilk, 2011). Bringing these theories together enables capturing those dual processes of resource depletion and emotional activation, better articulating the multifaceted nature of interpersonal conflict in organizational contexts.

Interpersonal conflict is not uniform and exhibits considerable variation in both forms and effects, varying from task-relevant disagreements to emotionally charged relational disputes (Jehn & Bendersky, 2003). While task conflict is sometimes productive in stimulating critical thinking and innovation, poor handling may slip into relational conflict, which increases emotional tensions and ultimately undermines team cohesion. Relationship conflict is the most injurious type of conflict because it is described by interpersonal incompatibilities and emotional hostility that destroy trust, impair collaboration, and enhance the negative affective states of employees (Jehn & Mannix, 2001). These conflicts act as chronic stressors that break

employees' emotional balance and reduce their psychological resources, which, in turn, causes emotional exhaustion and a higher tendency toward turnover intention (Maheshwari et al., 2023).

The intentions to leave, more precisely, the conscious and deliberate thoughts about leaving the organization, known as turnover intentions, are an important outcome of interest, given their serious consequences for organizational stability and costs (Hom et al., 2017). Indeed, while interpersonal conflict has been related to turnover intentions in several studies, the psychological mechanisms involved remain poorly theorized. Emotional exhaustion becomes an important mediator in this relationship, symbolising the psychological effects of prolonged conflict (Hobfoll et al., 2018). Employees experiencing emotional exhaustion show lessened organizational commitment, reduced job satisfaction, and a heightened tendency to quit; therefore, interventions dealing with the sources and the consequences of workplace conflict are needed (Chen et al., 2020).

Given this, emotional intelligence as a moderator is a promising avenue through which the negative impact of interpersonal conflict can be reduced. Individuals with high EI show better regulation of emotions and better conflict resolution; hence, they handle interpersonal tensions more aptly (Zhou & George, 2003). By utilizing emotional awareness and strategic thinking, an individual can de-escalate conflict situations and conserve their psychological resources, reducing the probability of emotional exhaustion and its spiralling effects (Wong & Law, 2017). Unfortunately, how the dynamic interplay among EI, conflict, and resource loss is unfolded has been neglected in the literature, and further exploration is required to inform theory and practice correctly.

In this light, the integration of COR and AET provides a theoretically compelling framework for further understanding such dynamics. Whereas COR highlights the resource-based implications of interpersonal conflict (Hofball, 1989), AET points to the emotional and cognitive pathways through which conflict influences employees' behaviours (Rothbard & Wilk, 2011). Combined, these disparate theories enable a richer understanding of how conflicts arise in the workplace and siphon resources and how individual differences in EI can shift their course (Halbesleben et al., 2014; Rothbard & Wilk, 2011). By incorporating this view, this study will contribute more to conceptual modelling with nuanced detail that captures the interactive nature of conflict, emotion, and resource dynamics as an outcome driver for employees.

In developing this model, the present study addresses several critical gaps in extant literature. First, though the moderating role of EI has been recognized, the exact mechanisms through which EI may buffer against resource depletion in conflict situations remain ill-defined (Joseph & Newman, 2010; Yang et al., 2024). The mediating role of emotional exhaustion has mostly been studied in the framework of burnout, and less attention has been given to its antecedents in conflict-laden environments (Lin et al., 2019). Lastly, existing research often considers interpersonal conflict a static variable, neglecting its dynamic and evolutionary nature within organizational settings (Curseu et al., 2012; Worren & Pope, 2022). In addressing these issues, the study will add to the further theoretical and practical understanding of interpersonal conflict management in the workplace.

The rest of the paper is organized as follows: the next section briefly explains how conflict research evolved from simplistic deficit models to more multidimensional frameworks. The section of the literature review synthesises the current knowledge on interpersonal conflicts,

emotional intelligence, emotional exhaustion, and turnover intentions, and it identifies the gaps and limitations in the literature. Conceptual analysis is done to deconstruct those constructs for precise meanings and their relationship. The theoretical propositions explain how these constructs influence employee outcomes based on COR and AET. Theoretical and practical implications of the proposed model are discussed in the conclusion, indicating avenues for future research and providing actionable insights to organizational practitioners.

Empirically underpinning a model through this study will further seek to enlighten complex mechanisms behind interpersonal conflict and organizational consequences. In doing so, this is also nuanced in that integrating the two major theoretical resources of COR and AET provides an in-depth framework through which the dynamics of resources and emotional processes cut across to influence experiences at work. This study should eventually offer insights that inform conflict management strategies in ways that better enhance the well-being of employees and the resilience of organizations in light of a complex, rapidly changing work environment.

Background and Context

Interpersonal conflict has been a focus of organizational behaviour research for decades because it is a pervasive and powerful force in any organizational context. Early research framed conflict mainly as a disruptive force and an inherently bad or negative occurrence. Researchers such as Pondy (1967) and Thomas and Schmidt (1976) focused on its negative impact on organizational efficiency and harmony. Analyses in this direction often used deficit-oriented models that looked at conflict as an interpersonal or structural system failure. This, however, was to be slowly countered when scholars realized that, under the right conditions, conflict does spur innovation and critical thinking (Jehn & Mannix, 2001; De Dreu & Beersma, 2005). This paradigmatic shift ushered in an era where conflict would be considered a multidimensional construct with destructive and constructive elements.

While modern research has managed to differentiate between the two concepts, task conflict can be defined as disagreements related to work issues. In contrast, relationship conflict emanates from interpersonal incompatibilities and emotional tensions. (Simons & Peterson, 2000; Ullah & Kundi, 2023). Whereas task conflict under conditions of high levels of trust and open communication has the potential to bring about several benefits for team performance (Boies et al., 2015), relationship conflict is almost always linked to adverse outcomes: job dissatisfaction, poorer collaboration, and emotional distress (De Dreu & Beersma, 2005). This differentiation has further investigated how conflict influences individual and organizational outcomes, revealing complex and dynamic processes.

The evolution of the conflict research field has also brought to the fore the critical role of individual differences that shape conflict experiences and outcomes. One of the most distinctive constructs that emerged was emotional intelligence, the ability to perceive, understand and regulate emotions within oneself and others (Wong & Law, 2017). Studies (Gaspar et al., 2021; Joseph & Newman, 2010) have shown that individuals with high EI are better at managing interpersonal tensions, which enables more adaptive responses to conflict and reduces its negative consequences. However, despite its growing prominence, the moderating role of EI in conflict dynamics remains underexplored, particularly regarding emotional exhaustion and turnover intentions (Gaspar et al., 2021; Joseph & Newman, 2010).

As the core dimension of burnout, emotional exhaustion has been given much attention as a psychological mechanism through which workplace stressors such as interpersonal conflict

operate (Cooper et al., 2018). Drawing from the COR theory, emotional exhaustion is when a person experiences resource depletion when perceiving that their resources are continuously threatened (Hobfoll, 1989). Interpersonal conflict refers to those strong and resource-depleting demands in nature. These demands lead out of the emotional and cognitive domains with which individuals cannot effectively cope (Halbesleben et al., 2014). Thus, a chronic effect not only leads to deterioration in psychological well-being but may also contribute to critical organizational effects, such as raised intentions of job abandonment (Hom et al., 2017).

Affective Events Theory (AET) supplements COR by drawing attention to the emotional processes underpinning work experiences. Sherf et al. (2020) argued that interpersonal conflicts, among other workplace events, elicit affective reactions that inform the attitudes and behaviours of employees. These emotional responses are crucial in shaping cognitive appraisals and subsequent actions, such as decisions to leave an organization (Pelletier & Bligh, 2007). While COR and AET together provide a sound theoretical basis for explaining how interpersonal conflict is translated into emotional exhaustion and, finally, into turnover intentions, whereas COR explains the resource loss, AET highlights the emotional mechanisms through which events at work influence individual-level outcomes and offers a more complete framework for conflict dynamics analysis.

Despite considerable developments, contemporary scholarship on interpersonal conflict is fragmentary: most studies either focus on isolated constructs or contexts without integrating their interdependencies (Curseu et al., 2012). For instance, although emotional intelligence has been explored in conflict resolution, its interaction with emotional exhaustion as a moderating mechanism is poorly understood (Wong & Law, 2017). Similarly, the studies on emotional exhaustion have mostly focused on its antecedents regarding workload or role ambiguity, giving less attention to the specific contributions of interpersonal conflict in this direction (Lussier et al., 2019; Halbesleben et al., 2014). These gaps suggest a need for a more integrative approach that considers how conflict, emotional intelligence, and emotional exhaustion jointly influence employee outcomes.

The broader organizational context amplifies the importance of addressing such gaps even more. Since the pandemic, remote or hybrid work arrangements have continued to rise, offering flexibility but also some new challenges in managing the interpersonal dynamics of the workplace (Davis et al., 2023).

The present study locates itself within this dynamic landscape by proposing a conceptual model that integrates interpersonal conflict, emotional intelligence, emotional exhaustion, and turnover intentions from the dual lenses of COR and AET. Thus, synthesizing these perspectives tries to extend understanding of the complex interplay between psychological resources, emotional processes, and organizational outcomes. This will be a theoretically informed but practice-oriented study that addresses existing conceptual gaps and offers guidance on the best approaches for managing workplace conflict in the contemporary environment. The contribution, therefore, will be towards the bigger discussion on developing healthier and more resilient organizational settings.

Conceptual Analysis

Interpersonal conflict is a central construct in organizational behaviour research and generally refers to the perceived incompatibilities and disagreements between individuals in workplace settings (Ilies et al., 2010). While task and relationship conflicts are often conceptually

differentiated, they seldom occur in isolation, with one usually transitioning into or worsening the other (Simons & Peterson, 2000). When well-managed, task conflict, a cognitive disagreement over work-related issues, is likely to generate innovation and critical analysis (Menguc & Auh, 2008). In contrast, relationship conflict, which emanates from emotional tension and interpersonal incompatibilities, has almost exclusively adverse outcomes, including lower levels of trust and psychological strain (Jehn & Mannix, 2001). Each of these conflict types thus interlinks, reinforcing the complexity and ever-changing nature that necessarily raises more profound theoretical questions if the organizational consequences of each are to be completely comprehended.

Emotional exhaustion is a critical mediating construct in this study, which refers to a chronic state of psychological exhaustion caused by prolonged exposure to stressors, including interpersonal conflict (Cheung & Cheung, 2013; Reizer, 2015). Based on the Conservation of Resources theory, emotional exhaustion represents the net loss of psychological resources an individual experiences over time when their demands are chronically greater than their capacity for resource gain (Hobfoll, 1989). For example, recurring relationship conflicts at work create emotional demands that deplete existing resources and prevent recovery, setting up a negative spiral of resource loss (Halbesleben et al., 2014). Such resource depletion is manifested in decreased job satisfaction, reduced organizational commitment, and increased turnover intentions, thus increasing the need for emotional exhaustion in conflict-laden environments (Hom et al., 2017).

Understanding the moderating role of emotional intelligence (EI) in this process is equally important. Emotional intelligence refers to the ability to perceive accurately, appraise, and express emotion; the ability to access and/or generate feelings when they facilitate thought; the ability to understand feelings and knowledge; and the ability to reflectively regulate feelings to promote intellectual growth (Mikolajczak et al., 2009; Wong & Law, 2017). Therefore, individuals with high EI will have heightened capacities for the regulation of emotions, and this will better their states by managing their responses to minimize friction with the other party in the conflict (Mulki et al., 2015). For instance, emotionally intelligent employees may reframe disagreements over tasks as opportunities for collaboration, thus avoiding escalation into relationship conflict and preserving psychological resources (Lebel, 2017). Despite its theoretical promise, the moderating influence of EI in conflict contexts remains little explored, especially in its interactions with emotional exhaustion and turnover intentions (Joseph & Newman, 2010).

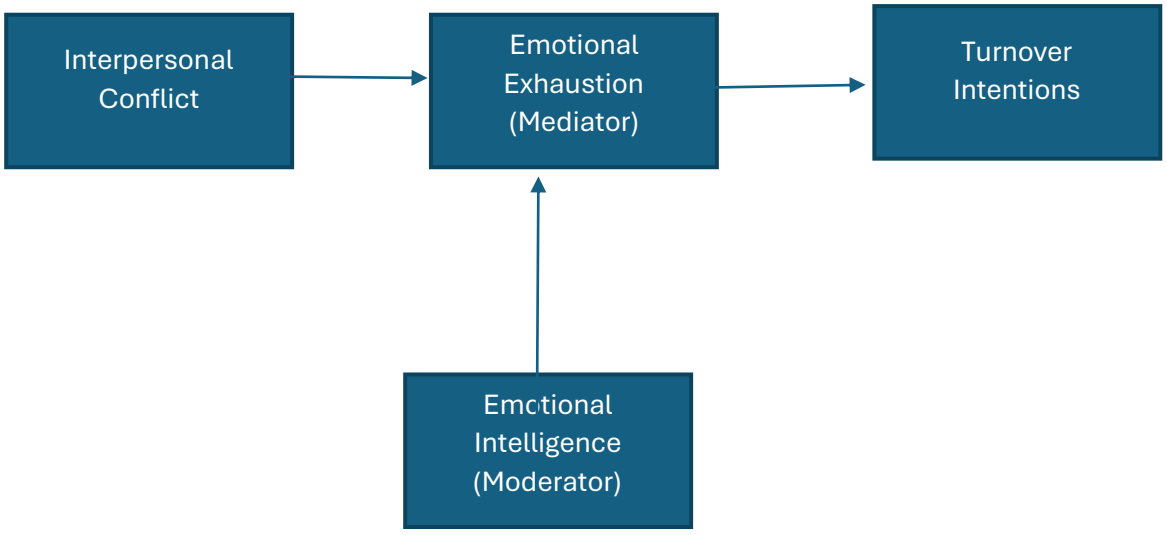
Turnover intentions are defined as an employee's conscious thinking about leaving the organization. They are considered vital outcomes that might influence the interaction between conflict, emotional exhaustion, and EI (Hom et al., 2017). This relation could be explained by AET, which assumes that discrete events, like interpersonal conflicts, at work create emotional reactions that form cognitive appraisals and eventual behaviours (Rothbard & Wilk, 2011). Emotional exhaustion mediates this pathway by translating the resource-depleting effects of conflict into feelings of disengagement and dissatisfaction, leading eventually to increased turnover intentions (Hafenbrack, 2017). High EI can potentially buffer this trajectory, offering a protective mechanism that interrupts the progress from conflict to exhaustion and eventually to turnover.

While COR and AET relate to analyses of these constructs and their associations, COR focuses on the conflict-as-resource-depleting framework. In contrast, AET emphasises the prominence of emotional processes as antecedents of behavioural outputs. Together, these dual theoretical

perspectives will highlight difficult interplay among conflict, emotional dynamics, and organization-wide outcomes for a cogent understanding of how these interdependent constructs interact in corporate environments. Synthesizing these views, this analysis extends theoretical insights and lays a sound foundation for developing practical interventions in mitigating adverse conflict effects.

Theoretical Framework

The study presents an integrated theoretical framework on interpersonal conflict, emotional exhaustion, emotional intelligence (EI), and turnover intentions based on the Conservation of Resources (COR) theory and Affective Events Theory (AET). The authors view interpersonal conflict as a dynamic process in which an individual's resources are constantly depleted, generating emotional and cognitive strain that will finally, if unresolved, result in emotional exhaustion and affect critical employee outcomes such as turnover intentions. This research positions emotional intelligence as a moderator of the injurious effects of interpersonal conflict on employees and as a mediator in how such conflict relates to their turnover intentions. Understanding these constructs using a richer conceptualization, using both the COR and the AET when analysing interlinked associations, permits a closer examination.



Source: Authors' (2024).

Encased within this framework is the proposition that interpersonal conflict, particularly relationship conflict, represents a major resource-eliminating stressor. COR theory postulates that individuals strive to acquire, maintain, and develop psychological resources; resource loss is, however, a more salient psychological experience than resource gain (Hobfoll, 1989). In organizational relationships, relationship conflict depletes emotional stability, trust, and psychological resiliency resources, leading to an upward spiral of resource depletion over time (Halbesleben et al., 2014). The more one experiences such conflicts, the more emotional strain may occur, making a recovery or rebuilding of psychological resources harder and increasing the likelihood of emotional exhaustion (Hobfoll et al., 2018).

Therefore, an obvious reflection in this framework is that Maslach & Leiter (1997) theoretically represent emotional exhaustion as a mediated structure. This denotes a situation of chronic psychological depletion emitted or related to an environment where the need for resources has

constantly outweighed available resources in preponderant conditions associated with contested environments (Maslach & Leiter, 1997). After that, it is shown how interpersonal conflict brings about massive organizational results in lower job satisfaction, decreased organization commitment, and a higher turnover intention (Hom et al., 2017). The process is consistent with AET, centring on the role of emotional reactions to events at work in influencing employees' cognitive appraisals and behaviours (Rothbard & Wilk, 2011). Conflict events give rise to negative emotions, which, as maintained, contribute to the deterioration of psychological well-being and promote disengagement, culminating in turnover intentions.

Emotional intelligence's moderating role brings a critical dimension into the proposed framework. It means the capability of perception, comprehension, and regulation of emotions allows the individual to manage interpersonal interactions more competently (Wong & Law, 2017). This competency disrupts the cycle of resource depletion caused by lessened emotional impact due to conflict and, therefore, reduces the risk of emotional exhaustion with its downstream consequences. In this paper's model, EI moderates the emotional reactions elicited by interpersonal conflict. Drawing from AET, the higher a person's EI, the better that individual would be at regulating their emotions when exposed to conflict and, therefore, avoid the snowballing effect of negative emotions, thereby reducing the impact of conflict on emotional exhaustion (Rothbard and Wilk, 2011). By embedding EI within this framework, we illustrate how emotionally intelligent individuals can curtail the spillover of negative emotion from the conflict itself and, hence, reduce its adverse influence on emotional exhaustion and turnover intentions.

The last construct in the framework is turnover intentions, which refer to the conscious consideration of an employee to leave their organization. According to Mölders et al. (2017), the relationship between interpersonal conflict and turnover intentions is mediated by emotional exhaustion. Conflict-induced resource depletion fosters dissatisfaction and disengagement, driving employees to seek alternatives (Maslach & Leiter, 1997). The above pathway could be better conceptualized through the helpful lens of AET, which proposes that emotional spillover from conflict events provides the impetus for cognitive appraisal and thus forms the basis of organizational withdrawal decisions (Rothbard & Wilk, 2011). Including EI as a moderator indicates variability in the reaction to the conflict events- the variation ensured by high EI to weaken this unfolding chain, starting with conflicts and leading to exhaustion, ending with turnover intentions.

Integrating COR and AET within this framework provides a sound theoretical basis for analysing the dynamics of workplace conflict. COR focuses on the resource-based effects of conflict, explaining how losing psychological resources leads to emotional exhaustion and turnover intentions (Hobfoll, 1989). AET adds to this perspective by highlighting the emotional mechanisms through which conflict impacts employee behaviour and further underlines the important role that affective responses will play in shaping workplace outcomes (Rothbard & Wilk, 2011). Integrating these two theories provides a comprehensive lens to study the complex influence of conflict by highlighting both the resource-depleting and emotion-driven dimensions of the process.

Therefore, the proposed framework can make several theoretical contributions to the literature on organizational behaviour. First, this paper extends prior research on interpersonal conflict by adding emotional intelligence and emotional exhaustion as two significant constructs which can mediate and moderate the link between the conflict and outcomes thereof. The manuscript further makes the second worthy contribution to the development for application of COR

and/or AET on conflict-related research in a specific way, by demonstrating how the said fundamental theories could inter alia be synthesized since their respective resources, emotions and behaviors interleave complexly in workplace encounters. To round it all up, this kind of framework provides heterogeneity of experiences associated with experiences of conflict. It desolates these most typically deterministic views, usually stating that employees uniformly respond to similar situations when they will involve the same type of experience.

The model, therefore, provides actionable insights for organizations in the quest to reduce the negative impact of interpersonal conflict on employee turnover. It underlines the importance of targeted interventions, such as EI training programs and conflict resolution workshops, by identifying emotional intelligence as a critical moderating factor. In this light, the framework points out the role of organizational policies in reducing stressors, offering psychological support, and engendering an open atmosphere where emotional exhaustion can be discussed. These may serve as potential interruptions in the conflict-exhaustion-turnover pathway, resulting in better employee well-being and organizational resilience.

Theoretical Propositions

Building on the integrated framework of Conservation of Resources (COR) theory and Affective Events Theory (AET), the following propositions articulate the relationships between the core constructs:

Proposition 1: Interpersonal conflict is positively related to emotional exhaustion, such that higher levels of interpersonal conflict lead to greater emotional exhaustion among employees.

Proposition 2: Emotional intelligence moderates the positive relationship between interpersonal conflict and emotional exhaustion, such that individuals with higher emotional intelligence will have fewer resource depletions and emotional strains.

Proposition 3: Emotional exhaustion is positively related to turnover intentions, such that employees experiencing higher emotional exhaustion are more likely to develop turnover intentions

Proposition 4: Emotional intelligence negatively moderates the relationship between emotional exhaustion and turnover intentions, such that the positive relationship between emotional exhaustion and turnover intentions is weaker when emotional intelligence is high.

Discussion and Implication

This paper provides an integrated framework incorporating interpersonal conflict, emotional exhaustion, emotional intelligence, and turnover intentions, which are of immense theoretical and practical importance. The framework advances existing scholarship by critically examining and refining three central propositions grounded in the Conservation of Resources (COR) theory and Affective Events Theory (AET). These propositions are evaluated and contextualized below to illustrate their contributions and limitations while highlighting areas for future research and practical application.

Theoretical Implications

Proposition 1: Interpersonal conflict is positively related to emotional exhaustion, such that higher levels of interpersonal conflict led to greater emotional exhaustion among employees

This proposition underlines interpersonal conflict's cumulative and evolving nature as a resource-depleting stressor. Through the application of COR theory, the framework extends the traditional conflict research that conceptualizes conflict as a discrete or episodic event (De Dreu & Beersma, 2005). It indicates how unresolved conflicts accelerate the depletion of psychological resources over time, making employees more vulnerable to emotional exhaustion (Hobfoll, 1989; Halbesleben et al., 2014).

Although this view is well supported by evidence linking conflict with stress and burnout (Maslach & Leiter, 1997; Spector & Jex, 1998), it does raise some critical questions about contextual variability. For instance, are there organizational cultures or environments in which resource replenishment mechanisms, such as team-building initiatives or managerial support, buffer the cumulative effects of conflict? Future research should consider such mitigating factors and, in so doing, perhaps broaden the explanatory scope of this proposition by incorporating the insights of organizational support theory (Eisenberger et al., 2002).

Proposition 2: Emotional intelligence moderates the positive relationship between interpersonal conflict and emotional exhaustion, such that individuals with higher emotional intelligence will have fewer resource depletions and emotional strains

This proposition introduces a new perspective on explaining individual-level variations in conflict outcomes; it positions EI as a moderator in the relationship between conflict and resource depletion. High EI individuals, with better skills for emotional regulation and social competencies, can more constructively reframe and handle conflicts and thus maintain their psychological resources longer (Wong & Law, 2017).

However, the generalisability of the proposition remains debatable. For example, while EI is held to influence conflict resolution positively, its success may be contingent upon factors such as the nature of the conflict or the balance of power. For instance, task conflicts may be more amenable to EI-driven resolution than deep-seated relationship conflicts. Furthermore, the cultural variance in expressing and regulating one's emotions could also moderate the role of EI. Thus, cross-cultural studies may validate this proposition through further refinement (Joseph & Newman, 2010).

Proposition 3: Emotional exhaustion is positively related to turnover intentions, such that employees experiencing higher emotional exhaustion are more likely to develop turnover intentions

This proposition emphasizes that emotional exhaustion is the pivotal pathway by which interpersonal conflict gets translated into turnover intentions. The role of emotional exhaustion as a mediator is supported by both COR theory and AET, which jointly explain the process through which resource depletion and negative affective responses form cognitive appraisals and behavioral outcomes of employees (Rothbard & Wilk, 2011; Hobfoll et al., 2018). AET explains that the emotional reactions from work incidents, such as interpersonal conflict, tend to spill over into broader cognitive judgments and actions, such as turnover intentions. When

anger or frustration results from a conflictive situation, it impacts employees' attitudes toward the organization, increasing emotional exhaustion and reducing job satisfaction (Rothbard & Wilk, 2011). The stronger the emotional exhaustion, the higher the tendency to develop turnover intentions. This emotional process, typified by conflict-related emotions, explains why unresolved interpersonal conflict may result in disengagement and, consequently, higher turnover rates.

This provides a strong explanatory mechanism for this proposition, but it conceptualizes a linear progression from conflict to exhaustion and turnover. Empirical evidence, however, suggests that this pathway can be more complex. For example, alternative employment opportunities and personal resilience might deflect this path so that employees with similar levels of conflict and depletion arrive at different endpoints (Hom et al., 2017). Future research should explore such contingencies, adding more mediators and moderators better to capture the complex nature of the conflict-turnover relationship.

Proposition 4: **Emotional intelligence negatively moderates the relationship between emotional exhaustion and turnover intentions, such that the positive relationship between emotional exhaustion and turnover intentions is weaker when emotional intelligence is high.**

This proposition suggests that the framework is complex, in the belief that emotional exhaustion and EI interact dynamically to influence the variability in turnover intentions of the potential leavers. In addition, the leading mediator mechanism may link conflict to turnover based on the moderating effects of EI in this process. Individuals with high EI would be better positioned to manage the emotional spillover of resource depletion, and therefore, the effects of resource depletion on turnover intentions would be minimized (Wong & Law, 2017). In contrast, a low-EI individual may feel more vulnerable because of the limited capacity for emotional regulation that enhances the influence of exhaustion on the intention to leave.

The proposition is tenable within the broader framework because it points to the importance of individual differences in conflict outcomes; however, it presents some rather important questions concerning the boundary conditions of such moderating EI effects. Does emotional intelligence, for example, retain its buffering capacity when emotional exhaustion becomes extreme, or is there a threshold beyond which the high-level EI is just inadequate? Moreover, these interactions may be context-bound; for example, the shield of EI may be magnified in highly supportive or weakened in highly toxic organizational cultures. Therefore, future research longitudinal-multi-level designs will capture these contingencies for nuanced interactions among exhaustion, EI, and turnover intentions.

Practical Applications

These insights generated from this framework have important implications for organizational practice. First, identifying interpersonal conflict as a dynamic process that gradually depletes resources means early intervention is necessary. In this respect, an organization needs to invest in conflict prevention strategies, like developing open communications, clarifying the expectations about roles, and training employees in conflict resolution. For example, mediation programs can be instituted to handle conflicts at their initial stages before they escalate and reduce their impact on employees' psychological resources (Jehn & Mannix, 2001).

Second, from the moderating role played by EI, investment in employees' emotional intelligence could mitigate the adverse effects of conflicts through targeted training programs. For instance, such interventions could be tailored towards developing empathy and emotional regulation skills and, importantly, constructive communication, a better way of handling interpersonal conflict (Mo & Shi, 2015; Mayer et al., 2004). Additionally, leaders and managers should be trained in EI to model appropriate conflict behaviors and create a supportive organizational climate (Segon & Booth, 2014).

Third, identifying emotional exhaustion as a mediating mechanism highlights proactive measures to protect employees' psychological well-being. Organizations can develop and implement stress-reduction programs such as mindfulness training and resilience workshops to help employees cope with conflict-induced stressors. Therefore, access to counseling services and a supportive workplace culture can minimize burnout and turnover (Maslach & Leiter, 2016).

In conclusion, this framework elaborates on interpersonal conflict and its implications for organizations in a critical manner, develops theory by integrating COR and AET in ways that fill important gaps in the literature, puts emotional intelligence and emotional exhaustion into focus, and thus offers practical implications for organizations on how to manage conflict better and improve the well-being of their employees. This framework provides a quite adequate basis if critically debated, for further research and practical innovation concerning conflict management.

Conclusion

This paper develops the current understanding of interpersonal conflict in the workplace by integrating the Conservation of Resources (COR) theory and Affective Events Theory (AET) to establish an overall framework. The model views interpersonal conflict as a dynamic and resource-depleting process that leads to emotional exhaustion, which mediates its relationship with critical outcomes such as turnover intentions. Emotional intelligence is positioned as a critical moderator in a buffering role for the psychological strain brought by conflict and fostering more adaptive responses.

The theoretical contributions of this paper are threefold: reframing conflict as a cumulative and evolving process, emotional exhaustion as the centrality in translating conflict into organizational outcomes, and finally, individual differences in EI moderate the outcomes of conflict. The framework thus represents both resource-based and affective dimensions of

conflict as a synthesis of COR and AET. It, therefore, provides the dual process view that gives a richer look at the dynamics of the conflict.

Therefore, this conceptual examination emphasizes the necessity of interpersonal conflict management strategies from theoretical and practical perspectives. It helps to fill some of the important gaps in the existing literature. Also, it provides several organizational strategies that can boost employees' well-being while reducing turnover and promoting a healthy work environment. Future empirical studies will further refine and validate these propositions, strengthening their applicability across diverse organizational contexts.

Limitations and Future Research Directions

Limitations

While the proposed framework offers theoretical insight, several limitations are evident. First, relying solely on COR and AET may limit consideration of alternative mechanisms driving conflict dynamics. Self-determination or social exchange could provide complementary perspectives on relational and motivational factors.

Second, as the model is grounded in theoretical assumptions, it requires empirical validation. Without longitudinal or experimental studies, the causal links among interpersonal conflict, emotional exhaustion, emotional intelligence, and turnover intentions remain speculative. The assumption of generalizability across diverse organizational and cultural settings may also be unrealistic, particularly in collectivist or hierarchical contexts.

Lastly, the model overlooks contextual factors such as leadership style, organizational climate, and team dynamics, which limits its practical applicability. Future studies should integrate these elements to reflect the complexities of real-world organizations.

Future Research Direction

The framework offers opportunities for empirical exploration. Longitudinal research could validate interpersonal conflict's dynamic and cumulative effects and examine how resource replenishment mechanisms influence outcomes. Experimental designs may assess the impact of EI training on conflict resolution, while cross-cultural studies can test the model’s broader applicability.

Future research should also explore interactions between contextual factors, such as team composition, leadership style, organizational culture, and the proposed constructs. For instance, participatory leadership may enhance protective effects, while competitive cultures may intensify conflict’s resource-depleting impact. Such insights would improve both the model’s relevance and theoretical depth.

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Track 4 - Sustainability, Business Ethics, and Social Responsibility

ATTITUDES AND PURCHASE BEHAVIOUR OF LUXURIOUS SUSTAINABLE GARMENTS: A YOUNG CONSUMER PERSPECTIVE

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Abstract

This study focused on exploring the attitudes and purchasing behaviours of Generation Z (Gen Z) consumers toward high-end sustainable fashion within an emerging market context. Scant studies have been conducted on high-end sustainable fashion in South Africa as the study region. As a result, this study revealed the multifaceted perspectives of Gen Z in their attitudes and purchase behaviour towards high-end sustainable garments. An exploratory research design was adopted, and a qualitative approach was applied. This study further utilised the nonprobability convenience sampling method. Data was collected using an interview guide through semi-structured interviews among seven (7) participants within the sample group of interest. The key contribution of this study was the key findings that several factors impact Gen Z sustainable fashion attitudes, including environmental consciousness, ethical values, quality and the longevity of sustainable high-end garments. Furthermore, social networks, particularly technological platforms such as Instagram and blogs, significantly impact Gen Z's decision to purchase sustainable high-end clothing. The findings in this study also revealed that brand transparency, media influence, mindful consumption, environmental and ethical values, as well as economic considerations all play a significant role in shaping attitudes toward sustainable high-end clothing. These findings offered vital insights into Gen Z consumers' nuanced and changing tastes. In addition to offering suggestions and directions for future research, this study added to the expanding scope of work on sustainable high-end fashion consumption in the face of evolving technology accessibility.

Keywords: Buying behaviour, Generation Z (Gen Z), High-end fashion, Sustainability,

Introduction

The research problem aims to understand how young consumers are becoming increasingly aware of the environmental and social impacts of fashion production and consumption (Van den Bergh, 2022) and how they make purchasing decisions in the emerging economic context of South Africa. By exploring the variables that impact Gen Z's attitudes and purchase behaviours towards sustainable fashion, this research can offer valuable information to stakeholders in the fashion industry (Nowinsa, 2020) and policymakers to develop more sustainable and socially responsible practices.

Sustainability is defined as finding a balance between environmental responsibility, economic viability, and meeting social expectations and needs (Holland, 2018). Wiles (2019) adds that sustainability involves acting consciously, considering the limited resources the environment offers, to ensure that the current generation's needs are met without compromising the ability of future generations to meet their own needs. This definition underscores the role of societal norms and desires in sustainability, a crucial aspect of this study. Wiles (2019) views sustainability as the idea that people and businesses should act in a manner conscious of the limited resources the environment offers. Sustainable fashion is a necessary path forward, aligned with sustainability principles and addressing urgent environmental and social challenges (Bowlin, 2022). Sustainability also involves creating ethically made, environmentally friendly garments, and respectful of the entire supply chain (Marshall, 2022).

Global environmental sustainability issues are influencing and changing human consumption patterns, leading to environmental degradation and constant shifts in consumer attitudes and behaviours. Recognising the unsustainable practices of our current way of life, the modern notion of sustainability can be traced back to the Brundtland Report of 1987, also known as Our Common Future (International Institute for Sustainable Development, 2022) in which the unsustainable practices in various industries could lead to more harm than good. Fast fashion has been identified as one of the unsustainable practices involving the production of a substantial volume of affordable garments to stay current with the prevailing trends (Gildan Brands, 2023). Gildan Brands (2023) established that fast fashion garments often lack the best quality. Despite its popularity for affordability and meeting the demand for fashionable clothing, fast fashion has significant negative environmental impacts, including excessive production and consumption of cheaply made garments that contribute to the accumulation of textile waste in landfills due to a throwaway culture (Jovanovich, 2022) and damage to the ozone layer. Fast fashion is also a concern for its excessive consumption of natural resources and the heavy use of chemicals during the production and dyeing of fibers (Pereira, Carvalho, Dias, Costa, & António, 2021). The issues impacting sustainability practices also include environmental degradation and the wastage of natural resources. Greenhouse gas emissions generated by the apparel industry contribute substantially to global carbon emissions (Pereira et al., 2021). The issue is compounded by the complex supply chain, which includes energy-intensive production and manufacturing, and the global transportation of garments (Pereira et al., 2021), a worldwide concern to date. These practices pose significant harm to the environment and society, requiring further research to mitigate more negative impacts.

Alternatively, the adoption of slow, sustainable fashion can minimise resource depletion, carbon emissions, and pollution associated with clothing production. According to Arora and Manchanda (2022), Gen Z consumers in South Africa express relatively positive attitudes toward sustainable fashion. Yet, few empirical studies exist to provide more depth and comprehension of this research area. However, the attitudes of young consumers are not always reflected in actual purchasing behaviours, as many admit to buying fast fashion products

despite awareness of the environmental and social impacts (Jacobs, Petersen, Hörisch, & Battenfeld, 2018).

Gen Z exhibits a complex attitude toward fashion, seeking both quality and quantity, exclusivity, and mainstream trends, while acknowledging sustainability concerns even as they continue to buy fast fashion (Hous von Eden, 2018). Gen Z's diverse and independent characteristics suggest unique attitudes and motivations that extend beyond their political beliefs and values (Pastore, 2020). This diversity may contribute to variations in attitudes and behaviours, where positive attitudes may not always align with actual purchasing decisions (Pastore, 2020). Despite expressing a strong desire for sustainable fashion, Gen Z appear to be the predominant consumer of fast fashion, revealing a gap between their sentiments and actions (Herron, 2023). The relationship between luxury brands and sustainability is also evolving, highlighting the challenge of aligning consumer preferences for exclusivity and high quality with sustainability concerns (Pencarelli, Ali Taha, kerháková, Valentiny & Fedorko, 2019).

Despite the increasing literature on the purchasing behaviour of Gen Z, inconsistencies persist between their attitudes and purchase behaviours, particularly regarding sustainable fashion (Grazzini, Acuti, & Aiello, 2021) in contrast to the less desirable fast fashion. A study conducted by Zhang, Liu, and Lyu (2023) revealed that Gen Z consumers strive for mindful consumption, prioritising quality over quantity and seeking environmentally friendly fabrics and high-quality craftsmanship. They opt for timeless fashion aesthetics and versatile clothing to extend the garments' lifespan and reduce the disposal frequency. Despite a strong interest in sustainable clothing, challenges such as pricing and access to information can hinder sustainable consumption. Although price and performance still matter, sustainability can significantly impact purchasing choices, especially when they align with one’s values and are associated with compatible brands (Manley, YooKyoung & Shin, 2023). Gen Z exhibits a keen interest in shopping while maintaining a careful approach to spending (Vogue Business, 2021). They actively engage with brands, seek new trends, and prioritise quality (Vogue Business 2021), researching and comparing options before purchasing. Brand loyalty is not a top priority for Gen Z as they prefer to shop around for the best deals (Bewicke, 2023), which may not always lead to sustainable fashion purchases.

Further research is desirable to explore factors impacting Gen Z’s purchasing behaviour in the context of less explored high-end sustainable garment fashion in an emerging economy, that is, South Africa. Although some research resources provide a general overview in the context of South African females in Durban regarding their general fashion purchase behaviour (Naidu, 2018), additional studies, such as Williams (2022) and Naidu (2018), focus on sustainability awareness and purchasing habits of Gen Z consumers, in general. The value of this study lies in obtaining empirical findings that offer imperative information for sustainable fashion brands operating in South Africa. In addition, the study contributes to a better understanding of purchasing patterns for sustainable high-end garment fashion. High-end fashion represents the pinnacle of creativity, craftsmanship, and innovation in the fashion industry (Yellow brick, 2023). By exploring high-end garment fashion, the objective is to gain insight into the forefront of fashion innovation, shape responsible fashion practices, and explore the relationship between Gen Z’s attitudes towards sustainable fashion and their purchasing behaviour in general.

Research question

Based on the study's rationale, the research question that guides this study reads as follows: *What are Generation Z's attitudes towards purchasing sustainable high-end clothing in Gauteng, South Africa?*

Research objectives

The following process-driven research objectives have been formulated.

- To assess the attitudes of Generation Z consumers towards sustainable high-end garment fashion.
- To identify the purchasing behaviour of sustainable high-end garment fashion among Generation Z consumers in an emerging economy.
- To explore the factors impacting Generation Z's attitudes towards sustainable high-end garment fashion and purchasing behaviour.

Review of sustainability and sustainable fashion

Globally, countries grapple with severe issues related to environmental pollution and resource wastage, with the fashion industry often criticised for its ecological footprint, driven by mass production, labour exploitation, and a throwaway culture (Thorisdottir & Johannsdottir, 2020). Fast fashion brands such as Zara, Mango, H&M, and Asos have faced accusations of environmental pollution and, in response, have made public commitments about sustainability. However, these efforts are sometimes criticised for lack of transparency and accused of greenwashing (Lai, 2021). Greenwashing, a deceptive practice that misleads consumers about a company's environmental actions or product benefits, has been prevalent in the fashion industry (Wang, Ma, Wu, Sun, Xu, Hua, & Sun, 2023). Brands like Veja, Reformation, Nanushka, Stella McCartney, and Gucci have embraced sustainability practices, aiming to align with environmental, social, and economic dimensions (Grazzini et al., 2021).

Sustainable fashion, originating in the 1960s, refers to clothing produced and consumed in a manner that considers environmental, social, and economic aspects (Lee, Choi, Han, Kim, Ko, & Kim, 2020). The multidimensional approach by Lee et al. (2020) aligns with the study's exploration of Gen Z's attitudes and behaviours towards sustainable high-end garment fashion. The integration of sustainable fashion within the industry continually evolves, reflecting diverse visions, ideas, processes, and products (Kozlowski, Searcy, & Bardecki, 2018). Despite an awareness of the environmental impacts of fast fashion, the industry persists, driven by its rapid production cycles. This study emphasises the importance of further research in slow fashion through sustainable high-end garment fashion to address the negative environmental, social, and economic impacts associated with fast fashion (Mandarić, Hunjet & Vuković, 2022).

The importance of sustainable fashion consumption lies in consumers' conscious actions throughout a garment's entire lifespan, from its creation and production to its everyday use and eventual end-of-life management (Maguire & Fahy, 2023). This approach aims to minimise the environmental and social impacts of the fashion industry by promoting responsible consumption practices. Mandarić et al. (2022) provided some interesting findings pertaining to

issues of sustainable fashion consumption. That study found that environmental awareness and values would directly influence perceived product quality and durability. In many circumstances, customers do not always buy products solely based on psychological expectations; rather, the outstanding ecological materials of the design play a crucial role (Gonios, 2023).

In response to critical environmental, social, and economic challenges, there is a growing movement toward sustainability in the fashion industry (Pereira et al., 2021). The need for changes in consumer behaviour, supply chain management, and business practices is emphasised (Pereira et al., 2021). It highlights the importance of not only adopting sustainable practices, but also effectively communicating these efforts to consumers, to build trust and transparency (Pereira et al., 2021).

Attitudes of Generation Z towards sustainable fashion

Emerging as the 'sustainability generation', Gen Z is particularly interested in sustainable fashion. They are increasingly concerned about their purchasing decisions' social and environmental impact and actively seek brands that align with their values (Petro, 2021). Due to their extensive use of social media and other online channels, Gen Z's attitudes are often influenced by such platforms, shaping their purchasing decisions based on how well they identify with the personality and values of a brand (Thilina, 2021). With their purchasing power and easy access to digital information, they are poised to significantly impact the market for sustainable fashion products in general. Liu & Ye (2021) predict that by 2026, a substantial portion of Gen Z will possess significant spending power, and their environmental conscience will play a key role in their attitude toward high-end sustainable fashion.

Gen Z is further characterised by distinctive attributes and aspirations, set to become a significant workforce and consumer demographic rapidly. Organisations must understand their unique traits and adapt strategies to foster their growth. As this generation is projected to represent more than 30% of the workforce by 2020 (Gaidhani, Arora, & Sharma, 2019), delving into their attitudes towards products and services becomes paramount to effectively leading, collaborating with, and fostering business growth and sustainability. Moreover, Gen Z holds a positive attitude towards sustainable fashion and eco-friendly brand attributes, but economic factors and personal preferences also play a role in influencing their consumption behaviour (Palomo-Domínguez, Elías-Zambrano & Álvarez-Rodríguez, 2023). Gen Z displays a range of intriguing traits, from strong attachment to feedback on work results to seamless integration with new technologies. Gen Z stands out from other generations (Dolot, 2018), warranting further empirical studies on their attitudes, which cannot be fully predicted against those of other consumer generations.

The provided literature suggests that Gen Z's attitude toward sustainable fashion blends environmental consciousness and consumerism. While they support sustainability and contribute to the second-hand market, they also consume fast fashion, indicating a complex relationship with fashion sustainability (Mazzu, 2023). Their stance on sustainable fashion is somewhat contradictory; despite expressing a desire for sustainably produced items and engaging in thrifting practices, economic factors, social media influence, and challenges in understanding sustainable attributes contribute to a multifaceted approach to sustainable fashion consumption. There is a tendency to prioritise price and convenience over sustainability in some cases (McKinsey & Company, 2023). Manley et al. (2023) suggest that despite Gen Z's desire for sustainable fashion, challenges such as pricing and access to information can

hinder their purchasing behaviour. This suggests that, while environmental and ethical concerns drive their interest in sustainable clothing, practical factors such as price and availability also play a significant role in their consumption choices. The significant traits of Gen Z on the job could potentially allow researchers to understand their attitudes and traits better.
The traits possessed by Gen Z at the workplace are summarised in Table 1 below.

Table 1: Generation Z traits at work

Attire	Anything comfortable
Motivators	Maintain personal life
Career goals	Build a few careers and have several jobs
Work environment	Office or Remote Work with a Flexible Schedule
Client orientation	Email or texting
Mentoring	Constant feedback is needed.
Technology	Own documents created; databases and Web used for research

Source: Understanding the attitude of generation Z towards work (2019)

Gen Z purchasing behaviour concerning sustainable fashion

The influence of social media and celebrities on Gen Z's fashion choices (Thilina, 2021), the desire for products that align with their values and beliefs (Kihl & Vähänen, 2018), as well as their concern for issues such as climate change and sustainability (Ariker, 2017) are critical factors guiding the selection of sustainable fashion items. Gen Z consumers are motivated by a desire to express themselves, align with social trends (Özkan, 2017), and exhibit ethical behaviour through their fashion choices (Lundblad & Davies, 2016). Song, Qin, and Qin (2020) found that factors influencing Gen Z's attitude towards sustainable fashion included their willingness to spend disposable income, active social responsibility, interest in social issues, and participation in environmentally friendly behaviour. Gen Z's attitudes towards sustainable fashion are shaped by their strong environmental awareness, positive perceptions of sustainable brands, and their digital-savvy nature, complementing the findings from Liu's study (2022). Peer influence, significant roles in household purchasing decisions, and a desire for affordable yet high-quality sustainable products further characterise their behaviour, emphasising the importance of addressing these factors when targeting Gen Z (Liu, 2022).

Empirical studies are imperative to understand Gen Z attitudes in contemporary settings. Despite the growing awareness of sustainable fashion, there exists a discrepancy between consumer attitudes and behaviours (Jeong & Ko, 2021). The varied background, reasons, and overall experiences that lead to differences in Gen Z attitudes underscore the need for empirical studies, such as this one, to determine Gen Z attitudes in different cultural and geographical contexts. Gen Z's purchasing behaviour is characterised by a distinct preference for sustainable high-end garments, driven by their concern for environmental protection and a healthier planet (Dabija, Bejan & Pușcaș, 2020). Dabija et al. (2020) further emphasise that Gen Z are willing to pay a premium for eco-friendly products if they believe it contributes to reducing pollution

and supporting environmental causes. They exhibit distinctive consumer behaviour marked by pragmatism, digital proficiency, commitment to diversity and inclusion, and a demand for environmental responsibility (Mintel, 2023). Gen Z also considers prioritising brands that align with their ethical values, seeks authentic and attainable beauty standards, and is influenced by social networks, particularly TikTok, in their purchasing decisions, making them a unique and influential demographic in the consumer landscape (Mintel, 2023). However the evolving dynamics between Gen Z and sustainable high-end fashion reflect a shifting consumer landscape where younger generations increasingly prioritise sustainability in their purchasing decisions (Zhang, Zhang, & Zhou 2021) differently. Moreover, this trend signifies a growing awareness of environmental and social issues within the fashion industry.

Despite ethical concerns, consumers often struggle to translate their intentions into sustainable fashion purchases due to various factors, including price, availability, sustainability knowledge, transparency, image, inertia, and consumption habits (Wiederhold & Martinez, 2018). Price emerges as a significant barrier to the adoption of sustainable fashion among young consumers. Gen Z often perceive sustainable clothing as more expensive than conventional options and may prioritise style and trendiness in their purchasing decisions (Mandarić et al., 2022). Core issues such as price, sustainability knowledge, transparency concerns, negative perceptions that affect consumer image, and resistance to change driven by inertia and established consumption habits (Jacobs et al., 2018) contribute to reducing the purchase of sustainable fashion items.

Exploring the intersection between sustainability, fashion, and social media influencers highlights the global surge in sustainability interest driven by consumer pressure, investor activism, and corporate action. Advertisers are capitalising on sustainability to attract environmentally conscious consumers, resulting in rapid growth in the sustainable fashion industry (Jacobson & Harrison, 2022). However, some consumers remain skeptical of advertising claims, causing confusion and leading to avoidance of purchasing sustainable fashion. Moreover, social media influencers (SMIs), known for their trustworthiness and strong connections with Gen Z followers, emerge as an effective bridge in communication and influential figures in sustainable fashion purchasing decisions. SMIs influence purchasing decisions by sharing their experiences and endorsements with their followers (Ao, Bansal, Pruthi, & Khaskheli, 2023). Their recommendations carry weight due to the trust they have built, often leading to increased customer engagement and a higher likelihood of followers making purchasing decisions based on those recommendations (Ao et al., 2023). The role of SMIs is crucial in shaping consumer behaviour and driving interest in sustainable fashion.

In the South African context, Gen Z is willing to pay more for brands that are proudly South African-produced, black or female-owned, incorporate inclusive practices, strive for a positive societal impact, and operate sustainably (Rhodes, 2022). Despite financial stress and challenges, they are open to brands using their personal data for product improvement and better service and exchanging personal data for free services or discounts (Rhodes, 2022). Gen Z in South Africa also values interaction, engagement, and personalised experiences, strongly emphasising diversity and inclusion in brands (Rhodes, 2022). They are further influenced by environmental awareness and sustainable attributes when purchasing in various sectors, including food and beverage, technology, and fashion (Palomo-Domínguez et al., 2023). Whereas in the fashion industry, Gen Z are concerned about the origin, composition of fabrics, and avoiding animal cruelty when making sustainable purchase decisions (Palomo-Domínguez et al., 2023).

Gen Z consumers highly prioritise privacy, value personalisation, and are willing to be loyal to brands that align with their expectations (Stone, 2023). They prioritise access over ownership, view consumption as a means of expressing their unique identities, value ethical considerations in brand choices, and display practical decision-making shaped by economic uncertainty (Francis & Hoefel, 2018). In addition, they emphasise individuality, ethical values, and practicality, reshaping the consumer landscape. Data privacy and trust, with the willingness to share personal information if they trust a brand, and loyalty are important for Gen Z, depending on a brand's mission, product quality, and service quality, with rewards programmes playing a crucial role (Stone, 2023). Prioritising social responsibility and spending substantial time on social networks are what Gen Z does (Wordstream, 2022). This group of individuals prefers genuine, visually captivating advertisements while valuing privacy and transparency in advertising as crucial components in their purchasing decisions.

Gen Z demonstrates a strong social conscience, giving preference to brands that align with their values, and they appreciate straightforward and uncomplicated advertising (Autumn Fair, 2019). Their sense of self and self-image significantly influences their buying choices, with brand recognition and perception of success being significant (Autumn Fair, 2019). Furthermore, they maintain extensive online connectivity, underscoring the importance of brands and retailers to establish a robust online footprint for effective engagement. Considering that purchasing behaviour is driven by attitudes, this study envisions exploring the relationship between attitudes and purchasing behaviour in the context of sustainable high-end fashion garments. Therefore, the relationship between attitudes and purchase behaviour is discussed in the next section.

Relationship between attitudes and purchase behaviour

In a study conducted by Jeong and Fiore (2019), a survey among 300 consumers in the United Kingdom aimed to investigate the correlation between consumers' knowledge of sustainable fashion, their attitudes toward sustainable fashion and their willingness to purchase sustainable fashion products. The results revealed that consumers' understanding of sustainable fashion is associated with favourable attitudes toward sustainable fashion. This positive correlation further amplifies their desire to purchase sustainable fashion products and engage in sustainable behaviour, such as repairing and recycling clothing. Various factors can evolve over time, and circumstances influence consumer attitudes and purchase choices. To harness the full potential of the inner loops of the circular economy (recycle-reuse-reduce), consumer perceptions and behaviours toward circular products must transform (Szilagyi, Cioca, Bacali, Lakatos & Birgovan, 2022).

A study by Kahawandala and Peter (2020) delved into the purchasing behaviour of Generation Z, emphasising the importance of understanding the factors influencing their consumer decisions. The factors included Gen Z characteristics, social connectivity, mobile technology, market experts, technology self-efficacy, and social identity (Kahawandala et al., 2020). These factors are incorporated into the expanded model proposed based on the Theory of Planned Behaviour (TPB) to provide a better understanding of Gen Z's purchasing behaviour (Kahawandala & Peter, 2020). The study suggested that marketers and organisations must consider these factors to engage and cater to Gen Z consumers effectively. The attitudes and online shopping behaviours of Gen Z have been extensively explored compared to other generational groups (Generation X and Generation Y) (Králová, 2020). The study revealed that Gen Z exhibits different attitudes and behaviours in online shopping than other generational groups (Králová, 2020). Gen Z is more receptive to new technologies, prioritises quality and

sustainability, and relies on peer recommendations and independent reviews when making purchase decisions (Králová, 2020). However, these findings do not focus Gen Z's attitudes toward high-end sustainable fashion in Gauteng, South Africa. This study seeks to address this gap.

Another study explored the factors influencing the transition of Gen Z consumers from ethical purchase intentions to actual purchase behaviour (Djafarova & Foots, 2022). Using the TPB model, the study aimed to understand how Gen Z engages in ethical consumerism (Djafarova & Foots, 2022). The study highlighted the ethical awareness and desire of the cohort, along with the financial constraints they face, while underscoring their future aspirations for ethical consumption (Djafarova & Foots, 2022).

In addition, another study explored the purchasing behaviour and attitudes of Gen Z concerning sustainability (Elgammal & Al-Modaf, 2023). The study delved into Gen Z's perceptions of sustainability, encompassing both environmental and social aspects (Elgammal & Al-Modaf, 2023). The study shed light on the multifaceted understanding of the sustainability of Gen Z and how factors such as materialism, religiosity, self-esteem, and awareness of mortality can influence their attitudes towards sustainable purchasing (Elgammal & Al-Modaf, 2023). Duffett's (2020) pointed out that the influence of YouTube marketing communication (YMC) on the attitudes of Gen Z consumers in South Africa, involving 3750 high school and college students aged 13 to 18 years, shaped attitudes toward YouTube marketing. The findings reveal a positive impact of YMC on young consumers' attitudes, particularly in cognitive, affective and behavioural responses. Notably, factors like log-on frequency, commercial exposure, age, and racial background are significant in molding the attitudes of young South African consumers toward YouTube marketing.

Goh and Lee (2018) researched on understanding Gen Z's attitudes towards working in the hospitality industry. The study evaluates the applicability of the TPB as a framework for analysing Gen Z perceptions and purchasing intentions related to the hospitality industry. The findings indicate that Gen Z generally have positive views about the industry, considering it exciting and fulfilling, with a focus on job satisfaction and career prospects over salary. The study by Alaeddin and Altounjy (2018) explores the factors that influence the attitudes and intentions of Malaysian Gen Z to use cryptocurrency for financial decisions. In particular, the study considers Malaysia's central bank's regulatory efforts in 2018. The findings emphasise the significant impact of awareness and trust on attitudes, subsequently influencing young consumers' intention to use cryptocurrency. The study underscores the importance of technology awareness, trust, and customer satisfaction in shaping Gen Z's inclination towards cryptocurrency adoption. Reviewing these studies, valuable insights into Gen Z's attitudes and behaviours across various domains emerge. While there are similarities in exploring Gen Z's attitudes, the unique focus on sustainable high-end clothing fashion remains less explored. The location factor makes this research particularly relevant in the context of this study.

Theoretical framework of the study

In this study, there are two main variables of interest, namely 'attitudes' and 'purchasing behaviour'. The study's objectives propose concepts that explore 'attitudes', which include social influences, knowledge, ethical values, and environmental awareness. The other concepts of interest explore the 'purchase behaviour' which consists of buying intentions, price sensitivity, product attributes, and lastly, purchase frequency, which are crucial in developing the theoretical framework that guides this study (see Figure 1).

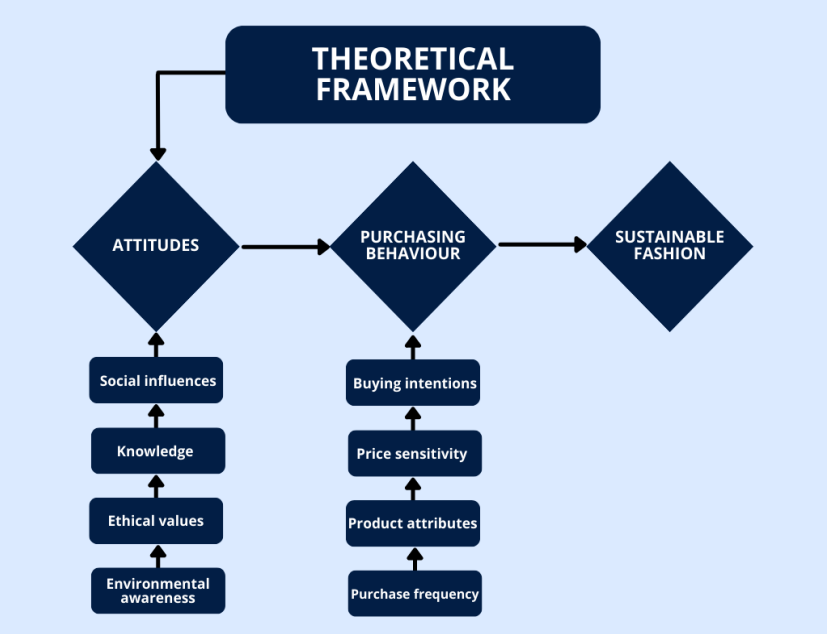


Figure 1: Theoretical framework that guides this study

Source: Developed by the researcher (2024)

The variables of interest in the framework (Figure 1) draw inspiration from studies by Witek and Kuźniar (2020) and Ruiz-Lozano, De los Ríos-Bergillos, Tirado-Valencia and Millán-Lara (2023). The aim is to discern the purchasing behaviour patterns of sustainable fashion among Gen Z consumers in South Africa. Additionally, the study explores the intricate factors influencing the relationship between Gen Z's attitudes toward sustainable fashion and their purchasing behaviour.

Methodological approach and research design

This study adopted an exploratory research design since the study is underpinned by an interpretivism research philosophical standpoint (helping the researchers understand social phenomena). Since the researcher could not obtain a sample frame, the study adopted a nonprobability convenience sampling among seven (7) Gen Z consumers. The sample size was considered appropriate for this qualitative research approach study as supported by prior research (Hair, Anderson, Tatham, & Black, 1998; Ha & Janda, 2012; Hsu & Chan, 2015; Ahn, Kang, & Hustvedt, 2016). Three well-trained research assistants administered the online semi-structured interviews among the sample of interest. They contacted fifteen (15) Gen Z, but only seven (7) agreed to participate in the interview process and were still considered valid for data analysis using thematic analysis procedures.

Data analysis procedures

Thematic analysis method was used to analyse the data collected from online semi-structured interviews with the use of the latest AtlasTI software (Ravindran, 2019). Thematic analysis enabled the researchers to delve deeper into the collected data (Jones, 2022). Thematic analysis is a qualitative method that involves identifying emerging themes or codes from non-numerical data, allowing interpretation and understanding of the meaning of the data (Roberts, Dowell, and Nie, 2019). In this case, the approach was inductive, which refers to the analysis being driven by the data itself, allowing themes, patterns, and insights to emerge naturally from the

data during the research process without trying to fit the data into preexisting theories or paradigms (Mihas, 2019). The initial thematic analysis stage involved conducting interviews, with each interviewee taking approximately 20 to 30 minutes. Subsequently, in the second stage, attention was given to observing the reactions, features, behavioural traits, and non-verbal cues exhibited by the interviewees. Observation, in this context, referred to the organised procedure of documenting the behaviour patterns of participants, objects, and events without the need for direct questioning or communication with them (Creswell, Ebersohn, Eloff, Ferreira, Ivankova, Jansen, Nieuwenhuis, Pietersen, Plano Clark, & Van der Westhuizen, 2016).

Study results and discussion

The participants in this study represented diverse backgrounds and perspectives, providing valuable information on their attitudes and behaviours related to high-end sustainable fashion garments. Their views collectively illuminate the multifaceted nature of Gen Z's engagement with sustainable fashion.

Participant 1 (P1) demonstrated a profound awareness of the environmental impact of sustainable fashion practices, emphasising the importance of recycling and upcycling. Most of the participants expressed a conscious consideration of price sensitivity, highlighting the need for value for money in their high-end sustainable garment fashion purchases. The insights of P1 of P1 of P1 revealed the influence of the media and education, citing sources such as social networks, magazines, and academic writings on-line on-line on-line in shaping their views. The participant's commitment to mindful consumption and ethical considerations was evident, emphasising the need for high-end fashion items to align with sustainable practices. Additionally, P1 shared a personal experience of actively contributing to sustainability by donating clothing for recycling or upcycling.

Participant 2 (P2) contributed to the study by expressing appreciation for high-end sustainable fashion. Economic considerations played an important role in their purchasing choices of high-end sustainable fashion garments. The influence of social media platforms such as TikTok and Instagram was evident, shaping their perceptions and choices related to sustainable fashion purchases. The participant emphasised mindful consumption and its implications for purchasing long-lasting and durable high-end garments. Environmental awareness and ethical factors also played a crucial role in the purchase decision-making process.

Participant 3 (P3) reinforced the importance of sustainability as a positive and responsible choice in fashion. P3 revealed the delicate balance between the attractiveness of high-end sustainable fashion and the considerations of price. The role of media, including magazines and online articles, has emerged as a significant factor in shaping perceptions of high-end sustainable fashion garments. The commitment of P3 to mindful consumption was evident through its emphasis on quality, durability, and ethical production practices. Environmental and ethical factors underlined their focus on reducing environmental impact and promoting fair labour practices. Brand transparency and reviews from conscious shoppers were also influential. Challenges in sustainable shopping, such as limited availability and higher prices, were acknowledged, highlighting the complexities Gen Z consumers face in adhering to sustainable choices.

Participants 4 (P4), 5 (P5), and 6 (P6) further enriched the contribution of the study by reinforcing the importance of sustainability, price considerations, media influence, and the inherent challenges in balancing sustainability with affordability and availability. Ethical and

environmental factors consistently emerged as significant influencers, reflecting a growing concern for social responsibility and ecological impact among Gen Z attitudes and future purchases of high-end sustainable garments. Although participant 7 (P7) provided a distinctive perspective, noting that while high-end sustainable fashion garments are perceived as environmentally friendly and worth the investment, price sensitivity remains a crucial factor. P7 initially downplayed the influence of the media on their purchasing decisions, but later acknowledged that social media campaigns, particularly those that emphasise recycled materials, could influence their purchasing preferences. Mindful consumption and ethical considerations were highlighted, strengthening the participant's commitment to ethical sources, production processes, and fair treatment of workers.

Collectively, these discussed contributions offer a comprehensive view of Gen Z's attitudes toward high-end sustainable fashion garments, highlighting the complex interaction of environmental awareness, price sensitivity, media influence, mindful consumption, and ethical considerations in shaping their purchasing behaviour. These insights contribute to a better understanding of how the consumer segment in this study approaches sustainability within the high-end fashion industry and the implications for future trends and consumer preferences.

A common theme that emerged from both the literature and the research findings is the high level of environmental awareness among Gen Z consumers. The literature suggests that they are often referred to as the 'sustainability generation' due to their increased concern for the social and environmental impact of their purchasing decisions (Petro, 2021). Similarly, the participants in this study demonstrated a commitment to ethical values, highlighting the importance of supporting fair labour practices and environmental sustainability. In addition, the role of social networks in influencing fashion choices is underscored in both the literature and the findings. The literature indicates that Gen Z's attitudes and purchasing decisions are often influenced by social media platforms (Thilina, 2021), which aligns with the study's findings, where participants acknowledged the impact of social media platforms such as Instagram and fashion blogs on their sustainable fashion purchase choices.

The influence of economic factors and budget constraints on purchasing behaviour is another common theme in this study. The literature suggests that Gen Z's attitudes towards sustainable fashion can be influenced by pricing and availability (McKinsey & Company, 2023), which is corroborated by the findings of this study. The study participants recognised the importance of balancing sustainability with budget limitations, highlighting economic considerations in their purchasing decisions. Both the literature and research findings recognise the role of price and affordability in Gen Z's purchasing decisions. The literature suggests that Gen Z are influenced by economic factors and that research participants recognise barriers related to the price and availability of high-end sustainable fashion. This convergence emphasises the economic considerations that affect their choices and elicits the need for more affordable sustainable options (Mintel, 2023).

The research findings also emphasise the commitment of the participants to incorporate high-end sustainable fashion into their lifestyles. This parallels the claim of the literature that sustainable fashion is not merely a passing trend for Gen Z, but a conscious choice to align your habits with ethical values (Liu and Ye, 2021). Furthermore, the findings underscore the role of brand transparency in shaping purchasing behaviour, echoing the literature's emphasis on the importance of brands communicating their eco-friendly and ethical practices (Mazzu, 2023).

The literature and empirical findings emphasise the importance of ethical values in shaping Gen Z's fashion choices. The literature points to the generation's desire for products that align with Gen Z's values and beliefs, and the research participants stressed the importance of supporting fair labour practices, promoting environmental sustainability and investing in ethical fashion brands. This shared commitment to ethical considerations further strengthens the link between the existing literature (Kihl & Vähänen, 2018) and that of this study.

Quality and longevity indicate that Gen Z focuses on quality and longevity when it comes to clothing choices, in general. The literature notes that Gen Z values high-quality, durable garments that last longer, reducing the need for frequent replacements. The research findings confirm this by highlighting that the participants prefer high-quality, high-end sustainable fashion items and consider them as long-term investments. This common emphasis on quality and longevity serves as a point of alignment between the literature (Mintel 2023) and empirical contributions.

This study and the prior literature acknowledge the influence of social networks on Gen Z's fashion choices. The views from Thilina (2021) points out that social networks play a role in fashion decisions, and the research findings reflect this by noting the influence of Instagram and blogs. This similarity underlines the importance of social networks in shaping Generation Z attitudes and behaviours (Thilina, 2021). There is, however, a contradiction with sustainable fashion influencers, as participants did not mention anything about learning from fashion influencers.

Recommendations for future research

1) Influence of high-end sustainable fashion influencers

Conducting further research to explore the longitudinal role and impact of high-end sustainable fashion influencers on Gen Z's purchasing behaviour would be valuable. This could involve a more in-depth analysis of how influencers shape perceptions, preferences, and actual buying decisions among Gen Z consumers over time since this study did not find a strong influence by influencers, although they impacted Gen Z in other studies. Understanding the dynamics of influencer marketing in the context of high-end sustainable fashion could provide insights into effective strategies for high-end sustainable brands.

2) Effectiveness of social media social media marketing strategies

Investigating the effectiveness of different marketing strategies or campaigns that promote high-end sustainable fashion on social media platforms, such as Instagram and TikTok, would be beneficial (Gouveia and Chabata, 2023). Analysing the engagement, reach, and impact of various marketing initiatives can help brands tailor their approaches to resonate better with Gen Z consumers.

3) Communication strategies for luxurious brands

It is crucial to explore the challenges and opportunities luxury brands face in effectively communicating their ethical and eco-friendly practices to Gen Z consumers in South Africa. Understanding the barriers that may hinder effective communication and identifying innovative ways to overcome them can improve the brand-consumer relationship. This research could lead to developing more compelling and relatable communication strategies for luxury brands in the sustainable fashion space.

4) Geographical coverage and sample size expansion

Expanding geographical coverage and increasing the sample size for a more extensive study would contribute to a comprehensive understanding of Gen Z's attitudes and behaviours regarding sustainable high-end fashion. By including participants from different regions, variations in attitudes and behaviours could be revealed. A larger sample size would also improve the generalisability of the findings, providing a stronger foundation for understanding the broader implications of sustainable high-end fashion among Gen Z.

By addressing these recommendations, future research endeavours can contribute to refining strategies in the high-end sustainable fashion industry, creating more informed marketing approaches, and fostering a deeper understanding of the complex interplay between Gen Z's attitudes and their purchasing behaviour.

Limitations of the study

While this research has provided valuable insights, it is crucial to recognise certain limitations inherent in the study. The geographical focus was confined to the Gauteng region in South Africa, potentially restricting the generalisability of the findings to the broader Gen Z population in South Africa and other regions. This geographic limitation might not fully capture the diversity and variations in attitudes and behaviours among Gen Z across different locations. Additionally, although the research design initially intended to include interviews among fifteen participants, several constraints resulted in the final sample of only seven participants. This limitation could impact the comprehensiveness of the data collected, potentially leaving out certain perspectives among Gen Z. Furthermore, the study was conducted in a snapshot timeframe. A longitudinal study could address the time constraint limitations observed by the researchers, providing a more in-depth understanding of the dynamics and changes in Gen Z's attitudes towards high-end sustainable fashion over an extended period.

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CLIMATE FINANCE AND CORRUPTION NEXUS: EMPIRICAL EVIDENCE FROM SUB-SAHARAN AFRICA

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Abstract

The global commitment to reduce greenhouse gases has spurred significant financial investments from multilateral, bilateral, national, and subnational development finance institutions. These entities have committed to spending trillions of dollars on climate change mitigation and adaptation in developing countries until 2050. However, a major hurdle in sub-Saharan Africa is the governance risk of corruption. This study used panel data from 33 sub-Saharan African countries from 2005 to 2021 to explore the relationship between climate finance flows and perceived corruption. Using the fully modified ordinary least squares, a semi-parametric estimator, we provide evidence that perceived corruption is statistically significant and negatively related to climate finance in sub-Saharan Africa. For robustness, further disaggregation across resource-rich and resource-poor countries and levels of income categorization are also undertaken. The results show that perceived corrupt resource-rich countries attract less climate finance than resource-poor countries. Similarly, the same relationship exists for perceived corrupt middle-income, lower-middle, and low-income countries and the flow of climate finance into sub-Saharan economies.

Introduction

Firms, both for-profit and non-profit, combine various kinds of input to generate output in whatever form they desire, subject to technology. The technological process of getting output from inputs is what emits greenhouse gases into the environment. The six dominant greenhouse gases in the Kyoto Protocol of 1997 are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), F-gases (hydrofluorocarbons and perfluorocarbons), and sulphur hexafluoride (SF_6). These gases and emissions have detrimental effects on the environment, which has been of concern to many stakeholders within the sustainable development movement across the world.

Many nations have made numerous attempts, including ratifying agreements and protocols, to support the deployment of climate-friendly technologies in producing goods and services to meet human needs. Beginning with the Kyoto Protocol of 1997, industrialised nations and developing economies were urged to limit and reduce greenhouse gas emissions following individually agreed targets. The second commitment period of the Kyoto Protocol, known as the 2012 Doha Amendment, ended in 2020. Then came the legally binding Paris Agreement of 2015 that came into force on November 4, 2016, which has an overarching goal to hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels (UNFCCC, 2023). To the extent that, the UN Sustainable Development Goal (SDG) 13 Climate Action raises concern about the negative impact of deteriorating climatic conditions and the need to create a life sustainable climate gives impetus to climate finance, across the world. The COP 29 Climate Submit urges developed nations to commit US$250 billion per year to submit climate action in developing nations. The earlier Paris Agreement, had the Green Climate Fund, the world's largest climate fund, set up to support developing countries in raising and realising their Nationally Determined Contributions (NDC) ambitions towards low emissions and climate-resilient pathways. The framework for climate change funding is fund mobilisation, fund administration and governance, fund disbursement, and fund implementation (Schalatek & Bird, 2012). Clearly, reducing greenhouse gases would demand substantial financial outlays in the form of climate finance, most likely from developed economies (Islam, 2022). The funding is disbursed through multilateral, bilateral, national and sub-national development finance institutions to developing economies and climate-vulnerable countries.

In many instances, climate finance, sustainable finance, and green finance are used interchangeably. Climate finance, which is a subset of green finance, is also within sustainable finance, which has environmental, social and governance factors. According to the United Nations Framework Convention on Climate Change (UNFCCC), climate finance refers to local, national, or transnational financing, drawn from public, private and alternative sources of financing, that seeks to support mitigation and adaptation actions that will address climate change (UNFCCC, 2023). Similarly, for Transparency International (TI, 2019) climate finance is the money invested in helping countries prevent climate change and adapt to its worst effects.

The call for climate change mitigation and adaptation demands huge financial investment through the use of renewable energy and expensive technology (Boehm et al., 2021). These investments are, in many instances, beyond the reach of many developing economies, considering their current development priorities. Hence, per Article 4.3 of the UNFCCC (1992), the current burden of climate finance falls on developed economies and international financial institutions to lead the charge in providing financial resources for climate mitigation and climate change adaptation. The flow of climate finance into developing economies, including Sub-Saharan Africa (SSA), exposes the financiers to governance risk in the area of corruption, which will in the long run negatively impact the expected outcomes of climate finance.

As pointed out by Amoah et al. (2022), corruption is hardly discussed in the energy sector. By extension, polluting fuels that cause climate change and discussions on climate adaptation and mitigation have been largely silent on corruption, although there are a few studies on pollution, environment and corruption (example, Habib et al., 2020; Biswas et al., 2012; Cole, 2007; Damania, 2003). However, the introduction of climate finance, where developed countries and institutions have a responsibility to transfer monies towards the fight against climate change in climate-vulnerable countries with weak and inefficient public sectors, makes the discussion on corruption and climate finance highly relevant. The question raised to support our claim is: is it possible for a government or private agent responsible for climate funds to pursue self-interest, possess superior information, and not be perfectly monitored? Then, in the view of Acemoglu and Verdier (2000), corruption is possible. In Africa, whiles corruption is relatively high (Amoah et al., 2023; Amoah et al., 2022), there is a global call for climate finance hence the need for this present study. Conceptually, corruption is the abuse of public office or entrusted power for private gain (World Bank, 1999; TI, 2011). TI holds that corruption is in eight forms: bribery, extortion, wage/asset stripping, fraud, favouritism and negligence in the provisioning of services; influence peddling; and procurement irregularities. Corruption, according to Bahoo et al. (2020, p.2), is "an illegal activity conducted through misuse of authority or power by public or private officeholders for private gain and benefit, financial or otherwise." They note in this definition that corruption encompasses bribery, fraud, financial crimes, abuse, falsification, favouritism, nepotism, manipulation, and misrepresentation by public or private officials, domestically or internationally, in a social, business, or governmental context.

Lucey et al. (2023) have shown that there is an increase in research activities in the area of finance and corruption, dominated by publications from the UK and the US. The motivation for this study is that, to the best of their knowledge, no empirical assessment has yet been conducted on how, in general, climate finance relates to corruption in SSA, a region with so many natural resources that has also recorded a high level of corruption, as earlier indicated. Furthermore, whether natural resource endowment and economic status influence the direction of climate finance, considering the level of corruption, is also of interest in this paper. To provide an answer to this gap, this paper reviews the empirical literature on climate finance and the evidence on corruption to explore any link exist between the two subject matters, which are of importance in sustainable development and international business.

This paper contributes to the existing scholarly literature in two ways. First, it investigates the flow of climate finance into SSA in the presence of corruption and answers the question of how corruption influences climate finance in the region. Second, the paper analyses how the perceived level of corruption in natural resource-endowed countries using crude oil as a proxy influences climate finance in SSA in addition to the economic status of these countries. The rest of the study is structured as follows: Section 2 reviews the literature in the subject area; the methodological considerations is outlined in Section 3; the findings and discussion of the results are presented in Section 4; and the conclusion of the study is in Section 5.

Literature Review

Climate finance, defined as financial resources mobilized to support mitigation and adaptation actions to address climate change, is crucial in helping developing countries transition to low-carbon economies and strengthen climate resilience. However, many sub-Saharan African (SSA) countries face significant challenges in accessing and using climate finance effectively due to factors such as corruption, bureaucratic inefficiencies, and limited institutional capacity (Adom et al., 2024; Halimanjaya, 2015; Nakhooda et al., 2016; Doku et al., 2021; Nest et al., 2022).

The Principal-Agent Theory explains that corruption in climate finance occurs when agents use funds for personal gain due to lack of oversight, thus diverting resources from climate goals while diminishing donors' trust (Popp et al., 2022; Smith & Brown, 2021). The Rent-Seeking Theory argues that organizations with political ties secure climate funding for their own benefit, driving up costs while diverting resources from pressing climate needs, especially in developing countries with weaker governance (Kumar & Sengupta, 2023; Jones, 2020).

Scores of studies have empirically examined the determinants of climate finance (Halimanjaya, 2015; Zhang & Filippaios, 2020; Doku et al., 2021; Wen et al., 2023). For instance, Halimanjaya (2015), using data on 180 developing countries from 1998 to 2010, found that nations with stronger governance structures tend to attract more climate finance. This relationship is plausible as strong governance enables countries to enact laws and policies prioritizing climate action. Nakhooda et al. (2016) argue that corruption and weak governance often undermine the effectiveness of climate finance mechanisms in the region, while Michaelowa and Michaelowa (2017) show that countries with higher corruption levels receive less climate finance and use it less efficiently, as corruption creates an environment of uncertainty that deters donors. Additionally, Doku et al. (2021) and Nest et al. (2022) demonstrate the adverse impact of corruption on climate finance, noting that it can undermine mitigation efforts and reduce the quality of adaptation infrastructure.

Wen et al. (2023) highlight that corruption deters both domestic and international investors, who may perceive investment in sustainable initiatives as risky due to potential financial setbacks or misappropriation of funds. Such an environment restricts the capacity of the private sector to participate in green innovation, which is essential for steering Sub-Saharan African economies toward sustainability. Lu et al. (2023) likewise conclude that corruption obstructs green innovation by undermining institutional trust and diminishing the robustness of regulatory frameworks. Corruption tends to encourage short-term exploitation of environmental resources rather than sustainable use and allows environmentally destructive practices such as illegal logging and unregulated mining.

Foreign direct investment (FDI) and GDP per capita are also significant economic drivers of climate finance. FDI can positively impact climate finance by promoting the adoption of cleaner technologies and renewable energy (Zhang & Filippaios, 2020). Gallagher and Zhang (2021) argue that FDI can incentivize governments to implement stricter environmental regulations and foster green financing. Conversely, Busse and Gröning (2018) highlight that in corruption-prone SSA countries, the positive spillover effects of FDI on environmental projects may be compromised, as corruption distorts climate finance allocation into sustainable sectors.

Population and GDP per capita are also key factors. Halimanjaya (2015) found that larger populations increase the likelihood of climate finance allocation for mitigation in developing countries. Doku et al. (2021) report an inverted U-shaped relationship between population and climate finance in SSA, with moderately populated countries receiving the most funding. Regarding GDP, Robertsen et al. (2015) and Halimanjaya (2015) found that lower-GDP countries receive more climate finance, as they often lack the resources to transition to sustainable practices. This financial support helps these countries build capacity and adopt environmentally friendly technologies.

Forest cover is a crucial factor in attracting climate finance, particularly for mitigation. Halimanjaya (2015) found that countries with significant forest areas are more likely to receive mitigation finance, as forests act as essential carbon sinks, sequestering carbon dioxide from the atmosphere (Houghton & Nassikas, 2017). In SSA, where about 23% of the land is forested, maintaining forest

cover is vital not only for biodiversity but also for enhancing ecosystem resilience to sustain climate finance flows (FAO, 2020; Baccini et al., 2017).

Greenhouse gas (GHG) emissions also play a significant role. Higher GHG levels necessitate substantial resources for mitigation, and projects with measurable mitigation potential have better access to climate finance (Gereffi et al., 2021; Nemet et al., 2018). Halimanjaya (2015) similarly found that countries with higher carbon intensity receive more climate finance, as they require support to adopt cleaner technologies.

While much of the literature on climate finance in SSA focuses on governance, economic, and environmental factors, the field is still evolving. Recent studies, such as Benavides-Franco et al. (2023), explore factors influencing renewable energy project finance success in low- and middle-income countries, underscoring the impact of national governance on project funding. The present study builds on this literature by accounting broadly for environmental variables, such as forest area, forest rent, and GHG emissions, which are key considerations for donors. Furthermore, it examines data through income-classification and oil-exporting perspectives, offering insights into how high-pollution countries attract climate finance despite challenges like corruption.

The literature on climate finance for SSA highlights a multifaceted set of determinants, including governance, economic conditions, environmental factors, and population dynamics. Addressing corruption and strengthening governance are central to enhancing climate finance effectiveness in SSA. Additionally, understanding the impact of FDI, GDP per capita, and environmental assets like forest cover can help tailor financing strategies that meet the region's unique challenges in combating climate change.

Methodology

3.1 Econometric Modelling

Following standard theories such as the principal-agent theory, institutional theory, political economy theory, and rent-seeking theory, overwhelming theoretical evidence establishes a relationship between corruption as a right-hand-side variable and climate finance as a left-hand variable. In this light, we specify a standard panel model of the form similar to Amoah (2022) which is presented as follows:

$$CF_{i,t} = \beta_0 + \beta_1 Corruption_{i,t} + \beta_3 \mathbf{X}_{i,t} + \alpha_i + \alpha_t + u_{i,t} \quad \text{.....eqn. 1}$$

where the dependent variable, CF represents climate finance (*details presented in section 3.2*), of country *i* in year *t*. The β_s represent all unknown parameters of the constant term, the variable of interest and the controls used in the model. The variable of interest is corruption (*details presented in section 3.2*). Therefore, the study is interested in examining how variation in corruption influences the variation in climate finance over time (*t*) and within SSA (*i*), assuming all other factors are held constant. The relevant theoretically and empirically motivated controls are represented by vector **X** for country *i* in year *t*. Further, α is used as a proxy for country and year-specific differences. The error term is shown as, *u.*

In this study, three models are estimated. In the first estimation, we estimated a bivariate model and subsequently estimated a multivariate model controlling for other relevant variables one after the other until the final model 6. In effect, regarding the variable of interest, we observed robustness across models 1 to 6.

Furthermore, we disaggregated the data by different income levels, controlled for the relevant variables as in previous cases and yielded consistent results in terms of the signs. Moreover, we

categorised the sample into oil and non-oil exporting countries and still found evidence to substantiate our claim across all sub-samples.

3.2 Data

This study has an overarching aim of examining the extent to which corruption is associated with climate financing in SSA. The data on climate finance is sourced from Our World in Data (OWD, 2023)[1] while data on corruption is also from T.I (2023)[2]. All other variables were obtained from the World Development Indicators (WDI) of the World Bank (2023)[3]. Following the data used, climate finance is "the total financial support provided to developing countries for climate change mitigation and adaptation" (OWD, 2023, p.1). Corruption is also measured as "how corrupt each country's public sector is perceived to be, according to experts and business people" (T.I, 2023, p.1). T.I produces rank and score data on corruption. In this study, we used the score of corruption because T.I describes the score as a better index for measuring the extent to which a country is corrupt. The score measures "the perceived level of public sector corruption on a scale of 0-100, where '0' means highly corrupt and '100' means very clean" (p.1). For simplicity in our data structure and analysis, we recoded the score in its inverse form where '0' now means very clean or less corrupt and '100' means very dirty or highly corrupt.

3.2.1 Endogeneity and Related Diagnostics

Evidence from the empirical literature has shown that generally, corruption is endogenous (see Amoah et al., 2022; Méndez and Sepúlveda, 2006; Ehrlich and Lui, 1999). This problem of corruption being endogenous is further highlighted within the context of climate finance. This is because corruption correlates with institutions, policies and societal structures, making it a systematic issue rather than an external force acting upon a system. In this study, we argue that the sources of endogeneity may stem from a reverse causality (*This is plausible where incentive structures of the climate finance system correlate with corruption*), missing variable bias or the error term correlating with the variable of interest (*This may arise where an omitted theoretically relevant variable is captured by the error term*).

To address this problem, the instrumental variable approach has been recommended. However, in the absence of a good instrument in the dataset, one estimator that has been widely used in the literature is the fully modified ordinary least squares (FMOLS). This estimator was first introduced by Phillip and Hansen (1990). It is a semi-parametric estimator which makes use of inherent instruments. Indeed, it churns out robust and consistent estimates in the absence of stationarity and cointegration (Tetteh and Amoah, 2020). Again, the FMOLS performs better in small samples. It modifies the ordinary least squares (OLS) method, and accounts for serial correlation error in the regression as well as endogeneity. Following Amoah et al. (2020), the FMOLS estimator for a panel regression is presented as:

$$\widehat{\beta}_{FMOLS} = \left[\sum_{i=1}^{N}\sum_{t=1}^{N}(X_{i,t}-\overline{X}_i)(X_{i,t}-\overline{X}_{i,t})'\right]^{-1}\left\{\sum_{i=1}^{N}\left[\sum_{t=1}^{T}(X_{i,t}-\overline{X}_i)\widehat{Y}_{i,t}^{+}-T\widehat{\Delta}_{\varepsilon,u}^{+}\right]\right\} \quad \text{.....eqn. 2}$$

From equation 2, the endogeneity correction and the serial correlation terms are presented as $\widehat{Y}_{i,t}^{+}$ and $\widehat{\Delta}_{\varepsilon,u}^{+}$, respectively. In effect, we used the FMOLS estimator to address possible endogeneity and serial correlation identification problems associated with the data. Again, we introduced year and country fixed effects to control for possible differences in the countries and the time period as earlier indicated. It further addresses heteroscedasticity concerns that may be associated with the

[1] https://ourworldindata.org/grapher/international-finance-clean-energy
[2] https://www.transparency.org/en/cpi/2022
[3] https://databank.worldbank.org/source/world-development-indicators

data. Another technique prescribed for addressing possible heteroscedasticity in the data is by transforming the variables using logarithms to help stabilise the variance. The variables of interest and some control variables with high standard deviations were also transformed into logarithms. In effect, the variables of interest can now be interpreted as elasticities.

Another concern in macroeconomic studies is possible multicollinearity. In this study, we investigated the possible correlation among the explanatory variables. From the results presented in Table A1 (Appendix), we show some degree of correlation among the explanatory variables, however, we argue that the magnitude is not too high to raise multicollinearity concerns.

The descriptive statistics of all variables used in the regression are presented in Table 1.

Results and Discussions

This section presents the regression results. We start with the descriptive statistics of all variables used in estimating the regression model. As shown in Figure 1, from 2011-2020, globally, we observed a rising trend in the total financial support provided to developing countries for climate change mitigation and adaptation.

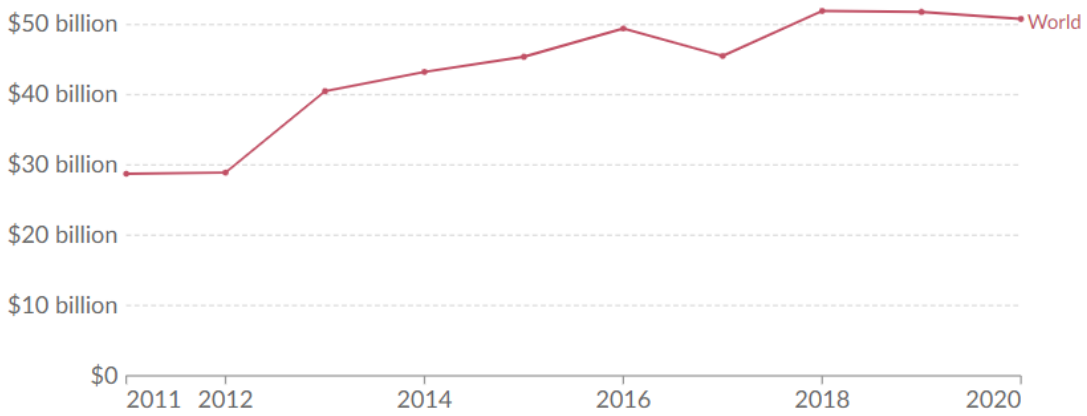


Figure 1: *A trend of financial support through green climate fund to developing countries*
Source: OWD (2023).

Regarding Table 1, we rely on 36 countries' data in SSA from 2000-2019, to show that the average climate financial support is about US$5million with a very large deviation of about $11million. The average value is woefully inadequate compared to the $100 billion per year target from 2020 onwards. Furthermore, it is obvious how the global picture has dwarfed the average value for SSA. Argued differently, as shown in Figure 2, from the years 2000-2021 in comparison with the global estimate of about $10 billion, the average international financial flows to SSA estimated around $4 billion in support of clean energy research and development, and renewable energy production, including in hybrid systems is relatively low. In effect, global climate financing keeps rising, however, African countries have received the least climate finance support for adaptation and mitigation. This view has also been expressed by Doku et al. (2021a).

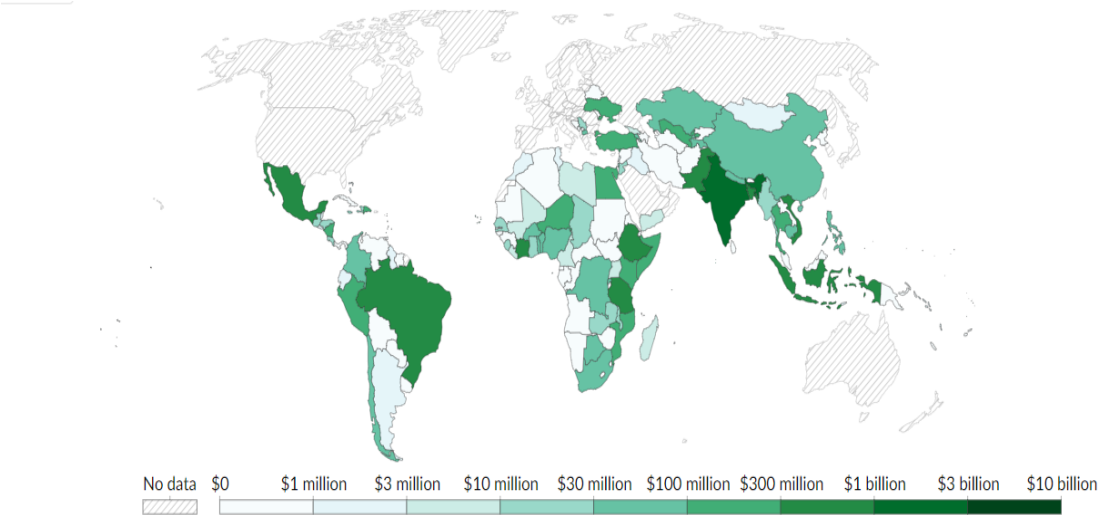


Figure 2: International financing to developing countries in support of all renewables.
Source: OWD (2023)

Table 1: Descriptive Statistics of Regression Variables

Stats	CF	CI	FDI	Rent	Greenhouse	Forest Area	GDPPC	POP
Mean	5416.39	32.35	3.50	5.40	47363.57	28.88	2034.84	22500000.00
Median	1982.01	30.00	2.33	3.60	21022.75	24.69	1072.36	12600000.00
SD	11269.92	10.75	5.15	5.49	91688.69	22.46	2392.75	32300000.00
Skewness	3.96	0.80	4.31	2.18	3.89	1.13	2.17	3.22
Kurtosis	19.10	3.10	36.34	9.68	18.74	3.96	7.72	15.23
Min	146.68	13.00	-10.95	0.00	1525.00	0.30	255.10	684977.00
Max	77179.35	65.00	64.38	40.41	555409.30	93.25	14222.55	219000000.00
N	612	459	817	782	756	792	817	828

Generally, a corruption score of less than 50 out of 100 marks is an indication of high levels of corruption. In the view of Cooper (2022), a score of less than 50 implies that the country has "a serious problem with corruption" (p.1). In SSA, T.I (2023)[4] reports an average score of 32 out of 100 marks and describes the average corruption index in SSA as high, compared to the previous year and further reiterate that it as "another year of stagnation" (p.1). Table 1 confirms the average score by the region, with a minimum score of 13 and a maximum score of 65. In line with earlier studies (for example: Amoah et al., 2022) and reports (for example: Rickard, 2023), we argue that the perceived level of corruption in SSA is high. To buttress our claim, another report published by Galal (2023) has reported that SSA recorded the worst average score of perceived corruption in 2022.

Foreign Direct Investment net inflow (FDI) is measured as a percentage of Gross Domestic Product (GDP). The mean FDI is reported as 3.50% of GDP. This is an indication of very low net inflows in the region. With a minimum and maximum net inflow of -10.95 and 64.38 (% of GDP), respectively, we observe a positively skewed distribution, hence the need to further transform FDI into logarithms and interpret the results as percentage points.

[4] https://www.transparency.org/en/news/cpi-2022-sub-saharan-africa-corruption-compounding-multiple-crises

Forest rent is roundwood harvest multiplied by the product of regional prices and a regional rental rate. The higher the forest rent may imply a larger harvest of the forest wood that is to mitigate against climate change. The average forest rent is 5.40% of GDP, which appears to be low.

The total greenhouse gas emission is measured as a kiloton of carbon dioxide. This study reports the mean total greenhouse gas emission in SSA as 47,363.57 metric tons. Comparing this regional estimate to some countries such as China (*11,336 million metric tons in 2021*) and the US (*5,032 million metric tons in 2021)*, it can be inferred that total greenhouse gas emission is relatively low in SSA. This perhaps can be explained by the absence of industrialisation with heavy polluting plants and energy in SSA.

Forest area (% of GDP) shows the value of afforested areas of a country as a percentage of GDP. The larger the afforested land area, the higher the value of the forest area. With a minimum and maximum forest area of 0.30 and 93.25, respectively, and a mean value of about 29% of GDP, it can be argued that forested areas are gradually being depleted over time.

In a developed country like the USA, GDP per capita is estimated at $76,399 in 2022. A comparison of the average GDP per capita of approximately $2,000 reported in SSA by this study shows that GDP per capita in SSA is relatively low. This is proof of the fact that the region is a developing region with low levels of income and high levels of unemployment. Ironically, such poor regions have a rising birth rate which keeps adding to their population, albeit low. For instance, the average population of SSA as reported in Table 1, is approximately most 23 million. Comparing this estimate to the USA of 331.9 million in 2021, it can be argued that the population in SSA is relatively not that high but low.

In Table 2, the study presents six regression results that examines the relationship between corruption and climate finance in SSA with and without controls.

Table 2: Regression Results

VARIABLES	(1) FMOLS	(2) FMOLS	(3) FMOLS	(4) FMOLS	(5) FMOLS	(6) FMOLS
Corruption (ln)	-0.4955***	-0.5030***	-0.5030***	-0.4947***	-0.2379***	-0.2209***
	(0.034)	(0.025)	(0.051)	(0.051)	(0.049)	(0.048)
FDI Inflows (ln)		0.0121***	0.0123***	0.0118***	0.0038*	0.0039*
		(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Forest area (% of land area)			-0.0122**	-0.0092*	0.0209***	0.0284***
			(0.005)	(0.005)	(0.005)	(0.005)
Forest rents (% of GDP)				0.0088***	0.0304***	0.0323***
				(0.002)	(0.002)	(0.002)
Total Green House Gases Em.				0.3861***	0.3541***	0.3156***
				(0.023)	(0.021)	(0.022)
GDP per capita (ln)					0.7895***	0.7886***
					(0.035)	(0.035)
Population (ln)						0.6720***
						(0.117)
Year Fixed Effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Country Fixed Effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Constant	11.8223***	11.7217***	12.4048***	7.8394***	-0.9037	-12.3994***
	(0.149)	(0.116)	(0.373)	(0.466)	(0.583)	(2.086)
Observations	242	229	229	229	229	229
R-squared	0.988	0.987	0.988	0.988	0.990	0.990

Dependent Variable: Climate Finance (ln)
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2 shows the regression results of the impact of corruption on climate finance from columns 1 to 6. The result shows a consistent negative and statistically significant relationship between corruption and climate finance across all specified models (columns 1-6). For the purpose of this study, we focus on model 6 which controls for all the explanatory variables. Specifically, in column 6 a 1 percent increase in corruption results in approximately 0.22 percent decline in climate finance. The inverse relationship between corruption and climate finance could be attributed to the in-built risks connected with corruption which has the potential to weaken the transparency, efficiency, and the effect of climate finance. Through misappropriation, corruption and illegal activities, public officials could divert funds allocated to climate-related projects, decreasing the actual allocation and thwarting the efforts aimed at climate mitigation and adaptation initiatives. The findings of the current study corroborate that of TI (2011) and the United Nations Development Programme (UNDP, 2012) reports which show that corruption could jeopardize the attainment of climate goals by redirecting funds which alter project outcomes. Similarly studies such as Michaelowa and Michaelowa (2017) posits that countries with high corruption levels receive less climate finance. Undoubtedly, mismanagement and lack of accountability can discourage investment in climate finance projects from the public and private sectors. In countries or jurisdictions where corruption is pervasive, investors may be reluctant to fund climate finance initiatives for fear that their monies

will be diverted and not be used effectively for the intended purpose. More recent studies such as Doku et al. (2021), Wen et al. (2023), and Lu et al. (2023) also lend support to the current study.

In this study, FDI is included as a control variable to see whether climate finance goes to where the financiers also do their business. A priori, we expect FDI to serve as another critical determinant of climate finance. The results in column 6 suggest a positive and statistically significant relationship between foreign direct investment and climate finance. The result of the present study is consistent with that of Zhang and Filippaios (2020); Gallagher and Zhang (2021), and the United Nations Conference on Trade and Development (UNCTAD, 2021). Advanced technologies and expertise are frequently brought to host countries by foreign direct investment. Sustainable practices, cleaner production techniques, and solutions for renewable energy can all be included in this technology transfer. FDI inflows have a positive impact on the adoption of cleaner technologies and renewable energy sources, which helps with efforts to mitigate climate change, according to a study by Zhang and Filippaios (2020).

UNCTAD's (2021) report reveals that foreign direct investment (FDI) inflows into the renewable energy sector have been rising which has led to the development of sustainable energy infrastructure and contributed to climate finance by funding low-carbon initiatives. Furthermore, FDI can affect the regulatory frameworks and policies of the host nation in a way that promotes sustainability. Studies conducted by Gallagher and Zhang (2021) show that foreign direct investment (FDI) can influence governments to enact stricter environmental laws and encourage green finance mechanisms, which in turn can draw in climate finance. Thus, the FDI and climate finance convergence highlights the possibility of a mutually beneficial partnership in which FDI can provide more financial, technological, and policy support to promote sustainable development and climate resilience.

Another major determinant of climate finance is forest area. In column 6, the results show that forest area exerts a positive and significant effect on climate finance consistent with the previous studies of Halimanjaya (2015). This result is plausible in that forests offer observable advantages that support adaptation, mitigation, and financial tools for tackling climate change. The forest acts as a carbon sink which absorbs and stores carbon dioxide from the atmosphere. As per the IPCC report of 2019, forests are presently storing approximately 2.4 billion metric tons of carbon annually. A valuable resource in carbon markets and programs like REDD+ (Reducing Emissions from Deforestation and Forest Degradation), which offers financial incentives for protecting forests, is this capacity to sequester carbon. In addition, afforestation/reforestation projects, sustainable management, and forest conservation are the focus of initiatives such as the Green Climate Fund (GCF). By the use of programs like the Green Climate Fund (GCF, 2021) forest-related projects have received a substantial amount of funding.

Some studies, though, have produced different results. The disparity in funding for projects related to forests as opposed to other climate sectors, for example, is highlighted by the World Bank's analysis of climate finance flows (World Bank, 2019). UNEP's reports on financing options for land use and forest initiatives also emphasize how underfunded these important areas are, even though they have a great deal of potential to mitigate climate change (UNEP, 2021).

Carbon dioxide (CO_2), methane (CH4), and nitrous oxide (NO_2) are major greenhouse gases responsible for climate change**.** The Greenhouse gas variable is found to be a driver of climate finance. The results of the present study show a positive and statistically significant relationship between GHGs and climate finance. This result is likely in that, making the switch from fossil fuel-

based to renewable energy sources is a common component of GHG reduction strategies. Climate finance helps with this shift by funding renewable energy initiatives that lower greenhouse gas emissions relative to traditional fossil fuels, like hydroelectric, solar, and wind power (IEA, 2021).

GDP per capita and climate finance have a positive and statistically significant relationship consistent with the studies of Halimanjava (2015) and Doku et al. (2021). This relationship may be explained by the fact that growth frequently necessitates greater industrialization, infrastructure development, and energy consumption -all of which can lead to higher greenhouse gas emissions and environmental degradation. The World Bank emphasizes in its reports that rising economic growth frequently leads to rising energy demand and emissions, requiring higher investments in clean energy technologies and climate-resilient infrastructure to counteract these effects (World Bank, 2019). Moving toward low-carbon economies, substantial investments in climate-smart infrastructure and technologies are necessary for sustainable economic growth (IMF, 2020).

Finally, the regression result shows a positive relationship between population growth and climate finance. The results could be attributed to the fact that rising populations frequently result in higher resource consumption, higher energy demands, and higher urbanization, all of which can make climate change more problematic. In order to address the related effects and promote sustainable development, there is an increasing need for climate finance as the population grows. Studies conducted by institutions like the Population Reference Bureau highlight how increasing population growth intensifies environmental stresses, requiring investments in renewable energy, climate-resilient infrastructure, and adaptation plans to support and maintain expanding populations (Population Reference Bureau, 2020).

We extend the analyses by examining the effect of corruption on climate finance by disaggregating the sample into middle-income, lower-middle-income and low-income countries as depicted in Table 2. The result shows that corruption exerts a negative and statistically significant effect on climate finance across all income categories, but the magnitudes and elasticities differ. Whereas the response of climate finance to corruption is elastic for middle-income countries, it is inelastic for lower-middle-income and low-income countries. Compared to low-income countries, middle-income countries are frequently the subject of more scrutiny regarding corruption. When it comes to sending money to nations where corruption is thought to be more of a risk, financiers and investors typically exercise greater caution. Any hint of corruption, real or perceived, may discourage financial institutions from funding climate projects.

Table 3: Climate Finance Regression Results by Income Classification

VARIABLES	(1) Middle-Income	(2) Lower-Middle-Income	(3) Low-Income
Corruption (ln)	-1.4820***	-0.1687**	-0.3070***
	(0.033)	(0.085)	(0.056)
Controls	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes
Constant	54.4134***	-28.0110***	-16.8964***
	(1.498)	(6.757)	(2.218)
Observations	38	83	106
R-squared	0.994	0.993	0.984

Dependent Variable: Climate Finance (ln)

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.

Finally, we examined the extent to which corruption could affect climate finance in oil and non-oil producing countries. The results in Table 3 show that corruption exerts a negative and statistically significant effect on climate finance in oil-producing countries across specifications.

Table 4: FMOLS Regression Results for Oil and Non-Oil Countries

VARIABLES	(1) FMOLS	(2) FMOLS	(3) FMOLS	(4) FMOLS	(5) FMOLS	(6) FMOLS
Corruption (ln)	-2.0185***	-3.1516***	-2.6944***	-1.6108***	-2.2649***	-2.1568***
	(0.169)	(0.138)	(0.166)	(0.180)	(0.209)	(0.201)
Number of Controls	No	One	Two	Four	Five	Six
Year Fixed Effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Country Fixed Effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Constant	18.5980***	23.6890***	13.6116***	-12.3270***	-2.0661	-14.9959*
	(0.749)	(0.630)	(1.334)	(2.005)	(2.470)	(8.833)
Observations	63	58	58	58	58	58
R-squared	0.982	0.985	0.986	0.990	0.989	0.989

Dependent Variable: Climate Finance (ln)
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

As earlier indicated, corruption can lead to the misallocation of resources to climate initiatives. Scores of studies attest to this. For instance, Transparency International conducted a study in Nigeria and discovered that significant revenue losses due to corruption in the oil sector prevented the funding of climate finance and other sustainable development initiatives (TI, 2018). Furthermore, due to worries about financial mismanagement and a lack of transparency, foreign financiers and investors may be reluctant to commit to climate finance projects in nations like Angola, where corruption in the oil sector is rampant (World Bank, 2019). Some have argued that weak governance and regulatory frameworks are ideal conditions for corruption to flourish. Inadequate governance structures and regulations in oil-producing African countries can facilitate corrupt activities, impeding the appropriate use of climate funds and resulting in inefficient project implementation (World Bank, 2018).

4. Conclusion and Policy recommendation

In this study, we have provided evidence that perceived corruption hurts the inflow of climate finance in SSA. This finding shows the tendency of corruption militating against the sustainability of the gains achieved in climate mitigation and adaptation space. This will not help many countries in SSA to achieve the climate action SDG goal 13. While corruption appears to be systemic in SSA, the good news is that it can be controlled to a larger extent even if not eradicated. One strategy to fight corruption and mitigate the inflow of climate finance in SSA is to put more resources into building a character of integrity in these countries. This calls for a radical paradigm shift from the traditional intervention approach of fighting corruption and to focus more on strategies to deal with the fundamental causes of corruption in SSA, which include weak governance institutions, political instability, weak law enforcement, a lack of transparency in the disbursement of public funds, nepotism and cronyism, and tribal and ethnic loyalty in the appointment of public officers to manage public resources.

The role of civil society organisations (CSOs) cannot be underestimated in the management of climate finance; their role is to insist on transparency, especially in countries that have persistently scored low levels of corruption. One way to do this is for the CSOs to insist on accountability measures or metrics in the area of climate finance management that make the assessment of financial resources reserved for climate mitigation and adaptation easy to access and understand.

The study also suggests that governments in SSA and donors of climate finance, such as private and public donors, set up strong accountability systems, anti-corruption guidelines, and transparency measures within climate finance frameworks. This will make it less likely that corrupt people in countries that receive climate finance will use resources meant for climate mitigation and adaptation for personal gain. Among the tactics to counteract corruption's negative effects on climate finance are bolstering oversight, encouraging financial transaction transparency, and involving CSOs in monitoring, especially public projects. Similarly, there should be stringent reporting requirements on climate finance inflows in the private sector. This is critical as the climate finance data SSA for the public sector is easily gleaned from the national budgets compared to that of the private sector, which is shrouded in opacity. Further studies can consider climate finance and small business energy consumption in SSA.

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Appendix

Table A1: Pairwise Correlation Test Results

	1	2	3	4	5	6	7
(1) Corruption	1						
(2) FDI	-0.0438	1					
(3) Rent	-0.3459	0.0263	1				
(4) Greenhouse	0.0187	-0.1103	-0.1672	1			
(5) Forest Area	-0.2024	0.1951	-0.0279	-0.0925	1		
(6) GDPPC	0.3726	0.0356	-0.4658	0.1935	0.3743	1	
(7) POP	-0.1920	-0.0821	0.0957	0.6364	-0.0686	-0.1161	1

HOW LEGITIMATE IS CORPORATE SOCIAL INVESTMENT IN SOCIAL AFRICA? INSIGHTS FROM BENEFICIARIES?

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Abstract

Businesses typically resolve social and environmental challenges by implementing corporate social responsibility (CSR) programmes. It is not always used for its intended purpose, but sometimes, superficially, it is used to appease stakeholders as a conflict management tool. Thus, this research aims to explore in-depth the purported beneficiaries' CSR perception as it influences corporate legitimacy by using systems thinking. We do this by answering the research question, "What is the perception of beneficiaries on the legitimacy of CSR initiatives in South Africa?" We used qualitative methods to gain in-depth knowledge about corporate social investment initiatives in South Africa. We conducted semi-structured interviews with 32 beneficiaries of these initiatives. The sampling was purposeful, including only beneficiaries of CSI initiatives in South Africa. Data was analysed using a systems thinking theoretical framework. The absence of meaningful engagement methods and beneficiary exclusion illustrates fundamental defects within CSI methods, which validate criticisms about CSI being more about corporate image than true social investment. This study demonstrates that when insights from systems thinking are combined with legitimacy theory, it becomes clear that CSI must be analysed in light of South Africa's unique historical and socio-economic circumstances. The current structure of CSI initiatives functions mainly as solutions imposed from outside instead of being interventions developed through community collaboration.

Keywords: Corporate Social Investment (CSI), Systems Thinking, Legitimacy, Stakeholder Engagement, Greenwashing.

Introduction

There are two ways to achieve legitimacy: one where company actions are in sync with expectations (credibility) (Seele and Lock, 2015; Lock and Seele, 2016) and the other is by deceptive social and environmental communication practices (greenwashing) (Torelli, Balluchi and Lazzini, 2020). Legitimacy is an incentive for companies to achieve, as it results in a positive view by stakeholders as relationships strengthen and social and environmental issues are addressed (Walker and Wan, 2012; Balluchi, Lazzini and Torelli, 2020). Companies usually address social and environmental problems through corporate social responsibility (CSR) initiatives (Balluchi, Lazzini and Torelli, 2020). It is not always used for its intended purpose, but sometimes, superficially, it is used to appease stakeholders as a conflict management tool (Zheng, Luo and Maksimov, 2015).

The theorisation of CSR has evolved from the seminal work of Bowmen (1953) to Carroll (1998) with the pyramids. This was on the backdrop of the recognition that companies significantly influence society, which goes beyond their profit-seeking core (Roberts, 1992). The turn of the century saw growth in CSR literature, focusing on general issues or theories (Frynas and Yamahaki, 2016). Garriga and Melé (2004) classified CSR theory into four categories: integrative, political, ethical and instrumental. Another classification is by Bachmann and Ingenhoff (2017), who argue that the most commonly used theories in CSR literature are Carroll's "CSR pyramid", Elkington's "triple bottom line", and Freeman's "stakeholder approach".

The use of such theories in existing literature results in divergent perspectives about the legitimacy of CSR. Research by Awis et al. (2018) established that because of CSR activities, non-governmental organisations thought highly of Malaysian Government-linked Companies (GLCs)' corporate legitimacy. More recently, Fatma, Khan and Rahman (2019) contributed to the literature on the effects of perceived CSR on employees' commitment and found a positive relationship between organisational identification (legitimacy) and employee perspective. They also highlight how this is mediated by perceived organisational support and external prestige. Another form of corporate legitimacy is highlighted by Zheng, Luo, and Maksimov (2015), who state that sociopolitical legitimacy results in political access, influencing the corporate strategy for CSR to take a philanthropic approach. The distinction they make of CSR strategy is that it is directed to employees if it is philanthropy-focused and to customers, partners and NGOs if it is sustainability-focused CSR.

With greater focus on ESG and the UN sustainable development goals, incorporating CSR has become a key part of many prominent organisations and has become essential rather than the traditional "nice to have" (Hutchins et al., 2019). Therefore, in going beyond just creating value for the stakeholders, organisations must evaluate the impact of their CSR initiatives through the lens of the beneficiaries to capture their perceptions and experiences. It is well recorded that part of the reasons companies engage in CSR initiatives is for the customers and stakeholder groups to gain a good reputation and for employees, who become proud to be associated with the company (Hu et al., 2020). However, the perspective of beneficiaries is often overlooked. These are the groups who stand to benefit from CSR initiatives or adherence to regulations for their protection (Monciardini and Conaldi, 2019). Previous studies that incorporate beneficiaries have focused on evaluating the impact of CSR programmes and stakeholder perceptions (Walker et al., 2017) and the satisfaction levels of beneficiaries towards the organisations initiating the CSR activities (Chauhan and Sukhmani, 2023); others have investigated the role of beneficiaries in the co-creation of CSR rules and practices (Monciardini and Conaldi, 2019). This indicates that studies have been conducted with a focus on the beneficiaries, more so in Africa; recent studies have focused on the

assessment of the CSR initiatives, their impact and the sustainability of programmes. Most studies focus on quantitative methods in their investigation, which does not capture the views of the beneficiaries regarding the CSR initiatives that are targeted at them for the benefit of legitimisation of the organisation implementing the initiatives. This study aims to gain an in-depth view of CSR initiatives implemented in the South African context.

The aim of this research is thus to explore the in-depth purported beneficiaries' CSR perception as it influences corporate legitimacy by using systems thinking. By so doing, we make an original contribution by introducing a new theory into the literature from the perspective of the beneficiaries. We do this by answering the research question, "What is the perception of beneficiaries on the legitimacy of CSR initiatives in South Africa?" Another distinctiveness of the research is that it captures the views of purported beneficiaries of various CSR initiatives instead of a single programme from a single organisation.

The next section provides the context in which the research is based, providing an understanding of why corporate social investment (CSI) is the preferred terminology and not CSR, although we use them interchangeably. We then enter into a conversation about CSR as a legitimacy tool for corporates. We present our theoretical framework, followed by the methodology, before presenting the basis of legitimacy (results). A discussion of the results follows, leading us into the limitations and areas of future research. The paper ends with our concluding remarks and recommendations.

Evolution in South African CSI

Unlike the rest of the world, where CSR was practised by companies conscious of their community engagement, it ran parallel with the disparities created by the oppression from capitalism and apartheid in South Africa (Hamann, 2009). The importance of this distinction lies in that it elucidated the philanthropic implementation of CSR through CSI and why this was the preferred terminology in South Africa (Fig, 2005; Hamann, 2009; Kabir, Mukuddem-Petersen and Petersen, 2015). Furthermore, although called an investment, it was charity or corporate philanthropy. However, it sounded better and became the new buzzword (Hamann, 2009). Additionally, Skinner and Mersham (2008) and Fig (2005) added that the term CSI did not remind the South African communities of the failures previously discussed, underlined by the capitalist and apartheid systems when using CSR. Therefore, for our research, we accepted the overarching quality of CSR for sustainability and the more focused quality of CSI reflected in its commitment to ensuring the social development of the communities (de Jongh, 2009).

Although slow and dampened by the apartheid and capitalist regimes, CSI in South Africa began to gain momentum after the end of that era (Ramlall, 2012). The new government introduced regulations locally and adopted international rules to facilitate socio-economic growth through CSR practice and socially responsible business operations (Ramlall, 2012; Kabir, Mukuddem-Petersen and Petersen, 2015). Notably, no law per se regulated CSR practice in South Africa, although the frameworks adhered to are products of the rights enshrined in the constitution of South Africa (Kabir, Mukuddem-Petersen and Petersen, 2015). The lack of policy was an important distinction, as this was not the same in the global North and West but was pervasive in Africa.

Mistakenly, Kabir, Mukuddem-Petersen and Petersen (2015) omitted the four King reports that had since been published in 1994 for the first time (Hamann, 2009; Ackers and Eccles, 2015). Nevertheless, this was a crucial report documenting that disclosure of voluntary CSR activity should be made, and if not, an explanation of nondisclosure should be provided. Additionally, this standard was applied globally and not just focused on South Africa,

although it played a significant role. In South Africa, to be listed on the Johannesburg Stock Exchange (JSE), companies were required to adhere to the King Code of Governance (Ackers and Eccles, 2015), and this boosted the advancement of the Social Responsibility Investment market (Viviers and Els, 2017).

Noticeably, according to Ackers and Eccles (2015), CSI was practised for (i) moral reasons and (ii) stakeholder satisfaction, although stakeholders were shareholders that ultimately benefitted, excluding other stakeholders like the communities who were purported to have been beneficiaries. The implication was that the reported CSI social impact tended to be writing less about the targeted communities of the CSI initiatives and more about the business itself. This was evidenced in Delmas and Burbano (2011) as well as Ackers and Eccles (2015). They argued how companies could be deceptive in their CSR reporting to gain favour with shareholders while not being role models for corporate citizens and ultimately failing to alleviate the apartheid disparities which CSI sought to eliminate. To do this, only positively oriented CSR-related information was disclosed. Ultimately, this questioned the corporate reliability and transparency that the King Code of Governance tried to advance regarding CSR in South Africa.

Corporate Legitimisation through CSR

Corporate legitimacy has become increasingly important as the business environment continues to change. Organisations are actively working to position themselves within the wider social and economic networks. Corporations achieve legitimacy by adopting and implementing strong corporate social responsibility practices (Kaur and Singh, 2021). Corporations now use CSR as an influential means to show their dedication to social and environmental welfare. According to legitimacy theory, organisations need to operate within societal norms of acceptability, which indicates that CSR practices play a crucial role in maintaining corporate legitimacy (Ramokate, 2013; Botshabelo, Mbekomize and Phatshwane, 2017; Mbekomize, Wally-Dima and Nametsegang, 2019). According to Shocker and Sethi (1974), businesses exist under a social contract where their expansion and survival depend on their capacity to conform to societal expectations and norms.

The connection between CSR and organisational reputation has been demonstrated by scholars (Hillenbrand and Money, 2007; Akşak, Ferguson and Duman, 2016; Famiyeh, Kwarteng and Dadzie, 2016). Socially responsible corporations build trust and alignment with societal values, enhancing their reputation and legitimacy. The positive reputation gained through CSR activities leads to better resource access, stronger stakeholder support and greater customer loyalty, which are essential for sustainable growth (Cretu and Brodie, 2009; Maráková, Wolak-Tuzimek and Tučková, 2021).

Therefore, for CSR legitimacy, companies incorporate CSR initiatives to justify the relevance of their activities or actions within the regulatory boundaries, beliefs and norms set out by various groups in society (Zheng et al., 2015). This incorporation of CSR has historically been driven by the acknowledgement of corporations of the impact their operations and activities have on society and the environment, thereby understanding their moral responsibility towards society (Hutchins et al., 2019). Therefore, enhanced legitimacy leads to approval by stakeholders and the long-term success of the company (Zheng et al., 2015). It is common practice for companies to gain legitimacy by developing strategies that incorporate the expectations of their stakeholders. By extension, some organisations may focus on social and environmental issues that are of great interest to the stakeholders to influence their perceptions of the organisation (Nielsen and Thomsen, 2018).

The growth of CSR has led to the increased adoption and routinisation of CSR legitimacy strategies to build corporate legitimacy (Nielsen and Thomsen, 2018). Stakeholder-orientated organisations are more inclined to adopt these strategies, seeing it as an investment that can positively affect their revenue, attract and retain employees, and attract investors and customers while gaining support from the greater society (Hutchins et al., 2019).

It has been reported that corporations that issue high-quality CSR reports are perceived to have enhanced legitimacy through government and media endorsements, which results in improved financial performance (Dai et al., 2018). However, that is not always the case, as some companies face major scrutiny due to the nature of their business, which leads to scepticism from other stakeholders, regardless of the CSR initiatives (Fatma et al., 2018). Corporations face multiple obstacles when they try to achieve legitimacy through CSR initiatives. According to Brown and Deegan (1998), legitimacy gaps develop when society expects certain behaviours from a company that the public does not observe in the company's actions. Corporations use strategic communication and disclosure practices as a response to such legitimacy gaps to preserve their standing.

Greenwashing around the term “Stakeholder” in CSR

In recent years, corporate social responsibility emerged as a prominent topic because companies have now started to acknowledge the necessity of meeting stakeholder needs and concerns. The casual application of the term "stakeholders" overlooks the precise communities corporate social projects are intended to assist.

Torelli, Balluchi, and Lazzini (2019) offer an important framework for analysing this topic. According to them, traditional stakeholder theory, which defines ethics as duty and responsibility, does not address the complex nature of CSR and philanthropic actions. Research shows CSR remains a contested domain because tensions exist between pursuing profits and the need to meet normative social expectations (Maphosa and Maunganidze, 2021).

The research by Torelli, Balluchi, and Lazzini (2019) shows that companies use social initiatives primarily to improve their public image instead of genuinely helping the communities they claim to support. The assertion that CSR has never operated in an entirely ethical framework exists because it constantly faces tension between profit goals and social responsibilities (Maphosa and Maunganidze 2021). According to Maunganidze (2021), corporations must shift from compliance-based social responsibility models to ones that embrace a committed values-based approach focusing on stakeholder interaction.

These authors stress the need to take into account the different and complex groups involved in stakeholder analysis, which extends beyond shareholders and employees to include local communities and non-profit organisations as well as vulnerable populations. The effectiveness of corporate social initiatives depends on a deeper understanding of stakeholder engagement to achieve genuine benefits for target communities.

Theoretical framework

Critical Systems Heuristics is a framework for designing and assessing purposeful systems (Flood and Jackson, 1991). CSH was developed to bridge the gap between positivist and interpretivist perspectives on systems thinking, presenting an emancipatory strand (Flood and Jackson, 1991; Reynolds, 2007; Gates, 2018; Ulrich and Reynolds, 2020). Given the history of corporate social investment in South Africa, which has aimed to address inequality, unemployment, and poverty exacerbated by apartheid and colonialism, this study finds CSH

to be a suitable framework (Midgley, 1997). Midgley has argued that CSH is effective in dialectical environments like the CSI space in South Africa. However, some critics, such as Flood and Jackson (1991), claim that CSH was designed solely for coercive situations, which diverges from this study's stance.

The literature identifies four key influences on CSH: motivation, control, knowledge, and legitimacy (Flood and Jackson, 1991; Reynolds, 2007, 2014; Ulrich and Reynolds, 2010; Rothkegel, 2014; Tirivanhu et al., 2016; Gates, 2018). These factors are determined by three boundary judgements that shape inclusion, exclusion, and marginalisation. This study focuses on the source of control, discussing decision-making structures in South African CSI initiatives sponsored by banks from the perspective of intended beneficiaries. The research framework was adapted from this depiction and modified as relevant. A comparison of normative and descriptive modes was conducted to evaluate the influence of boundary judgements on the social impact of CSI in South Africa.

Methodology

We used qualitative methods to gain in-depth knowledge about corporate social investment initiatives in South Africa. We conducted semi-structured interviews with 32 beneficiaries of these initiatives. The first 18 respondents were from an Early Childhood Development Practitioner Training programme in Mpumalanga, which aims to improve the quality of early childhood education by training women teachers in local communities. The following ten respondents were from the Western Cape and participated in CSI initiatives related to entrepreneurship, women's empowerment, and sports. Finally, four respondents from Gauteng participated in CSI initiatives to upskill small business owners. The sampling was purposeful, including only beneficiaries of CSI initiatives in South Africa. We also interviewed key informants from communities where banks funded the CSI initiatives, as this sector is a major contributor to CSI spending. The data was analysed using thematic summative content analysis based on the 12 critical systems heuristics questions.

Bases for legitimacy

Unfortunately, the data showed that the CSI initiative process excluded the worldviews shared by the purported beneficiaries. Additionally, they did not allow them adequate platforms, if any, to share their views and contribute to the CSI initiative to show that their interests were a significant part of the development of the initiative. Figure 15 depicts how discussing the following sub-themes connects and supports these findings.

Witness

There were divergent views on who should represent the purported beneficiaries' interests. For example, Participants 2, 23, 30 and 31 were some of the respondents who believed that the NPO should have represented their interests in the CSI initiative. However, Participant 12 proposed that a gas company, which brought them food during the CSI initiative, be their representative instead. The financial institution and the NPO that executed the initiative should have represented their interests in the CSI initiative. The adequacy of the NPO representation is illustrated in the quotes:

> *"Eh, it was [NPO] and [NPO Representative]. [NPO Representative] I think is a coordinator from [NPO]"* (Participant 30).
>
> *"Uhm, do you know [NPO Representative]"* (Participant 31).

However, some participants were not sure if they were represented or not. Participant 7 submitted, "*Maybe I discuss with the people outside or maybe the lecturers.*" Maybe it was the people they talked to or their lecturer who represented their interests, and it should *be "the social workers"*. Participant 10 said *"the manager"* currently represented their interest, although they suggested that *"someone who would be training her"* should have done it. Equally, Participant 11 said the *"[NPO] and social development and no one else"* that represented and should represent their interests. Finally, the mentor was Participant 20's submission to both who is and who should have represented their interests in the CSI initiative, a sentiment shared by Participant 22.

But Participant 24 said no one currently represented their interests. Additionally, they told the NPO owners that they were not the best people to prepare the purported beneficiaries for the CSI initiatives. Therefore, a person should be sent to the communities for a workshop to provide the required preparations before the CSI initiative is rolled out. Nonetheless, Participant 25 said that although there was clarity that the NGOs are more intimately involved with the participants of the initiatives, they would prefer to represent their interests. They were not sure that anyone did represent them currently. The relevant quote applied:

> *"The person that the academy sent to the community, to the workshops, to come prepare us better. Not just NPO owners or board members or directors that had nothing to do with, they are there, they are the NPO, we are here, we are the small business people. You don't know how to sell a packet of toilet there by the street corner. They don't know that. So the people that were supposed to come there and say, listen, what kind of business do you have. Then I say I have nails, I do nails every day. Then he ask me when do you do it. Then I say, only Fridays and Saturdays. That person that have experience of a beautician business or salon that's the person who was suppose to come. Not NPO members that's having a workshop for [Financial Institution] in partnership with them. [Financial Institution's] person that was here was supposed to identify the type of businesses represented at that workshop today…" (Participant 24)*.

Emancipation

Participant 3 noted no places to voice their interests in the CSI initiative. They stated that writing the sponsoring financial institution a letter that would respond should be their opportunity. However, Participant 6 responded that although the NPO and the Department of Health were responsible for representing the interests of the participants in the CSI initiative, they did not have any opportunities to voice their concerns currently. They would like some workshops with the two stakeholders to curb the gap. Also, Participant 7 echoed that there were no available opportunities to voice their interests. However, they would have tried calling a community meeting that the counsellors would be a part of. On the contrary, in Participant 11's position, a meeting was convened with the community. However, meeting other organisations in the same field was noted as something that should be done. The absence of a place to voice their interests is found in the following quotes:

> *"I would like to have a workshop. Maybe parents and [NPO] and the Department of Health"* (Participant 6).

> *"For example, me myself maybe I can call a meeting with my community to address that thing. The opportunity is there when you are calling the meeting"* (Participant 7).

This position continued through the participants, as Participant 19 noted no opportunities to represent their interests. However, they realised this and went out on a limb to seek the required assistance without support. They were discouraged by what should be done because they had tried several avenues without success, leaving them thinking maybe nothing would be done. Hence, the suggestion was to get another counsellor who would help. Nevertheless, Participant 22 said they were content when asked about the opportunities to voice their interests because all resources were provided. However, the sustainability knowledge and the skills gap were highlighted again when they mentioned the opportunities available to them to voice their interests. Similarly, Participant 23 held the NPO, which was reported as always being there for them to raise their interests even after the CSI initiative was complete. However, the mentors should be made available after completion. For example:

> *"I did reach out to the municipality. I did go to my ward councillor, she told me to go to municipality. I was there they told me that I must bring a partition list. I did bring a partition list, all the people in the street were signing that partition list. After that they uh uh uh they want a picture of how we must, the layout of the field neh, yes. I let it draw up and gave it to them and it's like nobody reach out and every time I go to the war councillor it's like they didn't give an answer"* (Participant 19).

Worldview

Regarding worldview, respondents were unaware of what to say. For example, Participant 1 submitted that there were no available spaces to reconcile their worldviews. Still, all government departments should have a role to play in providing such an opportunity. Similarly, Participant 3 claimed the worldview for such initiatives had also been neglected. The purported beneficiaries and the community members they should be working closely with also desired to contribute to the reconciliation of the divergent worldviews currently present. However, the respondent also highlighted that currently, there was no such involvement or opportunity to reconcile the worldviews. Lastly, Participant 19 said there were no opportunities in place, but a sense of fear that led participants to submit to lying about nothing should be made. For example:

> *"Maybe if you can call a meeting to ask the parents to come with some decisions too"* (Participant 3).

Discussion of Results

The affected in CSH for our research are the purported beneficiaries of CSI initiatives in South Africa, while those involved provide the resourcing and make the decisions. CSH was designed to bridge the gap between positivist and interpretive perspectives on systems thinking by presenting the emancipatory strand (Flood and Jackson, 1991; Reynolds, 2007; Gates, 2018; Ulrich and Reynolds, 2020). With this should come emancipation from the inequalities and poverty exacerbated by apartheid and colonialism, for which our study shows a concerning divide that could be attributable to the disconnect that is very apparent between those involved and the affected. The government needs to step in to enforce laws that remind everyone that the CSI system has deep roots in apartheid and colonialism. Therefore, to serve its purpose in the country's history, there is a severe need to disassociate ourselves from its global meaning and let it be contextualised locally to redress the effects of these suppressive systems.

The results of Gate (2017) show that evaluators do not make value judgements when using human systems dynamics as a system and integrate this with complex adaptive systems in evaluations. However, the exclusion is the quality and extent to which specific goals are reached by a system that the values of stakeholders determine. Our data shows that as the researcher/evaluator of CSI initiatives, our values are also independent of what is unearthed by those of the purported beneficiaries of the various CSI initiatives. When we used CSH, they acted as the stakeholders by providing their normative ideal for all four sources of influence used in CSH for value judgements. Therefore, our research could also unearth patterns from the data collected. However, unlike another participant in Gate's study, we had empirical theory preceding the value judgements presented by the normative responses of the respondents. These enabled us to identify alarming areas. Furthermore, Gate's research was based on the perspective of seasoned evaluators in development initiatives, whilst ours was based on discoveries from purported beneficiaries.

Using the systems thinking and complexity science approach proposed by Gates (2016), we noticed that the CSI initiatives under our study were developed using the traditional practice and assumptions of social problem-solving. Furthermore, the findings of our research confirm the differences that Gates discusses in more detail on all five dimensions of (i) studying problems, (ii) envisioning change, (iii) designing interventions, (iv) implementing interventions and (v) evaluating interventions. Therefore, when addressing the wicked problem defined by Gates (2016), the data confirmed that CSI initiatives must shift toward STCS approaches to achieve the social impact that alleviates inequality, unemployment and poverty in South Africa. All those currently involved in implementing, planning and evaluating CSI initiatives in South Africa should consider this. We can also confirm that using CSH would enable evaluators to use the reflexivity it provides, according to Ulrich (1987) and modified by Ulrich and Reynolds (2010), to constantly interrogate assumptions CSI implementors and planners used when solving social problems. This critical examination of their assumptions reduces (i) policy resistance, (ii) unintended negative results, and (iii) increases the success of CSI initiatives.

The findings of this study reveal significant legitimacy gaps in CSI initiatives, as perceived by the purported beneficiaries. Legitimacy theory posits that corporations must align their activities with societal norms and stakeholder expectations to maintain social acceptance (Ramokate, 2013; Botshabelo, Mbekomize and Phatshwane, 2017). However, the exclusion of beneficiaries' worldviews and the absence of meaningful participatory platforms challenge the legitimacy of CSI initiatives. The results indicate that participants experienced uncertainty regarding representation, with no clear consensus on who should advocate for their interests. While some participants believed that non-profit organisations (NPOs) fulfilled this role, others viewed corporate sponsors or community representatives as more appropriate. This fragmentation in perspectives underscores a fundamental legitimacy gap, where CSI initiatives do not adequately engage with stakeholders in a manner that aligns with societal expectations (Brown and Deegan, 1998). Such exclusion weakens CSR legitimacy and reinforces the critique that CSR is often a performative exercise rather than a substantive commitment to social development (Maphosa and Maunganidze, 2021). Without direct engagement and representation of beneficiary voices, CSI initiatives risk being perceived as externally imposed rather than organically developed responses to community needs.

Moreover, the absence of adequate platforms for dialogue and representation highlights a structural deficiency in legitimising CSI initiatives. Shocker and Sethi (1974) argue that corporations operate under a social contract, necessitating continuous alignment with stakeholder expectations. However, the data reveal that beneficiaries lacked opportunities to

voice their concerns, with some resorting to indirect avenues such as community meetings, letters to corporations, or seeking support from local government representatives. This lack of direct engagement mechanisms signifies a disconnection between corporations and the communities they purport to serve, undermining the credibility of their CSR efforts. While stakeholder-orientated corporations are more inclined to integrate CSR strategies that align with societal values (Hutchins et al., 2019), the results of this study suggest that such strategies remain superficial if they do not include participatory mechanisms for beneficiaries. Consequently, without integrating platforms for meaningful stakeholder engagement and incorporating diverse worldviews, corporations risk alienating the very communities they seek to support. This study affirms the need for a more inclusive, participatory approach to CSR to ensure legitimacy is not merely claimed but actively earned through genuine stakeholder engagement.

A serious gap exists between corporate aims and community requirements because beneficiaries' perspectives are excluded and sufficient platforms for their voices remain unavailable. Torelli, Balluchi, and Lazzini (2019) maintain that traditional stakeholder theory reduces corporate social responsibility (CSR) to a superficial performance instead of authentic social advancement. The study revealed participant confusion and dissatisfaction with CSI representation because of unclear definitions of who truly represents community interests. Opinions vary from support for NPOs to doubts about their effectiveness, showing deeper problems in how CSR projects handle representation and accountability. The fact that study participants could not find platforms to express their concerns supports Maphosa and Maunganidze's (2021) critique that CSR functions primarily as an image management tool rather than a means of true empowerment. Stakeholder engagement remains superficial because CSR lacks platforms to integrate different perspectives, leading to marginalising the communities it aims to serve. The concept of greenwashing applies here as corporations use social responsibility language without effectively meeting the needs of those who should benefit from their actions. To establish genuine stakeholder connections exceeding simple compliance requirements, CSR programmes must adopt an approach that prioritises values and includes active participation.

Limitations and Areas for Future Research

The limitations of this study are recognised. While adequate, the sample size of this qualitative inquiry is small and only covers three provinces within South Africa. Extending future research to cover CSI programmes from multiple regions and sectors will make the results broader. This research used Critical Systems Heuristics (CSH) to evaluate CSI initiatives, but future studies should consider applying different systems thinking methods like Soft Systems Methodology, complexity science/theory or Human Systems Dynamics to determine the success of CSI programmes in reducing systemic inequalities. Longitudinal research that monitors stakeholder involvement and community results would help evaluate the developmental success of corporate social investments based on observed legitimacy gaps and stakeholder exclusion.

Conclusion and Recommendations

The research advances the understanding of corporate social investment (CSI) in South Africa using Critical Systems Heuristics (CSH) to evaluate beneficiary experiences and the legitimacy of CSI programmes. The study shows a substantial legitimacy gap in CSI

programmes because beneficiary perspectives are neglected and there are insufficient participatory platforms based on insights from 32 semi-structured interviews with beneficiaries and key informants. This study demonstrates that when insights from systems thinking are combined with legitimacy theory, it becomes clear that CSI must be analysed in light of South Africa's unique historical and socio-economic circumstances. The current structure of CSI initiatives functions mainly as solutions imposed from outside instead of being interventions developed through community collaboration. The research develops theoretical understanding by showing how CSH functions as a reflexive instrument to examine fundamental assumptions of CSI programmes, which enhances stakeholder participation and boosts the impact of social investments. Empirical evidence from the research confirms existing criticisms that CSR activities are frequently performative rather than genuine social development commitments. This research paper adds to existing knowledge about CSR in Africa by presenting findings that advance both scholarly research and practical implementation.

For academics, the research recommends further research should explore the application of critical systems heuristics in other African contexts to assess whether similar legitimacy gaps exist in CSI initiatives beyond South Africa. Comparative studies between corporate-led and community-driven social investment models could yield valuable insights into best practices for stakeholder engagement. Additionally, interdisciplinary research that integrates complexity, human dynamics, and participatory evaluation methods may help refine theoretical frameworks that inform CSR practices in developing economies.

For practitioners, it recommends that organisations and corporations establish participatory systems that enable beneficiary voices to shape and assess CSI initiatives. Structured engagement platforms like advisory committees made up of community members will promote inclusive decision-making. Organisations need to adopt value-based corporate social investment models matching local needs instead of following compliance requirements. CSI frameworks need to incorporate training programmes that cover stakeholder engagement, systems thinking and adaptive management to improve these initiatives' reflexivity and responsiveness. Evaluators must implement research methods combining quantitative impact analyses with qualitative storytelling for comprehensive evaluation of CSI results.

The regulatory framework overseeing CSI activities in South Africa must enforce stronger beneficiary involvement processes so that CSI remains aligned with local community needs. Policy reforms must obligate corporations to perform stakeholder analyses and add participatory governance structures into their CSI programmes. Creating autonomous oversight bodies to monitor CSI activities would improve accountability and protect against the misuse of CSI as mere public relations campaigns. Government agencies must create platforms for collaboration between corporations, local government bodies, and civil society organisations to co-create investment initiatives that address specific local needs and maintain long-term sustainability. Policymakers need to understand corporate social responsibility's history in South Africa and legislate to ensure CSI helps correct previous inequalities instead of continuing current imbalances.

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INTEGRATED FRAMEWORK FOR ENHANCING FIRM PERFORMANCE THROUGH CORPORATE ENVIRONMENTAL SUSTAINABILITY, MARKET ORIENTATION, AND REGULATORY AWARENESS

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Abstract

This study examines the impact of corporate environmental sustainability (CES) on firm performance in the energy sector, considering market orientation and regulatory awareness as moderating factors. Grounded in dynamic capability theory and informed by stakeholder and institutional theories, the research employed structural equation modelling (SEM) with data from 382 managers in the energy sector. Findings reveal that CES positively influences financial, customer, learning and growth, and inter-business process performance. Market orientation, particularly customer and competitor orientation, strengthens the CES-performance relationship, except in inter-business process performance. Regulatory awareness enhances CES's impact on performance, though not in financial or customer dimensions. The study highlights the importance of market orientation and regulatory awareness in maximizing CES effectiveness. It suggests that energy firms and policymakers should prioritize these factors to improve sustainability outcomes. By exceeding regulatory compliance, energy firms can position themselves as leaders in sustainability, benefiting both the industry and the environment.

Keywords: Corporate environmental sustainability, performance dimensions, market orientation, regulatory awareness, energy sector, Ghana

Introduction

In recent years, corporate environmental sustainability has garnered increasing attention as firms are urged to address environmental challenges while also striving for long-term business performance (Gupta & Gupta, 2020; Nureen et al., 2023). The adoption of sustainable practices in the corporate world is not just a moral imperative but a strategic necessity (Edwards, 2021; Le, 2022; Pereira et al., 2021). However, while the intersection of CES and firm performance is widely acknowledged, a significant gap remains in understanding the specific relationships between these concepts and how they contribute to tangible performance outcomes, particularly in emerging markets.

Despite the growing body of literature on the role of sustainability in business, research has yet to provide a definitive answer regarding how CES affects financial performance, customer satisfaction, and inter-business relationships. Gupta and Gupta (2020) have highlighted the limited recognition of studies exploring the link between CES and performance outcomes, specifically in the context of financial performance. For example, while some studies argue that sustainability investments lead to long-term financial benefits (Bartolacci et al., 2020; Mngumi et al., 2022), others suggest that such investments may negatively impact short-term profitability (Baah et al., 2021). Additionally, there is a lack of consensus on standardised metrics for measuring the impact of CES on financial performance, complicating cross-study comparisons.

While CES is widely recognized for enhancing customer satisfaction and loyalty, research on this relationship remains limited (Tien et al., 2020). Studies like De Canio et al. (2021) highlight the positive impact of sustainability on customer perceptions, but systematic research on how CES translates into improved customer performance, especially in emerging economies with differing environmental regulations, is scarce (Gupta & Gupta, 2020). Additionally, CES's effect on inter-business processes and relationships has not been thoroughly explored. Gupta and Gupta (2020) noted the lack of research on how sustainability practices influence inter-business performance, particularly in diverse regulatory environments.

These gaps underscore the need for targeted research on the intersection of CES with financial, customer, and inter-business performance. Furthermore, the moderating roles of market orientation and regulatory awareness in strengthening the CES-performance relationship remain underexplored. While some studies (e.g., Demirer et al., 2020; Wang & Kim, 2022) have considered market orientation and regulatory frameworks in sustainability, they have not been fully integrated into CES performance outcomes. This study addresses these gaps by investigating these moderating roles, using stakeholder theory, institutional theory, and dynamic capability theory, particularly in the energy sector of emerging economies like Ghana. The research explores how evolving sustainability practices influence firm performance in specific regulatory and market-driven contexts.

Literature review

Corporate Environmental Sustainability

Corporate environmental sustainability refers to an organisation's commitment and actions to operate in an environmentally responsible manner, aiming to minimise negative impacts on the natural environment (Naidoo & Gasparatos, 2018). This involves incorporating environmentally conscious practices across various facets of a firm's operations, products, and services. It extends beyond mere compliance with regulations and legal mandates, representing a proactive stance towards addressing ecological issues and contributing positively to planetary health (Pan et al., 2023). Corporate environmental sustainability is thus about embedding

sustainability into the core strategies and day-to-day operations of a company (Yasin et al., 2023). It includes initiatives such as reducing carbon emissions, optimising energy usage, managing waste efficiently, and sourcing materials sustainably. Moreover, it involves innovation in product design to enhance environmental performance, such as developing energy-efficient products or using biodegradable materials. That is, companies can reduce their ecological footprint and foster long-term sustainability. In this study, corporate environmental sustainability is conceptualised and defined as a composite construct, following the framework provided by Gupta and Gupta (2020).

Dynamic capability, stakeholder and institutional theories

Dynamic capability theory emphasizes a firm's ability to adapt to changing environments by reconfiguring its internal and external resources. This is crucial for corporate environmental sustainability (CES), enabling firms to innovate and adopt sustainable practices in response to evolving environmental standards and stakeholder demands. Firms with strong dynamic capabilities can sense opportunities, seize them through innovation, and reconfigure resources to maintain competitiveness (Huang & Xiao, 2023; Coppola et al., 2023). For example, adopting circular economy practices or developing emission-reducing technologies showcases dynamic capabilities in action (Khan et al., 2021).

Stakeholder theory, as proposed by Freeman (1984), posits that a firm’s success depends on fulfilling the needs of all stakeholders, not just shareholders. This approach promotes ethical relationships with groups affected by the firm’s activities. Critics, like Marcoux (2003), argue that stakeholder theory overlooks the moral obligations of owners. However, studies have shown that strong relationships with stakeholders can provide firms with a long-term competitive advantage (Jones et al., 2018). This study applies stakeholder theory to assess how market orientation moderates the relationship between CES and firm performance in emerging economies, particularly within the oil and gas sector.

Institutional theory focuses on how external pressures influence firms to conform to societal expectations. Firms must adhere to institutional norms to gain legitimacy, access resources, and ensure long-term success (DiMaggio & Powell, 1983). This theory suggests that regulatory pressures, such as environmental laws, encourage firms to adopt sustainable practices. This study uses institutional theory to examine how regulatory awareness, driven by institutional pressures in the oil and gas sector, enhances the relationship between CES and firm performance metrics (Scott, 2008).

Hypotheses development

Corporate environmental sustainability and financial performance

The relationship between corporate environmental sustainability and financial performance continues to be a topic of ongoing investigation, characterised by various perspectives and unresolved issues. Empirical evidence indicates that sustainability initiatives, such as improving resource efficiency and reducing waste, can generate cost savings within organizations (Wu & Cerceo, 2021). Furthermore, enhancing environmental performance has been shown to reinforce brand reputation, foster customer loyalty, and appeal to environmentally conscious investors (Le, 2023). Proactive environmental management practices are also recognised for their potential to mitigate regulatory risks and lower operational costs, thereby potentially enhancing long-term profitability (Kaur, 2021). Nevertheless, significant gaps exist in our understanding of this relationship. Key challenges include the difficulty in measuring the precise impact of sustainability practices on financial performance due to the diversity of metrics and inconsistent reporting standards across

industries (Pham et al., 2021). One proposed solution to address these challenges is the adoption of the balanced scorecard approach to financial performance assessment (Kaplan & Norton, 1993). Despite its potential benefits, however, there remains limited understanding of how effectively the balanced scorecard framework can capture the full spectrum of impacts from corporate environmental sustainability initiatives (Gupta & Gupta, 2020). Therefore, this study hypothesised that:

H_1: Corporate environmental sustainability positively leads to financial performance.

Corporate environmental sustainability and customer performance

Previous studies have highlighted the considerable impact of corporate environmental sustainability on organisational effectiveness (Jo et al., 2015; Naidoo & Gasparatos, 2018). Gupta and Gupta conducted a survey involving 200 participants from Indian businesses, revealing that corporate environmental sustainability positively influences customer performance. Specifically, their research suggests that adopting environmentally responsible practices can enhance customer perceptions, foster loyalty, and increase satisfaction. Moreover, companies that prioritise sustainability are likely to appeal to environmentally conscious consumers who prefer products and services from socially responsible brands (Calza et al., 2023). These findings highlight the strategic advantage of integrating sustainability into business practices, not only in enhancing customer relationships but also in aligning with consumer values and preferences for sustainability. However, further exploration is necessary to fully understand the specific mechanisms through which environmental initiatives impact customer performance across different industries and cultural contexts. Specifically, within a developing African country's oil and gas sector such as Ghana. Hence, this study hypothesised that:

H_2: Corporate environmental sustainability positively leads to customer performance.

Corporate environmental sustainability and internal-business process performance

CES is critical for long-term business success (Tutore & Sorrentino, 2021). It involves reducing negative environmental impacts through sustainable practices such as cutting carbon emissions, minimizing waste, and using resources efficiently (Dadhich & Hiran, 2022). Research suggests that CES improves internal-business process performance by enhancing reputation, customer loyalty, and operational efficiency (Eisner et al., 2022). Sustainable practices lead to cost savings, better profitability, and competitive positioning (Pimenov et al., 2022). Firms with high environmental performance often experience better financial outcomes due to these operational and reputational advantages (Gupta & Gupta, 2020; Khan et al., 2023). Therefore, this study hypothesised that:

H_3: Corporate environmental sustainability positively leads to internal-business process performance.

Corporate environmental sustainability and learning and growth performance

The relationship between corporate environmental sustainability and learning and growth performance has increasingly captured scholarly attention (Gupta & Gupta, 2020). Achdiat et al. (2023) argue that sustainability initiatives can serve as catalysts for organisational learning and innovation by fostering a culture centred on environmental stewardship and responsibility. Employees actively involved in sustainability efforts are likely to cultivate new skills, knowledge, and capabilities that enhance organisational resilience and adaptability (DiBella et al., 2023). For instance, initiatives like implementing sustainable practices or engaging in environmental audits can prompt employees to develop problem-solving abilities and enhance their understanding of sustainability challenges. Despite theoretical support for these benefits,

empirical research directly examining the impact of corporate environmental sustainability on learning and growth performance remains sparse. Existing studies often overlook this dimension within the broader context of oil and gas sustainability practices (Gupta & Gupta, 2020). Based on these arguments, the current study hypothesised that:
H_4: Corporate environmental sustainability positively leads to learning and growth performance.

Customer orientation as a moderator between corporate environmental sustainability and firm performance dimensions

Customer orientation could moderate the relationship between corporate environmental sustainability initiatives and firm performance. This relationship highlights how aligning with customer expectations on sustainability impacts company success. Customer orientation involves understanding customer needs, preferences, and values (Ismail, 2023; Zaman & Kusi-Sarpong, 2024). Companies adopt sustainability practices in response to consumer demand for ethically sourced products and eco-friendly practices (Gallan et al., 2024). Such initiatives can enhance customer loyalty, attract environmentally conscious consumers, and improve brand reputation (Le et al., 2024).

Customer orientation influences how sustainability efforts affect profitability, customer performance, and operational efficiency. Companies integrating customer feedback into sustainability strategies can develop products that meet market demands while minimizing environmental impact (Calza et al., 2023). This approach boosts customer satisfaction and innovation, enhancing financial performance (Al-Shammari, 2023). However, challenges arise in balancing customer demands with sustainability, especially in industries with complex supply chains or regulations (Crittenden et al., 2011). Hence, this study proposes the following hypotheses:
H_5: Customer orientation significantly strengthens the relationship between CES and FP.
H_6: Customer orientation significantly strengthens the relationship between CES and CP.
H_7: Customer orientation significantly strengthens the relationship between CES and IBPP.
H_8: Customer orientation significantly strengthens the relationship between CES and LGP.

Competitor orientation as a moderator between corporate environmental sustainability and firm performance dimensions
Competitor orientation can significantly moderate the relationship between corporate environmental sustainability and firm performance (Feng et al., 2019). This approach emphasizes how companies' responses to competitive pressures influence sustainability outcomes (Reuter et al., 2012). Competitor orientation focuses on understanding and reacting to competitors' strategies (Narver et al., 2004; Slater & Narver, 2000). In sustainability, companies adopting this approach monitor rivals' practices to benchmark and identify opportunities for differentiation (Liu, 2013). By leveraging competitor insights, firms can align offerings with consumer preferences and capitalize on sustainable market opportunities (Baah et al., 2024; Kuo et al., 2022).

A competitor-oriented approach may lead companies to invest in sustainable technologies that reduce costs, improve efficiency, and boost profitability (Jiang et al., 2020). Moreover, positioning as leaders in sustainability strengthens brand image and attracts eco-conscious consumers (Borah et al., 2023). Despite its strategic importance, competitor orientation's role in sustainability remains underexplored (Gupta & Gupta, 2020). Hence, this study proposes the following hypotheses:

H_9: Competitor orientation significantly strengthens the relationship between CES and FP.
H_{10}: Competitor orientation significantly strengthens the relationship between CES and CP.
H_{11}: Competitor orientation significantly strengthens the relationship between CES and IBPP.
H_{12}: Competitor orientation significantly strengthens the relationship between CES and LGP.

Inter-functional coordination as a moderator between corporate environmental sustainability and firm performance dimensions

Inter-functional coordination integrates efforts across departments like operations, marketing, finance, and supply chain management to embed sustainability strategies throughout an organization (Mukhtar et al., 2023). In sustainability, operations may focus on energy efficiency, while marketing communicates these efforts, boosting brand reputation and loyalty (Asiedu et al., 2023; Murillo Oviedo et al., 2021). Effective collaboration fosters innovation, reduces costs, and improves efficiency (Al-Omoush et al., 2022; Brown et al., 2020). Cross-functional teams can optimize product design and supply chains to reduce environmental impacts, enhancing competitiveness (Montabon et al., 2007). Moreover, coordination facilitates organizational learning, accelerating sustainability adoption and improving performance (Gupta & Gupta, 2020). Despite its benefits, this construct's role in linking sustainability to firm performance remains underexplored (Gupta & Gupta, 2020). Hence, the following hypotheses are proposed:

H_{13}: Inter-functional coordination significantly strengthens the relationship between CES and FP.
H_{14}: Inter-functional coordination significantly strengthens the relationship between CES and CP.
H_{15}: Inter-functional coordination significantly strengthens the relationship between CES and IBPP.
H_{16}: Inter-functional coordination significantly strengthens the relationship between CES and LGP.

Regulatory awareness as a moderator between corporate environmental sustainability and firm performance dimensions

Regulatory awareness involves staying informed about environmental laws and policies that affect business operations. Companies prioritizing sustainability often do so to comply with regulations and anticipate future developments (Partiti, 2022; Schilling-Vacaflor & Gustafsson, 2024). This proactive approach helps mitigate compliance risks and capitalize on regulatory incentives (Kalubanga & Mbekeka, 2024). Effective environmental management can lead to cost savings, improved financial performance, and waste reduction (Awewomom et al., 2024). Meeting or exceeding regulations can enhance brand reputation, appealing to environmentally conscious consumers (Khan et al., 2024). Additionally, integrating environmental considerations into operations boosts efficiency and reduces impacts (Javaid et al., 2022).

Maintaining regulatory awareness fosters organizational learning, improving employee skills and innovation related to sustainability (Akinboade & Kinfack, 2012; Huang et al., 2020). However, navigating complex regulatory landscapes across regions and industries poses challenges (Aragòn-Correa et al., 2020). Balancing compliance with strategic sustainability goals requires proactive engagement with regulators and stakeholders (Kalubanga & Mbekeka, 2024). Based on these arguments, the following hypotheses are proposed:

H_{17}: Regulatory awareness significantly strengthens the relationship between CES and FP.
H_{18}: Regulatory awareness significantly strengthens the relationship between CES and CP.
H_{19}: Regulatory awareness significantly strengthens the relationship between CES and IBPP.

H_{20}: Regulatory awareness significantly strengthens the relationship between CES and LGP.

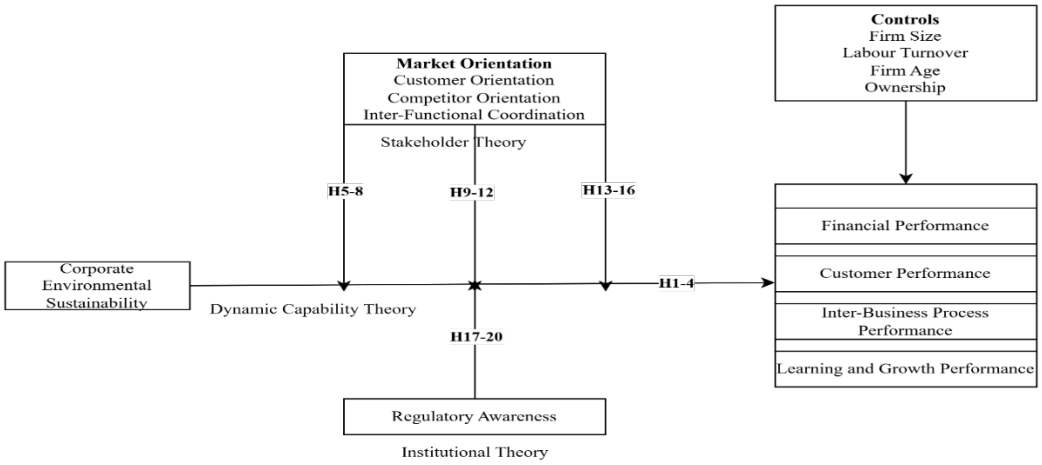


Figure 1: Proposed conceptual model: Source: Author's Own Creation

Methodology

Questionnaire design

This research used a questionnaire to collect data on nine constructs. Corporate environmental sustainability was measured with six items from Aktin and Gergin (2016). Firm performance dimensions were adapted from Karabulut (2015) with six financial, five customer, four internal-business, and six learning and growth items. Market orientation was measured using six customer orientation, four competitor orientation, and four inter-functional coordination items from Narver and Slater (1990). Regulatory awareness had six items from Zhu et al. (2017). A Likert scale ranging from "1 strongly disagree" to "5 strongly agree" was used.

Pretest

In this study, a pilot test of 41 participants was implemented to ensure the reliability and validity of the questionnaire. Following this, a reliability analysis of the latent constructs was performed using Cronbach's alpha. The results indicated that the Cronbach's alpha values for all latent constructs were above 0.75.

Data collection

An online questionnaire was created for this research, and respondents were recruited via social media using the snowballing technique. The study received 382 responses out of 470, yielding a response rate of 81.28%, surpassing the recommended 70% rate (Nulty, 2008), ensuring robust data. Most respondents (60.7%) are from the upstream sector, 85.1% represent indigenous firms, and 39.3% are operational/bottom level. A higher proportion are male (66.0%), with the largest age group being 31-40 years (41.4%). Additionally, 68.6% have been employed for under 10 years, 27.7% work in firms with 31-40 years of operation, and 63.1% hold a master's degree.

Table 1: Demographic Characteristics

Demographic Questions	Frequency (382)	Percent (%)
Which sector does your firm belong to?		
Downstream	49	12.8
Downstream regulator	6	1.6
Midstream	35	9.2
Midstream regulator	2	0.5
Power producer	3	0.8
Power transmission/ distribution	9	2.4
Service	32	8.4
Upstream	232	60.7
Upstream regulator	14	3.7
Is your firm an indigenous organization?		
No	57	14.9
Yes	325	85.1
Indicate your level in your firm?		
Operational/ Bottom Level	150	39.3
Strategic / Top Level	86	22.5
Tactical / Middle Level	146	38.2
Gender		
Female	129	33.8
Male	252	66.0
Prefer not to say	1	0.3
What is your age?		
20-30 years	84	22.0
31-40 years	158	41.4
41-50 years	91	23.8
51-60 years	45	11.8
61-70 years	3	0.8
Above 70 years	1	0.3
How long have you been employed?		
11-20 years	99	25.9
21-30 years	16	4.2
31 years and above	5	1.3
less than 10 years	262	68.6
How long has your firm been in business?	Frequency (382)	Percentage (%)
0 - 10 years	47	12.3
11 - 20 years	84	22.0
21-30 years	30	7.9
31-40 years	106	27.7
41-50 years	69	18.1
Above 51 years	46	12.0
What is your level of education?		
Bachelors	111	29.1
Diploma	5	1.3
Masters	241	63.1

Master's plus Chartered Accountant	1	.3
PhD	21	5.5
PLC	1	.3
Professional	2	.5

Source: Authors Own Creation

Results

The Confirmatory Factor Analysis (CFA) was conducted using SPSS-AMOS Structural Equation Modelling (SEM). Covariance-based SEM was chosen over variance-based SEM due to the large sample size and normally distributed data (Hair et al., 2017). It is also suitable for high loading or well-defined indicators (Hair et al., 2009). A factor loading cut-off of 0.50 was applied, as recommended by Fornell and Larcker (1981), to assess item reliability. Items with loadings below 0.50 were removed, improving model validity and reliability. The removal of four IFC items impacted its construct validity, leading to the entire IFC construct's exclusion (Byrne, 2013; Tabachnick et al., 2013).

Table 2 Fit Indices for Measurement Model

Fit Indices	Acceptable Thresholds	Fit Results (Before Deletion)	Fit Result (After Deletion)
$\chi 2$ /df	≤ 3	2.705	1.825
CFI	≥ 0.90	0.891	0.961
TLI	≥ 0.90	0.880	0.953
NFI	≥ 0.90	0.838	0.918
RMSEA	≤ 0.08	0.067	0.047

Source: Author's Own Creation

Table 3 Confirmatory Factor Analysis

Constructs	Codes	Loadings	AVE	CR	CA
Regulatory Awareness			0.711	**0.937**	.885
	RA3	0.781			
	RA2	0.881			
	RA1	0.821			
	RA5	0.859			
	RA6	0.900			
	RA4	0.813			
Customer Orientation			0.656	**0.919**	.869
	CO3	0.791			
	CO4	0.821			
	CO6	0.806			
	CO2	0.845			
	CO5	0.781			
	CO1	0.813			
Financial Performance			0.676	**0.926**	.880
	FP3	0.806			
	FP2	0.793			
	FP5	0.858			
	FP6	0.789			

	FP1	0.834			
	FP4	0.851			
Competitor Orientation			0.659	**0.853**	.881
	COMPO3	0.802			
	COMPO2	0.795			
	COMPO4	0.838			
Corporate Environmental Sustainability			0.514	**0.799**	.879
	CES4	0.661			
	CES1	0.792			
	CES3	0.744			
	CES5	0.662			
Customer Performance			0.637	**0.808**	.876
	CP1	0.809			
	CP3	0.840			
	CP5	0.713			
	CP2	0.824			
Inter-Business Process Performance			0.572	**0.875**	.895
	IBPP2	0.714			
	IBPP4	0.757			
	IBPP1	0.795			
Learning and Growth Performance			0.559	**0.717**	.880
	LGP2	0.718			
	LGP5	0.776			

Source: Author's Own Creation
Note: AVE; Average Variance Extracted, CA; Cronbach's Alpha, CR; Composite Reliability

The discriminant validity was also tested, and the square root of the AVE were greater than the correlation coefficients, which is an evidence of good discriminant validity in Table 3 (Fornell and Lacker, 1981). Additionally, the correlation coefficients showed in Table 4 were not above 0.80, indicating multicollinearity is not an issue within the data set (Hair *et al*., 2010).

Table 4 Inter-Correlation Matrix and Discriminant Validity

Constructs	1	2	3	4	5	6	7	8
RA	**0.843**							
CO	0.669***	**0.81**						
FP	0.507***	0.620***	**0.822**					
COMPO	0.519***	0.777***	0.536***	**0.812**				
CES	0.639***	0.780***	0.654***	0.618***	**0.717**			
CP	0.482***	0.686***	0.793***	0.582***	0.659***	**0.798**		
IBPP	0.306***	0.510***	0.489***	0.505***	0.448***	0.597***	**0.756**	
LGP	0.673***	0.804***	0.572***	0.792***	0.687***	0.648***	0.494***	**0.748**

Note: The bold diagonal is the square root of AVE; for discriminant validity, the square root of AVE should be higher than the off-diagonal variables.
Source: Author's Own Creation

Structural model

To examine the structural model and test the hypotheses, the study utilised the CB-SEM to assess the relationships between the variables. The findings of the proposed relationships or hypotheses are presented in Table 6 below. Prior to this, a thorough analysis of the structural model was performed to further enhance the fit indices of the data. The findings in Table 5 shows that all the indices are within the recommended threshold.

Table 5 Fit Indices for Structural Model

Fit Indices	Acceptable Thresholds	Fit Results
$\chi 2$ /df	≤ 3	2.775
CFI	≥ 0.90	0.945
TLI	≥ 0.90	0.930
NFI	≥ 0.90	0.918
RMSEA	≤ 0.08	0.068

Source: Author's Own Creation

The hypothesised paths were tested after structural model was conducted, and all the indices indicated a good fit. The beta estimates, SE, t values, p values, and decisions can be seen in Table 6 below.

Table 4.7 Direct Path Relationships

Paths			Estimate	S.E.	C.R.	P
LGP	<---	Firm Age	-.008	.040	-.208	.835
FP	<---	Firm Age	-.045	.038	-1.196	.232
IBPP	<---	Firm Age	-.027	.041	-.653	.514
CP	<---	Firm Age	-.126	.035	-3.612	***
LGP	<---	Ownership	.259	.108	2.393	.017
FP	<---	Ownership	.194	.101	1.921	.055
IBPP	<---	Ownership	-.052	.110	-.473	.637
CP	<---	Ownership	.184	.093	1.976	.048
LGP	<---	Firm Size	.094	.051	1.844	.065
FP	<---	Firm Size	.051	.047	1.085	.278
IBPP	<---	Firm Size	.076	.052	1.469	.142
CP	<---	Firm Size	.049	.044	1.120	.263
LGP	<---	Labour Turnover	.085	.061	1.411	.158
FP	<---	Labour Turnover	-.116	.057	-2.045	.041
IBPP	<---	Labour Turnover	-.035	.062	-.567	.571
CP	<---	Labour Turnover	-.051	.052	-.983	.326
FP	<---	CES	.516	.039	13.293	***
CP	<---	CES	.474	.036	13.224	***
IBPP	<---	CES	.331	.042	7.820	***
LGP	<---	CES	.485	.042	11.659	***

Source: Author's Own Creation
Note(s): ****p ≤ 0.001; **p ≤ 0.01; *p ≤ 0.05*

The finding from Table 6 showed the direct relationship between the independent variable and the dependent variables, and the moderation analysis. The results indicated that CES had a positive significant impact on FP (S.E. = 0.039, C.R. = 13.293), supporting H1. CES had a positive significant effect on CP (S.E. = 0.036, C.R. = 13.224), confirming H2. CES had a

positive significant impact on IBPP (S.E. = 0.042, C.R. = 7.820), indicating that H3 was supported. CES showed a positive significant effect on LGP (S.E. = 0.042, C.R. = 11.659), revealing that H4 was confirmed.

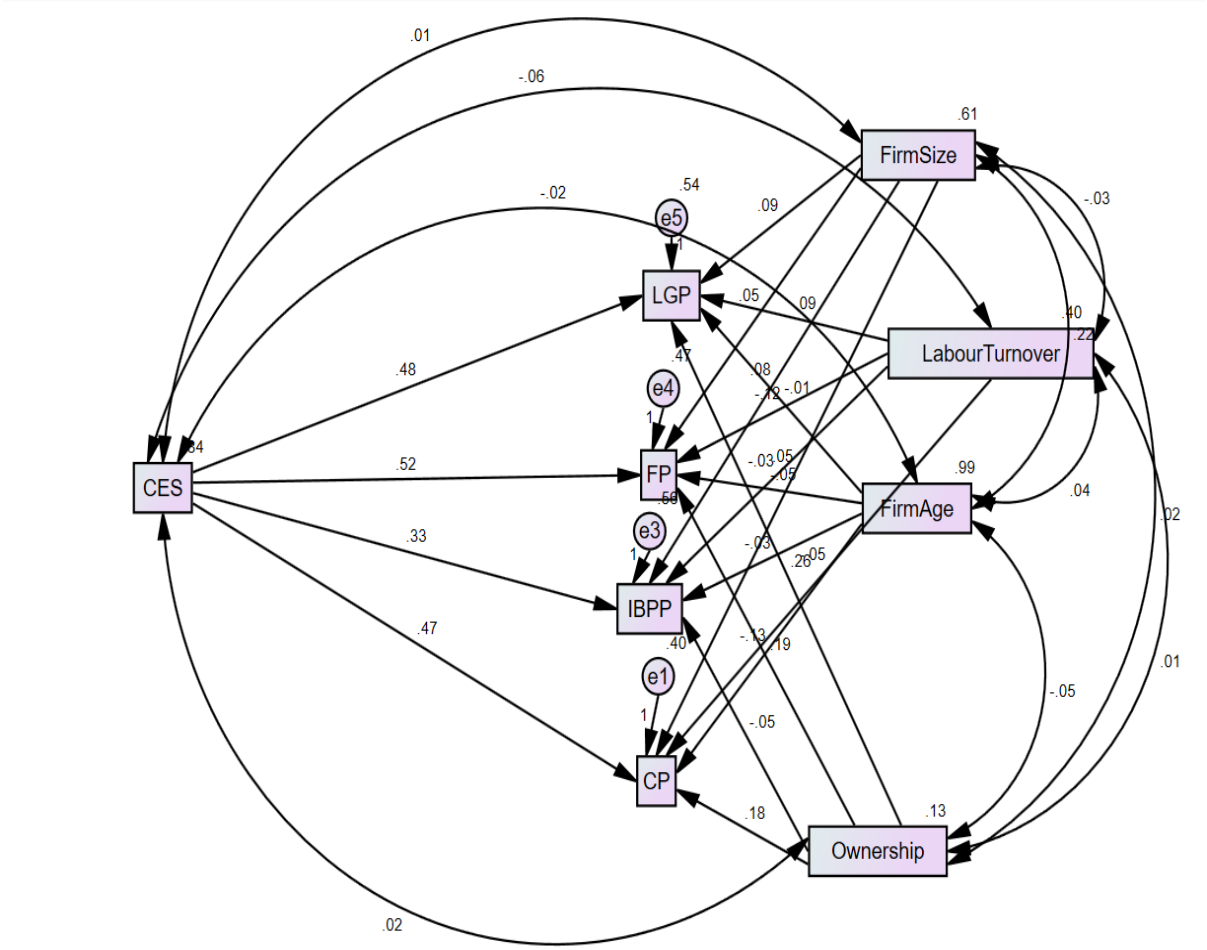


Figure 2: Impact of CES on Performance Dimensions

Source: Author's Own Creation

Table 4.8 Moderators Path Relationships

Moderators			Estimate	S.E.	C.R.	P
LGP	<---	Firm Age	-.022	.036	-.614	.540
FP	<---	Firm Age	-.051	.036	-1.405	.160
IBPP	<---	Firm Age	-.028	.039	-.702	.483
CP	<---	Firm Age	-.126	.033	-3.842	***
LGP	<---	Ownership	.085	.096	.889	.374
FP	<---	Ownership	.102	.098	1.043	.297
IBPP	<---	Ownership	-.159	.106	-1.491	.136
CP	<---	Ownership	.062	.088	.702	.482
LGP	<---	Firm Size	.112	.045	2.496	.013
FP	<---	Firm Size	.064	.046	1.389	.165
IBPP	<---	Firm Size	.087	.050	1.754	.079
CP	<---	Firm Size	.067	.041	1.614	.106
LGP	<---	Labour Turnover	.085	.053	1.593	.111
FP	<---	Labour Turnover	-.118	.054	-2.174	.030
IBPP	<---	Labour Turnover	-.018	.059	-.297	.767
CP	<---	Labour Turnover	-.038	.049	-.777	.437
FP	<---	CES*CO	.024	.011	2.100	.036
CP	<---	CES*CO	.034	.014	2.514	.012
IBPP	<---	CES*CO	.020	.013	1.556	.120
LGP	<---	CES*CO	.052	.012	4.251	***
FP	<---	CES*COMPO	.068	.016	4.292	***
CP	<---	CES*COMPO	.061	.019	3.200	.001
IBPP	<---	CES*COMPO	.032	.018	1.830	.067
LGP	<---	CES*COMPO	.059	.017	3.427	***
FP	<---	CES*RA	-.004	.014	-.316	.752
CP	<---	CES*RA	-.027	.017	-1.592	.111
IBPP	<---	CES*RA	.032	.016	2.036	.042
LGP	<---	CES*RA	.042	.015	2.711	.007

Source: Author's Own Creation
Note(s): ***$p \leq 0.001$; **$p \leq 0.01$; *$p \leq 0.05$***

Customer orientation (CO) strengthens the relationships between CES and FP, CP, and LGP, supporting H5, H6, and H8. However, CO does not strengthen the CES-IBPP relationship, so H7 is not supported. Competitor Orientation (COMPO) strengthens CES-FP, CP, and LGP, supporting H9, H10, and H12, but not CES-IBPP (H11). Inter-functional coordination was not tested due to item loadings below the 0.50 cut-off. Regulatory Awareness (RA) strengthens CES-IBPP and CES-LGP, supporting H19 and H20, but not CES-FP or CES-CP, so H17 and H18 are unsupported.

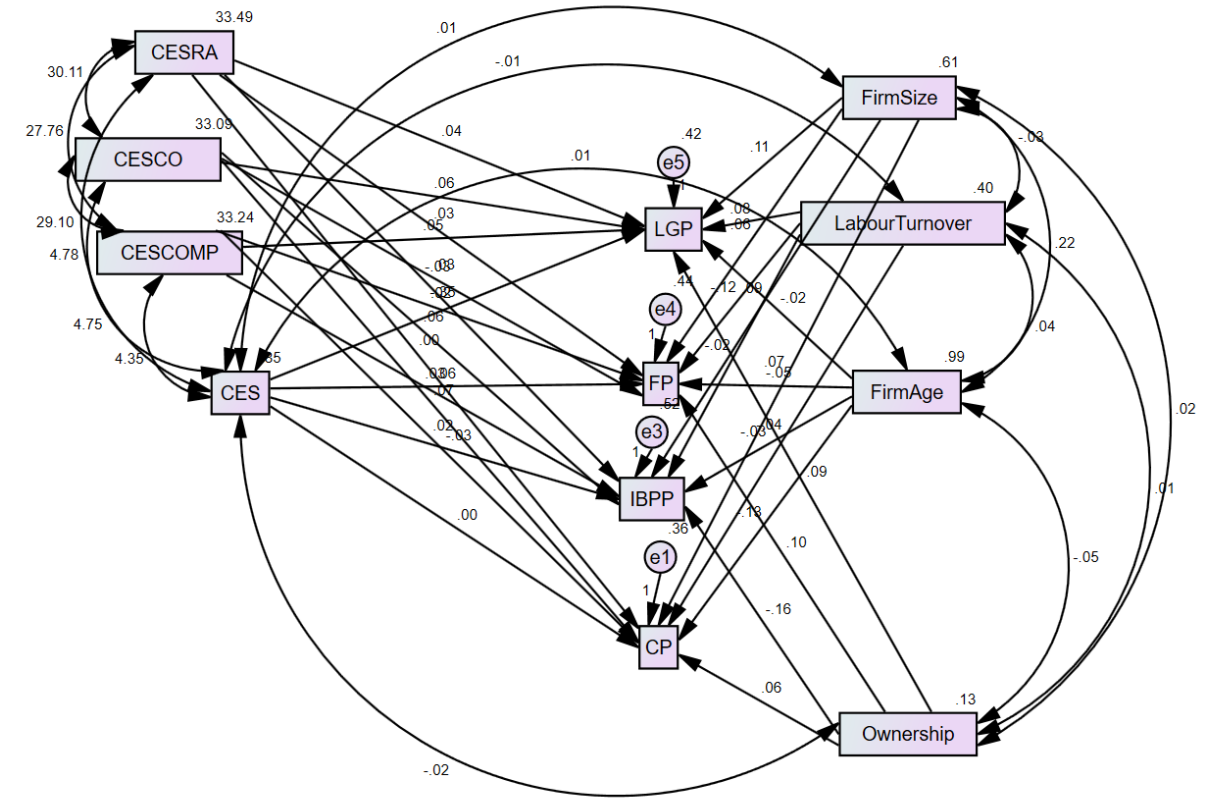


Figure 3: Moderating roles of CO, COMPO and RA.

Source: Author's Own Creation

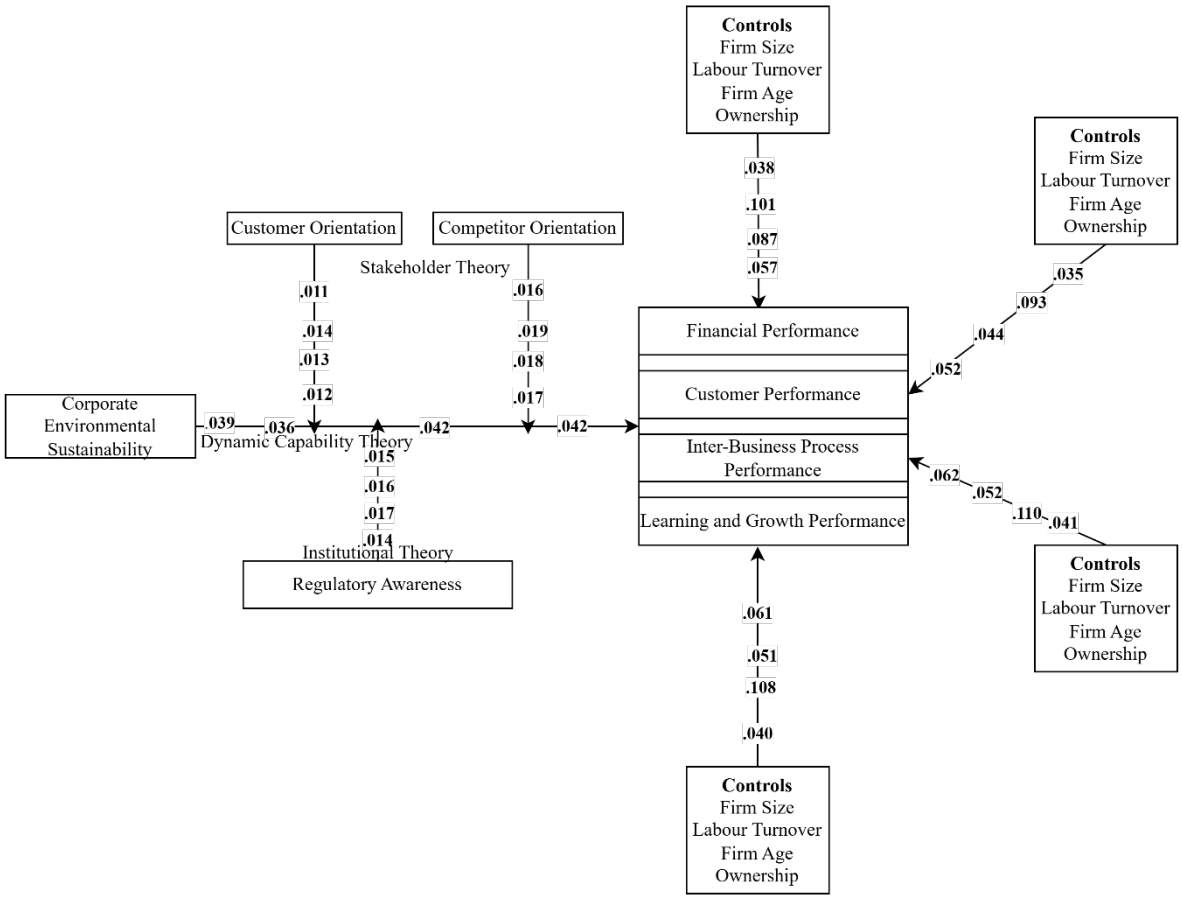


Figure 4: Tested Conceptual Model

Source: Author's Own Creation

Conclusions

The main objective of this study was to explore how corporate environmental sustainability (CES), using dynamic capabilities and stakeholder theories, can enhance firm performance, moderated by market orientation and regulatory awareness. Results showed CES positively impacts financial performance (Gupta & Gupta, 2020), customer performance (Calza et al., 2023), inter-business processes (Gupta & Gupta, 2020), and learning and growth (Achdiat et al., 2023). This highlights CES's role in improving operational efficiency, fostering innovation, and boosting employee learning (DiBella et al., 2023; Lu et al., 2023).

Customer orientation significantly moderates the relationship between CES and financial performance (Danso et al., 2022), improving brand loyalty and financial gains (Le et al., 2024). It also enhances customer performance by aligning sustainability with consumer demands (Gallan et al., 2024). However, it did not significantly moderate the relationship between CES and inter-business process performance (Liao et al., 2020). Customer orientation also strengthens learning and growth by promoting innovation and employee development (Al-Shammari, 2023). This study fills a gap in sustainability literature by exploring customer orientation as a moderator.

Competitor orientation strengthens the relationship between CES and financial performance, customer performance, and learning and growth. Firms focused on both sustainability and

competitor strategies can better translate sustainability efforts into financial success (Gupta & Gupta, 2020). Competitor-oriented firms are better positioned to outperform rivals by adopting sustainable practices that attract customers and improve profitability (Feng et al., 2019; Reuter et al., 2010; Tyler et al., 2020).

Regulatory awareness weakens the relationship between CES and financial performance, indicating that firms may face cost burdens that hinder financial outcomes (Ahenkora & Boateng, 2023; Sarkis et al., 2010). It also weakens CES's impact on customer performance in Ghana's emerging economy (Ahenkora & Boateng, 2023; Christmann, 2000). However, regulatory awareness strengthens CES's impact on inter-business process performance and learning and growth, as firms improve operational efficiency and foster innovation (Partiti, 2024; Akinboade & Kinfack, 2012; Huang et al., 2020).

Theoretical implications

This study enriches sustainability literature by examining the moderating roles of market orientation and regulatory awareness in linking CES to performance dimensions using dynamic capabilities theory. The findings reveal that market orientation (customer and competitor orientation), and regulatory awareness significantly strengthen the relationships between CES and performance dimensions (financial, customer, inter-business process, and learning and growth performance), a gap in prior research, especially in emerging economies like Ghana (Gupta & Gupta, 2020). The study highlights how market orientation enhances understanding of CES and performance.

Additionally, the study broadens the understanding of regulatory awareness as a moderator between CES and performance dimensions, showing that energy firm performance is strongly influenced by regulatory awareness. By integrating dynamic capabilities theory with stakeholder and institutional theories, this research develops a conceptual model exploring CES and performance dimensions. It reveals the serial moderating roles of market orientation and regulatory awareness in linking CES to performance, addressing an unexplored gap in sustainability literature.

Unlike previous studies, which focused solely on the direct impact of CES on performance (Gupta & Gupta, 2020), this research adds market orientation and regulatory awareness as moderators, offering a better understanding of stakeholders' roles in energy sector performance. Including market orientation and regulatory awareness in the Gupta and Gupta (2020) model demonstrates how energy firms' understanding of the market and regulations influences their sustainability efforts.

Finally, the study uncovers the complex moderation mechanism between market orientation, regulatory awareness, and CES, showing significant moderating effects on financial, customer, inter-business process, and learning and growth performances, except for specific interactions. These findings contribute to the underexplored literature on CES in the energy sector and provide valuable insights for improving sustainability in energy firms.

Managerial implications

For practitioners, the outcome of this study must be useful for energy firms and policy makers in the following ways. Energy firms should actively seek to understand and align their sustainability practices with the expectations of their customers. Also, the study found that regulatory awareness plays a pivotal role in driving corporate environmental sustainability within Ghana's energy sector. A deep understanding of environmental regulations and the

associated penalty for non-compliance is crucial for ensuring that firms stay on the right side of the law while reaping the benefits of sustainable practices. Further, energy firms in Ghana should prioritize building regulatory awareness among employees at all levels of the organization. Managers should invest in regular training programs that cover the latest environmental regulations, including those set forth by the Environmental Protection Agency, the Energy Commission, and the Petroleum Commission.

Limitations of the study and direction for future research

This study presents some notable limitations, which open avenues for further research. First, the research sample was limited to energy companies in Ghana, and as a result, the findings may not be generalisable to other countries or industries. Therefore, future research should consider expanding the scope to different countries or industries with diverse cultures and regulatory landscapes. Second, incorporating firm characteristics in future studies would provide a more enhanced understanding of how CES impacts performance across different types of organizations. It would also allow for more tailored recommendations to be made for companies with different profiles.

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METAVERSE AND SUSTAINABLE CONSUMPTION: CONSUMER EXPERIENCES, RESPONSE BEHAVIOUR, UNINTENDED CONSEQUENCES AND RESEARCH AGENDA

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Abstract

The adoption of sustainable consumption practices is promoted as a strategy for transitioning to a circular economy. However, consumers, who are key stakeholders towards this transition, are becoming more sophisticated due to the rapid development of the metaverse that empowers them to search, evaluate and select products of their choice. Emerging literature suggests that the rapid development of the metaverse offers opportunities and challenges for promoting sustainable consumption. Due to the novelty of the metaverse concept, a clear understanding of its role and implications on sustainable consumption in the context of organic food is still lacking. Against this background, this study employs the systematic review, to examine the role of the metaverse in sustainable consumption practices. A total of 25 studies were reviewed. The metaverse was found to promote sustainable consumption practices by enhancing perceived self-efficacy, digital green identity, social sustainability, dematerialisation and consumer well-being. The carbon footprint and energy consumption from metaverse technologies was identified as one the major unintended consequences of promoting sustainable practices in the metaverse.

Keywords: sustainable consumption practices; metaverse; consumer experiences; consumer response behaviour

Introduction

As economies are grappling with the human induced challenges of the anthropocene such as climate change, pollution and depletion of natural resources, there are increased calls to promote sustainable consumption practices (Meijers et al., 2022; Aglargoz & Aglargoz, 2024). The promotion of sustainable consumption practices at consumer level is one of the proposed interventions to address the anthropocene. This is crucial because human consumption behaviour is estimated to account for 19-29 percent of global greenhouse gas emissions (Heidenstrom & Hebrok, 2022; Meijers et al., 2022). The food and fashion industries as well as the tourism and hospitality sector are identified as the major drivers of consumer level greenhouse gas emissions (Rathi et al., 2022; Mohr et al., 2022; Aglargoz & Aglargoz, 2024). It is for this reason that concerted efforts are being made to promote the adoption of sustainable consumption practices in these sectors such as organic food, sustainable fashion and sustainable tourism. The promotion of sustainable practices resonates with the tenets of Sustainable Development Goal 12, which advocates for responsible production and consumption (United Nations, 2015).

Despite the economic, social and environmental benefits associated with the adoption of sustainable consumption practices, the actual performance of sustainable behaviours remains low (Meijers et al., 2022; aargoz & Aglargoz, 2024). The attitude-behaviour gap is a recurring finding in empirical studies (Biercewicz, 2024). This gap is depicted by consumers who report higher levels of environmental concern yet remain reluctant to engage in sustainability practices. In the context of organic food, consumers were found to experience challenges in evaluating the credence qualities (Mateo-Marquez et al., 2022). Moreover, the prevalence of greenwashing concerns is also diluting consumers' trust of sustainable consumption practices (Fella & Bausa, 2024). Another hurdle exists in the form of low self-efficacy beliefs as consumers perceive that their individual effort is not adequate enough to address grand challenges such as climate change (Meijers et al., 2022). Furthermore, consumers were found to perceive a psychological distance with environmental challenges and this is presumed to constrain the performance of sustainable behaviours (Meijers et al., 2022; Fella & Bausa, 2024).

The metaverse is emerging as a potential platform to capacitate consumers to embrace sustainable consumption practices (Borrello et al., 2020; Meijers et al., 2022; Pellegrino et al., 2023). With a critical mass of young consumers actively participating on metaverse platforms such as virtual reality, augmented reality, extended reality and block chain (Williams, 2021; Zhang et al., 2022; Barrera & Shah, 2023), we argue that consumers' ability to engage, interact and share sustainable consumption related information has been enhanced. Concurring with this view, Zhang et al. (2022) regard the metaverse as a futuristic and transformative digital space that offers massive opportunities to address environmental problems. Despite the potential of the metaverse to enhance the performance of sustainable practices, very little is known about consumers' experiences and conditions under which the metaverse direct consumers' sustainable consumption behaviour. As the metaverse continues to evolve, Shen et al. (2021) note that marketers of sustainable products and services are yet to fully comprehend opportunities and challenges presented by this platform. Similarly, Barrera and Shah (2023) note that some sustainable fashion brands are hesitant to enter into the metaverse with its complex ecosystem of digital platforms. The proliferation of metaverse platforms has also complicated efforts of developing a shared understanding of market opportunities, best practices and implications on performance of sustainability practices (Kolesova et al., 2020; Fuentes et al., 2021). In order to have a detailed understanding of the intersection between the metaverse and sustainable consumption practices, this study employs a systematic literature

review with the objective of creating a shared understanding of its potential to promote performance of sustainability practices.

By conducting a systematic literature review, this study seeks to provide input required for the development of coherent and effective strategies to promote sustainable consumption practices in the metaverse. Based on surveyed literature, there are no studies that have provided an integrated literature review with a focus on understanding the role of the metaverse in promoting consumer level sustainable consumption. This study contributes to literature by proposing a framework that seeks to predict human behaviour in the metaverse ecosystem. Specifically, this study seeks to address the following research objectives:

1) to explore the potential of the metaverse in promoting sustainable consumption practices,
2) to examine consumers' experiences and response behaviour as they interact with sustainability practices within the metaverse, and
3) to propose a framework that leverages on the power of the metaverse to promote sustainable consumption practices.

The findings of this study are expected to contribute to theory by shedding more light on the role of the metaverse as an emerging platform to promote the performance of sustainable behaviours. The next section reviews literature on the metaverse and sustainable practices.

Literature review

Metaverse and sustainable consumption practices

The rapid development of the metaverse is fast changing consumer behaviour including multifaceted implications on sustainable consumption practices (Pellegrino et al., 2023). The metaverse is a virtual environment where individuals interact with each other and virtual objects with the added advantage of creating and sharing content (Dwivedi et al., 2022). The metaverse is conceptualised as the convergence of digital platforms such as virtual reality (VR), augmented reality (AR), extended reality (XR), mixed reality (MR) and block chain (Dwivedi et al., 2022; Gursoy et al., 2022; Wong et al., 2023). The metaverse offers new innovative operating capabilities to organisations in the form of virtual business models, cost reduction opportunities, new product development, improved customer engagement and brand recognition (Kraus et al., 2022; Koohang et al., 2023).

The role of the metaverse in promoting sustainable consumption practices is widely acknowledged in literature (Hoenink et al., 2020; Smit et al., 2021; Arpaci et al., 2022). The metaverse has the potential to reduce carbon emissions as digital platforms reduce the overreliance on physical environments such as brick and mortar stores which consume large volumes of energy and water (Arpaci et al., 2022). However, it is worth noting the transition to the metaverse requires large investments in clean energy technologies and this may act as a constraining factor for developing economies (Bibri & Allam, 2022). Thus, it is important to consider the net return on sustainability investment when transitioning to the metaverse.

The metaverse was found to have the potential of enhancing sustainable consumption practices such as organic products (Smit et al., 2021; Meijers et al., 2022), sustainable tourism (Boluk et al., 2019; Nunkoo et al., 2023) and sustainable fashion (Yan, 2022; Jiang et al., 2023). For example, digital nudges and gamification techniques were found to play a crucial when promoting sustainable products in virtual environments (Smit et al., 2021; Pellegrino et al.,

2023). Also, the potential of block chain technology to minimise greenwashing concerns by ensuring transparency in the supply chain was confirmed (Nunkoo et al., 2023). As the metaverse offers virtual alternatives to physical tourism activities, it offers the advantage of reducing carbon emissions associated with physical transportation including the growing problem of over tourism (Martins et al., 2023; Nunkoo et al., 2023). Although the metaverse is emerging as a promising tool to enhance sustainability, researchers (e.g., Smit et al., 2021; Nunkoo et al., 2023, Pellegrino et al., 2023) emphasise the need to harmonise its practice to enhance its viability as a business model.

Metaverse and underpinning models

This study is supported by the UTAUT2 and stimulus-organism-response (SOR) models. The UTAUT2 was developed by Venkatesh et al. (2012) to understand consumers' acceptance and experiences with new technologies. Consistent with previous studies (e.g., Arpac et al., 2022) the UTAUT2 is utilised in this study to understand consumers' acceptance of new immersive technologies such as the metaverse. Drawing from the UTAUT2, performance expectancy, effort expectancy, social influence, facilitating conditions and hedonic motivation were identified as factors that influence technology acceptance and user experience. Performance expectancy measures the extent to which individuals perceive that the use of technology provides benefits (Venkatesh et al., 2012). Content sharing, co-creation of products or services and joint problem solving are identified as some of the benefits associated with the participating in the metaverse (Koohang et al., 2023).

Effort expectancy assesses the extent to which technology is perceived as ease to use (Venkatesh et al., 2012). In the context of this study, effort expectancy denotes the technical skills, expertise and knowledge required to operate in the metaverse. Social influence examines the extent to which an individuals' peers, family and social networks perceive that the use of technology is important (Venkatesh et al., 2012). In the context of this study, we argue that the virtual communities in the metaverse entice individuals to adopt immersive metaverse technologies. Facilitating conditions measures the availability of technological resources and technical support required to adopt new technology (Venkatesh et al., 2012). Thus, consumers' accesses to technological tools as well as their level of technical expertise are regarded as crucial to operate in virtual environments. Hedonic motivation measures the pleasure associated with the use of technology (Arpaci et al., 2022). In the context of the metaverse, the ability to generate and share content using gamification techniques create a sense of hedonism to users (Dwivedi et al., 2022).

The stimulus-organism-response (SOR) model, which was developed by Mehrabian and Russell (1974) is employed to understand consumers' experiences and response behaviour as they interact with sustainable consumption stimuli in the metaverse. The stimulus refers to the external factors that arouse an individual's psychological state (Peng & Kim, 2014). In the context of this study, the stimulus is the marketing messages that are used to promote the performance of sustainable consumption practices. Organism denotes an individual's perceptions, convictions, feelings and cognitive processes that develop when an individual is exposed to marketing stimuli (Mehrabian & Russell, 1974). Organism herein refers to consumers' emotional and cognitive changes that occur as they interact with sustainable consumption stimuli. The response refers to the behavioural outcomes which can be favourable or unfavourable (Mehrabian & Russell, 1974). The desired consumer response in the context of this study is the performance of sustainable consumption practices.

Materials and methods

Research method and search strategy

A systematic literature review (SLR) was employed as the research methodology. The SLR was employed because it is recommended for studies focusing on emerging concepts where there is a need to harmonise meaning and practice (Creswell, 2009). This is the case in the context of the metaverse which is regarded as an emerging novel concept whose application in consumer behaviour is still evolving (Nunkoo et al., 2023, Pellegrino et al., 2023). SLR was conducted using the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) technique was used as the guiding framework (Moher et al., 2015). Organic food consumption, sustainable fashion and sustainable tourism were the three sustainable consumption practices which were of interest to this study. The following were used as search phrases: 'metaverse and sustainable consumption practices', 'metaverse and organic food consumption', 'metaverse and sustainable tourism', 'metaverse and sustainable fashion'.

Search databases and selection criteria

Science direct, Scopus, Web of Science and Google Scholar databases were used to search for relevant studies. The COVID-19 pandemic stimulated the use of the metaverse as a business platform (Arpac et al., 2022; Schiopu, et al., 2022). Therefore, peer –reviewed journal articles, book chapters and conference papers published from 2019 to 2024 were considered for SLR. Studies with a focus on the metaverse and sustainable consumption practices such as organic food, sustainable tourism and sustainable fashion were considered. Only studies written in English that employed a robust research method such as -quantitative, qualitative or mixed methods were selected. Studies that only discussed the technical aspects of the metaverse without a focus on sustainable consumption practices were excluded.

An iterative process was followed to select relevant studies. The titles, abstracts and full texts were assessed for eligibility. Studies that did not meet the inclusion criteria were excluded. A backward citation tracking strategy was also used to identify relevant articles. This involved the process of checking the reference lists of selected articles to check for suitable studies. The yielded 25 articles and were considered for the final analysis. Figure 1 shows the inclusion and exclusion criteria.

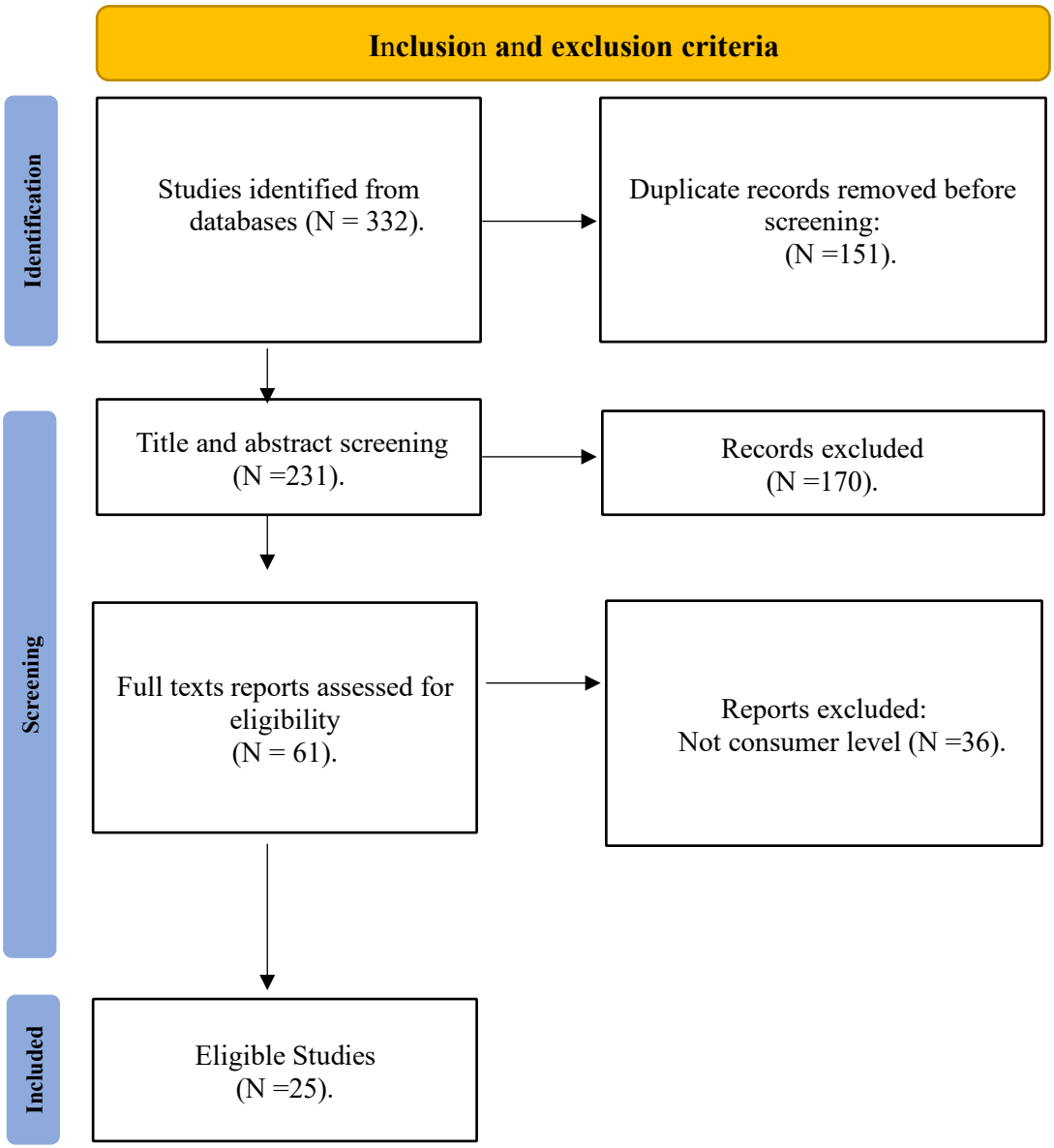


Figure 1: PRISMA Flowchart

Data extraction

The extraction of data from the selected 25 studies considered the theoretical and practical implications, the nature of the study, consumer experiences and response behaviour. Table 1 shows the names of journal articles and reports, authors and year of publication for the selected articles.

Table 1 Profile of selected studies

Journal	Authors	No. of articles
Current Issues in Tourism	Koo et al. (2023).	2
	Adnan et al. (2024).	
Environmental Communication	Özdemir et al. (2023).	1
International Journal of Contemporary Hospitality Management	Wong et al. (2023).	1
Tourism Review	Go and Kang, (2023	1
Journal of Hospitality Marketing & Management.	Gursoy et al. (2022).	1
Journal of Travel & Tourism Marketing	Chen et al. (2023).	1
Heliyon	Pellegrino et al. (2023).	1
Journal of Global Fashion Marketing	Profumo et al. (2024)	1
	Venturini and Columbano (2024).	
International Journal of Environmental Research and Public Health	Smit et al. (2021).	1
Sustainable Production and Consumption	Heidenstrøm and Hebrok (2022).	1
Sustainability	Li et al. (2020).	3
	Jauhiainen et al. (2022).	
	De Giovanni (2023).	
Journal of Retailing and Consumer Services	Xu et al. (2021).	2
	Fuentes et al. (2021).	
Food Quality and Preference	Dannera and Menapace (2020).	1
Journal of Fashion Marketing and Management	Mohr et al. (2022).	1
International Journal of Fashion Design, Technology and Education,	Sayem (2022).	1
International Journal of Behavioral Nutrition and Physical Activity	Hoenink et al. (2020).	1
Journal of Business Research	Barrera and Shah (2023).	1
International Journal of Production Economics	Lu et al. (2024)	1
International Journal of Information Management	Laukkanen et al. (2022).	1
Tourism Management	Fan et al. (2022).	1
Journal of Cleaner Production	Johri et al. (2024).	1
Total articles analysed		25

Data analysis

Descriptive and thematic approaches were used to analyse SRL data. This section presents the results of SLR which are clustered in five themes which include metaverse and sustainable consumption, consumer experiences, consumer response behaviour, and unintended consequences.

Results and discussion Metaverse and sustainable consumption practices

Metaverse and Sustainable Development Goals 12 and 13

The SRL revealed that the metaverse has multifaceted implications on sustainability consumption practices. The metaverse was found to contribute positively to the realisation of Sustainable Development Goals 12 and 13 (Siragusa & Tumino, 2022; Tučková & Balcarová, 2023; Biercewicz, 2024). The metaverse furthers the aspirations of SDG12 by reducing the physical consumption of resources and improving supply chain sustainability. Through the use of the tracking ability of block chain technology, SRL revealed that the metaverse promotes transparency and ethical sourcing of raw materials (Yang et al., 2021; Biercewicz, 2024). Studies reviewed however cautioned that supply chain transparency may only be enhanced when all stakeholders in the supply chain implement block chain technologies for traceability purposes. In the context of emerging markets, Wu et al. (2021) comprehensive supplier chain traceability may attract high operating costs which has the potential to reduce the viability of sustainability as a business model. In the tourism and hospitality sector, by offering virtual experiences, carbon emissions associated with physical travel are significantly minimised (Siragusa & Tumino, 2022; Liburd et al., 2022). In this way, the metaverse aligns with SDG 13 Climate Action, which seeks to mitigate greenhouse gas emissions. By minimising the need for traditional travel, the metaverse acts as a sustainable tool by preserving vulnerable tourist destinations from the growing challenge of over-tourism (Martins et al., 2023; Nunkoo et al., 2023).

Metaverse, greenwashing and perceived self-efficacy

The SRL revealed that the metaverse has the potential to address the pervasive challenge of greenwashing. The use of metaverse technologies was found to have the ability to empower consumers through the use of sensory analysis to assess the credence attributes of green products. This has the effect of promoting sustainable consumption by enhancing consumer trust (Escobar et al., 2021; Biercewicz, 2024). Thus, the metaverse through its sensory product evaluation capabilities contributes to sustainable consumption by safeguarding consumers from unscrupulous companies that use unsubstantiated claims to market green products. The use of block chain technology also allows consumers to have access to supply chain transparency information which empowers them to evaluate green product quality and entice them to be more willing to pay the premium price associated with sustainable products (Yang et al., 2021).

The results of SRL also affirmed the role of the metaverse as a tool for enhancing the environmental self-efficacy perceptions of consumers. It is established in sustainability literature that consumers perceive that their individual effort is not enough to address grand challenges such as climate change (Meijers et al., 2022; Biercewicz,2024). Literature reviewed showed that augmented reality and virtual reality technologies may be used as potent tools for promoting environmental awareness and imparting environmental knowledge. By observing in virtual environments how their individual and collective behaviours contribute to environmental sustainability, literature revealed (e.g., Meijers et al., 2019; Meijers et al., 2022; Biercewicz,2024) showed that consumers feel capacitated to address environmental challenges. For example, a study by Meijers et al. (2022) found that interactive environmental messages in virtual environments have the potential to stimulate consumers to engage in proenvironmental behaviours.

Metaverse and consumer experiences

Immersive experience

The SRL revealed that the metaverse gives consumers an immersive experience that allows them to interact and engage with sustainability practices oriented stimuli (Meijers et al., 2022;

Koo et al., 2022). Through multisensory immersion, the metaverse empowers consumers to assess the functional attributes of sustainable products and understand how they differ from conventional alternatives. The metaverse also accentuates consumers from being passive to active co-creators of sustainable products and services (Koo et al., 2022). The performance of sustainable behaviours in the metaverse was also found to be motivated by hedonism. The metaverse is a multi-channel environment and participants have the opportunity to interact with multiple devices with the advantage of creating several contextual scenarios with varying degrees of social interaction and collaboration. The higher levels of collaboration in virtual environments was found to foster collective efficacy to address environmental problems (Meijers et al., 2022), including promoting sustainable fashion consumption practices such as online sharing and rental (Profumo et al., 2024; Venturini & Columbano, 2024). This explains why the metaverse is also regarded critical to the development of a sharing economy (Profumo et al., 2024)

Digital green identity

The results of SRL revealed that participation in virtual environments may result in the development of a digital green identity (Fauville et al., 2020; Smit et al., 2021). This is facilitated by the self-expressive nature of the metaverse which enables users to develop their own unique identities. Studies reviewed indicated that the performance of sustainable behaviours is associated with a green self-identity which is associated with a green status (Smit et al., 2021). The desire for green status has resulted in the emergence of digital influencers who are championing the concept of sustainability in the metaverse (Gupta & Syed, 2022). The studies reviewed underscore the importance of leveraging on the expertise and credibility of digital influences to disseminate sustainable consumption messages through digital influencers. by tapping into the online interpersonal influence of digital influencers, studies reviewed recommended digital nudging as one of the most effective strategies to encourage the performance of sustainable consumption practices in the metaverse (Tsen & Cheng, 2021; Gupta & Syed, 2022).

Reconfiguration of social sustainability, dematerialisation and consumer well-being SRL results revealed that virtual communities in the metaverse also promote consumer wellbeing which is a form of social sustainability *(*Arpaci et al., 2022; Johriet al., 2024; De Giovanni, 2023). This is so because virtual communities accord consumers to the opportunity to escape from routine stressful daily activities. Studies reviewed also revealed that the desire to belong to a community of like-minded consumers improves the subjective and eudemonic well-being which can be used to promote the practice of sustainable consumption practices (Arpaci et al., 2022). In the context of the fashion industry, a review of studies by Mohr et al. (2022) as well as Venturini and Columbano (2024) showed that the metaverse promotes a sharing economy in the form of collaborative fashion consumption which promotes social sustainability. Moreover, the online fashion sharing platforms were found to actively promote dematerialisation which minimises overconsumption and depletion of resources. The emergence of online second-hand fashion consumption platforms is also another example of the role of the metaverse in promote social sustainability.

Metaverse and consumer response behaviour

Mixed results emerged from studies reviewed regarding consumers' response behaviour to the promotion of sustainable consumption practices in the metaverse (Lee et al., 2021; Ying et al., 2021; Lu et al., 2024). One stream of research (e.g., Bai et al., 2019; Canova et al., 2020; Li et

al., 2020) found that the metaverse technologies have significantly enhanced consumers' trust of organic food including consumption behaviour. The use of sensory evaluation techniques and **b**lock chain technology to track the implementation of sustainability practices is credited to the growth in consumer trust. The use of metaverse related digital technologies has been applauded for making it easier for consumers to adopt sustainable consumption practices (Borrello et al., 2020; Heidenstrøm & Hebrok, 2022). For example, the use of online food provisioning platforms is credited for stimulating organic food consumption and reduction of food waste by introducing novel strategies of food preparation and storage.

A sense of scepticism also emerged from another stream of studies reviewed (e.g., Wu et al., 2021; Ying et al., 2021; Lu et al., 2024). Alarmed by cases such as the Alibaba ''label scandal, consumers were found to doubt the reliability of digital technologies that are used to track the authenticity of sustainability claims of organic food (Wu et al., 2021). Similarly, in the context of sustainable tourism, environmental infidelity was identified as an emerging challenge (Ying et al., 2021). Environmental infidelity refers to the inability of the virtual environment to depict real world scenarios and is regarding as a form of misrepresentation. The degree of immersive experience associated virtual environments was also found to be dependent on the quality of the interface device (Melo et al. 2020; Cornelio et al., 2021; Wang et al., 2022). In this regard, consumers in emerging markets were found not to afford the cost of advanced virtual reality interface devices such as haptic-cue related applications.

Metaverse, sustainability practices and unintended consequences

Studies reviewed (e.g., Lange et al., 2020; Itten et al., 2020) underscored the need to consider the unintended consequences of transitioning to the metaverse. Virtual reality environments rely on the use of technological infrastructure that process and store large volumes of data. Such technology is associated with high levels energy consumption and greenhouse gas emissions. The use of block chain technology is also known to be energy-intensive whilst cloud computing data centres that support metaverse virtual environments also consumes more energy (Lange et al., 2020). Moreover, the mainstream adoption and participation of consumers in the metaverse may promote the ordering of more convenience food from online provisioning platforms (Borrello et al., 2020; Heidenstrøm & Hebrok, 2022). This will stimulate more demand for transportation and packaging services which will have the unintended consequences of generating more carbon emissions and packaging waste. Thus, the environmental implications of transitioning to the metaverse also need to be considered. The metaverse immersive environment has the potential to have adverse effects on consumer wellbeing. The possibility of consumers, if not monitored to engage in obsessive compulsive behaviour may not be ruled out (Ferguson & Colwell, 2020; Stankov & Filimonau, 2022). Thus, a mechanism of promoting consumer mindfulness in the use of the metaverse is required.

Managerial implications and research agenda

In order to address the mixed views that emerged from the SRL on the role of the metaverse in promoting sustainable consumption practices. The following research agenda is proposed with the objective of contributing to the understanding of the intersection between the metaverse and sustainable consumption practices.

Table 1 Proposed Research Agenda

Research focus area	Proposed research questions
Clean energy technologies and metaverse.	• To what extent does the metaverse aligns with NetZero targets? • What are the most effective strategies for quantifying the carbon footprint of metaverse technologies?
Metaverse and sustainable consumption behaviour.	• What is the role of the metaverse in promoting a sharing economy and dematerialisation? • How can marketers leverage on the power of the metaverse to address conflicting goals of sustainability?
Metaverse and sustainability research	• What is the role of the Omni channel in promoting sustainable behaviours? • What are the strategies that can be used to promote sustainability reporting in the metaverse?
Green Innovation and virtualisation	• What are the sustainable product innovations appropriate for the metaverse? • How can marketers leverage on the metaverse to develop digital markets?
Integrated sustainable marketing Communication,	• How can marketers develop effective sustainable marketing stimuli for the metaverse? • What are the green marketing strategies effective I the metaverse?
Consumer virtual experience	• What is the role of virtual identity in promoting sustainable consumption practices in the metaverse? • What is the role of digital nudging in promoting the consumption of sustainable products in the metaverse?
Consumer advocacy	• What are the most effective strategies for promoting consumer advocacy in the metaverse? • How can marketers promote digital citizenship in the metaverse?

Conclusion

This study reviews literature on the role of the metaverse on the performance of sustainable consumption practices. The metaverse was found to offer significant opportunities for opportunities for promoting sustainable consumption practices in the metaverse. The SRL revealed that the metaverse accord consumers an immersive experience that allows them to interact and engage with sustainability practices oriented stimuli. Through multisensory immersion, the metaverse empowers consumers to assess the functional attributes of sustainable products and understand how they differ from conventional alternatives. The metaverse was found to promote sustainable consumption practices by enhancing perceived self-efficacy, digital green identity, social sustainability, dematerialisation and consumer wellbeing. The carbon footprint and energy consumption from metaverse technologies was

identified as one the major unintended consequences of promoting sustainable practices in the metaverse.

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SUSTAINABILITY REPORTING AND FIRM'S VALUE: THE ROLE OF TECHNOLOGY

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Abstract

The aim of this study is to investigate the moderating effect of technology on the relationship between sustainability reporting and firm value among listed firms in Ghana. Utilizing data from 36 listed firms over the period 2010-2022, this study employs the system GMM method for data analysis. Additionally, the Hansen test and Arellano–Bond test for AR(2) are conducted to ensure the robustness of the model specification. The empirical results indicate that both sustainability reporting and technology have a positive and significant impact on the value of listed firms. Moreover, technology significantly moderates the relationship between sustainability reporting and firm value in a positive manner. These findings have important managerial implications for business leaders across various sectors. Firms are encouraged to strategically integrate sustainability reporting and technology into their business practices. By leveraging technology to enhance sustainability reporting, firms can amplify the positive impact on firm value.

Keywords: firm value, sustainability reporting, technology, esg disclosure, general method of moment.

Introduction

Sustainability has become a central issue for many organizations worldwide, especially in our current business environment, which faces significant sustainability risks. According to KPMG's international surveys (2017, 2020) investigating the status of sustainability reporting among 4,900 companies globally, three-quarters of these companies issue sustainability reports. The KPMG (2017) survey highlights a significant upward trend in sustainability reporting over the past decade, driven by increasing stakeholder demand for such disclosures. In response, many firms have begun incorporating sustainability information into their annual reports or publishing stand-alone sustainability reports (Carvajal & Nadeem, 2023).

International organizations like the Global Reporting Initiative (GRI) and the Sustainability Accounting Standards Board (SASB) have been established to provide frameworks for disclosing sustainability information and to encourage its adoption among firms not yet engaged in such practices (Carvajal & Nadeem, 2023; Moggi, 2023). Corporations are adopting sustainability disclosure practices to meet changing expectations and increased stakeholder awareness in this information age (Karaman et al., 2018).

Many countries have seen a significant shift in the acceptance and adoption of sustainability reporting (KPMG, 2020) due to factors such as increased awareness, new laws and regulations, legitimacy, and the understanding of how sustainability disclosures influence corporate value and financial performance. Organizations excelling in sustainability implementation and disclosure do so not only for societal acceptance but also as a business strategy that yields substantial returns on investment (Kaoje et al., 2020; Liou et al., 2023). Additionally, prior studies have shown that sustainability reporting impacts a firm’s value (Adonye et al., 2023; Bakry et al., 2023; Ndubuisi, 2019).

Enterprise value is described as a company’s performance as measured by its stock price, reflecting the public’s assessment of the company’s real performance (Arianpoor et al., 2023; Jannah & Sartika, 2022). It is perceived as an economic measure of market capitalization. Sustainability reporting aims to create value for firms by considering all stakeholders' benefits (Rezaee, 2016) and by fostering value creation through successful sustainability projects (Moreno-Monsalve et al., 2023). Sustainability reporting benefits not only stock exchanges but also corporate outcomes such as higher performance, better value, and greater reputation (Aouadi & Marsat, 2018), as top management strives to satisfy stakeholders’ demands.

Empirical evidence shows that the influence of sustainability reporting on firm value can be direct or through an interactive variable. Various streams of research have found positive (e.g., Bakry et al., 2023; Friske et al., 2023; Hardi et al., 2023; Mohamed & Younis, 2023; Van Linh et al., 2022), negative (e.g., Husnaint & Basuki, 2020; Oware & Mallikarjunappa, 2022a), and no effects (e.g., Kasbun et al., 2016; Raneses, 2020; Suttipun, 2018; Suttipun & Saelee, 2015) on firm value. Given the inconclusive nature of research on the relationship between sustainability reporting and firm value, and the varying results across different methodologies and jurisdictions, further studies are crucial to enhance our understanding of this relationship.

Technology has been found to enable firms to develop IT capabilities that enhance firm value (Ilmudeen, 2022; Ong & Chen, 2016). Studies by Ali et al. (2023) and Silaban & Dewi (2023) found that firms making strategic IT investments experience higher productivity and firm value compared to those with less strategic investments. Furthermore, a meta-analysis by Son et al.

(2018) and Sun et al. (2021) indicated a positive and significant relationship between IT investment and firm value. Investments in technologies such as enterprise resource planning (ERP) systems, customer relationship management (CRM) software, and data analytics tools enable organizations to streamline processes, enhance efficiency, and make data-driven decisions (Delvira & Kurniawan, 2022; Emrinaldi Nur & Putra, 2020; Nugraha et al., 2022). This paper examines the role of technology in the relationship between sustainability reporting and firm value.

This study contributes to the sustainability literature in several ways. First, it uses the Bloomberg index to measure sustainability reporting, which is considered a more reliable and accurate method compared to other approaches (Buallay, 2021). Second, it provides empirical evidence on sustainability reporting in an emerging economy, where research on this topic is still in its early stages. Consequently, the findings are expected to deepen the understanding of sustainability's impact on firm value. Moreover, by understanding the nexus between sustainability reporting and technology on firm value, policymakers can tailor their interventions to address specific challenges and opportunities facing listed firms in Ghana, thereby contributing to the country's broader socio-economic objectives.

The rest of the paper is structured as follows: Section 2 provides an overview of the existing literature. Sections 3 and 4 explain the methodology and present the results and discussion, respectively. Conclusions and recommendations are included in Section 5.

2. **Literature review**

This section provides a review of theoretical and empirical literature on sustainability reporting, technology and firm value.

2.1 **Theoretical review**

Several theories can be used to explain the association between sustainability reporting, technology and firm value. From the perspective of a firm, Deegan (2014) illustrated that, despite the existence of numerous theories explaining a firm's motivation to disclose sustainability information, the primary drivers of sustainable reporting are closely linked to legitimacy and the influence of stakeholders.

Legitimacy theory proposes that organizational legitimacy depends on the alignment between societal expectations concerning social and environmental responsibility and the firm's value and reputation (Deegan, 2014). This theory is defined by Suchman (1995) as “generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions” (p. 574). Adhering to societal norms is crucial, as companies must operate within these boundaries to avoid displeasing public opinion, thereby safeguarding their legitimacy (Dowling & Pfeffer, 1975). As stakeholders, including investors, increasingly prioritize transparency and environmental responsibility, the combination of comprehensive sustainability reporting and technological innovation becomes crucial. This strategic approach enhances the perceived value of firms.

Stakeholder theory posits that the sustainability of firms is contingent upon the effective management of their relationships with various stakeholders. These stakeholders encompass customers, suppliers, governmental entities, employees, and the general public (Ferrell et al.,

2010). It underscores the significance of transparent communication sustainability activities with various stakeholders. Sustainability reporting is regarded as a mechanism for companies to inform stakeholders about their social performance, cultivate a positive image, and sustain an open dialogue (Freeman, 1984; Roberts, 1992). Enhanced sustainability reporting has been associated with increased sales growth, as customer treatment substantially influences a firm's sales performance and overall value (Abdulsalam & Babangida, 2020; Carp et al., 2019; Nguyen, 2020; Swarnapali & Le, 2018).

Applying the Technology Acceptance Model (TAM) within the context of technology adoption and firm value is crucial for achieving operational efficiency. TAM serves as a theoretical framework designed to elucidate and forecast user acceptance and utilization of technology (Taherdoost, 2018). This model posits that the acceptability of an information system is primarily influenced by two factors: perceived usefulness (PU) and perceived ease-of-use (PEOU). The perceived usefulness of technology in enhancing productivity, alongside its perceived ease-of-use, are pivotal determinants of technology adoption. By employing TAM, firms can streamline technology adoption processes, thereby augmenting firm value through improved operational efficiency and technological capabilities. According to Ilmudeen (2022), technology has been shown to enable firms to develop IT capabilities that enhance firm value.

2.2 **Empirical review and hypothesis development**

2.2.1 **Sustainability reporting and firm value**

A growing body of empirical literature have examined the effect of sustainability reporting and firm value. For example, Rukmiyati et al. (2023) investigated the relationship between sustainability reporting quality and firm value, focusing on 320 non-financial sector companies listed on the Indonesia Stock Exchange between 2017 and 2020.The study employed a multivariate approach using a structural equation model (SEM) based on Partial Least Squares (PLS).It finds that the quality of sustainability reporting can increase firm value because investors view the quality of reporting as reflecting sustainable practices that have been implemented properly.

In a similar study, Adonye et al. (2023) examined the effect of sustainability reporting practices on firm value proxied by Tobin’s Q of 51 listed oil and gas firms in Nigeria. Multiple regression was used for the analysis of data. The authors found that environmental sustainability reporting has a positive significant effect on the value of listed oil and gas firms. The study concluded that adequate compliance with sustainability rules and regulations attracts more investors to the company, which will in turn ultimately increase the firm’s value

Friske et al. (2023) investigated the impact of voluntary sustainability reporting on firm value, using Tobin's Q as the measure. The research tested three primary hypotheses derived from signaling theory and existing sustainability reporting literature, analysing a large panel of both reporting and non-reporting organizations from 2011 to 2020. The findings revealed a negative relationship between sustainability reporting and Tobin's Q initially. However, over time, this relationship became increasingly positive. The study concluded that while sustainability reporting may initially be a costly signal, it ultimately enhances firm value as companies improve their communication of sustainability initiatives and investors become better at evaluating these reports.

Nguyen (2020) further explored the link between sustainability reporting and firm value in a study involving 97 large, publicly traded firms in Germany. The research aimed to understand the importance of sustainability disclosures by analysing their association with firm value, using multiple regression techniques. The results revealed a significant negative relationship between firm value and the level of adherence to GRI sustainability reporting standards.

Khunkaew et al. (2023) investigated the effects of sustainability reporting and gender diversity on corporate outcomes for listed firms in the ASEAN region. The study utilized seven key performance indicators from the Global Reporting Initiative (GRI) Standards to measure sustainability reporting. Sequential logit regression models were developed to test the hypotheses used in this study. The findings revealed that energy use, water management, work safety, and gender diversity positively impacted corporate performance, whereas carbon emissions and waste management had negative effects. Gender diversity moderated the negative relationships between energy use, water management, work safety, and corporate performance. Additionally, water management and work safety positively influenced firm value, while waste management had a negative impact. However, gender diversity did not moderate the relationship between sustainability reporting and firm value.

Hardi et al. (2023) examined the impact of three sustainability reporting indicators-sustainability reporting disclosure, sustainability reporting index, and sustainability reporting score-on firm value, considering firm size and leverage. Using data from 200 firms listed on the Indonesia Stock Exchange, the study found that the sustainability reporting index positively affects firm value, while the sustainability reporting score has a negative impact. Additionally, sustainability reporting mediates the positive relationship between firm size and firm value.

From the evidence emanating from the review of previous empirical studies on sustainability reporting and firm value, this study hypothesizes that:

H1. There is a positive relationship between sustainability reporting and firm value

2.2.2 **Technology and firm value**

Lee et al. (2021) investigate how technology trade impacts the sustainable market value of firms in 36 OECD countries using panel data analysis. They measure technology trade through the growth of intellectual property rights (IPRs) exports and imports. The study employs panel data regression to assess the effects of technology trade, represented by IPRs, on firms' market value, indicated by country benchmark composite stock return. The findings reveal nonlinear effects of IPR exports and net IPR trade on firms' sustainable market value. Notably, technology imports have a stronger positive impact on firms' market value at lower and middle levels of stock return distribution, indicating varied effects across different quantiles. Overall, the study concludes that the positive impact of technology trade on firms' market value is primarily driven by imports rather than exports.

Similarly, Choi and Yoo (2022) finds that technological innovation activities have a significant positive impact on the firm value, whereas strategic CSR conformity does not. Similar findings were documented by Ceptureanu et al. (2021) when the authors analyze how blockchain technology can improve supply chain variables and technology transfer in 383 Romanian medium-sized enterprises from IT&C sector which in turn would influence the firm value. Ali

et al. (2023) also examined the effect of technological initiatives on firms' market value. The study analyzed 249 firm-event observations containing firms from around the world and conclude that blockchain technology has a non-significant long-term impact on operating performance. The authors also found that blockchain announcements tend to elicit more positive market reactions from smaller firms.

Using structural equation modelling, Cinar et al. (2020) investigated the impact of technology transfer and innovation on firm value, using data from 252 top Turkish export firms. The study's findings highlight the positive effects of technology transfer on both innovation and firm value, with innovation acting as a mediator in this relationship. The results suggest that effective technology transfer enhances corporate innovation capacities and improves firm performance. Thus, this study hypothesises that:

H2. There is a positive relationship between technology and firm value

2.2.3 **Sustainability reporting, technology and firm value**

Technology plays a crucial role in moderating the relationship between sustainability reporting and firm value. Utilizing digital platforms and sustainability reporting software simplifies the reporting process, making it more accessible for stakeholders. Data analytics and visualization tools allow for detailed analysis and presentation of sustainability data, helping stakeholders understand its impact on firm value.

Blockchain technology improves transparency, reduces the risk of data manipulation, and enhances firm value (Ceptureanu et al., 2021; Klöckner et al., 2022). Artificial intelligence supports predictive analysis, aligning sustainability efforts with value creation (Lui et al., 2022; Wamba-Taguimdje et al., 2020). Social media engagement and online platforms enable real-time communication, positively affecting stakeholders. Integrating technology into supply chain management ensures adherence to sustainability practices, contributing to firm value. ESG rating platforms assess companies based on their sustainability performance, attracting socially responsible investors. Online collaboration tools promote inclusive stakeholder engagement, enhancing the credibility of reports. Continuous monitoring and automated reporting demonstrate a sustained commitment to sustainability, positively influencing stakeholder perceptions and firm value. Thus, this study hypothesises that:

H3. Technology moderates the relationship between sustainability reporting and firm value

3. **Methodology**

3.1 **Study sample**

The sample consists of 36 publicly listed firms in Ghana, spanning the period from 2010 to 2022. This study utilizes secondary data derived from the annual financial statements of the selected firms. The data were extracted from the audited annual financial statements of these firms throughout the study period. The selection of the period and firms was based on the availability of data.

3.2 **Model design and definition of variables**

The study employed the Two-Step System GMM estimator to test the impact of sustainability reporting on a firm's value. The System Generalized Method of Moments (GMM) technique offers the advantage of accommodating the dynamic nature of the dataset while addressing issues of endogeneity and heteroskedasticity within the series. The basic model is presented as follows:

$$FV_{it} = \beta_o + \beta_1 FV_{it-1} + \beta_2 ESG_{it} + \beta_3 TECH_{i,t} + \beta_4 (SR * TECH)_{it} + \beta_5 FS_{it} + \beta_6 CG_{it} + \beta_7 HC_{it} + \beta_8 EFF_{it} + \beta_9 LEV_{it} + \beta_{10} LIQ_{it} + \varepsilon_{it}$$

where FV is a continuous variable; the dependent variable is the firm value measured by Tobin's Q model. β0 is the constant and β1-10 is the slope of the controls and independent variables. The independent variable is sustainability reporting measured by Bloomberg index which combines E, S, G indicators. The moderating variable is technology (TECH) measured by expenses in acquiring and maintaining IT equipment and software. The firm's control variables are firm size (FS), corporate governance (CG), human capital (HC), firm's efficiency (EFF), financial leverage (LEV), and the firm's liquidity (LIQ), ε is the random error. i stands for the listed firms, and t stands for the period. Table I shows the measurement of the dependent variable, the independent variables, the moderating variable and the control variables employed for the study model.

Table 1: Measurement and definition of variables

Variable	Code	Measurement	Reference
Dependent variable			
Firm Value	FV	Tobin's Q = $\frac{\text{Market value of Equity þ Book value of Liabilities}}{\text{Book value of total assets}}$	(Bakry et al., 2023)
Independent variable			
Sustainable reporting	ESG	Bloomberg index, which combines E, S and G	(Buallay et al., 2021)
Moderating Variable			
Technology	TECH	Expenses in acquiring and maintaining IT equipment and software.	(Ray et al., 2013, Jeyaraj, A., & Sabherwal, R. 2015)
Control variables			
Corporate Governance (Board Independence)	BD	Measured by non- executive directors in board composition or It is percentage of independent members of board to all board members.	(Afify, 2009; Al-Matari, 2022; Al-Sayani & Al-Matari, 2023; Hashim & Abdul Rahman, 2012; Waris & Haji Din, 2023)
Firm Size	FS	Natural Logarithm of total assets of a firm	(Hasan et al., 2022; Hichri, 2023)
Financial Leverage	LEV	Ratio of total debt divided by total assets of firm	(Hichri, 2023)
Firm Liquidity	LIQ	Ratio of the current assets to current liabilities	(Hichri, 2023)
Firm Efficiency	EFF	Operational Efficiency Ratio	

	$= \frac{Operational\ Cost}{Net\ Sales} * 100\%$	
Human Capital	VA/HC (Pulic, 1998, 2000, 2004; Pulić, 2008) Pulic (1998) measure of Human capital efficiency.	(Mawutor et al., 2023; Molodchik et al., 2019; Pirozzi & Ferulano, 2016; Poh et al., 2018)

3.3 **Summary statistics and correlation analysis**

Based on Table 2, the dependent variable, firm value, is measured by Tobin's Q. The average Tobin's Q across 468 observations is 0.101, indicating that the market value of firms slightly exceeds their book value on average. The standard deviation of 0.249 suggests significant variability in firm value among the listed firms. The minimum value of -4.525 is an outlier, showing that at least one firm has a market value significantly below its book value. The maximum value of 0.511 indicates that the highest Tobin's Q is just over half the book value, suggesting no firm has an excessively high market valuation compared to its book value.

Sustainability reporting has a mean score of 0.422, indicating a moderate level of sustainability reporting practices among listed firms in Ghana. The standard deviation of 0.158 shows some variation in sustainability reporting, but it is less pronounced than the variation in firm value. The minimum score of 0 suggests that some firms do not engage in sustainability reporting, while the maximum score of 0.682 indicates that some firms are highly engaged in sustainability reporting.

The technology variable among listed firms in Ghana shows that firms are generally towards the higher end of technology utilization or investment, with a mean score of 6.305 on a scale ranging from 3.708 to 8.914. This suggests significant investments in technology by most firms. The standard deviation of 1.117 indicates moderate variability in technology adoption or investment, which could be influenced by factors such as firm size and industry sector. Firms in ICT, finance, or services sectors might have higher technology scores compared to those in traditional sectors like agriculture or manufacturing. The minimum and maximum values (3.708 and 8.914) highlight the range of technology adoption levels among firms.

For control variables, the mean value for firm size is 2.361, with a standard deviation close to 1, indicating variability around the mean. The negative minimum value suggests that the firm size variable may be log-transformed. Liquidity has a mean of 0.748, indicating a moderate level of liquidity among firms, with a standard deviation of 0.526 showing moderate variability. The minimum value of 0 indicates potential liquidity issues for some firms, while the maximum value of 10.29 suggests very high liquidity for at least one firm.

Corporate governance has a mean score of 2.822 and a standard deviation of 1.946, indicating a wide range of governance practices among listed firms in Ghana. The minimum score of 0 implies that some firms lack board independence, while the maximum score of 7 indicates strong governance structures in some firms. The mean score suggests a moderate level of board independence on average, with significant variability influenced by factors such as firm size, industry, ownership structure, and regulatory environment.

Human capital among listed firms in Ghana shows a mean score of 3.044 and a standard deviation of 2.157, indicating a moderate level of human capital development with significant

variability. This suggests that while some firms heavily invest in their workforce, others may not prioritize human capital to the same extent. The mean score indicates moderate engagement in human capital development activities, with variability influenced by factors such as firm size, industry sector, and strategic priorities.

Operating efficiency has a mean of 0.564, indicating moderate efficiency in operations among firms, with a standard deviation of 0.15 showing some variability. The minimum value of 0 and the maximum value slightly above 1 suggest that the measure of operating efficiency is likely normalized or indexed. Operating leverage has a mean of 1.593 and a standard deviation of 1.209, indicating moderate operating leverage with significant variability among firms. The minimum value of 0.892 suggests that all firms have some degree of operating leverage, while the maximum value of 10.474 indicates very high operating leverage for at least one firm.

Table 1 Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Firm Value	468	.101	.249	-4.525	.511
Sustainability Reporting	468	.422	.158	0	.682
Technology	400	6.305	1.117	3.708	8.914
Firm Size	460	2.361	.998	-.358	4.28
Corporate Governance	455	2.822	1.946	0	7
Human Capital	461	3.044	2.157	.992	9.492
Firm Efficiency	455	.564	.15	0	1.02
Financial Leverage	468	1.593	1.209	.892	10.474
Firm Liquidity	460	.748	.526	0	10.29

Source: Authors computations

Pre-diagnostic test

Pre-diagnostic tests, including assessments for multicollinearity and variance inflation factor (VIF), are crucial steps in the regression analysis process. These diagnostics serve as preventative measures to ensure the integrity and validity of the regression model's estimations. Table 3 and 4 present the correlation matrix of the dependent and independent variables and the VIF respectively.

The correlation matrix reveals that Sustainability Reporting does not exhibit statistically significant correlations with any other variables. This indicates that the level of sustainability reporting by firms does not have a discernible linear relationship with the other factors analysed. This finding suggests that sustainability practices may function independently of other dimensions of corporate performance and practices among the listed firms.

Firm Size shows notable correlations. It is positively associated with Technology and Corporate Governance but negatively correlated with Operating Efficiency (-0.272, $p<0.01$) and Operating Leverage (-0.202, $p<0.01$). This pattern implies that while larger firms may have better governance and more advanced technology, they might struggle to maintain high operating efficiency and tend to have lower operating leverage.

Corporate Governance also presents significant correlations. Besides its positive relationship with Technology, it is negatively correlated with Liquidity (-0.188, $p<0.01$), suggesting that firms with better governance might maintain lower liquidity, possibly due to more efficient resource utilization. Human Capital shows a positive correlation with Technology (0.110,

p<0.05) but is negatively correlated with Operating Efficiency (-0.111, p<0.05) and Operating Leverage (-0.203, p<0.01). This indicates that while human capital is essential for technological advancement, it may not directly contribute to immediate improvements in operating efficiency or leverage.

Operating Efficiency's negative correlations with Technology, Firm Size, and Human Capital suggest that higher values in these areas are associated with lower operating efficiency. This could reflect the complexities and costs associated with scaling, technological investments, and human capital management. Operating Leverage is negatively correlated with Firm Size, Corporate Governance, and Human Capital, indicating that higher operating leverage is associated with smaller firms, lower governance standards, and less emphasis on human capital. Lastly, Liquidity is positively correlated with Technology (0.130, p<0.05) but negatively correlated with Corporate Governance (-0.188, p<0.01) and Operating Leverage (0.102, p<0.05). This suggests that more technologically advanced firms tend to have higher liquidity, whereas those with better governance or higher operating leverage maintain lower liquidity levels.

In conclusion, none of the variables exceed the 0.8 criterion for multicollinearity as per Gujarati and Porter (2009). However, the study deemed it necessary to utilize the Variance Inflation Factor (VIF) for further confirmation of multicollinearity presence in the models.

Table 2 Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Sustainability Reporting	1.000							
(2) Technology	-0.067	1.000						
	(0.180)							
(3) Firm Size	-0.143*	0.194*	1.000					
	(0.002)	(0.000)						
(4) Corporate Governance	-0.004	0.194*	0.111*	1.000				
	(0.937)	(0.000)	(0.018)					
(5) Human Capital	-0.022	0.110*	0.055	0.048	1.000			
	(0.632)	(0.028)	(0.232)	(0.310)				
(6) Firm Efficiency	-0.006	-0.203*	-0.272*	-0.016	-0.111*	1.000		
	(0.901)	(0.000)	(0.000)	(0.733)	(0.017)			
(7) Financial Leverage	0.032	-0.037	-0.202*	-0.176*	-0.203*	-0.104*	1.000	
	(0.494)	(0.460)	(0.000)	(0.000)	(0.000)	(0.024)		
(8) Firm Liquidity	0.079	0.130*	-0.034	-0.188*	-0.023	-0.031	0.102*	1.000
	(0.087)	(0.009)	(0.457)	(0.000)	(0.623)	(0.507)	(0.027)	

*** p<0.01, ** p<0.05, * p<0.1

In terms of the Variance Inflation Factor (VIF), a common guideline is that a VIF value exceeding 10 (VIF > 10) indicates high collinearity (Gujarati, 2012; Wooldridge, 2015). The VIF test in this study, with a mean VIF of 1.150, showed minimal correlation among the independent variables, suggesting that multicollinearity was not a concern.

Table 3 Variance Inflation Factor (VIF)

	VIF	1/VIF
Sustainability Reporting	1.220	0.823
Technology	1.210	0.827

Firm Size	1.170	0.854
Corporate Governance	1.170	0.858
Human Capital	1.160	0.860
Firm Efficiency	1.150	0.869
Financial Leverage	1.050	0.950
Firm Liquidity	1.040	0.963
Mean VIF	**1.150**	

Source: Authors computations

4. Results and discussion

Table 5 presents the regression results. Column (1) shows the effect of sustainability reporting on firms value, Column (2) indicates the effect of technology on firm value while Column (3) shows the results of the moderating role of technology on the relationship between sustainability reporting and firms value (**c.SR#c.TECH).** Column (3) also presents the total effect $(\boldsymbol{\beta 1 + \beta 2 * SR})$ $(\boldsymbol{dy/dx})$ of on the relationship between sustainability reporting on firms' value in the presence of technology adoption.

Table 4 Estimation of Two-Step System GMM Regression and Moderation Results

	(1) Firms Value	(2) Firms Value	(3) Firms Value
Lag of Firms Value	.105***	.085***	
	(.006)	(.005)	
Sustainability Reporting	**.020****		.254***
	(.008)		(.017)
Firm Size	.009	-.036**	.021***
	(.009)	(.017)	(.004)
Corporate Governance	-.083***	-.256***	.005***
	(.014)	(.01)	(.002)
Human Capital	.009***	.001	.003**
	(.003)	(.003)	(.002)
Firm Efficiency	-.333***	-.014	-.435***
	(.027)	(.036)	(.042)
Financial Leverage	.002***	.001	-.001***
	(.001)	(.001)	(0)
Firm Liquidity	-.003	-.272***	.109***
	(.01)	(.015)	(.013)
Technology		**.303*****	**.029***
		(.035)	**(.017)**
c.Sustainability reporting#c.Technololgy			**.209****
			(.098)
			.154***
Total Effect $(\boldsymbol{\beta 1 + \beta 2 * SR})$ $(\boldsymbol{dy/dx})$			**(.028)**
			(.036)
_cons	.454***	.752***	.081
	(.04)	(.196)	(.115)

Observations	420	366	387
R-squared			.109
AR(1)	0.001	0.000	
AR(2)	0.334	0.357	
Sargan	0.000	0.000	
Hansen	0.325	0.257	

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*
Source: Authors computations

Sustainability reporting and firm value
In support of hypothesis 1 sustainability reporting has a positive coefficient with firm value. This suggests that firms engaging in sustainability reporting are perceived as more valuable by the market. The coefficient indicates that, all else being equal, an increase in sustainability reporting is associated with a 2% increase in firm value. This finding aligns with existing literature on corporate sustainability and firm value (Botchwey et al., 2022; Bartlett, 2012; and Loh et al., 2017; Herbert et al., 2020; Nguyen, 2020. Aouadi & Marsat (2018) argue that sustainability reporting benefits not only stock exchanges but also corporate outcomes such as higher performance, better value, and greater reputation, as top management allocates resources to meet stakeholders' demands. Reporting on sustainability practices theoretically enables firms to align their corporate practices with Sustainable Development Goals (SDGs), resulting in improved firm value (Huang & Zhu, 2015; Kang & Liu, 2014; Yang et al., 2021).
Several factors explain the positive effect of sustainability reporting on firm value. First, it can improve transparency, allowing investors to make more informed decisions about the firm's long-term prospects (Loh et al., 2017). Second, it indicates a firm's commitment to managing ESG risks, which is particularly important in high-risk industries (Alghamdi & Agag, 2023). Third, sustainability reporting can attract socially responsible investors seeking firms that align with their values (Whetman, 2018).

Technology and Firm value
The study found that technology positively impacts firm value, with a coefficient of 0.303 and significance at the 1% level. This indicates that technological advancements and adoption significantly increase a firm's market value. Specifically, a unit increase in technology adoption is associated with a 30.3% increase in firm value, holding other factors constant.
The implications of this positive effect are multifaceted. Firstly, technology adoption can lead to improved operational efficiencies, reducing costs and increasing output (On-Piu Chan, 2020). Secondly, technology can enhance product and service quality, leading to greater customer satisfaction and loyalty. Thirdly, technology enables firms to enter new markets and create new revenue streams, diversifying income sources and reducing risk (Shah et al., 2024; Tsou & Chen, 2023; Wang et al., 2023).

The competitive nature of modern business environments underscores the need for a positive nexus between technology adoption and firm value. Firms that fail to embrace technological advancements risk falling behind competitors in efficiency, innovation, and customer engagement (Dold & Speck, 2021; Kahrović & Avdović, 2023; Mgunda, 2019; Rakic et al., 2022). Additionally, as investors increasingly recognize the importance of technology in driving future growth, firms committed to technological innovation may enjoy higher

valuations and easier access to capital (Kahrović & Avdović, 2023; Kalluri, 2023; Limani et al., 2020).

Moderating effect of technology

The study's findings indicate a significant positive moderating effect of technology on the relationship between sustainability reporting and firm value among listed firms in Ghana. The direct effect of sustainability reporting on firm value, without considering technology, is relatively small (0.020). However, when technology is introduced as a moderating variable, this effect increases substantially to 0.209, significant at the 5% level. This suggests that technology not only directly enhances firm value but also amplifies the positive effects of sustainability reporting. The findings highlight the need to understand how technology interacts with sustainability reporting. Technology can influence the dynamics between sustainability reporting and firm value by enabling more efficient data collection, processing, and communication. It can also facilitate compliance with regulatory requirements and standards, such as the Global Reporting Initiative (GRI), further enhancing firm value.

The significance of the interaction terms was tested following Wooldridge (2016) by first examining the total effect of technology in the presence of sustainability reporting on firm value. The total effect, with an estimated coefficient of 0.154 and statistical significance at 1%, is higher than the effect of sustainability reporting on firm value alone. This indicates that technology's role is not just as a simple moderator but as an enhancer of the overall relationship. Initially, technology positively moderated the relationship between sustainability reporting and firm value with a coefficient of 0.209. However, this coefficient reduces to 0.154 after considering the total effect, indicating that technology positively moderates the relationship between sustainability reporting and firm value among listed firms in Ghana. This result has been empirically validated in previous studies (Mawutor et al., 2023; Ofoeda et al., 2020; Ofoeda et al., 2022a).

5. **Conclusion and recommendations**

The aim of this study was to investigate the impact of sustainability reporting and technology on the value of firms listed in Ghana. The study analysed data from 36 listed firms over the period from 2010 to 2022. An explanatory research design was utilized to explore the relationships between the variables. The theoretical model is built on the legitimacy, stakeholders' theories and technology acceptance model. The system Generalized Method of Moments (GMM) was employed for data estimation. To ensure the robustness of the model specification, the Hansen test and the Arellano–Bond test for AR(2) were conducted.

The empirical results show that sustainability reporting has a positive coefficient with firm value suggesting that firms engaging in sustainability reporting are perceived as more valuable by the market. This finding is consistent with existing literature as several studies have found that sustainability reporting leads to increased firm value in Indonesia (Rukmiyati et al. 2023; Hardi et al., 2023), in Germany (Nguyen, 2020), and in Nigeria (Adonye et al., 2023). Again, as expected, the coefficient of technology is positively and significantly related to firm value. This indicates the pivotal role technology plays in enhancing overall performance and competitiveness. The results also indicate that technology plays a significant positive moderating role, suggesting that it amplifies the positive effects of sustainability reporting on firm value. This finding underscores the synergistic relationship between technology and sustainability reporting. Technology enables firms to collect, analyze, and communicate

sustainability-related data more effectively, enhancing the transparency and credibility of their sustainability reporting efforts.

The study suggests that firm management should invest in modern technology to enhance sustainability practices and reporting. This includes using software for data management and analysis, platforms for stakeholder engagement, and tools for monitoring and reporting ESG metrics. Additionally, the government should support the corporate sector's digital transformation by providing infrastructure and policies that promote technology adoption. This could involve grants for purchasing sustainability reporting software, tax incentives for technology investments, and digital literacy programs to equip firms with the necessary skills.

This study is limited to firms listed on the Ghana Stock Exchange. Future research should explore other countries, particularly in Africa, to expand the currently limited literature in this area.

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SUSTAINABILITY-FIRST MARKETING: A PRO-WELLBEING PARADIGM SHIFT FOR THE FOOD INDUSTRY

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Abstract

The global food system, responsible for up to 37% of greenhouse gas emissions, faces critical challenges. This paper introduces Sustainability-First Marketing (SFM), a paradigm shift in food industry marketing that places sustainability at the core of all decisions. Drawing on a systematic literature review of 185 papers and integrating insights from sustainability science, institutional theory, and social practice theory, the paper develops a comprehensive SFM framework. The objectives are to conceptualize SFM for the food industry, propose implementable strategies, explore implications for brand equity and consumer behavior, and identify relevant metrics for assessing effectiveness. The paper contributes an interdisciplinary theoretical framework, testable propositions, practical implementation strategies, and a future research agenda. SFM addresses the urgent need to transform food systems within planetary boundaries while meeting growing global demand. It redefines marketing's role from driving consumption to fostering sustainable food systems, potentially bridging the attitude-behavior gap in sustainable consumption.

Keywords: Sustainability-First Marketing; Sustainable Food Systems; Green Marketing; Consumer Behavior; Food Industry; Transformative Consumer Research

Introduction

The global food system is responsible for up to 37% of total greenhouse gas emissions (Crippa et al., 2021) and is at the center of some of the most urgent challenges of our time, including climate change, biodiversity loss, and public health crises. As we approach a population of 10 billion by 2050 (United Nations, 2019), the imperative for sustainable food systems has transitioned from an aspirational goal to an existential necessity. This challenge, however, extends beyond mere production efficiencies; it demands a fundamental reimagining of consumption patterns and the marketing forces that shape them.

Marketing, as a discipline and practice, has been a formidable architect of consumer behavior in the food industry (Khan & Pandey, 2023). Its influence extends from the normalization of processed foods in the mid-20th century to today's era of personalized nutrition and ethical consumption (Toti & Sánchez Romero, 2023). Yet, this influence has largely been wielded in service of short-term profit maximization, often at the expense of long-term sustainability and societal well-being. The result is a food system characterized by overconsumption, extensive waste, and a preference for environmentally intensive products – a system fundamentally at odds with planetary boundaries and social equity (Altintzoglou & Aschemann-Witzel, 2023).

The food industry faces a "sustainability-marketing paradox", a fundamental tension between traditional marketing goals and sustainability imperatives. This paradox manifests in several critical dimensions. Temporal conflicts arise as pressure for short-term financial results undermines long-term sustainable investments (Vaupel et al., 2023), particularly problematic in the food industry where ecological impacts may take years to materialize. A volume vs. value tension exists where traditional metrics prioritizing sales growth conflict with the need for reduced consumption in unsustainable markets (Kemper & Ballantine, 2019). The differentiation-standardization dilemma pits brand uniqueness against the need for industry-

wide sustainability collaboration (Dauvergne & Lister, 2012). A consumer-planet misalignment challenges consumer-centric approaches, as sustainable consumption often requires reshaping desires to align with planetary boundaries (Steffen et al., 2015). Measurement incongruity emerges as traditional metrics fail to capture the full spectrum of sustainability impacts, potentially sacrificing environmental and social outcomes for financial performance (Varadarajan, 2018). These tensions underscore the urgent need for a paradigm shift in food industry marketing conceptualization and practice.

While a growing body of literature addresses sustainable marketing and food consumption (see Tollin & Christensen, 2019; Chen et al., 2023), significant gaps remain in integrating these streams into a cohesive, actionable framework for the food industry. Current research suffers from fragmentation, often focusing on isolated aspects of sustainability or specific products, failing to provide a holistic approach to transforming marketing practices (Kemper & Ballantine, 2019). Concepts such as green marketing (Sharma, 2021) and societal marketing (Kotler, 2011) often position sustainability as an add-on rather than a fundamental reimagining of marketing's role. Much research fails to adequately integrate insights from sustainability science, systems thinking, and institutional theory, resulting in frameworks that do not fully capture the complexity of sustainable food systems (Sachs et al., 2019). There is a notable lack of comprehensive metrics linking marketing activities to sustainability outcomes (Varadarajan, 2018), and insufficient research on practical implementation, particularly in large-scale food industry operations (White et al., 2019).

Given these constraints, in addition to the urgent sustainability challenges, there is a clear need for a significant change in the role of marketing within the food industry. This shift must reorient marketing's primary objective from driving consumption to fostering sustainable food systems, integrating sustainability principles into the core of marketing strategy. It requires developing new metrics and decision-making frameworks that align marketing success with sustainability outcomes, leveraging marketing's influence to drive systemic change towards sustainable production and consumption patterns. Furthermore, it must foster cross-sector collaboration to address the complex, interconnected challenges of the global food system. This new paradigm should bridge theory and practice, offering a comprehensive approach to sustainable marketing in the food industry.

To address identified challenges and research gaps, this paper proposes “Sustainability-First Marketing” (SFM), a paradigmatic shift making sustainability the primary driver of all marketing decisions and activities in the food industry. SFM aims to align marketing strategies with sustainable food system goals, prioritizing environmental regeneration, social equity, and long-term economic viability. SFM is distinguished by key principles, including systemic orientation, long-term value creation, collaborative approach, consumer behavior transformation, and measurement integration. It views marketing decisions within the broader food system context, prioritizes long-term sustainability outcomes alongside short-term financial performance, emphasizes cross-sector partnerships, seeks to reshape consumer behaviors towards sustainability, and employs metrics capturing both marketing effectiveness and sustainability impact.

This paper aims to advance SFM understanding and implementation through four objectives. First, develop a comprehensive theoretical framework integrating sustainability science (Rockström et al., 2009; Raworth, 2017), institutional theory (Dahlmann & Grosvold, 2017), and social practice theory (Shove et al., 2012). This framework defines the operational space for sustainable food systems, understands barriers and enablers of SFM adoption, and

comprehends how marketing can reshape sustainable consumption practices. Second, propose principles and practices for implementing SFM, addressing challenges like overcoming organizational inertia (Slawinski & Bansal, 2015), developing sustainability-focused marketing competencies (Varadarajan, 2018), and navigating tensions between firm competitiveness and industry-wide collaboration (Dauvergne & Lister, 2012). Third, explore SFM implications for brand equity, consumer behavior, and long-term business performance, examining sustainability-first approaches' influence on brand perceptions (Kumar & Christodoulopoulou, 2014), potential for creating shared value (Porter & Kramer, 2011), and long-term financial implications (Eccles et al., 2014). Fourth, identify relevant metrics and KPIs for assessing SFM effectiveness (Varadarajan, 2018), developing a balanced scorecard integrating sustainability metrics with traditional KPIs, proposing new metrics capturing systemic impacts, and outlining methodologies for long-term tracking of marketing activities' sustainability outcomes.

To achieve these objectives, the paper employs a multi-method approach. It conducts a comprehensive literature review at the intersection of sustainable marketing, food systems, and consumer behavior, synthesizing insights from marketing, sustainability science, and organizational theory. Building on the literature review and theoretical foundations, it develops the SFM framework through an iterative process of conceptualization and refinement. Based on our framework, it develops a set of testable propositions to guide future research in SFM.

This paper makes several significant contributions to marketing theory and practice. The paper contributes to marketing theory by: a) Integrating insights from sustainability science, institutional theory, and social practice theory to create a novel framework for sustainable marketing in the food industry. b) Extending the concept of market orientation to include ecological and social considerations, proposing a “sustainability market orientation” construct. c) Developing a typology of SFM strategies that accounts for varying levels of sustainability integration and market contexts. The current paper provides food industry practitioners with: a) A comprehensive roadmap for transitioning towards SFM, including strategies for overcoming common barriers and leveraging opportunities. b) Decision-making frameworks that integrate sustainability considerations into core marketing processes. c) Guidelines for developing marketing capabilities that support SFM implementation. It advances marketing research methodology by: a) Proposing new measurement approaches that capture the complex, long-term impacts of marketing activities on food system sustainability. b) Outlining a research agenda that employs systems thinking and complexity science methods to study sustainable marketing phenomena. It offers insights for policymakers on: a) Creating regulatory environments that incentivize SFM practices in the food industry. b) Fostering public-private partnerships to address systemic challenges in sustainable food marketing. c) Developing consumer education initiatives that complement SFM efforts by firms.

The paper is structured as follows: The next section presents the theoretical foundations supporting our SFM framework, while the subsequent section details the systematic literature review methodology and findings. Following that, the paper introduces the SFM framework, its components, and underlying principles. The subsequent section discusses the implementation of SFM in the food industry, including challenges and opportunities. The remaining sections cover the research propositions and their theoretical justifications, the implications of SFM for theory, practice, and policy, and the conclusions.

Theoretical Foundation

The Sustainability-First Marketing (SFM) framework integrates three complementary theoretical perspectives: sustainability theories, institutional theory, and social practice theory. This synthesis provides a robust foundation for understanding the complex dynamics of sustainable marketing in the food industry.

Sustainability theories, particularly the Triple Bottom Line (TBL) concept introduced by Elkington (1997), form the basis for understanding sustainability in business contexts. In food marketing, TBL necessitates balancing economic, environmental, and social outcomes. Economic sustainability extends beyond short-term profitability to include long-term viability, resilience to market shocks, and shared value creation throughout the supply chain (Porter & Kramer, 2011). Environmental sustainability focuses on reducing ecological footprints, conserving resources, and mitigating climate change impacts (Garnett, 2013). Social sustainability involves promoting fair labor practices, enhancing food security, and contributing to community well-being (Maloni & Brown, 2006). Adopting a TBL approach requires a fundamental shift in strategy formulation and performance measurement for food marketers. Indicators of environmental stewardship and social impact must complement traditional metrics. This holistic approach challenges marketers to innovate across product development, pricing strategies, and communication approaches to address all three sustainability dimensions simultaneously. The Circular Economy (CE) model also offers valuable insights into sustainable food marketing (Geissdoerfer et al., 2017). CE principles call for a systemic redesign of production and consumption patterns to minimize waste, optimize resource use, and regenerate natural systems (Velenturf & Purnell, 2021). For food marketers, this involves promoting closed-loop systems, encouraging the use of by-products and food waste in new product development, promoting sustainable packaging innovations, developing service models for packaging reuse, and creating demand for "imperfect" produce.

Institutional theory provides a lens for understanding organizational responses to societal expectations and norms (DiMaggio & Powell, 1983). In sustainable food marketing, institutional pressures manifest as regulatory, normative, and cognitive pressures. Regulatory pressures include government regulations on food safety, labeling, and environmental standards. Normative pressures arise from industry standards and consumer expectations. Cognitive pressures stem from shared cultural understandings about sustainability and ethical consumption. Organizations respond to these pressures in various ways, ranging from passive compliance to proactive leadership (Oliver, 1991). These responses influence marketing strategies and organizational structures. Proactive organizations are more likely to develop comprehensive sustainable marketing strategies, innovate in sustainable product design, and engage in transformative communication campaigns.

Social Practice Theory (SPT) offers a novel perspective on sustainable consumption by focusing on the collective, routinized nature of human behavior (Shove et al., 2012). SPT conceptualizes practices as comprising materials (objects, infrastructure), competences (skills, know-how), and meanings (cultural conventions, expectations). In food consumption, these elements interact to shape eating practices. For food marketers, SPT suggests strategies for promoting sustainable consumption through material interventions, competence building, and meaning transformation. Effective sustainable food marketing from an SPT perspective involves coordinated efforts to reshape the entire practice of food consumption. This might include collaborating with retailers on store layouts, partnering with educational institutions on

food literacy, engaging in co-creation initiatives with consumers, and leveraging social media to normalize sustainable food behaviors.

The integrated SFM framework synthesizes these theoretical perspectives. From sustainability theories, SFM adopts a holistic view, balancing economic, environmental, and social outcomes, embracing circular economy principles in product development, packaging, and consumer engagement. Institutional theory informs SFM's understanding of external pressures driving sustainability adoption and the range of organizational responses. This helps develop strategies that respond to and shape institutional expectations around sustainable food marketing. Social Practice Theory grounds SFM in a nuanced understanding of consumer behavior, emphasizing the need to address materials, competencies, and meanings in marketing interventions to effectively transform food consumption practices. This integrated framework provides a robust foundation for developing the SFM approach, informing both strategic decision-making and tactical implementation of sustainable marketing practices in the food industry. It emphasizes systemic thinking, long-term orientation, and deep engagement with the socio-cultural contexts of food consumption. The SFM framework addresses several critical aspects of sustainable food marketing, recognizing the multi-dimensional nature of sustainability, acknowledging institutional pressures, offering a nuanced understanding of consumer behavior, emphasizing systemic approaches, and providing a basis for developing new metrics and performance indicators.

By integrating these diverse theoretical perspectives, the SFM framework offers a comprehensive approach to sustainable marketing in the food industry. It challenges marketers to think beyond traditional boundaries, considering the broader societal and environmental impacts of their activities. This framework sets the stage for developing innovative marketing strategies to drive meaningful progress towards more sustainable food systems.

Systematic Literature Review

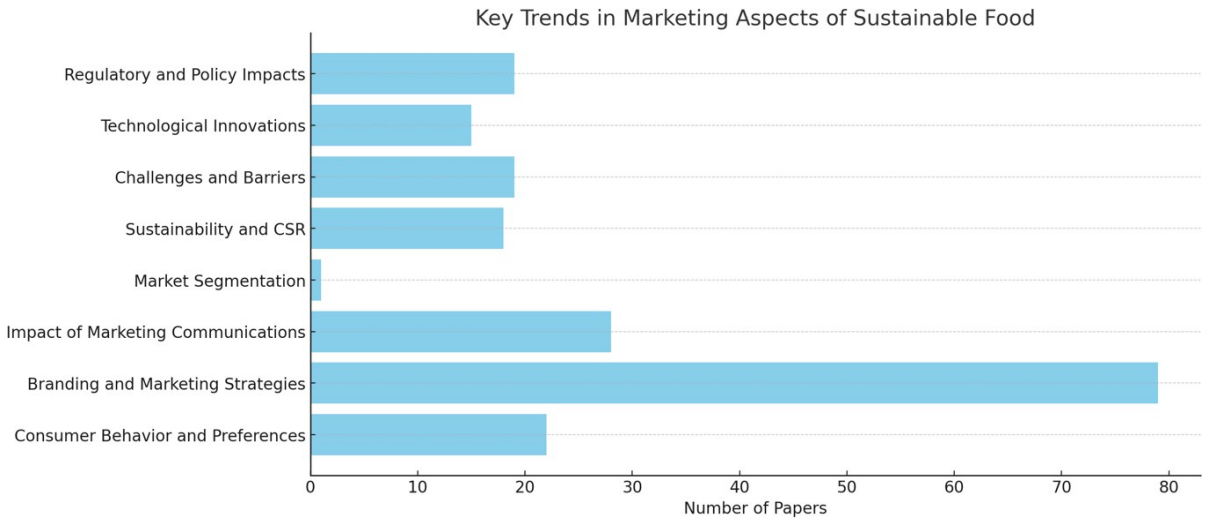
To comprehensively analyze the current state of research on sustainable food marketing, the paper conducted a systematic literature review following PRISMA guidelines. The search strategy encompassed multiple academic databases, including Scopus and Web of Science, focusing on peer-reviewed articles published between 2010 and 2024. The paper used a combination of primary keywords such as “sustainable marketing,” “green marketing”, and “sustainable food consumption”, along with secondary keywords including “consumer behavior”, “brand strategy”, and “food waste” to ensure thorough coverage of the field.

The initial search yielded 3,899 papers, which were subsequently filtered based on strict inclusion and exclusion criteria. The paper included studies that focused on marketing aspects within the context of sustainable food and demonstrated clear relevance to the food industry, food waste, or food consumption with sustainability implications. Papers solely focused on agricultural practices without marketing implications or those addressing general sustainable consumption without a specific focus on the food industry were excluded. This rigorous filtering process resulted in a final dataset of 185 papers deemed highly relevant for our analysis. To ensure the quality and relevance of the included studies, the paper employed a modified version of the Critical Appraisal Skills Programme (CASP) checklist. Each study was evaluated for methodological rigor, relevance, and contribution to the field on a scale of 1 to

10. This assessment process helped maintain a high-quality standard across the reviewed literature.

The analysis revealed several key trends and themes in sustainable food marketing research. Consumer behavior emerged as a dominant focus, accounting for 32% of the studies. These papers explored factors influencing sustainable food choices, the persistent attitude-behavior gap in sustainable food consumption, and segmentation of consumers based on their sustainability preferences. Marketing communications represented another significant theme, comprising 28% of the studies. This research stream investigated the effectiveness of various sustainability claims and certifications, the impact of framing and message design on sustainable food perceptions, and the role of social media in promoting sustainable food consumption. Product development and innovation emerged as the third major theme, representing 18% of the studies. This research focused on new product development processes for sustainable food, consumer acceptance of novel sustainable food products such as plant-based meat alternatives and insect protein, and packaging innovations for sustainability. Pricing and willingness to pay (12% of studies) and distribution and supply chain strategies (10% of studies) rounded out the main research streams.

Figure 1: Key Trends in Marketing Aspects of Sustainable Food (2010-2024)



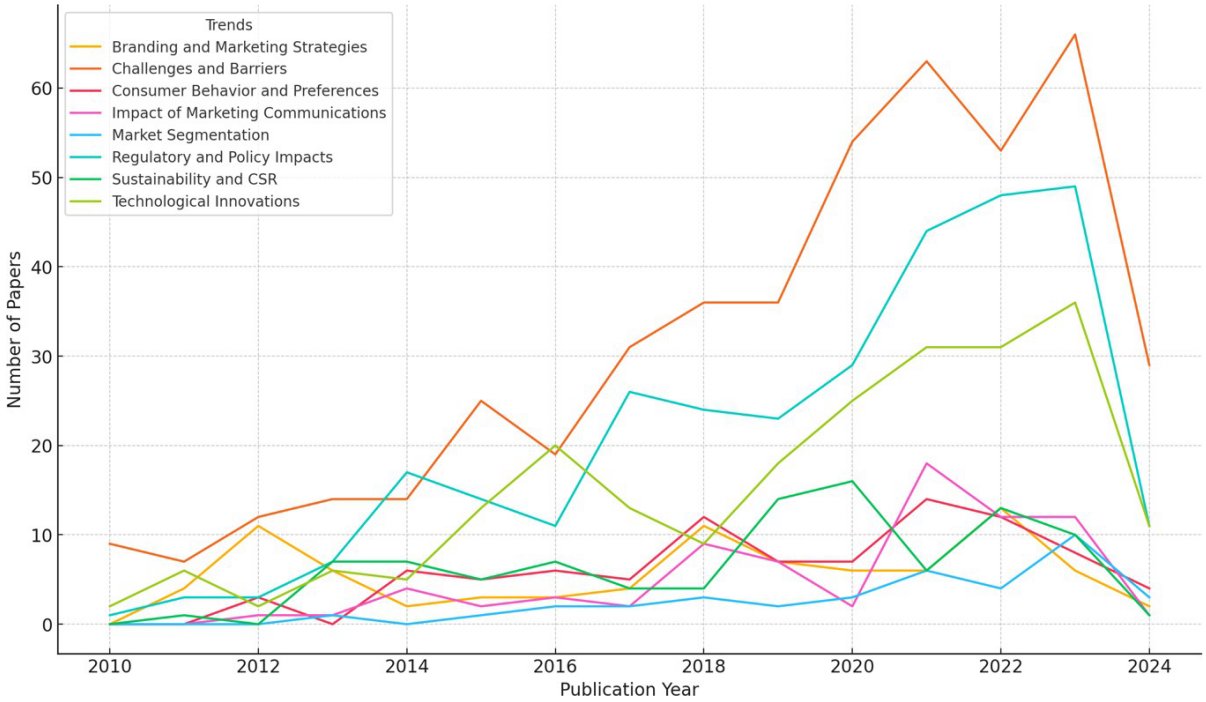
Methodologically, quantitative approaches dominated the field, accounting for 65% of the studies, with a particular emphasis on surveys and experiments. Qualitative studies, comprising 20% of the research, offered in-depth explorations of consumer motivations and industry practices. The remaining 15% employed a mixed-methods approach, providing more comprehensive insights into the complex dynamics of sustainable food marketing.

The review also identified several emerging topics that have gained traction in recent years. These include marketing strategies for upcycled food products, the use of blockchain and IoT technologies in sustainable food marketing and traceability, gamification approaches to promote sustainable food choices, and the marketing implications of personalized nutrition for sustainability. Additionally, researchers have begun to explore strategies for marketing sustainable food in the context of food delivery and e-commerce platforms, reflecting the changing landscape of food consumption.

Despite the growing body of research, the review revealed several significant gaps in the current literature. There is a notable lack of longitudinal studies examining the long-term impacts of sustainable marketing practices on consumer behavior and brand performance. Cross-cultural research comparing consumer preferences for sustainable food across different regions and cultures remains limited, hindering the development of globally applicable marketing strategies. Additionally, there is insufficient research on integrating emerging technologies, such as artificial intelligence and blockchain, into sustainable food marketing strategies. Another critical gap lies in developing comprehensive metrics and key performance indicators that effectively link marketing activities to sustainability outcomes in the food industry. This deficiency hampers the ability of firms to measure and improve the effectiveness of their sustainable marketing initiatives. Furthermore, there is a need for more research on overcoming organizational barriers to implementing sustainable marketing strategies, particularly in the context of large-scale food industry operations.

The identified gaps and trends in the literature inform the subsequent development of the Sustainability-First Marketing (SFM) framework. By addressing these gaps, the framework aims to provide a more holistic, long-term, and practical approach to sustainable marketing in the food industry. The next section will detail this framework, drawing on the insights gained from our systematic literature review and the theoretical foundations discussed earlier.

Figure 2: Trends in Marketing Aspects of Sustainable Food (2010-2024)

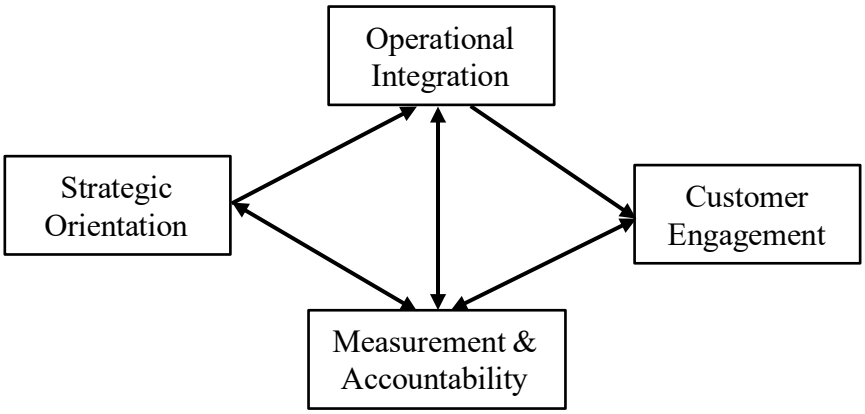


Conceptual Development: Sustainability-First Marketing Framework

Drawing on the insights from the systematic literature review and the theoretical foundations discussed earlier, the paper proposes the Sustainability-First Marketing (SFM) framework as a comprehensive approach to integrating sustainability into food marketing strategies. This framework addresses the identified gaps in current research and practice, offering a holistic, long-term perspective on sustainable marketing in the food industry. At its core, SFM represents a paradigm shift in marketing philosophy and practice, placing sustainability at the

forefront of all marketing decisions and activities. SFM is defined as a comprehensive approach to marketing that prioritizes environmental stewardship, social equity, and economic viability across all aspects of the marketing mix, with the goal of creating long-term value for consumers, society, and the planet. The SFM framework comprises four interconnected components: Strategic Orientation, Operational Integration, Consumer Engagement, and Measurement and Accountability. Each component addresses specific gaps identified in the literature review and builds on the strengths of existing research.

Figure 3: SFM Component Interactions



The Strategic Orientation sets the foundation for embedding sustainability into all marketing operations. The sustainability vision and long-term goals established in this component guide sustainable practices in product design, pricing, distribution, and promotion. By defining sustainability goals and a vision, Strategic Orientation informs how brands engage with consumers. It ensures that consumer engagement initiatives align with the broader sustainability mission, fostering a consistent message and approach. The objectives and sustainability vision defined in Strategic Orientation provide the benchmarks and targets for measurement and accountability. This ensures that all marketing activities are evaluated against the strategic sustainability goals.

Operational Integration translates the strategic sustainability goals into actionable marketing activities. Sustainable product development, value-based pricing, sustainable supply chain management, and transparent promotions directly implement the sustainability vision. Operational Integration creates sustainable products, pricing, and promotional activities that are critical for engaging consumers. It provides tangible offerings and communications that help build consumer competencies and foster sustainable consumption behaviors. The sustainable practices implemented in Operational Integration generate data and metrics needed for assessing sustainability performance. This component ensures that all marketing activities can be tracked and evaluated for their sustainability impact.

Consumer Engagement provides insights and feedback from consumers, which can inform and refine the strategic sustainability goals. Engaging consumers in co-creation and feedback loops ensures that the strategy remains relevant and aligned with consumer expectations and behaviors. Initiatives in Consumer Engagement drive the demand for sustainable products and practices. By educating consumers and fostering sustainable communities, this component encourages the adoption of sustainable offerings created through Operational Integration. Consumer Engagement activities generate valuable data on consumer behaviors, preferences,

and engagement levels. This information is crucial for measuring the effectiveness of sustainability initiatives and making necessary adjustments.

Measurement and Accountability provide the tools and metrics to assess whether the strategic sustainability goals are being met. Regular assessments and transparent reporting validate the effectiveness of the sustainability vision and objectives. This component ensures that all operational activities are evaluated for their sustainability impact. It provides a feedback mechanism to ensure that sustainable practices in product development, pricing, distribution, and promotion are achieving the desired outcomes. The results from Measurement and Accountability can inform consumer engagement strategies. Transparent reporting and accountability build consumer trust and can enhance their engagement with the brand's sustainability initiatives.

Propositions and Theoretical Justifications

Table 1 summarizes the theoretically justified propositions based on the systematic literature review and the SFM framework to guide future research.

Table 1: Propositions and Theoretical Justifications

Proposition	Sub-Hypotheses	Theoretical Justification
P1: The adoption of a Sustainability-First Marketing approach positively influences long-term brand equity in the food industry.	**P1a**: Companies that adopt SFM will experience higher consumer trust and loyalty compared to those that do not.	Institutional Theory: Organizations aligning with societal values increase legitimacy (DiMaggio & Powell, 1983).
	P1b: SFM adoption will lead to improved financial performance through increased market share and consumer loyalty.	Triple Bottom Line: Balancing economic, environmental, and social outcomes leads to long-term success (Elkington, 1997).
	P1c: The positive impact of SFM on brand equity is stronger in markets with higher consumer awareness of sustainability issues.	Higher awareness markets value genuine sustainability commitment.
P2: The effectiveness of Sustainability-First Marketing is moderated by the level of integration across the marketing mix.	**P2a**: Integrated sustainability efforts across the marketing mix will lead to greater consumer adoption of sustainable products.	Systems Thinking: Holistic approaches create synergies that reinforce sustainability messages (Velenturf & Purnell, 2021).
	P2b: Disjointed sustainability efforts (e.g., sustainable product but not sustainable pricing) will	Inconsistent messages dilute perceived commitment to sustainability.

	have a lesser impact on consumer behavior.	
	P2c: Integration across the marketing mix will enhance operational efficiency and reduce overall costs.	Synergistic approaches streamline operations and optimize resource use (Velenturf & Purnell, 2021).
P3: Consumer engagement in co-creation of sustainable value positively influences the adoption of sustainable food practices.	**P3a**: Consumer involvement in the development of sustainable products will increase their commitment to adopting these products.	Social Practice Theory: Co-creation fosters a sense of ownership and aligns products with consumer values and needs (Shove et al., 2012).
	P3b: Educational initiatives that engage consumers will improve their sustainable consumption competences.	Building consumer competence bridges the attitude-behavior gap (Shove et al., 2012).
	P3c: Community-building activities around sustainability will strengthen social norms favoring sustainable consumption.	Social norms significantly influence individual behavior (Ajzen, 1991).
P4: The implementation of comprehensive sustainability metrics in marketing decision-making leads to improved sustainability outcomes and business performance.	**P4a**: Companies using comprehensive sustainability metrics will achieve better environmental performance.	Management Principle: "What gets measured gets managed" (Drucker, 1954).
	P4b: Sustainability metrics integrated with traditional KPIs will lead to balanced decision-making, enhancing both business and sustainability outcomes.	Balanced metrics ensure sustainability goals are not sidelined in favor of short-term gains.
	P4c: Transparent reporting of sustainability metrics will improve stakeholder trust and corporate reputation.	Transparency builds credibility and stakeholder trust (Elkington, 1997).
P5: The impact of Sustainability-First Marketing on consumer behavior is mediated by the perceived authenticity of the brand's sustainability efforts.	**P5a**: Brands perceived as authentic in their sustainability efforts will experience higher consumer trust and loyalty.	Institutional Theory: Organizations must conform to societal expectations and be perceived as genuine to maintain legitimacy (Suchman, 1995).
	P5b: Perceived authenticity will positively influence consumer willingness to pay	Consumers value genuine sustainability efforts and

	a premium for sustainable products.	are willing to support them financially.
	P5c: Transparent communication of sustainability initiatives enhances perceived authenticity and drives sustainable consumer behavior.	Clear, honest communication reinforces the brand's commitment to sustainability (Suchman, 1995).

Implementation of SFM in the Food Industry

The transition to Sustainability-First Marketing in the food industry requires a comprehensive approach that addresses organizational structures, processes, and culture. Drawing from the systematic literature review and the theoretical underpinnings of the framework, the paper presents strategies for implementation and discusses challenges and opportunities.

Strategies for SFM Implementation

Implementing SFM requires significant organizational change. Our review highlighted a gap in research on overcoming organizational barriers to implementing sustainable marketing strategies. To address this, the propose the following strategies. Firstly, leadership commitment is key. Securing top management support for SFM is crucial (Epstein & Buhovac, 2014). This involves articulating a clear vision for sustainability in marketing and aligning it with overall business strategy. Leaders must champion the SFM approach and allocate the necessary resources for its implementation (Lüdeke-Freund et al., 2017). Secondly, cross-functional integration is required through the establishment of sustainability councils or task forces that bring together marketing, R&D, supply chain, and sustainability teams to ensure coherence in SFM initiatives (Nidumolu et al., 2009). This addresses the need for more holistic approaches identified in our literature review. There must also be incentive alignment by revising performance metrics and incentive structures to reward sustainable marketing practices and outcomes encourage employee buy-in and drive behavioral change throughout the organization (Unruh & Ettenson, 2010). There must also be cultural transformation by fostering a culture of sustainability through internal communications, training programs, and employee engagement initiatives is essential for the long-term success of SFM (Harris & Crane, 2002). There should also be stakeholder engagement by developing mechanisms for ongoing dialogue with consumers, suppliers, and other stakeholders to inform SFM strategies and build trust (Svendsen & Laberge, 2005). This aligns with our proposition on the importance of consumer engagement in co-creating sustainable value. Lastly, there must be iterative implementation through adopting an agile approach to SFM implementation, starting with pilot projects and scaling successful initiatives, allowing for learning and adaptation (Lüdeke-Freund et al., 2017).

Challenges and Opportunities

The literature review identified several challenges in implementing sustainable marketing practices in the food industry. These include Short-Term Profit Pressures, which means a focus on quarterly results can conflict with long-term sustainability investments (Eccles et al., 2014). SFM requires reframing success to include long-term sustainability outcomes alongside short-term financial metrics. Additionally, there is a lack of integration between marketing and sustainability functions (Organizational Silos) can hinder effective SFM implementation (Belz & Peattie, 2012). Cross-functional collaboration and integrated decision-making processes are crucial to overcome this challenge. Increasing awareness of greenwashing can make consumers skeptical of sustainability claims (Johnstone & Tan, 2015). This underscores the importance of our proposition on the mediating role of perceived authenticity in SFM effectiveness. The multifaceted nature of food sustainability can make it challenging to develop coherent marketing strategies (Garnett, 2013). SFM's systemic approach helps navigate this complexity. Difficulty in quantifying the impact of sustainable marketing practices on both business and sustainability outcomes remains a significant hurdle (White et al., 2019). The framework's emphasis on comprehensive metrics addresses this challenge.

Despite these challenges, SFM offers several opportunities for food companies to gain a competitive advantage. These include brand differentiation – in a crowded market, SFM can help brands stand out by offering genuine sustainability value (Kumar & Christodoulopoulou, 2014). SFM can stimulate product and process innovations that create new market opportunities (Nidumolu et al., 2009). SFM also comes with risk mitigation which brings about proactive sustainability marketing that can help companies anticipate and address emerging regulatory and reputational risks (Unruh & Ettenson, 2010). SFM can strengthen relationships with consumers, employees, and other stakeholders, enhancing brand loyalty and attracting talent. SFM centers on sustainable marketing practices which lead to resource efficiencies and cost savings in the long run (Porter & van der Linde, 1995). SFM can help companies tap into growing markets for sustainable food products and services (Ottman, 2011).

Implications and Conclusion

Theoretical Implications: SFM contributes to marketing theory in several ways. First, it extends the concept of market orientation (Narver & Slater, 1990) by incorporating sustainability as a core component. This "sustainability market orientation" suggests that firms must not only be responsive to current customer needs but also anticipate and shape future needs in alignment with sustainability imperatives (Crittenden et al., 2011). Second, SFM challenges the traditional view of marketing's role in society. While marketing has long been criticized for promoting unsustainable consumption (Kilbourne et al., 1997), SFM posits that marketing can be a powerful force for promoting sustainable behaviors. This aligns with recent calls for transformative consumer research (Mick et al., 2012) and macromarketing approaches to sustainability (Kemper & Ballantine, 2019). Third, our framework integrates insights from institutional theory, social practice theory, and sustainability science, offering a more holistic understanding of how marketing can drive sustainability in complex systems like the food industry. This interdisciplinary approach addresses calls for more integrated theoretical perspectives in sustainability marketing research (Leonidou & Leonidou, 2011).

Managerial Implications: For practitioners, SFM necessitates a fundamental rethinking of marketing strategies and practices. It requires marketers to develop new competencies, such as systems thinking, stakeholder management, and sustainability assessment (Wiek et al., 2011).

Companies adopting SFM may need to reconfigure their organizational structures, fostering greater integration between marketing, sustainability, and other functional areas (Nidumolu et al., 2009). SFM also implies a shift in how marketing performance is measured and rewarded. Traditional metrics focused on short-term sales and market share must be complemented by indicators that capture long-term sustainability impacts (Varadarajan, 2018). This may require the development of new key performance indicators and reporting frameworks that integrate financial and sustainability outcomes. Moreover, SFM challenges marketers to move beyond incremental improvements in product sustainability to consider how they can reshape entire consumption systems. This might involve developing new business models, such as product-service systems or circular economy approaches, that fundamentally alter how value is created and delivered (Bocken et al., 2014).

Policy Implications: The SFM framework has several implications for policymakers. First, it highlights the need for policies that create an enabling environment for sustainable marketing practices. This might include regulations on sustainability claims to prevent greenwashing, incentives for companies that demonstrate genuine commitment to sustainability, and support for consumer education initiatives (Horne, 2009). Second, SFM underscores the importance of systems-level interventions to promote sustainable consumption. Policymakers should consider how they can facilitate collaboration between different actors in the food system to address sustainability challenges that no single entity can solve alone (Svendsen & Laberge, 2005). Third, the emphasis on measurement and accountability in SFM suggests a need for standardized sustainability metrics and reporting frameworks at the industry level. Policymakers could play a role in developing and mandating such frameworks, similar to financial reporting standards (Eccles et al., 2014).

This paper introduces the Sustainability-First Marketing (SFM) framework, a comprehensive approach to integrating sustainability into food marketing strategies. This work contributes to marketing and sustainability science by developing an integrated theoretical framework that synthesizes insights from sustainability theories, institutional theory, and social practice theory. The paper proposes testable propositions for future empirical research, addressing gaps in long-term studies on sustainable marketing practices' impact on brand equity and consumer behavior. The paper further outlines implementation strategies for SFM, implications for theory, management practice, and policy, providing actionable insights for stakeholders. The transformative potential of SFM for the food industry and society is significant. By placing sustainability at the core of marketing decisions, SFM can drive innovation in sustainable food products and practices, reshape consumer preferences towards sustainable choices, accelerate the transition to sustainable food systems, and create long-term value for businesses, consumers, and the planet. This approach aligns with the triple bottom line concept and has the power to address critical sustainability challenges in the food industry. Future research on SFM should focus on empirical testing of propositions across diverse sectors and cultures, emphasising longitudinal studies. Developing comprehensive metrics to assess SFM effectiveness and integrate sustainability with traditional KPIs is crucial. Further investigation into consumer behavior, organizational change dynamics, and the role of emerging technologies in SFM is needed. Research should also explore policy implications, governance mechanisms, and cross-cultural adaptations of SFM strategies.

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Track 5 - Artificial Intelligence and Information and Communication Technologies

AI-ENABLED MOBILE BANKING: DETERMINANTS OF REUSAGE INTENTIONS AMONGST YOUNG ADULTS IN EMERGING MARKETS

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Abstract

This study investigates the impact of relevant antecedents (perceived usefulness, perceived ease of use, perceived risk, perceived trust, performance expectancy, service quality, perceived intelligence, and perceived anthropomorphism) on young consumers' attitudes towards AI-enabled mobile applications and their intention to reuse AI-enabled mobile banking applications in South Africa. It is grounded on two technology acceptance theories, namely, the Technology Acceptance Model and the Unified Theory of Acceptance and Use of Technology, along with the Theory of Planned Behaviour. Multiple linear regression analysis was used to test the proposed conceptual model of nine hypotheses based on the validated quantitative survey data gathered from 300 young adults in South Africa. Empirical results show that seven out of the eight antecedents have positive effects on attitude towards AI-enabled mobile banking app, and that attitude towards AI-enabled mobile banking app exhibits statistical significance on the re-usage intention of AI-enabled mobile banking applications amongst young adults. The study is limited to a youthful demographic aged between 18-35 years. The research holds valuable insights for bank marketers to deliver effective digital marketing strategies for the provision of personalisation and convenience in digital financial services and mobile banking applications.

Keywords: Artificial intelligence (AI), Mobile banking application, AI-enabled mobile banking application, Fintech, Re-usage intention, Young adults

Background of the Study

1.0 Importance of Artificial Intelligence

Technology has become the way of the future and according to Rahman, Ming, Baigh and Sarker (2021) automated technology is growing at an annual rate of 20%. One of the most popular and evolving automated technologies is Artificial Intelligence (AI) (Rahman et al., 2021). The term "Artificial intelligence" (AI) was originally developed in 1957 by John McCarthy (Lee & Chen, 2022) and in 1969 it was officially introduced in Washington at the first International Joint Conference on Computer Science (Dogan, 2018). The creation branched from computering (Singh, 2020) and was created for the purpose that AI is to act as a general problem solver that imitates human solving problem abilities, allowing it to have a thought process of a human (Lee & Chen, 2022). This indicates that there is a possibility that computer usage can intensify and embed a degree of human intellect, such as visual and touch awareness, decision making, speech detection, language recognition etc. (Singh, 2020). Mannino et al. (2015) suggest that AI in computer systems is more competent and exceptional than human experts. The concept of AI was adopted from the previous studies of Alan Turing in 1950 who aimed to find out the possibility of an electronic computer having a thought process (Dogan, 2018; Lee & Chen, 2022). He generated a test called the "turing test" to assess if machines could be categorised as smart thinkers (Perez, Deligianni, Ravi & Yang, 2018; Lee & Chen, 2022). Russell and Norvig (1995) later broke down AI into 4 areas: to think like a human, to act like a human, to think rationally, and to act rationally. Technologically, AI can be subcategorized into data mining, predictive modelling, data analytics and big data processing (Dogan, 2018).

AI aims to create solutions that are concurrent to the growth of technology in the fast evolving digital and technological spaces (Kornienko, Kornienko, Fofanov & Chubik, 2015). AI analyses complex puzzles that can be identified as intelligence in decision making to find the best solutions that humans may not be able to comprehend (Dogan, 2018). This indicates that AI is designed to enhance and process information and data on scales that are much faster and more accurate than a human can (Makridakis, 2017). AI also has a presence within cyber security (Li, 2018). This is further enhanced by the perceived intelligence that AI holds in terms of visual and touch perception and speech recognition, amongst its other features. AI is a growing concept that can process and analyse data relationships to make strategic decisions as well as contribute to constant learning.

AI usage and investment rapidly increased in the 21st century due to the growth of digital technology as well as availability of numerous large data sets, evolving computer hardware and new methods (Mhlanga, 2020). The importance of AI and its impact on intelligence and human abilities is widely accepted and reflected through the large amount of investment in AI by companies and organisations (Dogan, 2018). Artificial Intelligence research and development has had a presence in Africa from a while back (Carman & Rosman, 2021). In South Africa, AI has gained much more attention and popularity within the last 5 years (Carman & Rosman, 2021). According to Hamadziripi and Chitimira (2021) AI has been utilised by about 40% of South African companies in some type of way. Johannesburg and Stellenbosh are seen as the country's strongest hubs when it comes to AI (Carman & Rosman, 2021). AI has made its debut in various discipline areas, such as banking, retail and healthcare amongst others (Payne, Peltier & Barger, 2018). Therefore, we find it viable to conduct further research relating to AI-enabled mobile banking applications among young adults in South Africa.

1.1 Artificial Intelligence and the Financial Services Industry

Resulting from the COVID-19 social distancing restrictions, the world had to swiftly embrace the digital revolution, and the planning of resolution procedures consisted of an increased use of data and digital instruments (Chivungo & Tempest, 2021). Mhlanga (2020) denotes 'fintech' (or financial

technologies) to various business models that innovatively provide different financial services or products automatically via the broad scope of the internet. Fintech creates solutions for customers and introduces new concepts within the financial industry (Abu Daqar, Arqawi & Abu Karsh, 2021).

Financial transactions are more frequently being conducted as digital payments, digital investment and digital financing, increasing the approach of AI for use in financial services and continually contributing to rising financial inclusion (Mhlanga, 2020). According to Liu (2020), a rounded amount of 11 billion US dollars was invested into AI in the year 2020, with the financial industry making up the largest industry that contributes to AI. Due to greater customer expectations in this age of digital disruption, banks are now broadening their business outlook to include AI characteristics within their retail, IT and telecommunications departments in order to facilitate services like "mobile banking, e-banking and real-time money transfers" to its most efficient state (Singh, 2020).

1.2 Artificial Intelligence and Mobile Banking Applications

Internet banking and mobile banking first emerged in the late 90s/early 2000s (Indriasari, Gaol & Matsuo, 2019) and was initially introduced in South Africa in August 2002 (Nyoka, 2018). According to Yusaivi, Lu, Syarief and Suhartanto (2021) mobile banking can be defined as "a service platform provided by a financial institution" through which consumers can make use of "bank features and services" via a smart electronic device without having to engage with bank representatives in-person. In other words, mobile banking provides an efficient and direct alternative to traditional banking services (Lee & Chen, 2022), whereby customers can transact electronically (Payne et al., 2018). In South Africa, ABSA was the first bank to establish an internet banking service (for basic balance checking), thereafter influencing the likes of FNB, Standard Bank and Nedbank (Nyoka, 2018). Today, these banks have successfully employed mobile technology in providing convenient financial services to its customers. It is evident that mobile banking has become an "innovative tool" for banks and non-bank institutions to grow current and future revenues, decrease service costs, and sustain and strengthen customer service (van Deventer, 2019).

Although mobile banking can be performed on several technological devices, the smartphone is found to be the most popular platform, specifically with the use of mobile applications (Payne et al., 2018). The use of smartphones and the application of AI technology has boosted the advancement of mobile banking services, allowing banks to improve accessibility with minimal effort to basic banking services (Mhlanga, 2020; Nyoka, 2018). In 2019, South Africa's statistics showed that the number of mobile connections in the country amounted to over 90 million and an average of 21 million members (out of approximately 59 million) of the population used smartphones (Statista, as cited in Thusi & Maduku, 2020). However, it was also noted that only 43% of these mobile users adopted some form of banking service on their mobile platforms (Thusi & Maduku, 2020). Banks are therefore aiming to reduce the gap between the "unbanked population" and the "financial mainstream" through mobile banking channels in order to encourage financial inclusion in developing economies like South Africa (van Deventer, 2019). Furthermore, mobile banking applications benefit banks by diminishing operational and distribution channel costs and in improving customers' satisfaction in their banking experience (Thusi & Maduku, 2020; van Deventer, 2019). Through AI-enabled mobile banking applications customers can attain personalised banking services; and the internal features that AI offers such as chatbots and robotic self-services have enhanced banking experience and could even rank higher than traditional banking services (Rahman et al., 2021). Hence, in employing AI-enabled mobile banking applications to better customer experiences, the goal for financial services institutions is to ensure re-usage of the application. The re-usage intention implies longer-term acceptance of the mobile platform and AI, and this assists financial service providers as well as its customers to effectively achieve the advantageous effects that are reduced costs and heightened customer loyalty.

1.3 Young Adults and Mobile banking applications

Young adults consist of individuals between the ages of 18 to 35 years old and are referred to as Generation Y and Generation Z (Bapat, 2020).

1.4 Young Adults: Generation Y

Generation Y, otherwise known as millennials, are born between the early 1980's to mid-1990's and make up most of the younger employed population at the present time (Schwieger & Ladwig, 2018). According to an article by Glazer, Mahoney and Randall (2018), 75% of the world's workforce will be made up by millennials in the 2020's. These individuals are generally more confident in the decisions that they make as they have more exposure to the real world (Schwieger & Ladwig, 2018). They are eager to learn and are strong-willed individuals who show consistent interest in learning more about the digital environment and its technologies, as they are now living in a time where one cannot go a day without interacting online and through mobile device applications, whether it be for employment or personal reasons (Augustine & Kingsley, 2020). Most individuals in this category are in the peak of their careers, have families or are budding entrepreneurs, so time is an asset for them. Most would be hesitant to stand in long lines at the banks – they are looking for fast, easy and on-demand access services for an unlimited amount of time. AI-enabled mobile banking meets this criterion (Payne, Peltier & Barger, 2021).

1.5 Young Adults: Generation Z

Generation Z consists of persons born between the mid 1990's to the early 2010's (Schwieger & Ladwig, 2018). As of today, these individuals are between their pre-teens and mid 20s and are at a critical age group wondering what lies ahead for them in the future. Their future is much different from that of their parents due to the rapidly and constantly growing age of digital technology. Generation Z is known to be extremely tech-savvy and holds strong attachment to technology and the digital space. Many of the individuals from this category grew up with easy access to the internet and familiarise themselves with the world wide web, social media, online gaming and mobile applications (Schwieger & Ladwig, 2018). Being the first generation to have not experienced life before technology, these individuals are used to instant contact with friends and family as well as acquiring information at the touch of a few buttons (Roblek, Mesko, Dimovski & Peterlin, 2018). A study done amongst 3 200 Generation Z individuals in Brazil, Japan, China, Germany, India, Mexico, the UK and the US, by Ernst & Young (2016), discovered that 91% of teenagers had access to a mobile cellphone and 69% of teenagers had access to a tablet. Generation Z are inclined towards self-service technological experiences as well as personalisation that run smoothly and are error-free (Schwieger & Ladwig, 2018). A study done by Alaeddin, Rana, Zainudin and Kamarudin (2018) found from a study conducted with 2004 US respondents that Generation Z tend to give more thought about their financial decisions. Through AI-enabled banking applications, these individuals are able access their banking account with ease, to engage with a bank's personalised financial services on a digital platform as they please (Payne et al., 2021).

1.6 Young Adults and Mobile Banking

Mobile device usage amongst young adults has rapidly increased in recent years. Statista (2021) predicts that there will be about 41.89 million smartphone users in South Africa by 2025. Mobile applications and the internet are used to connect with friends and family, attend to business needs, play games, read, seek guidance, study, or bank amongst many other uses. The reason for this digital shift is due to the ease of use, accessibility, flexibility and openness to information and learning that digital platforms offer (Hashim, 2018). Young people value their time and find it frustrating to stand in lines. In the banking industry, to speak with a consultant one has to stand for a long period of time in lines and might even have to be directed to different departments. Through the implication of

mobile banking applications, one can access their bank accounts and get the service that they require from the comfort of their homes. Mobile banking application services can be provided to customers in a fast and efficient manner, so developers have to have a comprehensive insight of the demands and expectations of their customers in order to create ease of use within the banking application in a secure and accurate manner (Boonsiritomachai & Pitchayadejanant, 2019). Through AI, this is possible. AI is known to be one of the most popular and evolving technologies in this era as many companies are incorporating AI into their strategies and day-to-day activities, and it has made its way into the banking industry as well as been integrated into banking applications (Payne et al., 2021). According to Dapp, Slomka and Hoffmann (2015) the number of mobile financial transactions increased by roughly 58.33% from 2014 to 2015. In relation to this, the paper goes on to determine the factors that influence young people to re-use AI-enabled mobile banking applications.

1.7 Problem Statement

There is significant potential for economic outcome and betterment with the implication and usage of AI in the financial services industry (Stalidis, Karapistolis, & Vafeiadis, 2015). Existing research has analysed consumers' intention to adopt artificially intelligent mobile banking applications (Lee & Chen, 2022; Yusaivi et al., 2021; Kala Kamdjoug et al., 2021; Payne et al., 2018; Nyoka, 2018; van Deventer, 2018) and the re-usage intention of internet banking (Yoon & Joung, 2020; Nelwan, Yasa, Sukaatmadja & Ekawati, 2021). However, insufficient research has been conducted to investigate the particular re-usage intention of mobile banking applications (Nelwan et al., 2021; Prodanova, Ciunova-Shuleska & Palamidovska-Sterjadovska, 2019). The focal research area is therefore to determine the factors that result in the intention by application users to continue using the mobile banking platform as well as to explore the relationship between consumers' attitude towards AI and their re-usage intention.

1.8 Research Objectives

The fundamental objective of this study is to gain an in-depth understanding of the factors that influence the re-usage intention of AI-enabled mobile banking applications amongst young adults.

1.2.1 Theoretical Objectives

To review current literature on the following established theoretical components:

- Perceived Usefulness
- Perceived Ease of Use
- Perceived Risk
- Perceived Trust
- Performance Expectancy
- Service Quality
- Perceived Intelligence
- Perceived Anthropomorphism
- Attitude Towards AI
- AI-Enabled Mobile Banking Applications Re-Usage Intention

1.8.1 Empirical Objectives

- To investigate if perceived usefulness is a component that impacts young adults' attitude towards AI and influences their re-usage intention of AI-enabled mobile banking applications.
- To investigate if perceived ease of use is a component that impacts young adults' attitude towards AI and influences their re-usage intention of AI-enabled mobile banking applications.
- To determine if perceived risk is a component that impacts young adults' attitude towards AI and influences their re-usage intention of AI-enabled mobile banking applications.
- To examine if perceived trust is a component that impacts young adults' attitude towards AI and influences their re-usage intention of AI-enabled mobile banking applications.
- To investigate if performance expectancy is a component that impacts young adults' attitude towards AI and influences their re-usage intention of AI-enabled mobile banking applications.
- To determine if service quality is a component that impacts young adults' attitude towards AI and influences their re-usage intention of AI-enabled mobile banking applications.
- To investigate if perceived intelligence is a component that impacts young adults' attitude towards AI and influences their re-usage intention of AI-enabled mobile banking applications.
- To examine if perceived anthropomorphism is a component that impacts young adults' attitude towards AI and influences their re-usage intention of AI-enabled mobile banking applications.
- To investigate the relationship between attitude towards AI and AI-enabled mobile banking re-usage intention.

1.9 Research Questions

1.9.1 Primary Research Question

What factors influence young adults' intention to reuse AI-enabled mobile banking applications?

1.9.2 Secondary Research Questions

- Does perceived usefulness of AI-enabled mobile banking applications affect young adults' attitude towards AI and re-usage intention?
- Does perceived ease of use of AI-enabled mobile banking applications affect young adults' attitude towards AI and re-usage intention?
- Does perceived risk of AI-enabled mobile banking applications affect young adults' attitude towards AI and re-usage intention?
- Does perceived trust of AI-enabled mobile banking applications affect young adults' attitude towards AI and re-usage intention?
- Does performance expectancy of AI-enabled mobile banking applications affect young adults' attitude towards AI and re-usage intention?
- Does service quality of AI-enabled mobile banking applications affect young adults' attitude towards AI and re-usage intention?

- Does perceived intelligence of AI-enabled mobile banking applications affect young adults' attitude towards AI and re-usage intention?
- Does perceived anthropomorphism of AI-enabled mobile banking applications affect young adults' attitude towards AI and re-usage intention?
- Does young adults' attitude towards AI influence their re-usage intention of AI-enabled mobile banking applications?

1.10 Theoretical Framework

This study is substantiated by two theories that relate to technology acceptance: Technology Acceptance Model (TAM) (Davis, 1989) and Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003); as well as the Theory of Planned Behaviour (TPB) (Ajzen 1991), relating to the relationships between consumers' attitudes and behaviours.

1.10.1 Technology Acceptance Model (TAM)

Davis (1989) adapted Fishbein and Ajzen's (1975) theory of reasoned action (TRA) to create the Technology Acceptance Model (TAM). The TAM makes use of two constructs, perceived usefulness and perceived ease of use, to determine an individual's attitude and behavioural intention towards the adoption (or rejection) of a new information technology (IT) system. Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" and perceived ease of use refers to "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989). Davis, Bagozzi and Warshaw's (1989) TAM indicates that perceived usefulness is influenced by ease of use, because, according to Nyoka (2018), the easier the IT system is to use, the more useful it can become for consumers. Several studies have applied TAM in analysing consumers' decisions to adopt mobile banking technologies (Kala Kamdjoug et al., 2021; Pankomera & van Greunan, 2018; van Deventer et al., 2018; Nyoka, 2018). Therefore, this research aims to employ TAM along with other models and constructs in understanding young adults' attitude and behaviour towards the re-usage of mobile banking applications.

1.10.2 Unified Theory of Acceptance and Use of Technology (UTAUT)

To gain a deeper understanding to information system (IS) and information technology (IT) Venkatesh et al. (2003) looked into 8 of the most prominent models and theories that are adopted in technological acceptance and innovation research and extracted the core variables from these to create the Unified Theory of Acceptance and Use of Technology (UTAUT). These 8 models and theories are: theory of reasoned action (TRA), information diffusion theory (IDT), theory of planned behaviour (TPB), technology acceptance model (TAM), a combined model of TPB and TAM (C-TAM-TPB), motivational model (MM), model of personal computer utilisation (MPCU) and social cognitive theory (SCT). The original UTAUT model created by Venkatesh et al. (2003) had been put in place to explain a substantial amount of variance in behavioural intention and usage (Dwivedi, Rana, Jryarai, Clement & Williams, 2019). Over the last 2 decades the UTAUT model is well-known in the technological space in terms of communication, predicting system usage, supporting technology-embedded acceptance and usage-orientated decisions within various industries (Chatterjee, Rana, Khorana, Mikalef & Shama, 2021). The core variables of the UTAUT model are performance expectancy, effort expectancy, social influence and facilitating condition (Williams, Rana, & Dwivedi, 2015). These variables are the direct determinants of behavioural intention and user behaviour and are moderated by age, gender, experience and voluntariness of use (Williams et al., 2015).

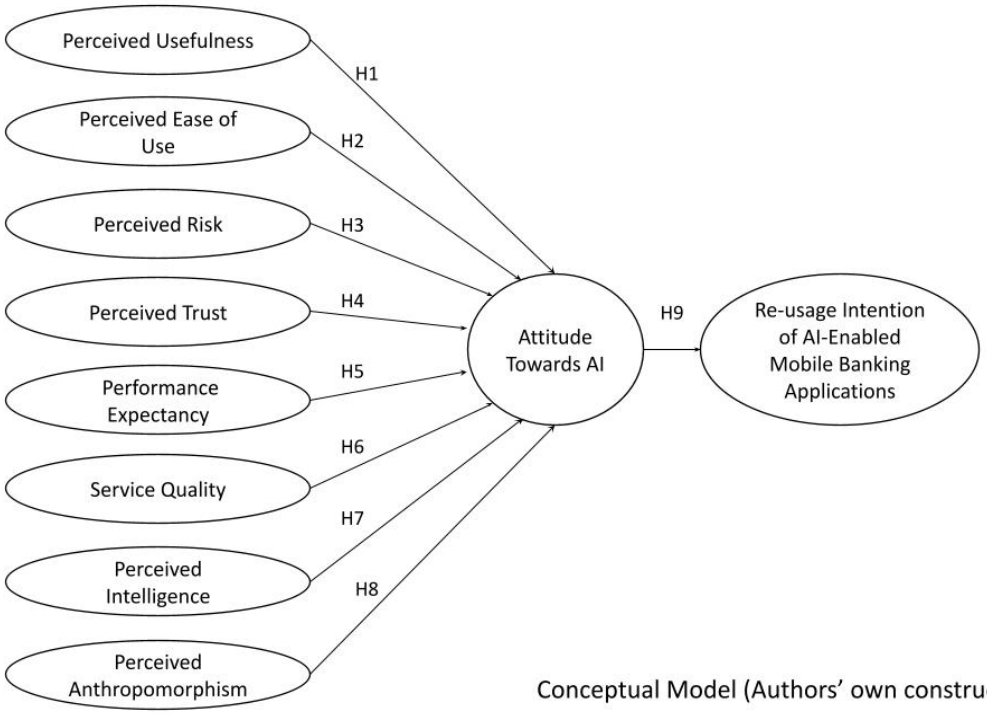
1.10.3 Theory of Planned Behaviour (TPB)

Ajzen (1991) formulated the Theory of Planned Behaviour (TPB) by extending the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975). The TPB model postulates that behaviour is impacted by the intention to perform, which is influenced by attitude toward the behaviour, subjective norms, and perceived behavioural control (Ajzen, 1985; George, 2004). "Perceived behavioural control", affecting actual behaviour and behaviour intentions, is the added construct to the TPB model which has not been included in the TRA model (Asongu & Nwachukwu, 2018). The TPB is the most favourable model to researchers for studying and predicting human behaviour (Ajzen, 1988, 2001; Mazambani & Mutambara, 2019). Several studies had used TPB to predict and understand behaviour, intention, acceptance and usage of technologies (Venkatesh et al., 2003), including literature relating to e-commerce, online services and mobile technologies amongst other industries (Mazambani & Mutambara, 2019).

1.11 Conceptual Model and Hypotheses Statements

The predictor variables in the model consist of perceived usefulness, perceived ease of use, perceived risk, perceived trust, performance expectancy, service quality, perceived intelligence and perceived anthropomorphism to understand attitude towards AI and hence AI-enabled mobile banking re-usage intention as an outcome variable. The conceptual model below depicts these relationships.

Figure 1.0. Conceptual model



Conceptual Model (Authors' own construction, 2022)

Derived from the conceptual model, the following hypotheses are proposed:

H1: The relationship between *perceived usefulness* and *attitude towards AI* is positive.

H2: The relationship between *perceived ease of use* and *attitude towards AI* is positive.

H3: The relationship between *perceived risk* and *attitude towards AI* is negative.

H4: The relationship between *perceived trust* and *attitude towards AI* is positive.
H5: The relationship between *performance expectancy* and *attitude towards AI* is positive.
H6: The relationship between *service quality* and *attitude towards AI* is positive.
H7: The relationship between *perceived intelligence* and *attitude towards AI* is positive.
H8: The relationship between *perceived anthropomorphism* and *attitude towards AI* is positive
H9: The relationship between *attitude towards AI* and *re-usage intention of AI-enabled mobile banking applications* is positive.

1.12 Study Procedure and Design

The research design in this study is descriptive, branching from conclusive research as it is to describe a phenomenon (Saunders et al., 2019). The study follows a cross-sectional time horizon as data is only collected once from any sample within the population at a selected period (Saunders et al., 2019). For this research, the population of interest comprises young adults (Generations Y and Z) from 18 to 35 years old, of all races, income groups and genders, who have used AI-enabled mobile banking applications within the past 2 years. The motivation for choosing this target population is that it is presumed that young adults are most likely to be engaged in AI systems and utilise mobile banking services. The extent of the research falls within the boundaries of the University of the Witwatersrand, Johannesburg and time constraints for data collection have been set. A target population of 40 778 students registered at the University of the Witwatersrand in 2022 has been selected for this study (Wits University Deputy Registrar, 2022).

This research specifically utilises a non-probability, convenience sampling approach. This method is favoured by many researchers due to its affordability, convenience, and availability of subjects to participate in the study (Etikan et al., 2016). Stratton (2021) describes the process of convenience sampling whereby the researcher circulates the study, and the participants voluntarily consent to participate. It is an inexpensive and simple approach that is not as time consuming as other sampling techniques (Stratton, 2021). Raosoft (2022) indicates that for a target population of 40 778 with a confidence level of 95% and a marginal error of 5%, a sample size of 381 is required. The sample of 300 young adults at the University of the Witwatersrand was deemed substantial for this study.

A self-administered online questionnaire created on Google Forms is the data collection method adopted for this research. Online surveys benefit both the researcher and respondent as they are flexible, efficient and inexpensive (Evans & Mathur, 2005). The data collected from the study's survey was processed and examined through regression analysis using the IBM SPSS program (version 28), the most accepted statistical software package used for research in the social sciences.

1.13 Findings

1.14 Descriptive Statistics

In this section, demographic statistics and the measurement scale are analysed and discussed to better understand the respondents in the context of AI-enabled mobile banking applications.

1.14.1 Demographic Profile of Respondents

A total of 310 responses were collected from the online survey questionnaire. However, a screening question was administered to ensure that the participants have used a mobile banking application

within the past two years, and the responses were filtered to include 300 respondents that met this criterion. The demographic variables used to undertake the study included the participants' gender, age, annual household income, the number of times they use a mobile banking application in a month as well as the faculty in which they were enrolled at the time the study was conducted. Tables 1.0 (see appendix) summarises the demographic profile of respondents.

1.14.2 Gender

Majority of the participants were female, comprising 60.7% of the total sample (300 respondents), while 37.7% of the participants identified as male and the remaining 1.7% did not wish to disclose their gender.

1.14.3 Age

As the study focuses on young adults, respondents were requested to indicate their age from 18 and 35 years old. The profile illustrates that most of the participants (60.3%) are within the age range of 18-23 years, followed by 23.7% being between 29 and 35 years and 16% of the participants aged between 24-28 years old.

1.14.4 Annual Household Income

Four levels of household income were established for this study. Most of the participants' household income falls below R200 000, comprising 27.3% of the total sample. Moreover, 23.7% classified their annual household income in the range of R200 000 – R500 000, and 20% consider their household to earn above R750 000 annually. 11.3% of the participants indicated that their household earns between R500 000 and R750 000 annually, while 17.3% prefer not to disclose their household income. Based on the results, it can be concluded that most participants that fall within the lower income brackets utilise mobile banking applications.

1.14.5 Mobile Banking Application Use Per Month

The data signifies that the majority (64%) of participants use mobile banking applications more than six times in a month. 25% of the participants use mobile banking applications 3-5 times a month, while 10% use it 1-2 times a month and 1% only use it occasionally, indicating less than once per month.

1.14.6 Faculty

The sample is dominated by participants who were registered within the faculty of Commerce, Law and Management (40%), followed by those enrolled in the faculty of Humanities (22%). The faculties of Engineering and the Built Environment, Health Sciences, and Science comprised 15.3%, 10.7% and 9.7% of the total sample, respectively. Participants that selected 'Other' (2.3%) were either registered in a different academic program, or it was not applicable to them.

1.14.7 Central Tendency Measures

The results in Table 1.2 (see appendix) consist of the Central Tendency Measures for all ten constructs within the conceptual model. The study uses a five-point Likert scale that was adopted to measure each construct. It contains numerical values where "1" relates to "Strongly Disagree" and "5" relates to "Strongly Agree" while "3" relates to "Neither agree nor disagree" as the midpoint. To analyse the

responses collected through this scale, mean scores between 2.5–3.5 explain that most respondents are neutral towards the statement while scores below 2.5 or above 3.5 explain that most respondents disagree or agree with the statement, respectively.

From the table it is depicted that most of the respondents were neutral towards Perceived Anthropomorphism (M=3.0833; Std Dev.=0.9604) and Perceived Risk (M= 3.3383; Std Dev.=1.0226). Most of the respondents agreed with statements of: Perceived Usefulness (M=4.0183; Std Dev.=0.9749); Perceived Ease of Use (M=3.9992; Std Dev.=0.9028); Perceived Trust (M=3.6156; Std Dev.=0.8986); Performance Expectancy (M=3.84; Std Dev.=0.9052); Service Quality (M=3.5489; Std Dev.=0.8695), Perceived Intelligence (M=3.7917; Std Dev.=0.8201); Attitude Towards AI (M=3.7011; Std Dev.=1.005) and AI-enabled Mobile Banking Application Re-usage (M=3.5722; Std Dev=1.0081).

1.15 Measurement Instrument Assessment

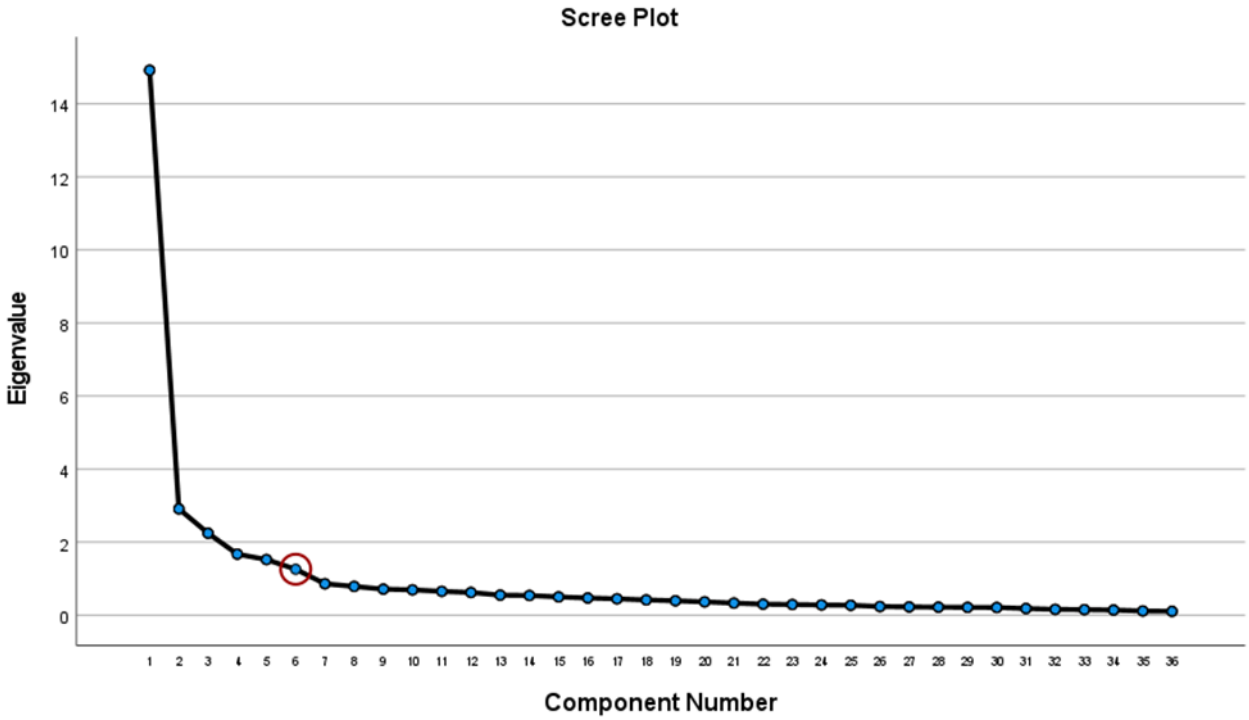
1.15.1 Testing for Reliability

Table 1.3 (see appendix) demonstrates the reliability of the study's 10 constructs: PU, PEU, PR, PT, PE, SQ, PI, PA, AT and RI. The results demonstrate that all ten constructs have Cronbach Alpha values exceeding the required threshold of 0.7, confirming that all ten constructs are reliable.

1.8.2 Testing Convergent Validity through an Exploratory Factor Analysis

The Kaiser-Meyer-Olkin (KMO) and Bartlett's Test in Table 1.4 (see appendix) presents a significant KMO value of 0.93 (KMO value > 0.6), and the Bartlett's test of significance is statistically significant at a value of 0.00 ($p < 0.05$). The significance of these two values proves the data to be suitable for factor analysis. The Kaiser-Guttman rule of thumb states that components that have Eigenvalues above 1 should be retained. The Eigenvalue is an arbitrary figure that explains the degree of variance observed. From Table 1.5 (see appendix) it is seen that 6 out of the 10 components hold Eigenvalues above 1. Furthermore 68.15% of the variance of the 36 items is explained by these six components. This is supported by the scree-plot in Figure 1.2, which illustrates the inflection point that warrants the retention of the six factors.

Figure 1.1. Scree Plot – Factor Analysis



It is seen in the varimax rotation conducted (Table 1.6, see appendix) that PI, PE, SQ and PI all load in column 1, while both AT and RI load in column 2. From the results (Table 1.6) it is evident that these shared factor loadings are strong (> 0.5). Despite four of the constructs failing to obtain Eigenvalues above 1, and the issue of cross loadings, it has been chosen to retain all ten factors for two reasons:

1) For this study cross-loadings are a limitation.
2) Retention decisions are looked at from a theoretical understanding rather than a statistical one. From our proposed model, AI is the determinant factor of RI, therefore the study allows for the two factors to load within the same construct. Table 1.8 (see appendix) shows that there is a strong correlation between PT, PE, SQ and PI.

The correlation is justifiable based on previous studies that contributed to theoretical literature. Sultan and Wong (2013) define service quality to be the combination of features and characteristics that a product or service embeds to achieve satisfaction and found trust to be directly linked to service quality. According to Gao and Waechter (2017) service quality is a factor that influences trust initially. Results from Choi, Choi and Kim (2020) found that clients generally get frustrated with staff who lack knowledge or professionalism within their service field and find it annoying to deal with staff that are not able to assist them in a language that they are comfortable with. Participants from this study found that the use of AI-enabled technology is useful as they would be able to acquire 100% accurate knowledge and information that they desire in a language of their choice suggesting that perceived intelligence does in fact affect service quality of AI-enabled technologies (Choi et al., 2020). Furthermore, Lee, Sang and Joen (2019) found that the quality of service that clients are exposed to has an influence on performance expectancy.

The communalities explain the degree of variance shared between the items of the construct. A threshold value above 0.3 is acceptable in the context of behavioural and social sciences. Table 1.7 (see appendix) shows that all communalities from the items of this model exceed the required threshold, with the smallest value being 0.402 for PI4, and therefore all the factors are retained.

1.15.2 Testing Discriminant Validity Using Inter-Construct Correlation Matrix

The correlation matrix (Table 1.8) explains that all ten constructs in the model have correlation coefficient values below 0.8, with the highest value being 0.778 between AT and RI. Therefore, it is concluded that all constructs within the model are significant and there is no issue of discriminant validity.

1.16 Regression Analysis

Model One (Regression One)

- **Dependent variable:** Attitude Towards AI (AT)
- **Independent variables:** Perceived Usefulness (PU), Perceived Ease of Use (PEU), Perceived Risk (PR), Perceived Trust (PT), Performance Expectancy (PE), Service Quality (SQ), Perceived Intelligence (PI) and Perceived Anthropomorphism (PA)

Model Two (Regression Two)

- **Dependent variable:** AI-enabled Mobile Banking Application Reusage (RI).
- **Independent variables:** Attitude Towards AI (AT).

1.16.1 Testing the Assumptions

Assumption of Multicollinearity

Tables 1.9 and 1.10 (see appendix) display that the Tolerance and VIF values for both outcomes fall within the thresholds of >0.1 and <10 respectively, indicating that neither of the regressions have an issue of multicollinearity.

Assumption of Normality

Table 1.11(see appendix) shows that all dependent and independent variables of the data fall within the required intervals of Skewness (-2 to +2) and kurtosis (-7 to +7) indicating that the conditions of normality have been met.

1.16.2 Testing the Hypotheses

Model 1 - The impact of various independent variables on Attitude Towards AI (AT) as the dependent variable. The model summary table (Table 1.12- see appendix) explains that 53.2% (R2 = 0.532) of the variance of AT is explained by PU, PEU, PR, PT, PE, SQ, PI and PA. The ANOVA (Table 1.13- see appendix) highlights the p-value (Beta Coefficient) to be significant ($p<0.001$; $F=43.555$), which predicts that some of the independent variables significantly influence the AT indicating the model to be statistically significant.

Model 2 - The impact of Attitude Towards AI (AT) on Reusage Intention of AI-enabled mobile banking applications (RI) The model summary table (Table 1.14- see appendix) explains that 60.3% (R2 = 0.603) of the variance of RI is explained by AT. The ANOVA (Table 1.15- see appendix)

highlights the p-value (Beta Coefficient) to be significant ($p<0.001$; $F=455.544$), which predicts that AT significantly influences RI indicating that this model to be statistically significant.

1.17 Model Coefficients

Model 1

From the Regression Coefficient table (Table 1.16 see appendix) below, the Beta coefficient explains if there is a positive or negative relationship between the dependent and independent variables, while p-value (Sig.) explains whether the relationship between the two are significant or not.
It is evident that PU has a positive and significant influence on the dependent variable (Beta=0.16; p=0.005). PEU has a positive and non-significant effect on AT with p=0.052 (Beta=0.097; $p > 0.05$). PR has a negative non-significant influence on AT with p=0.112 (Beta= – 0.069; $p > 0.05$). PT has a positive and non-significant influence on AT with p=0.086 (Beta=0.11; $p > 0.05$). PE has a positive and significant influence on AT and is seen as the strongest predictor variable of the model (Beta=0.227; p=0.002). SQ has a positive and non-significant influence on AT with p=0.8 (Beta= 0.016; $p > 0.05$). PI has a positive and significant influence on AT (Beta= 0.163; p=0.012). Finally, PA has a positive and significant influence on AT (Beta=0.119; p=0.017).

Looking at Table 1.16 the following decisions are made regarding the hypotheses related to this model:

H1: The relationship between perceived usefulness and attitude towards AI is positive.

The Beta coefficient (Beta=0.16) and the p-value (p=0.05) indicates that PU has a positive and significant influence on AT.

Therefore, H1 is accepted.

H2: The relationship between perceived ease of use and attitude towards AI is positive.

The Beta coefficient (Beta=0.097) indicates that PEU has positive influence on AT. Therefore, H2 is accepted.

H3: The relationship between perceived risk and attitude towards AI is positive.

The Beta coefficient (Beta= - 0.069) indicates that PR has a negative influence on AT. Therefore, H3 is rejected.

H4: The relationship between perceived trust and attitude towards AI is positive.

The Beta coefficient (Beta=0.11) indicates that PT has a positive influence on AT. Therefore, H4 is accepted.

H5: The relationship between performance expectancy and attitude towards AI is positive.

The Beta coefficient (Beta=0.227) indicates that PR has a positive influence on AT. Therefore, H5 is accepted.

H6: The relationship between service quality and attitude towards AI is positive.

The Beta coefficient (Beta=0.016) indicates that SQ has a positive influence on AT. Therefore, H6 is accepted.

H7: The relationship between perceived intelligence and attitude towards AI is positive.

The Beta coefficient (Beta=0.163) indicates that PI has a positive influence on AT. Therefore, H7 is accepted.

H8: The relationship between perceived anthropomorphism and attitude towards AI is positive.

The Beta coefficient (Beta=0.119) indicates that PA has a positive influence on AT. Therefore, H8 is accepted.

Model 2

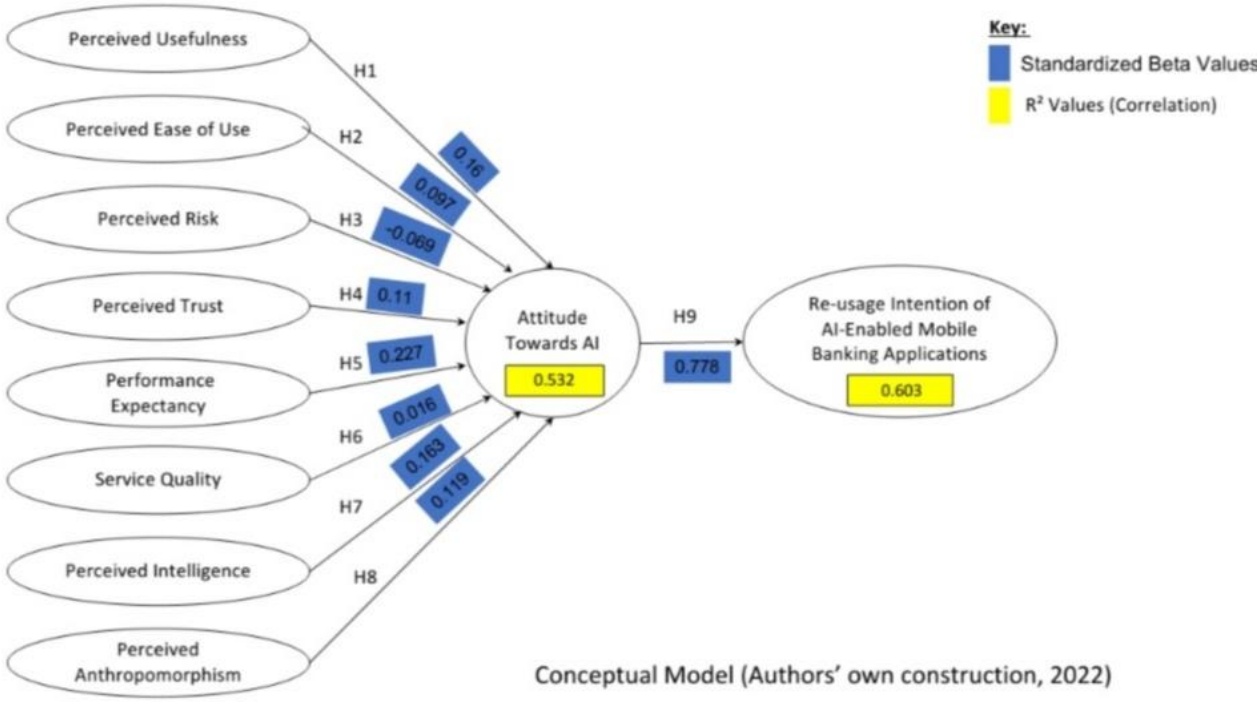
The Beta coefficient and p-value (Sig.) obtained from the Regression Coefficient table (Table 4.18) explain that AT has a positive and significant influence on RI (Beta= 0.778; $p < 0.001$).

Looking at Table 1.17 (see appendix) the following decisions are made regarding the hypothesis related to this model:

H9: The relationship between attitude towards AI and re-usage intention of AI-enabled mobile banking applications is positive.

The Beta coefficient (Beta=0.778) indicates that AT has a positive influence on RI. Therefore H9 .is accepted.

Figure 4.2. Conceptual Model Depicting Beta and R^2 Values



1.18 Conclusion, Limitation and Recommendation

Hypotheses

H1: The relationship between Perceived Usefulness and Attitude Towards AI is positive.

The results demonstrate that the perceived usefulness of mobile banking applications significantly influences a user's attitude towards AI technology embedded in the service. This finding is also validated by Rahman et al. 's (2021) and T. Zhang et al. 's (2018) research, confirming the positive function that usefulness of the technology has with regards to attitude towards AI.

H2: The relationship between Perceived Ease of Use and Attitude Towards AI is positive.

Although it is evident that perceived ease of use is positively associated with attitude towards AI, the results indicate that it does not significantly largely influence it. This could be due to a deficiency in digital education of the study's sample as Alalwan et al. (2016) suggest that it may be necessary for users of AI systems to have a required level of technological knowledge to use it efficiently and effortlessly.

H3: The relationship between Perceived Risk and Attitude Towards AI is positive.

This hypothesis is rejected as perceived risk was found to be negatively related to attitude towards AI. This is contrary to findings from Lee and Chen (2022), who proposed that AI-embedded services lead to a decrease in uncertainty and risk. Rather, it is in line with studies by Thusi & Maduku (2020), Ho et al. (2020), and Alalwan et al. (2016), implying that privacy and security concerns regarding mobile banking applications are still very much evident even with the implication of AI technology, resulting in a negative attitude towards AI.

H4: The relationship between Perceived Trust and Attitude Towards AI is positive.

The results show that the relationship between perceived trust and attitude towards AI is positive yet insignificant. Although trust is portrayed as an important mediator in a user's attitude towards AI (Ridel et al., 2021), it is likely that this study's sample of respondents do not experience high levels of trustworthiness in their banks' ability to effectively provide secure and reliable services through AI-enabled mobile banking applications.

H5: The relationship between Performance Expectancy and Attitude Towards AI is positive.

The strongest positive relationship was found between performance expectancy and attitude towards AI. This finding is in line with the previous literature on mobile banking performance expectancy (Thusi & Maduku, 2020; Rahi et al., 2019) which infers that when a mobile banking application performs well, a user's attitude towards using the technology is positive and their intention to adopt or reuse it is greater.

H6: The relationship between Service Quality and Attitude Towards AI is positive.

The results identified the weakest positive relationship to be between service quality and attitude towards AI. Previous literature (Suhartanto et al., 2020; Payne, James & Victor, 2018) expected that that technological service quality would extend a negative relation between attitudes towards AI-embedded mobile banking applications towards millenial youth, however the results of both studies explain that the relationship held is a positive significant one.

H7: The relationship between Perceived Intelligence and Attitude Towards AI is positive.

Perceived intelligence was found to have a strong positive influence on attitudes towards AI, which are in line with the findings of Balakrishnan and Dwivedi (2021). This indicates that mobile applications embedded with AI systems have the ability to efficiently and automatically respond to the request of the user in a sensible manner, thereby displaying a high level of competency through its intelligence.

H8: The relationship between Perceived Anthropomorphism and Attitude Towards AI is positive.

The findings explain that perceived anthropomorphism has a positive and significant relationship on attitudes towards AI as well, following the findings of Balakrishnan and Dwivedi (2021). Blut et al. (2021) emphasises in their findings that anthropomorphism is an important factor to consider when studying the customer interaction, hence attitudes, towards technological systems.

H9: The relationship between Attitude Towards AI and Re-Usage Intention of AI-enabled mobile banking applications is positive.

This study followed in the path of Mehrad and Mohammadi (2017) where re-usage intention was assessed by attitude towards AI through indirect factors (hypotheses 1 – 8) but also directly through scales adapted from Rahman et al. (2021).

1.19 Theoretical and Practical Contribution

The study provides empirical evidence supporting the influence that young consumers' attitude towards artificial intelligence technology has on their intention to reuse technology within the financial industry. Specifically, it confirms that young adults' attitude towards AI has a positive impact on their reusage intention of AI-enabled mobile banking applications. However, from the findings of this study, not all hypotheses were supported or significant. The strongest relationship was found between performance expectancy and attitude towards AI, implying that users of AI-enabled technology expect the software to perform optimally. Furthermore, the antecedents of perceived usefulness, perceived ease of use, perceived trust, service quality, perceived intelligence and perceived anthropomorphism on attitude towards AI positively influence the extent to which users continue to use AI-embedded mobile banking applications, while perceived risk greatly reduces their re-usage intention. Thus, this study makes a meaningful contribution to the research on AI and digital banking.

1.20 Limitations of the Study

Time was also a limit to the study and did not allow for a deeper investigation into the topic of AI-enabled mobile banking applications. For instance, a qualitative research component could have benefitted the study by obtaining participants' detailed expressions of their experiences with mobile banking applications as well as acquiring recommendations from users regarding features they would like AI embedded applications to have. Additionally, as the survey was automatically conducted online and in one language only (English), the respondents did not have an interviewer to assist them in the interpretation or clarification of the measurement scales. This could have possibly hindered the understanding of the research objective by some respondents.

1.21 Recommendations

Future research can include bigger samples to account for a greater age range and to obtain more accurate results. By including older consumers in the study sample, an analysis of traditional-bank customers' responses to remote digital banking could be made and hence,

provide banks and their marketers. Additionally, further studies can investigate attitudes towards AI as well as re-usage intention in various other contexts where smart technology is/can be utilised, such as in the medical, retail and automobile industries, amongst others.

References

Appendix

Table 1.0. Demographic Profile of Respondents			
Variable	**Sub-variable**	**Frequency**	**Valid Percent**
Gender	Male	113	37.7
	Female	182	60.7
	Prefer not to say	5	1.7
	Total	300	100
Age	18 - 23 years old	181	60.3
	24 - 28 years old	48	16.0
	29 - 35 years old	71	23.7
	Total	300	100
Household Income	Below R200 000	82	27.3
	R200 001 – R500 000	71	23.7
	R500 001 – R750 000	34	11.3
	Above R750 000	61	20.3
	Prefer not to say	52	17.3
	Total	300	100
Faculty	Commerce, Law and Management	120	40.0
	Engineering and the Built Environment	46	15.3
	Health Sciences	32	10.7
	Humanities	66	22.0
	Science	29	9.7
	Other	7	2.3

	Total	300	100
How often do you use AI-enabled mobile banking applications per month?	Less than 1 time	3	1.0
	1 - 2 times	30	10.0
	3 - 5 times	75	25.0
	6 or more times	192	64.0
	Total	300	100

Table 1.2. Central Tendency Measures

Construct		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree	Mean	Median	Std. Deviation	Skewness	Kurtosis
PU	Frequency	7	4	16	49	88	4.0183	4	0.9749	-1.123	1.094
	Valid Percent	2.3	1.3	5.3	16.3	29.3					
PEU	Frequency	3	8	19	44	74	3.9992	4	0.9028	-0.899	0.586
	Valid Percent	1.0	2.7	6.3	14.7	24.7					
PR	Frequency	8	11	33	24	27	3.3383	3.25	1.0226	-0.213	-0.523
	Valid Percent	2.7	3.7	11.0	8.0	9.0					
PT	Frequency	4	9	43	51	36	3.6156	3.6667	0.8986	-0.419	-0.015
	Valid Percent	1.3	3.0	14.3	17.0	12.0					
PE	Frequency	4	7	27	63	46	3.84	4	0.9052	-0.945	0.986
	Valid Percent	1.3	2.3	9.0	21.0	15.3					

SQ	Frequency	6	9	47	51	24	3.5489	3.6667	0.8695	-0.549	0.49
	Valid Percent	2.0	3.0	15.7	17.0	8.0					
PI	Frequency	1	7	28	59	41	3.7917	4	0.8201	-0.467	0.034
	Valid Percent	0.3	2.3	9.3	19.7	13.7					
PA	Frequency	8	10	26	27	15	3.0833	3.2	0.9604	-0.119	-0.349
	Valid Percent	2.7	3.3	8.7	9.0	5.0					
AT	Frequency	9	5	41	54	55	3.7011	4	1.0050	-0.683	0.183
	Valid Percent	3.0	1.7	13.7	18.0	18.3					
RI	Frequency	10	9	32	44	42	3.5722	3.6667	1.0081	-0.536	-0.112
	Valid Percent	3.3	3.0	10.7	14.7	14.0					

Table 1.3. Composite Reliability

Constructs	Cronbach's Alpha	Number of items
Perceived Usefulness (PU)	0.931	4
Perceived Ease of Use (PEU)	0.891	4
Perceived Risk (PR)	0.848	4
Perceived Trust (PT)	0.838	3
Performance Expectancy (PE)	0.854	3
Service Quality (SQ)	0.81	3
Perceived Intelligence (PI)	0.806	4
Perceived Anthropomorphism (PA)	0.879	5
Attitude Towards AI (AT)	0.880	3
AI-enabled Mobile Banking Application Re-usage Intention (RI)	0.837	3

Table 1.4. KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.939
Barlett's Test of Significance	Approx. Chi-Square	7985.937
	df	630
	Sig.	0.000

Table 1.5. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	14.922	41.450	41.450	14.922	41.450	41.450	6.814	18.927	18.927
2	2.912	8.088	49.538	2.912	8.088	49.538	3.936	10.934	29.861
3	2.246	6.238	55.776	2.246	6.238	55.776	3.819	10.608	40.469
4	1.673	4.647	60.423	1.673	4.647	60.423	3.485	9.681	50.150
5	1.523	4.230	64.653	1.523	4.230	64.653	3.381	9.391	59.541
6	1.258	3.494	68.147	1.258	3.494	68.147	3.098	8.606	68.147
7	0.061	2.392	70.539						
8	0.788	2.188	72.727						
9	0.714	1.983	74.71						
10	0.694	1.927	76.636						

Extraction Method: Principal Component Analysis

Table 1.6. Rotated Component Matrix a						
	Component					
	1	2	3	4	5	6
PU1				0.755		
PU2				0.793		
PU3				0.764		
PU4				0.756		
PEU1					0.811	
PEU2					0.789	
PEU3					0.838	
PEU4					0.733	
PR1						0.877
PR2						0.882
PR3						0.848
PR4						0.626
PT1	0.583					
PT2	0.613					
PT3	0.577					
PE1	0.559					
PE2	0.689					
PE3	0.694					
SQ1	0.68					
SQ2	0.739					
SQ3	0.585					
PI1	0.577					
PI2	0.705					
PI3	0.638					
PI4	0.46					
PA1			0.694			
PA2			0.59			
PA3			0.72			
PA4			0.867			
PA5			0.843			

AT1		0.746				
AT2		0.726				
AT3		0.721				
RI1		0.653				
RI2		0.689				
RI3		0.499				

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalisation.
a Rotation converged in 7 iterations.

Table 4.7	**Evidence of convergent validity (Rotated Component Matrix)**			**Communalities**	
Constructs	**Items**	**Factor-loading**	**Corrected Item-Total Correlation**	**Initial**	**Extraction**
Perceived Usefulness	PU1	0.755	0.786	1.000	0.752
	PU2	0.793	0.874	1.000	0.863
	PU3	0.764	0.835	1.000	0.803
	PU4	0.756	0.858	1.000	0.845
Perceived Ease of Use	PEU1	0.811	0.734	1.000	0.741
	PEU2	0.789	0.806	1.000	0.784
	PEU3	0.838	0.778	1.000	0.790
	PEU4	0.733	0.725	1.000	0.711
Perceived Risk	PR1	0.877	0.744	1.000	0.782
	PR2	0.882	0.768	1.000	0.788
	PR3	0.848	0.739	1.000	0.745
	PR4	0.626	0.503	1.000	0.497
Perceived Trust	PT1	0.583	0.689	1.000	0.579
	PT2	0.613	0.746	1.000	0.587
	PT3	0.577	0.667	1.000	0.566
Performance	PE1	0.559	0.657	1.000	0.551

Expectancy	PE2	0.689	0.746	1.000	0.679
	PE3	0.694	0.775	1.000	0.714
Service Quality	SQ1	0.68	0.729	1.000	0.660
	SQ2	0.739	0.723	1.000	0.684
	SQ3	0.585	0.530	1.000	0.432
Perceived Intelligence	PI1	0.577	0.618	1.000	0.518
	PI2	0.705	0.727	1.000	0.661
	PI3	0.638	0.658	1.000	0.593
	PI4	0.46	0.500	1.000	0.402
Perceived Anthropomorphism	PA1	0.694	0.680	1.000	0.634
	PA2	0.59	0.615	1.000	0.559
	PA3	0.72	0.702	1.000	0.659
	PA4	0.867	0.807	1.000	0.841
	PA5	0.843	0.761	1.000	0.777
Attitude Towards AI	AT1	0.746	0.799	1.000	0.752
	AT2	0.726	0.799	1.000	0.807
	AT3	0.721	0.707	1.000	0.713
Reusage Intention of AI-Enabled Mobile Banking Applications	RI1	0.653	0.746	1.000	0.760
	RI2	0.689	0.762	1.000	0.780
	RI3	0.499	0.570	1.000	0.526

Table 1.8. Assessment of the discriminant validity: Inter-construct correlation

		PU	PEU	PR	PT	PE	SQ	PI	PA	AI	RI
PU	r	1									
	p-value										
PEU	r	.524**	1								
	p-value	<.001									
PR	r	-.210**	-.129*	1							
	p-value	<.001	0.026								
PT	r	.577**	.464**	-.333**	1						
	p-value	<.001	<.001	<.001							
PE	r	.649**	.522**	-.114*	.687**	1					
	p-value	<.001	<.001	0.048	<.001						
SQ	r	.577**	.465**	-.154**	.639**	.737**	1				
	p-value	<.001	<.001	0.008	<.001	<.001					
PI	r	.565**	.543**	-.150**	.661**	.717**	.674**	1			
	p-value	<.001	<.001	0.009	<.001	<.001	<.001				
PA	r	.423**	.351**	-0.069	.522**	.539**	.499**	.535**	1		
	p-value	<.001	<.001	0.232	<.001	<.001	<.001	<.001			
AI	R	.589**	.498**	-.213**	.607**	.658**	.572**	.627**	.501**	1	
	p-value	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001		
RI	R	.657**	.517**	-.225**	.603**	.639**	.590**	.615**	.546**	.778**	1
	p-value	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	

**. Correlation is significant at the 0.01 level (2-tailed).

Table 1.9. Multicollinearity Diagnostic		
Model 1	**Collinearity Statistics**	
	Tolerance	**VIF**
PU	0.497	2.013
PEU	0.627	1.595
PR	0.846	1.182
PT	0.384	2.602
PE	0.300	3.332
SQ	0.392	2.553
PI	0.375	2.665
PA	0.633	1.581
a Dependent Variable: AT		

Table 1.10. Multicollinearity Diagnostic		
Model 2	**Collinearity Statistics**	
	Tolerance	VIF
AI	1.00	1.00
a Dependent Variable: RI		

Table 4.11. Normality Assumptions									
	PU1	PU2	PU3	PU4	PEU1	PEU2	PEU3	PEU4	PR1
Skewness	-0.91	-0.968	-1.191	-1.203	-0.92	-1.012	-0.886	-0.961	-0.305
Kurtosis	0.301	0.405	0.877	1.056	0.234	0.527	0.362	0.266	-0.868
	PR2	PR3	PR4	PT1	PT2	PT3	PE1	PE2	PE3
Skewness	-0.113	-0.341	0.106	-0.491	-0.405	-0.59	-0.56	-1.113	-0.758
Kurtosis	-0.967	-0.868	-0.998	-0.358	-0.219	0.053	-0.064	0.847	0.249
	SQ1	SQ2	SQ3	PI1	PI2	PI3	PI4	PA1	PA2
Skewness	-0.629	-0.439	-0.29	-0.815	-0.531	-0.686	-0.584	0.119	-0.543
Kurtosis	0.17	-0.201	-0.196	0.342	-0.374	-0.082	-0.151	-1.091	-0.069
	PA3	PA4	PA5	AT1	AT2	AT3	RI1	RI2	RI3
Skewness	-0.316	-0.062	0.009	-0.792	-0.775	-0.532	-0.723	-0.914	-0.124
Kurtosis	-0.124	-0.843	-0.689	0.293	-0.186	-0.356	-0.081	0.387	-1.061

Table 4.12. Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.738	0.545	0.532	0.68721

Table 1.13. ANOVA						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	164.552	8	20.569	43.555	<.001b
	Residual	137.425	291	0.472		
	Total	301.977	299			

a Dependent Variable: Attitude towards AI

b Predictors: (Constant), PAnthropomorphism, PRisk, PEaseofUse, Service Quality, PUsefulness, PTrust, PIntelligence, PExpectancy

Table 1.14. Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
2	0.778	0.605	0.603	0.63503

Table 1.15. ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
2	Regression	183.706	1	183.706	455.544	<.001b
	Residual	120.174	298	0.403		
	Total	303.88	299			
a Dependent Variable: Reusage Intention b Predictors: (Constant), Attitude towards AI						

Table 1.16. Regression Coefficients						
Model	**Unstandardized Coefficients**		**Standardised Coefficients**	**t**	**Sig.**	**Decision on hypothesis**
1	B	Std. Error	Beta			
(Constant)	0.207	0.287	-	0.722	0.471	Accepted/Rejected
Perceived Usefulness	0.165	0.058	0.16	2.859	0.005	Accepted
Perceived Ease of Use	0.108	0.056	0.097	1.95	0.052	Accepted
Perceived Risk	-0.067	0.042	-0.069	-1.596	0.112	Rejected
Perceived Trust	0.123	0.071	0.11	1.725	0.086	Accepted
Performance Expectancy	0.252	0.08	0.227	3.148	0.002	Accepted
Service Quality	0.019	0.073	0.016	0.254	0.8	Accepted
Perceived Intelligence	0.199	0.079	0.163	2.522	0.012	Accepted
Perceived Anthropomorphism	0.125	0.052	0.119	2.4	0.017	Accepted
a Dependent Variable: Attitude towards AI						

Table 1.17. Regression Coefficients						
Model	**Unstandardized Coefficients**		**Standardised Coefficients**	**t**	**Sig.**	**Decision on hypothesis**
2	B	Std. Error	Beta			
(Constant)	0.685	0.14	-	4.892	<.001	Accepted/Rejected
Attitude towards AI	0.78	0.037	0.778	21.343	<.001	Accepted
a Dependent Variable: Reusage Intention						

ASSESSING THE USE OF E-BUSINESS SYSTEMS TO ACHIEVE TOTAL QUALITY MANAGEMENT AMONG ISO 9001 CERTIFIED FIRMS IN GHANA

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Abstract

This study examined the adoption and use of e-business systems to achieve total quality management among ISO 9001 certified firms' in Ghana. A review of empirical studies carried out revealed that most research on Information Technology (IT), Management Information System (MIS) and Information and Communications Technology (ICT) impact on Total Quality Management (TQM) have been broadly focused and failed to yield the required interest in its implementation. This study, hence focuses narrowly on e-business adoption and use, a sub domain of the IT, MIS and ICT fields.

The study deployed a sequential explanatory mixed research method based on pragmatic philosophical perspective where both quantitative and qualitative approaches were adopted in collecting and analyzing data. Data were collected through the use of questionnaires and face-to-face interviews by sampling thirty seven (37) ISO 9001 certified firms from the database of ISO 9001 accredited certification bodies in Ghana. The findings revealed that the extent of e-business adoption and use contribute positively to an organizations' ISO 9001 system implementation to significantly achieve TQM as the partial least square structural equation modelling (PLS-SEM) gave a degree of influence of 0.961. This implies that there is a perfect relationship between achieving TQM and e-business adoption and use, indicating that ISO 9001 certified firms will achieve TQM status when their e-business systems are used to support their ISO 9001 implementation activities. This was supported by qualitative study in phase two as all Quality Systems Managers interviewed mentioned that e-business adoption and use enhance document management and facilitates ISO 9001 processes to achieve TQM. The study asserts that e-business adoption and use accelerate TQM achievement where the firms ISO 9001 system implementation is the moderating variable.

Keywords: E-business adoption, Ghana, Information Communication Technology, ISO 9001, Total Quality Management

Introduction

The introduction of the Internet has led to transformations in the use of Management Information Systems (MIS), Information Technologies (IT) and Information and Communications Technologies (ICT) in business organizations to enhance their operations and activities. MIS is defined as information system that provide managers with information, they need to take better decisions to effectively manage organizations (Karim, 2011; Alcami and Caranana, 2012). IT is the design, development and support of computer-based information system where hardware and software are used to acquire, store, manipulate, display, transmit and receive knowledge, information or data (Pollock, 2002). ICT has been described as technologies that offer access to information through telecommunication systems which include the local area networks, wireless networks, mobile phones and other communication devices (Tamilselvan, 2012). The areas where businesses have received tremendous gains from these Internet-enabled technologies is with their processes. Modern management practices like change management, Total Quality Management (TQM), Business Excellence, Business Process Reengineering, etc. are all process driven and hence their effective use in contemporary business organizations should be integrated with Internet enabled technologies to achieve their desired objectives.

The objective of this study is to examine the various e-business systems adoption and use to achieve TQM among ISO 9001 certified organizations in Ghana. It also seeks to assess the relationships between e-business systems adoption and use to achieve TQM among certified firms. The study further seeks to examine how e-business systems adoption and use can enhance an organizations ISO 9001 system to achieve TQM and finally to obtain further understanding of the current state of e-business adoption and use among ISO 9001 certified firms in Ghana. The study defines e-business as the use of internet technologies such as intranets, web portals, extranet, electronic payments, enterprise resource planning (ERP), supply chain management (SCM) and customer relationship management (CRM) to transform business processes along the firms value chain internally and externally to enhance the organization's profitability (Stone 2003a; Ramsey and McCole 2005). With speedy delivery and accuracy as key objectives for organizations, this can only be realized when there is effective use of these internet-enabled technologies that have been specifically designed for businesses or e-businesses. However this has not been the case as some gaps exists concerning how management systems have been implemented without integration with e-business technologies. A case study research conducted by Lin et al. (2012) on national quality award winning firms in Taiwan concluded that using MIS aids in the development of process-oriented activities, can integrate processes, disseminate information for the organization and also improve the effectiveness of a TQM program. TQM is a philosophy that organizations pursue so that quality is adhered to by all employees, all processes, all systems and all activities to deliver goods and services that satisfy their customers' needs.

According to Tan et al. (2003), the revised ISO 9001:2000 is a process led approach based on eight quality management principles, where it emphasizes the need to consider process in terms of value added and continual improvement of processes. They further indicated that it allows documenting of work procedures by employees, monitoring of information flow throughout the organization and sharing of information. They proposed an integrated quality information system structure based on an e-commerce environment that captures all the requirements under the revised

ISO 9001. Four kinds of information (document management, message communication, administration assistance and quality improvement) shall be collected, recorded, and processed to the specific ISO 9001 required sections (Tan et al., 2003).

From the above, some works have been done to unveil the relevance of MIS, IT, and Internet-enabled technologies to ISO 9001 systems and hence TQM, however, they have all failed to reveal the specific contribution that e-business can have on these modern management development systems (Barata et al., 2017) . With e-business being a more focus aspect than the much broader MIS and IT, this study is unique as it carries out an empirical evidence to assess its relevance to achieving TQM for an ISO 9001 certified organization. Research has shown that the key to customer satisfaction and competitive success lies in achieving product and service quality for an organization (Wanjau et al., 2013). Hence it is important for firms to study, adopt and implement a total quality management (TQM) system, which several researches have shown to yield long term competitiveness and enterprise excellence.

Literature review

E-business systems

Kjølseth, (2005) indicates that e-business includes buying and selling online, and other aspects of online business activity, such as purchasing, tracking inventory, managing production and handling logistics, customer support services, supply chain management and collaborative engineering. This shows that to adopt and use e-business, there must be a strategic decision that seek to achieve efficiency for the whole organization. E-business has again been severally defined in various research as the process of conducting business activities through the use of computer and internet technologies to improve the operational efficiency of the organization (Maditinos et al., 2014; Hinton and Barnes, 2009; Lucia-Palacios et al., 2014; Caniato et al., 2009; Fillis et al., 2003; Oliveira and Martins, 2010; Chen and Holsapple, 2013).

The Internet-based technologies may include intranets, extranets, customer relationship management (CRM) applications and webpages to share information, maintain relationships and facilitate transactions. Here, the Internet can be seen as a powerful tool that is effecting tremendous changes in businesses and yielding effective cost, time and resource reductions through improved communications; transmission of data and information; and integrating supply chain activities (Lowson and Burgess, 2006). With the conduct of e-business through the use of internet technologies and websites Lowson and Burgess (2006) identified six categories: as a sales channel; as a supplementary channel to extend your market reach; a technical support channel to help solve customers' problems; an embellishment channel; a processing channel for orders; and an information channel. This truly reflects how an organizations' information is electronically exchanged both internally and externally, and supporting all the business processes (Hinson and Sorensen, 2007; Taylor and Murphy, 2004). E-business has also been described as a fundamental way of doing business based on internet technologies that allow companies to serve their customers through different coordinated channels. It has been identified as enhancing organizations' profitability by transforming business processes and optimizing interactions with stakeholders to increase efficiency and reduce risk (Stone, 2003; Ramsey and McCole, 2005; Chang and Dasgupta, 2015; Salwani., Marthandan and Norzaidi, 2009).

Total Quality Management Systems

TQM is identified "as a set of guiding principles and practices as well as a philosophy that addresses not only management of quality but the quality of management in an organization"(Brah and Tee, 2002, p. 2). Effectively managing the factors, principles, practices and elements of TQM, the organization benefits from improved reputation, lower operation cost, increased employee motivation and improved profitability (Brah and Tee, 2002).TQM hinges on planning, controlling and improving the quality of goods and services for the long term business performance and profitability of an organization, to ensure that productivity is improved, cost reduced and meet customer needs (Boateng-Okrah and Fening, 2012).

This study adapts the definitions offered by Ahmad et al., (2012); Mustapha et al., (2011); Muyengwa, (2013); Yusuf et al., (2007), and define TQM as a management philosophy that has a set of principles that allows the organization to create a culture of continuous improvement that involves every personnel and unit focused on attaining customer satisfaction to improve the effectiveness of the organization and lead it to a world class status. In enhancing any organizations' quality management system (QMS) to gradually lead them to TQM status, a set of QMS principles have been prescribed, which have been tested empirically over a period and in several industries and economies. Principles of QMS are a set of quality policies, rules and activities that a company applies to give an assurance that a standard of quality has been achieved for their products and services (Yu et al., 2012; Galetto et al., 2017). This is based on the two approaches to pursuing QMS in organizations and these set of quality management principles are also classified as the elements of TQM. This exhibit the close correlation that exist between TQM and ISO 9001 which is a reflection of a QMS (Bernardo et al., 2015). The two perspectives are the award-based approach and the researcher/academic based framework.

This study adopts the academic based framework for quality management systems, as it has been applied widely in research and help to examine QMS of any organization pursing TQM. Also, the various CSF identified, have been used in studies that relate to a developing country context and aligns with the adoption and use of information technology or e-business in TQM implementation. These principles of QMS or elements of TQM are considered vital and the only established framework to examine an organizations quality management activity (Karapetrovic and Jonker, 2003). It gives the opportunity for an organization to assess their strengths and weakness of these CSF, and hence commit resources to deal with their weakness. These shortfalls with their QMS implementation must be understood and communicated to all, so that the cooperation of all staff will be obtained to drive processes and activities required to get them to the expected TQM status.

Innovation adoption and diffusion theories

Innovation diffusion or innovation adoption or technology diffusion theories have been used in literature to empirically study how it's a valuable tool to understand innovative systems such as ICT technologies, internet technologies, e-commerce, e-business, enterprise resource planning, electronic data interchange, etc. The innovation diffusion theories have been identified in three dimensions, there are theories that explain the technological context of an innovation, the organizational context where the innovation will take place and the individual employee context who uses it (Barnes and Hinton, 2012; Oliveira and Martins, 2010; Alshamaila et al., 2013; Gangwar et al., 2014). According to Barnes and Hinton (2012), the technology

focused theories under innovation diffusion consist mainly of the diffusion of innovation (DOI) or innovation diffusion theory (IDT) as proposed by Everest Rogers, which has been used extensively in studies to confirm the rate of technology adoption based on the innovation, social system, communication channels and time (Parker and Castleman, 2009a). In Roger's work, he outlined these key characteristics of innovation, relative advantage, compatibility, complexity, trialability, and observability, influence the innovation adoption (Safari et al., 2015; Hossain, 2014). Then there is the firm or the organization focused theories where institutional theory, organizational learning theory and the Technology-Organizational-Environment (TOE) framework theories are identified. And finally the individual focused theories consisting of the technology acceptance model (TAM), theory of reasoned action (TRA), theory of planned behaviour (TPB) and unified theory of acceptance and use of technology (UTAUT) (Parker and Castleman, 2009; Lai et al., 2007; Chen and Holsapple, 2013; Nguyen and Barrett, 2006).

The TOE framework helps establish and answers the study's question on how the technological, organization and environmental factors influence the company to adopt e-business systems to achieve TQM. This is because for an organization to adopt and pursue such systems, it must align with the overall objectives and vision of the firm, which then justify its adoption decision. However, this TOE framework focuses only on the adoption of new technology by a firm and is silent on how the adopted new technology will be used in the organization, hence the need to consider the stages model that emphasizes stages in the use of an adopted technology.

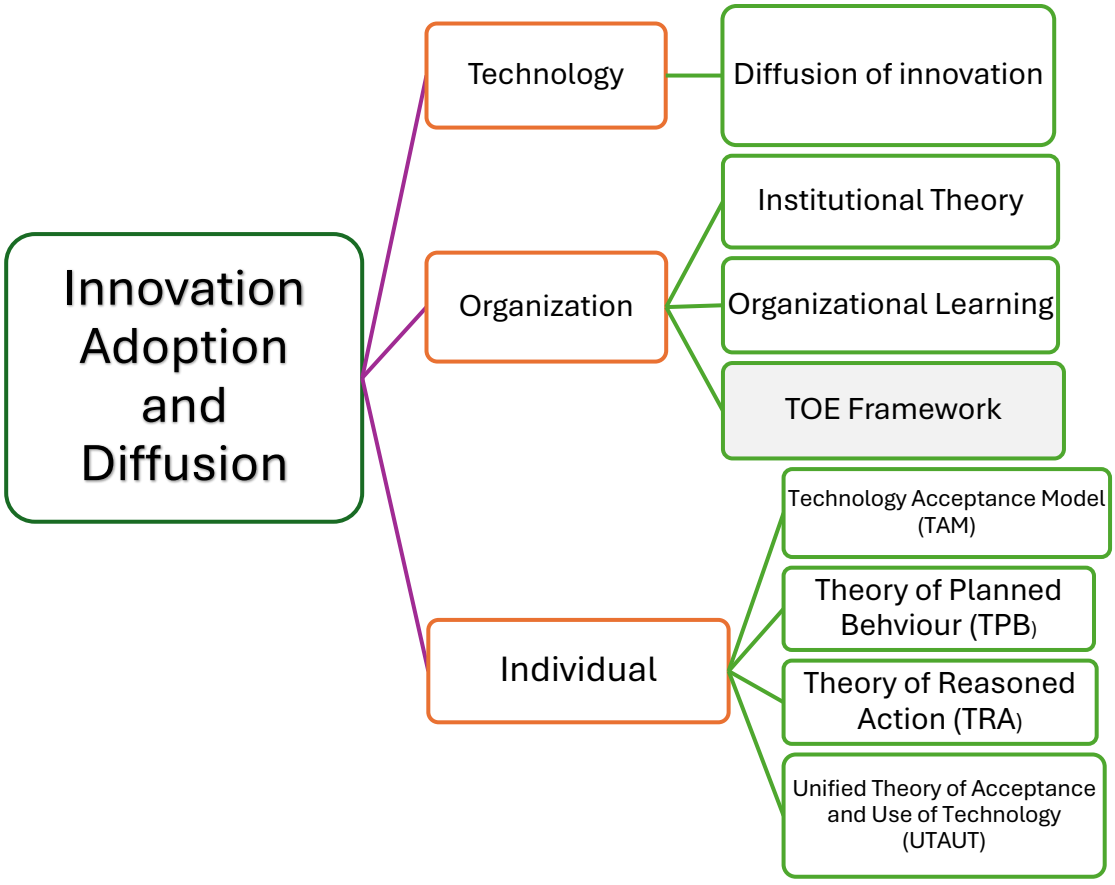


Figure 1.0 Innovation adoption and diffusion theories

E-business adoption stages model

This study strongly aligns with the three stages model postulated by Stone (2003), as it offers a clear e-business use at each stage on the e-business journey or continuum. This study is keenly interested in e-business use by the various ISO 9001 certified firms, as the model help examine the state of an organizations' e-business use and its relationship with TQM. Some e-business adoption literature reviewed only considers factors that influence adoption with little recognition for the e-business state of the firm, however for this study both adoption factors and e-business use and state are being assessed as stated in the research objectives. The use of this model helps to determine the various stages of e-business use among ISO 9001 certified firms and how it is aiding them achieve TQM (Al-Somali, 2015).

The relationship between e-business adoption and use and TQM

Review of research on e-business adoption and use has revealed several interesting perspectives on studies in this domain. The first perspective indicates that studies on e-business have highlighted the benefits of accelerating transactions and reducing cost for all businesses whether in developed or developing economies. Secondly, considerable amount of research has been carried out for companies in developed economies, which are mostly large firms with little work on firms in developing countries. Hence, it is refreshing that this study focuses on e-business adoption and use within the context of a developing economy like Ghana. Thirdly, it was also revealed that SMEs are slow to adopt despite the benefits that can be gained (Koh and Maguire, 2004). This may not reflect an accurate position as it does not give an absolute percentage and since majority of businesses in every economy are SMEs, then slow uptake of e-business could be misleading. With current phenomena of intense technology revolution, uptake could be rising but slowly (Mohammed et al., 2013) hence this current study can offer revealing insights as it seeks to assess e-business uptake in both large and SME firms that are ISO 9001 certified. Fourthly, it was also realized that most research has been undertaken in the manufacturing industry than the services industry. This study looks at e-business adoption for both manufacturing and services firms that are ISO 9001 certified in Ghana. With the penultimate perspective, majority of researches carried out to examine and explain how e-business adoption have used only the Technology, Organization and Environmental (TOE) framework and ignored the stages models. However for this study, the two models have been considered appropriate, as it allows the environmental context of the organization to be assessed and also the state of e-business use to be identified.

A study that surveyed 2,459 firms that were both large and SMEs in the telecommunication and tourism industries across 27 European Union countries and use the TOE framework concluded that the important drivers or factors for e-business adoption include perceived benefits and obstacles of e-business, technology readiness, competitive pressure, and trading partner collaboration (Oliveira and Martins, 2010). This supports other studies that were not limited to two industries but also concluded with similar factors of e-business adoption and a further on external pressure;

governmental support; and core competence of labor in ICT and IS (Ramsey and McCole, 2005; Maditinos et al., 2014; Koh and Maguire, 2004; Ifinedo, 2011; Hinson and Sorensen, 2007; Hanna, 2010; Chatzoglou and Chatzoudes, 2016). Based on the objective of this study, the e-business adoption drivers from the TOE framework and offered by Oliveira and Martins (2010) will be used, and these are perceived benefits and obstacles of e-business, technology readiness, trading partner collaboration, competitive pressure, top management commitment and their technology willingness.

Another dimension that was realized from e-business and TQM literature review was IS and MIS to support activities of ISO 9001 QMS, which are indicative elements of TQM (Sánchez-Rodríguez, et al., 2006). Again, this is still a much broader perspective of IS and MIS, where fundamental issues are discussed. For a deeper reflection and understanding of the issues, a much narrower perspective such as e-business would be ideal. Hence this study will contribute to knowledge and provide insights on e-business use by ISO 9001 certified organizations in a developing economy context.

TQM Implementation and ISO 9001 Systems

First, it has been indicated by several authors in their studies that ISO 9001 standards should be implemented as the foundation or a stepping stone to initiate TQM (McAdam and Henderson, 2004; Abusa and Gibson, 2013; Iqbal et al., 2014; Boys et al., 2004; Hasan et al., 2007; Hill et al., 2001; Huarng, 1998; Poksinska et al., 2002). However, others have indicated otherwise, as Sun et al. (2004b), have indicated that it is organizations that show great interest who progress from ISO 9001 to TQM for which the Researcher strongly agree with.

As certification to ISO 9001 is not a guarantee of progression, a lot of effort and commitment is needed to attain TQM status. Other researchers failed to indicate the ideal stage organizations should commence quality management systems, and how ISO 9001 is initiated and progressed to TQM. However, the interesting thing is that once an organization has submitted to ISO 9001, they are seen to be quality focus and hence on that path to TQM. It is based on these premise that this research is structured, as it seeks to assess the activities of ISO 9001 certified firms both in manufacturing and service industry in Ghana. As these certified firms are in a position to enhance their ISO 9001 systems to achieve TQM status.

Evidence from some empirical work gave indications that organizations can sustain and enhance their ISO 9001 implementation and progress to TQM or quality excellence by focusing on the soft elements of a QMS. An empirical study conducted on two ISO 9001 certified Malaysian service companies on how to maintain and go beyond their ISO 9001 certification, concluded that human resource issues are critical to achieving an effective maintenance of an organizations' ISO 9001(Ab Wahid et al., 2011; Wahid, 2012). Human resource issues concerning employee involvement through empowerment, recognition and training, customer focus, effective relationship with subcontractors, top management commitment, quality culture and continuous improvement are important to maintain a quality management system (Poksinska et al., 2002; Williams, 2004; Gotzamani and Tsiotras, 2001; Lin and Jang, 2008; Vouzas, 2011; Vouzas, 2013; Quazi and Padibjo, 1998; Hassan et al., 2012; Gotzamani and Tsiotras, 2002; Escanciano et al. 2001; Claver et al., 2002; Williams, 2006; Ismyrlis et al., 2015). The essence of human resource factors in sustaining a QMS is further proved by Calvo-Mora et al. (2014) who carried out a survey questionnaire study on 116 ISO certified SMEs and large private firms in both

manufacturing and service sectors, concluded that the soft factors are key to improving an organizations QMS.

From review of literature discussed above, this study proposes a conceptual model where e-business adoption and use yields TQM for ISO 9001 certified firms in both manufacturing and service sectors in Ghana. This model, as shown in figure 2.0, hypothesizes that the adoption of e-business and the use of e-business have a significant impact on TQM. E-business adoption and use are the independent variables, a company's level of ISO 9001 system is the moderating variable and the elements of TQM the dependent variables.

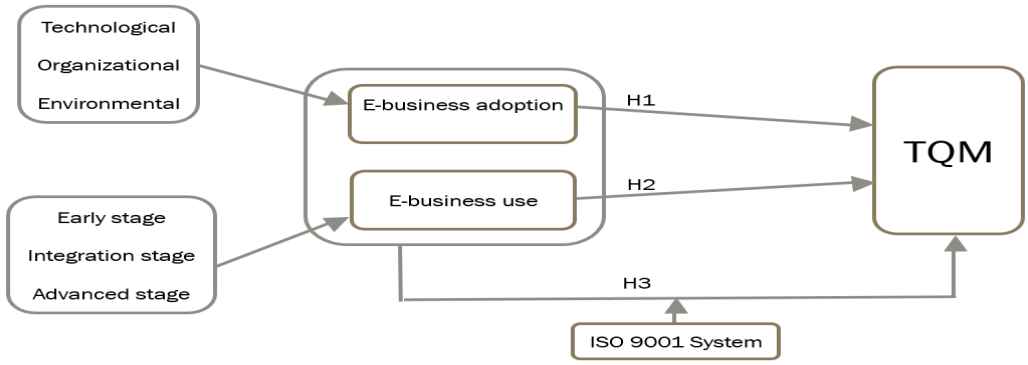


Figure 2.0: Conceptual framework of the study

H1.0: e-business adoption by ISO 9001 certified firms have no significant impact on TQM

H1.1: e-business adoption by ISO 9001 certified firms have a significant impact on TQM

H2.0: e-business use by ISO 9001 certified firms have no significant impact on TQM

H2.1: e-business use by ISO 9001 certified firms have a significant impact on TQM

H3.0: the extent of e-business adoption and use by ISO 9001 certified firms have no significant impact on a company's ISO 9001 system to achieve TQM

H3.1: the extent of e-business adoption and use by ISO 9001 certified firms have a significant impact on a company's ISO 9001 system to achieve TQM

Research methodology

This study aligns with a pragmatic philosophical stance as both quantitative and qualitative methods and approach are considered with greater priority given the former than the later. This is to allow the research objectives to be dealt with in a holistic manner and also provide insights from the human actors and players directly to obtain meanings that gives much understanding to the subject under study.

The sequential explanatory mixed method strategy is adopted, as quantitative data were collected and analysed first, after which qualitative data were collected and analysed and used to explain the quantitative results (Saunders, Lewis and Thornhill, 2009). This approach allows for a deeper examination of the research questions and objectives and for weaknesses identified in the quantitative method to be counter balanced by the strengths in the qualitative approach (Jogulu and Pansiri 2011). This

approach causes the study to be phased, where phase one collects and analyses quantitative data and phase two collect qualitative data based on themes that emerged from the quantitative analysis.

This study was conducted by relying on a sampling frame of ISO 9001 certified firms in the registers of Ghana Standards Authority (GSA), SGS Ghana Limited (SGS) and Bureau Veritas Ghana Limited (BV), the leading certification firms in Ghana. The sampling frame has a population of fifty-six (56) ISO 9001 certified firms that are implementing e-business systems. They were found in the Accra – Tema Metropolitan area of the Greater Accra Region of Ghana - the region that majority of businesses operate from or where their headquarters are situated. A convenience sampling technique was used to select 4 ISO 9001 certified firms that are a mix of manufacturing and service organizations. The research instrument used for phase one of this study was the questionnaire which was sent to respondents by emails. A five-point Likert scale was used to assess the level of impact with TQM factors, with one point representing strongly disagree and five point strongly agree. During phase two the interview schedule was used as a qualitative tool to interview respondents who have participated in the survey questionnaire discussed in phase one above (Dilley, 2000). The interview schedule was designed to obtain further information, expand and build on the responses from the survey, and it is organized along key themes that emerged from the analysis of the survey results.

The study's Cronbach's α reliability and validity coefficient values were all satisfactory and also validity was also achieved through triangulation where themes used in interviews conducted relied on themes that were realized from quantitative data collection and analysis. These were the extent of e-business adoption and use among ISO 9001 certified firms Ghana and the contribution of e-business use to ISO 9001 system implementation in ISO 9001 certified firms

Data Analysis

This study uses the Statistical Package for Social Sciences (SPSS) to apply statistical formulae and also carry out computations (Cohen et al., 2007), that will seek to predict the associations and relationships stated in the study's objective and those that have been defined by the hypothesis. Further to this SPSS was used to compute inferential statistics for the study's data to test the stated hypothesis, which makes it possible for inferences and predictions to be made from the data. Also, to assess the strength of the relationship between the dependent variable and two or more independent variables, regression analysis and multiple regression analysis is performed. The Pearson product moment coefficient of correlation is calculated. This is computed based on a significance level of 0.05 to determine whether a relationship exist and that the null hypothesis is rejected or accepted and also the direction of relationship, is positive or negative. Finally, measures of difference is carried out to assess significant difference among the variables. Further employed structural equation modelling (SEM) to test the study's hypothesis developed to assess the relationship among observed and unobserved or latent variables using SMARTPLS 3.0 software.

The approach for this study is the deductive thematic, since the qualitative data were collected based on themes and concepts that emerged from the survey questionnaire conducted earlier in phase one. In analysing the qualitative data, each of the recorded interviews were transcribed and organized into sections where each interview is given a code and word processed with each sentenced numbered (Creswell, 2003; Lacey and

Luff, 2001; Bartholomew et al., 2000). Finally, interpretations were made from the findings and were compared to theories from literature and results from the quantitative analysis in phase one. Sub-themes generated were further examined to determine appropriate major theme that reflects them (Brown and Stockman, 2013). In all one hundred and ninety six statements were coded from the interviews leading to the development of eight primary themes.

Findings

The study revealed that seventy six percent of respondents have between 4 to 10 years' experience in their firms indicating that they have considerable exposure in the operations and activities of the firm. However majority of respondent 91.9% are identified with the Quality Department, clearly reflecting the role they play in the implementation of the company's ISO 9001 system. It was also revealed that majority (54.1%) of the ISO companies studied are into manufacturing while 45.9% of them are service firms. It was also established that the ownership structure of their companies are mostly private limited liability as 56.38 percent of respondents indicated this, this is followed by 27.0 percent of companies that are identified as subsidiary entities.

From the quantitative survey, it was revealed that the highest ranked reason for e-business adoption and use was identified as the need to improve their image or brand awareness as 83.8 percent of respondents agree to this. All the companies that responded use internets and have websites this confirms with the authors visit of their websites for contact information. All the structures of the companies in terms of technology, organizational structure and the external environment support e-business. This therefore reveals that all the companies adopted the e-business system. The study revealed that all the ISO companies studied have access to internet, have websites for publications and enable transactions via the internet. All these indicate that the companies studied uses e-business. The study revealed a positive significant correlation ($r=0.928$, p-value$=0.00<0.05$ or 0.01) between e-business adoption and TQM achievement at 99% confidence level. This therefore means that the hypothesis that 'e-business adoption has a significant impact on achieving TQM' is statistically confirmed. Also, there is a positive correlation between e-business use ($r=0.784$, p-value$=0.00<0.05$ or 0.01) and TQM achievement at 99% confidence level. Also, reasons for e-business adoption and use, contribution, motivation were all positively correlated to TQM achievement at 99% confidence level. This therefore shows that for an organization to achieve its Total Quality Management targets, it has to adopt e-business systems in all its operations.

The regression analysis indicates that in order to model TQM achievement, variables to consider are perceived benefits, technological readiness and infrastructure, management commitment and support and availability of financial resources. This has been proven by the findings of the study that about 100% of the total variation in TQM achievement can be explained by a combination of these variables in the model. The approximate model fit indices calculated revealed an acceptable model fit between the model and the data. From the structural analysis, all the path coefficient had values close to 1, which signifies that there is a strong relationship among the variables. The structural analysis linking e-business adoption, use and TQM achievement with ISO 9001 System implementation as the intermediary variable. It appears from the structural analysis that E-business adoption had an adjusted R2 values of 0.802, a great impact on ISO 9001 System implementation followed by E-

business use (0.084) as shown in figure 3.0. It is also obvious that ISO 9001 System implementation influences about 96.1% of the variation in TQM achievement. This figure is the highest which implies that although both E-business adoption and use do have a direct positive influence on TQM achievement, the implementation of ISO 9001 Systems accelerates TQM achievement.

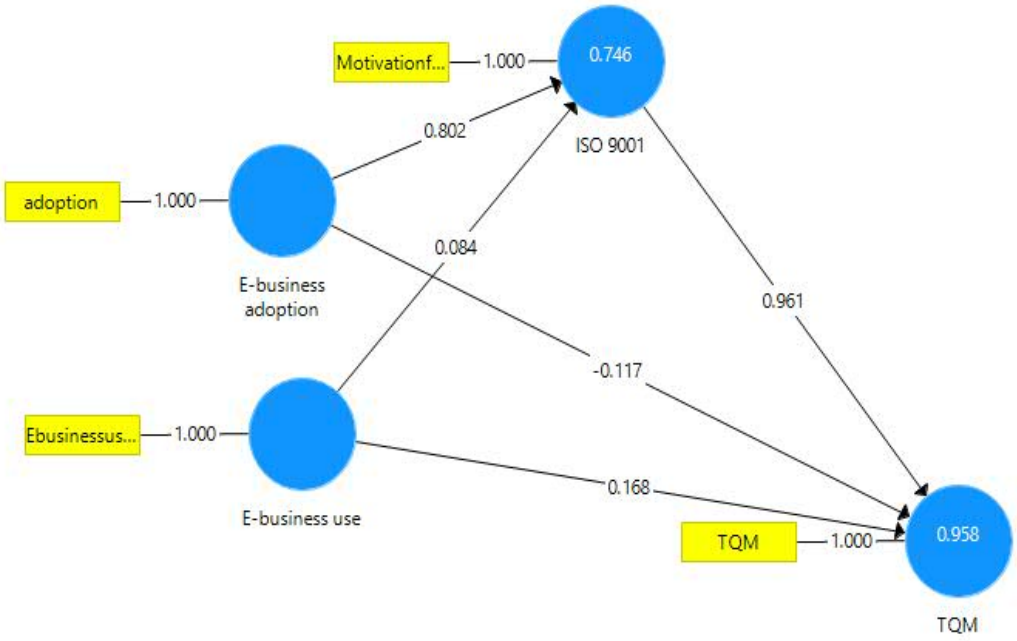


Figure 3.0: Structural Analysis linking e-business adoption, use and TQM achievement with ISO 9001 as the intermediary variable

Source: Quantitative Data Analysis, 2019

The key findings from the interview conducted indicated that implementing ISO 9001 systems in an organization helps develops documented procedures that gives confidence to external parties about your products and services. From the interviews conducted three out of four mentioned how ISO 9001 system helps develop procedures about what you do in the organization, as one administrative manager mentioned that

"…..we didn't know where to start off and it was documentation and documentation, with the migration we got to know that it was what we do every day, just document it. So when an order is made over the phone and it's not recorded, this ISO is teaching us on how to have a procedure on when somebody calls to make an order".

Another quality systems manager also said that

"…..so they send auditors down here to come and do verification on how it (ISO systems) works and they equally conduct interviews as well, call workers and ask how much is your salary, do they give you PPE, what kind of training do they give, like the one this morning and this gives a good picture of the company outside and builds so much confidence with anybody who wants to trade with us".

The results of the qualitative analysis showed that each of the eight primary themes had over 50% of participants mentioning them. Also in figure 4.0, a radial diagram is presented to show how the eight primary themes all relates to the study's overall objective.

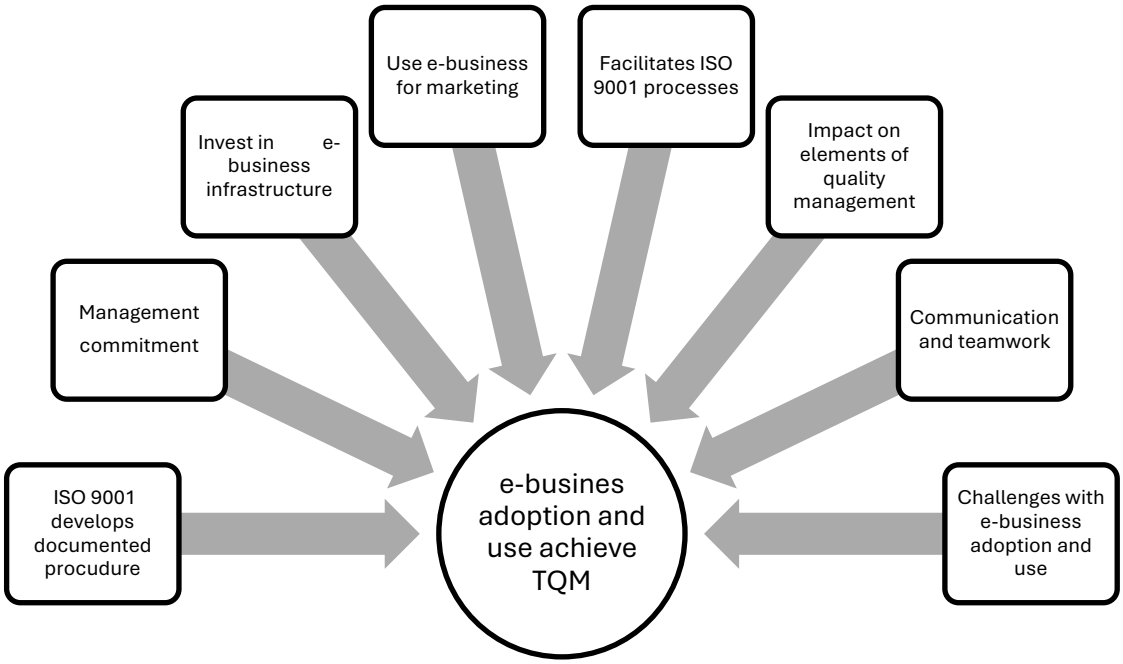


Figure 4.0: Radial diagram of the eight themes

Discussion

From the data, 67.6% of respondents are in middle management position and 32.4% in top management positions. This result is a reflection of mid-level emphasis that is placed on quality management in our organizations as it is still seen as an isolated unit and not fully embraced by management. Also, this low level of recognition of quality management systems is attributable to the generally low quality standards of goods and services that suppliers are made to comply within the country and inability to meet required standards from foreign trading partners. However, those companies that do a lot of exports, place huge emphasis on complying with quality standards to gain access to international markets. This is mentioned in a study carried out in Saudi Arabia on ISO 9001 certified manufacturing firms by Magd, Kadasah and Curry (2003) concluded that “export involvement is an important factor associated with ISO 9001 implementation” since companies that export are required to obtain ISO 9001 before their goods are accepted.

The results indicated that there is a positive significant correlation between e-business adoption and TQM. The regression analysis carried out also indicated that 100% total variation in achieving TQM (dependent variable) can be explained by the combination of the independent variables (perceived benefits, technological readiness and infrastructure, management commitment and support. external pressures and capabilities of supply chain partners and availability of financial resources). All these

concluding that there is a positive influence on e-business adoption to significantly impact on TQM hence the hypothesis that "H1: e-business adoption has a significant impact on achieving TQM" is statistically true. The regression analysis indicated that 73.5% of variation in achieving TQM can be explained by the extent of e-business adoption and use contribution in an organizations' ISO 9001 system. It was also identified that 51.1% of total variation in achieving TQM can be explained by document management. Hence supporting the claim that the extent of e-business adoption and use in document contribute positively to ISO 9001 to achieve TQM.

From the PLS-SEM analysis, it was revealed that both E-business adoption and use do have a direct positive influence on TQM achievement, however the implementation of ISO 9001 system accelerates TQM achievement as the degree of influence was given as 0.961. This agrees and confirms with the third hypothesis of this study where e-business adoption and use significantly impacts on the organizations' implementation of ISO 9001 system to achieve TQM. The findings arrived at for this session matches with some empirical works done and reviewed earlier in this study. According to Hasan et al. (2007), recommend that ISO 9001 be used as a foundation for a much broader TQM system for companies that want to be competitive and that ISO 9001 is an important part of TQM.

It indicated that e-business use in document management, message communication, administrative assistance and data analysis activities contribute positively to ISO 9001 to achieve TQM. This is further confirmed from the qualitative findings where all interview subjects agreed that e-business use helps to manage and cope with ISO 9001 records and documents. They also indicated that it helps to develop documented procedures that serves as evidence of conformance to standard which is communicated to all. It allows for the management of all activities associated with ISO 9001 and also analyse data and audit all processes. Hence from the qualitative findings there is strong emphasis that seeks to reinforce, provide deeper understanding and confirm results obtained from the quantitative study. Results of findings that addresses the third objective shows that e-business adoption and use significantly impact on a company's ISO 9001 system implementation to achieve TQM. This is seen in how e-business adoption and use influence document management, message communications, administrative assistances and data analysis activities of ISO 9001 system implementation contribute to have significant impact on achieving TQM. The discussion of findings from the one on one face-to-face interviews shows that all participants indicated that implementation of ISO 9001 system helps develop documented procedures that give confidence to your customers about your products and services.

Conclusions

It is concluded that there is a significant positive correlation between the extent of e-business use in document management, message communication, administrative assistance and data analysis and TQM. The result of the regression analysis carried out indicated that the extent of e-business use in document management, message communication, administrative assistance and data analysis contribute positively to ISO 9001 to achieve TQM. The SEM-PLS structural analysis carried to test and confirm the conceptual model of the study revealed that both e-business adoption and use positively impact on achieving TQM as hypothesized. It further emerged that to effectively achieve TQM, e-business adoption and use activities can be accelerated by the organizations' ISO 9001 system implementation as a mediating variable

confirming what was hypothesized in the conceptual framework. The conclusions from the semi-structured interviews conducted to achieve these two objectives confirmed that ISO 9001 implementation had to contend with rigorous documentation regime but however the system helps to develop documented procedures for the organization which leads to positive image about our products and services from external parties. Another firm conclusion from the interviews that support findings of the quantitative analysis is the strong emphasis by quality systems managers that management commitment to e-business adoption and use is essential and key to achieving TQM.

Study contributions

The study provides empirical evidence for organizations seeking to adopt e-business systems, that they must obtain management support and interest and the perceived benefit to be derived from e-business adoption is the offering of new market opportunities and expansion of market for existing products and services. The study offers empirical evidence that firms' e-business use among ISO 9001 certified company's in developing countries like Ghana are mainly at the early and integration stages of the stages model. Hence policy makers must direct any support for e-business adoption and use among firms in Ghana at these stages.

To achieve TQM, empirical evidence suggests that organizations top management must adopt and use e-business systems to coordinate and communicate activities of quality in organizations including document management, message communication, data analysis, etc. Also e-business systems should be used to enhance teamwork, train employees on quality improvement and enhance discussions and collaborations among departments. This study is the first of its kind to assess how two theories, the TOE framework and the stages model of e-business adoption and use to assess e-business application to impact on the elements of QMS and achieve TQM. The study is the first, as far as the researcher knows, to identify that the determinant variables of e-business adoption and e-business use, which are a narrow focus of the broader MIS, ICT and IT systems, are important and significantly correlate positively to achieve TQM. The study uses two statistical analysis, that is regression analysis and SEM-PLS structural analysis to triangulate hypothesized relationships among e-business adoption, use and achieving TQM.

Study limitations and future research directions

The study investigated how e-business adoption and use impact on TQM; however it is admitted that TQM impact on financial performance could also have been assessed. This is an opportunity for further research as organizations may be interested in how e-business adoption and use reflect on the financial performance of the firm. Data collected was limited to ISO 9001 certified firms and did not include their customers. The customers may have provided further insights into the gains realized from dealing with a firm that has adopted and uses e-business systems and hence triangulate responses from the firms. There is limited literature on quality management systems and ISO 9001 system implementation in Ghana. This is due to limited research and this domain has also been identified as an emerging phenomenon.

It was identified that all the elements of quality management impacts on a firms' ISO 9001 system implementation to achieve TQM, hence researchers can further explore the impact of each of this element in achieving TQM. Future studies should be carried out to assess e-business adoption and use among ISO 9001 certified and non-certified firms in Ghana.

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BENEFITS AND BARRIERS OF DIGITAL TRANSFORMATION IN THE HIGH EDUCATION SECTOR: A SYSTEMATIC LITERATURE REVIEW

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Abstract
In this epoch of the Forth Industrial Revolution (4IR), digital revolutionary and technological initiatives and advancements as well as their imperative role has improved universities' performance and transformed business models and practices and processes. This study aims to systematically review the existing digital transformation discourses as the main axis for the higher education sector. It elucidates the skill sets, benefits, barriers, and challenges needed and brought by digital transformation. The article commenced by identifying the relevant literature on digital transformation in general, which was not confined to one methodology, followed by case studies that have been conducted across the globe, skills needed to drive the transformation agenda, benefits, barriers, and challenges that impede digital transformation in the HE sectors. This article found that the sector has been exploiting the digital tools to improve performance, business processes, restructuring systems, structures and practices. The myriad of digital transformation impacts, benefits and a bag of skills to drive the digital transformation has been overshadowed by diverse barriers and challenges in the higher education sector. Inadequate funding, employee resistance, lack of digital knowledge and infrastructure is contrary to the Connectivity Theory.

Keywords: *benefits and barriers; connectivity theory; digital literacy; digital transformation**;** performance improvement.*

Introduction

The present era of the 4IR with digital transformation (DT) at the forefront has seen massive benefits, barriers and disruptive digital technologies with a perpetual influence on the development of flexible and creative business models. According to Livari et al. (2020), digital transformation experienced in the higher education sector (HES) has been influenced by disruptive ways as a result of technological developments and immensely motivated by the inherent requirements of the Covid-19 pandemic. Digital transformation is considered as inevitable (Dell, 2018; Rodríguez-Abitia. Bribiesca-Correa, 2021) and should be dealt in a tactical way and consider each institution's peculiarity (Llorens & Fernández, 2018). This review analyses the impacts of DT and the digital skill-set necessary to drive the transformation agenda, benefits, barriers and challenges in the HES. This study questions whether the barriers and challenges brought by DT impede the massive impacts and benefits post the radical implementation of digital tools in the HES.

Methods

Procedures as described by various authors in writing systematic literature reviews (Keele, 2007 and Webster & Watson (2002) and a hermeneutic approach (Boell & Cecez-Kecmanovic, 2014) from 2010 until the present were followed. A pre-determined review protocol was used to detail the methods and to reduce the possibility of researcher bias (Keele, 2007). The protocols as guided by the previous author included the rationale, the research questions that the review was attempting to answer, search strategy, selection criteria (inclusion and exclusion) study selection procedures including the role of assessors, the quality assessment checklists, data extraction strategy, synthesis of the extracted data and dissemination strategy (Keele, 2007). To complete the drafting of the research question, a systematic literature review was conducted on the topical debates in the HES, skills needed to drive the initiatives, benefits and barriers and challenges brought by the digital transformation. The online searches were done on highly credible databases, which have highly ranked as well as cited journals (high h-indexes) listed on Scopus and the Web of Science (WoS). In the search engines, the following keywords were used: digital transformation, university, higher education sector, university sector, skills, benefits and barriers. In the case of both databases, the inclusion criteria were followed where articles that were published before 2010 were excluded, and those who were not written in English and not within the disciplines of business management, IT, Engineering, education, public administration were excluded as they did not meet the inclusion criteria. The articles that were yielded during the process were 649 with 166 removed as they were duplicated in Microsoft Word. The articles were filtered, and 16 articles remained that were aligned to the research questions for the study and accessible without paying an access fee. The last 16 were screened and confirmed by two experts in the discipline as they were relevant to the study questions and aligned to the chosen theory.

The final 16 included journal articles that were then uploaded onto the ATLAS-ti software for further analysis and the codes developed as guided by the research questions and the chosen theory for the study, namely the theory of connectivism. The emerging themes and patterns were also verified, and their quality and credibility confirmed by independent experts in the sub-discipline of digital learning and teaching.

Results

Conceptual

Digital transformation has been termed differently by different authors in different disciplines. For instance, some authors (Forrester, 2016; Solis and Szymanski, 2016) have linked it to business operations harnessing technology to reinvent or improve business performance and expand their business (Rodrigues, 2017). Similarly, researchers (Forrester, 2015; Wade, 2015) share similar sentiments that digital transformation is central to institutional change and encapsulates processes, systems, strategies, structures, people and competitive dynamics by advancing emerging technologies and achieving a competitive edge (Alenezi, 2021). Digital transformation is the amalgamation of individual and firm IT conditions and encases the transformative consequence of the latest digital technologies, such as social, mobile, analytical, cloud, and the IoT (SMACIT) (Ziyadin, Suieubayeva & Utegenova 2020; White, 2008). In this epoch, digital transformation has been considered a complex phenomenon and an evolutionary process (Skog, Wimelius & Sandberg, 2018) influencing cultures, processes, people, organisations and technology that will prepare institutions to compete in the era of the 4IR (Forrester, 2015). Digital transformation can be described as the formation of IT institutional practices and operations (Heilig, Schwarze & Voss, 2017); as a process involving dramatic and disruptive changes and outcomes leading to the disruption of an organisational environment (Alenezi, 2021). It leverages the digital technologies and capabilities as an evolutionary process yielding positive results by generating value-adding business models (Matt, Hess & Benlian, 2015), improved and efficient business practices and operations, thus improving service delivery (Morakanyane, Grace & O'Reilly, 2017).

The crucial term 'digital transformation' has been extensively used and applied in scholarly literature on other sectors with minimal reference to the higher education sector. Furthermore, the effects of digital transformation improving operational efficiency, culture and mindset change, processes, systems, and institutional change have not been precisely and scientifically analysed by scholars in the university sector across the globe. This has necessitated this systematic literature review to study the existing concepts and how they show the impacts, outcome and barriers to the university sector.

Theoretical frame

In the past seven decades, educational technology has been receiving attention in the education sector (Denhere & Moloi, 2021), with a host of researchers with an interest in the intellectual processes behind the human learning process coining numerous teachings and technology-orientated learning theories including cognitivism, constructivism, experiential learning, innovative diffusion and anchored instruction (Mhlanga, Denhere & Moloi, 2022; Ouyang & Stanley, 2014). A plethora of researchers have anchored the connectivism theory in providing insights and realities in a global world by facilitating e-learning in a constant and evolving digital way (Abad-Segura & González-Zamar, 2020); the pertinent role of internet technologies opening opportunities in teaching and learning and sharing of information (Mhlanga, Denhere & Moloi, 2022); encouraging students to use the search engines and social media to connect with external stakeholders during the learning process (Anderson, 2016). This systematic review study is informed by the connectivism theory as it is guided by technology, as it intends to analyse the theoretical dimensions and realities of digital transformation, essential skills and competencies to drive the digital agenda in the higher education sector. The inherent nature of the connectivism

theory as a newly invented learning theory is influenced immensely by technology coined by George Siemens in 2004, which has become known as the theory of the digital era (Fiore, 2018; Ouyang & Stanley, 2014).

Using the lens of the connectivism theory, various constructs, including digital transformation, in HEIs are essential skills required to drive digital transformation, global studies, benefits and barriers and challenges are systematically reviewed and analyzed in this study.

Digital transformation in a global arena: prospects and challenges

The emerging digital technologies have been exploited and embraced by universities and gained momentum with an intent to improve performance, transforming processes, practices, models, processes and adopt to the technologically savvy society (Alenezi, 2021; Rodrigues, n.d). In HEIs, digital transformation presents some challenges that impede the development of digital processes that might be considered when defining policies and strategies (Iivari et al. 2020; Rodrigues, n.d). The radical changes which result in digital transformation in the HEI sector encapsulates the transfer of scientific and technological knowledge (Arango Serna et al. 2018); transferring analytical and professional skills (Gylfason, 2001). Furthermore, it contributes to new strategic options using policies and plans to respond to the new demands of the labour market that has been brought by ICT in HEIs (Bryndin, 2019) and newly invented business models to respond to the internal and external stakeholder needs (Díaz-García et al. 2022).

The European policy-making innovations in HEIs have been influenced by the impact of digital transformation and the permeated by the prospects of technological advancement and 4IR (Benavides et al. 2020; Vicente et al. 2020). In countries like Portugal, individual HEIs have made concerted efforts to digitalise their institutions rather than be influenced by policy-making processes (Dias & Gomes, 2018) including “Bologna Digital” (Rampelt et al. 2018) and a digital Education Action Plan (European Commission, 2018).

A plethora of disruptions mostly observed in the Global South, radical reforms, innovations coupled with the disruptive force of digital revolution have changed the HES landscape, including online courses (MOOCs), Massive Open, models and free education, blended learning and collaborative models mostly in elite universities (Marques, 2013). In developed countries such as Australia, the digital revolution has been compounded by funding cuts and proposed reforms to the university funding model (Matchett, 2013). The digital transformation capability, lack of holistic vision, data structure and processing were found in a study by Marks (2020) conducted in the United Arab Emirates HEIs, which investigated the role of digital transformation. An empirical study conducted in three Russian universities analysing the trends of digital transformation from a lens of academic administrators, students and administrators unearthed three key principles that include transparency readiness convenience and trust for effective digital transformation (Mikheev, Serkina & Vasyaev. 2021). In Russia, new technological advancements with new formats of education have led to the new important restructuring and challenges, and the transformation of universities is without the state’s intervention (Livari et al. 2020).

Skills and digital transformation

In the 21st century, the workforce does not stay in one organisation during their career span (Mahlow & Hediger, 2019). Therefore, universities should ensure that students are prepared for continuous learning and development through employability, technical and programming skills in order to survive in the labour market for the next 30 to 40 years (Alenezi, 2021). Though such digital skills have not been limited to technology, digital learning in particular has been observed as enhancing the pedagogical approaches, increasing the quality of learning and remote exchanges of information and cooperation (Keegan, 2002). Hence, Mian et al. (2020) have cited that it is essential that self-sufficient adaptive thinking (Chappell, Gonczi & Hager, 2020), cognitive and computational skills and data analytics be acquired by employees in the area of information technology. The latter can be accomplished through digital transformation playing an important role in contextualising learning with a "critical thinking" and "abstract thinking" model (Moreau & Leathwood, 2006). The digital transformation of higher education institutions should not be limited to the adoption of advanced digital tools only (Alenezi, 2021), it should equip learners with digitisation skills rather than focusing on supporting the learning processes with technology (Hildebrandt, 2019) and enriching traditional pedagogical approaches and education system through digital tools (Jackson, 2019). Innovation driven by HEIs encapsulates various dimensions, which include human capital and skills development of both students and employees, locally relevant research and development activities, exchanging knowledge by engaging with external stakeholders and the availability of digital technology (Hasanefendic et al. 2017) and digital technology shaping HEIs (Posselt et al. 2019). However, the soft- and hard-core skills competencies have not been scientifically tested by scholars on how students and graduates have adapted to the workplace environment with the benefits, weaknesses and strengths gleaned from the applied digital skills and tools.

Benefits of digital transformation

The significance of digital transformation at macro level in the HE sectors include the adoption of digital transformation to innovate, improve service delivery and the education system, meet the international standards, adhere to policies and standards and support students with advanced learning mechanisms and knowledge delivery that are tailored to the curriculum (Alenezi, 2021). In Latin American countries such as Chile, higher education institutions have established digital transformation to be multi-perspectival and multi-dimensionally in response to the needs of various interest groups in the economic, social, environmental and cultural arena (Reuters, 2019; Rodríguez, Fernández & Rodeiro, 2018). In terms of cultural dimension, Rodríguez-Abitia and Bribiesca-Correa, (2021) posit that through digital transformation, knowledge becomes a trade-off between action and inquiry, which is composed of connections and networked entities. According to Godin and Gingras (2000), universities as knowledge-intensive institutions have a national imperative and strategic role to play of generating technological knowledge transferable to the industry, which can bring economic growth, social cohesion (Bendul et al. 2015) and social growth, values and development to society, consumers and clients.

The economic benefits brought about by digital transformation is pertinent in the HES as it improves efficient operating processes (Eastermann et al. (2020), profitable business models, lowers the cost of exchanging information, enhances value proposition and introduces automated processes by selecting talented students and researchers in accordance with sustainable management (Wallace, 2020).

Socially, digital transformation integrates digital technologies in learning, teaching and institutional practices and improves students' experience and their lifestyle (Valdés & Alpera, 2021). Argote et al. (2000) link effective knowledge transfer to survivability and increased productivity as well as giving a competitive advantage (Argote & Ingram, 2000). Conversely, the failure to cooperate and collaborate may lead to failure to transfer knowledge (Pasaribu et al. 2017). The digital tools should make sure that supporting the learning of students (Eden et al. 2019) with digital transformation at the centre ensures that the production and processing of knowledge occurs through information technologies such as online learning video integration, virtual reality, big data and gamification (Orellana et al. 2019). Furthermore, the benefits of digital transformation in the HES have been exemplified by attracting better students, improving teaching materials and courses, detecting training obstacles and reducing dropouts, training processes, developing and nurturing demand-driven digital and technical skills (Abad-Segura et al. 2020; Han, 2016; Zeleza & Okanda, 2021).

Digital technologies can transform a plethora of dimensions including **the** usage of tools that respond to educational techniques and standards (Bozhko et al. 2016); impacting on curricula, organisation and structure (Bond et al. 2018). It further provides new roles and responsibilities to academics, researchers and learners, increasing more engaged, interactive and stimulating methods of teaching and learning (Elena, 2017); establishing digital skills and curriculum modernisation (Orellana, 2019). Digital transformation also equips employees with the technological skills, expertise and contemporary knowledge that are essential and in demand in this era (Azarenko et al. 2018); prepares students to be employable and equips them with technical and instructional advice (Bond et al. 2018), and adds value to the digital transformation of the administrative architecture which results in an agile and flexible architecture with management who can adapt effectively and efficiently to the emerging technological systems (Tay & Louw, 2017). Lastly, it makes data-driven proactive and informed decisions and the management of student data and curriculums possible, innovates their management experiences (Faria & Nóvoa, 2017) and enables digital learning, tends to cause various learning experiences, improves teaching materials and training processes (Rodríguez-Abitia & Bribiesca-Correa, 2021).

While numerous researchers have cited different advantages of digital teaching that include designing examinations to meet legal requirements and avoid technical problems (Valdés, & Cerdá Suárez, 2021), formats being flexible for both teachers and learners (Orellana et al. 2019). Other scholars mention the valuable information that digital teaching eliminates commutes for students and lecturers and saves time (Balyer & Öz, 2018). While the sustainable digitisation of research is notable, progress is slow (Mahlow & Hediger, 2019). Equally, the risks associated with digitalisation have been cited as including increased consumption of raw materials (Estermann et al. 2020), an increase in the consumption of resources and the disposal of digital devices Estermann et al. (2020); an increase in greenhouse gas emissions (Andrae & Edler, 2015) and increased electricity demands (Cook, 2017). Inadequacy to prepare for overcoming barriers, lack of understanding of barriers and failure to design and implement digital transformation make it difficult to formulate relevant transformation strategies. In addition, learning can be attained in the digital transformation era individually and socially to support diverse ideas (Mpungose, 2020), which is the opposite of traditional learning methods although

learning can happen provided internet connectivity and technology are available on campuses and in their homes. While the benefits of digital transformation in the HES is mainly about the effective transfer and sharing of knowledge improving the curricula and the teaching and learning process, there is a paucity of data on the benefits to the industry, society and teaching staff.

Barriers to transformation

While strides have been made with regard to the planning and implementation of digital transformation across the globe, a myriad of barriers and have hampered the gains made in previous years. In the Indonesian higher education sector, twenty-two barriers to the implementation of digital transformation were identified that were classified into nine groups which include: strategy and policy, leadership, knowledge technology, vision, resources, digital skills, resistance to change, technology, and government and economics (Aditya, Ferdiana & Kusumawardani, 2021; Aditya, Ferdiana & Kusumawardani. 2021). The authors categorised the previous barriers to digital transformation as social, contextual, technical and cultural barriers. Similarly, there are various main, strategic, high-level challenges which act as obstacles while adopting digital transformation in the higher education sector (Rodrigues, 2017; Smith & Beretta, 2021). These high-level challenges include prioritisation (prioritise immediate results); decentralised decision-making (may cause delays in the implementation of the large-scale projects) and human resistance to change (adjusting to new teaching and learning methods and models). In South Africa, an abrupt change to online learning brought by the Covid-19 pandemic increased universities reliant on digital technologies (Mhlanga, D.; Denhere & Moloi, 2022) while bringing to the fore the deficiencies (Weeden & Cornwell, 2020), with the strategic planning (Bond et al. 2018) for the sector being understudied and the academic staff members' existing constraints to digital innovation being overlooked (Vicente et al. 2020). Rodríguez-Abitia & Bribiesca-Correa (2021) who assessed the level of maturing in the HEI sector regarding their digital transformation and compared them with other sectors revealed the university sector as lagging behind due to an inadequate degree of innovation and financial support, effective leadership, and cultural changes. There are both technological and non-technological factors linked to the failure or success of digital strategy in an organisation, which include organisation silos; legal and regulatory implications; lack of data to justify the value of digital transformation; the culture and internal organisation; the organisational resistance to change; the understanding of the behaviour or impact of customers; lack of resources and budget; lack of competencies and digital literacy (Hafsi & Assar, 2016; Solis & Szymanski, 2016). Alenezi (2021) posits that the most crucial barrier to digital transformation is fed by the generation gap of native students which emanates from the decentralised decision-making, short-term outcome and insufficient prioritisation of investments, digital literacy of academic staff members and internal resistance.

Some of the challenges or barriers of digital transformation are a lack of organisational, technical, legal and user-related perspectives to ensure a consistent flow of information across digital services (Maltese, 2018). Gkrimpizi and Peristeras (2022) mentions fragmentation and diversity of data as some of the challenges with regard to digital transformation in the higher education sector. In countries such as Saudi Arabia, Alhubaishy and Aljuhani (2021) focused on examining the non-technical challenges to implementing digital transformation from the category of students and the academic professors. The analyses by previous authors were categories into

cognitive, behavioural and affective barriers. Early identification of barriers can allow decision-makers to take appropriate and coordinated countermeasures (Gkrimpizi & Peristeras, 2022).

Discussion

Digital transformation

The systematically reviewed literature reveals similar themes and patterns regarding the characteristics of digital transformation, which are linked to performance improvement, business processes and models, practices and restructuring being conspicuous to the universities in the Global North that have responded to the technologically savvy society and are responsive to both the internal and external stakeholder needs and challenges (Alenezi, 2021; Rodrigues, n.d; Díaz-García et al. 2022; Livari et al. 2020). The Global North scholars have, through their empirical studies, documented technological advancement and 4IR prospects (Benavides et al. 2020; Vicente et al. 2020), innovative strategies to improve the education system, service delivery improvement, adherence to the international standards, advanced learning methods and scientific and technological knowledge transfer that is aligned to the curricula (Arango Serna et al. 2018; Alenezi, 2021). While other notable studies have reservations about the sustainability of digital transformation in the HE sectors (Ulber, 2021), others cite the funding cuts (Matchett, 2013), inadequacy regarding digital transformation capability, lack of broad institutional vision, data structure and processing (Marks, 2020).

Skill set

Common themes have emerged on the impact of digital transformation through digital learning that prepare students through continuous learning to attain digitisation and employability skills, which learning is supported by technology (Alenezi, 2021; Hildebrandt, 2019). The digital learning tools have been seen to enhance the traditional pedagogical approaches and education system, increase the quality of learning and open distance exchanges of information and cooperation (Jackson, 2019; Keegan, 2002). The most common soft (problem solving, creative thinking, creative thinking), technical (computational skills and data analytics) and cognitive skills including cross-cultural competencies and agile working skills are said to be attained through the digital learning processes (Alenezi, 2021; Moreau & Leathwood, 2006).

Benefits

Reuters, 2019; Rodríguez, Fernández and Rodeiro (2018) opine that digital transformation has benefitted a host of interest groups in the economic, social, environmental and cultural spheres. The literature has shown the benefits for students extensively, namely knowledge transfer, education methods and mechanisms and enhanced innovative strategies. For instance, digital technologies in learning have been found to have improved students' experience and their well-being (Valdés & Alpera, 2021); technological transfer that is used in the industry impacts on socio-economic growth (Bendul et al. 2015). Furthermore, the transfer of knowledge through online learning has been linked to productivity, competitive edge (Argote & Ingram, 2000), production and processing of knowledge (Orellana et al. 2019).

Researchers have unearthed a host of digital transformation benefits in the HES which include the new techniques and standards being invented (Bozhko et al. 2016); the academics and researchers' new roles and responsibilities being introduced, which has enhanced more engaged, interactive and simulated methods of teaching and learning (Elena, 2017). In addition, the digital

skills and curriculum modernisation (Orellana, 2019), capacitating academics with technical and instructional methods (Bond et al. 2018) and the improvements in the learning and teaching materials and training process (Rodríguez-Abitia & Bribiesca-Correa, 2021) have been experienced in the HES.

Barriers to digital transformation

The literature reveals common themes in terms of the barriers to digital transformation, which are based on internal resistance, lack of digital skills, culture, decision-making, lack of funding and innovation (Aditya, Ferdiana & Kusumawardani, 2021; Aditya, Ferdiana & Kusumawardani. 2021). The lack of digital innovations amongst employees in the HE sector being overlooked (Vicente et al. 2020), silos mentality, inadequate existence of data to justify the value of digital transformation, resistance to change, lack of funding, competencies and increased digital illiteracy (Hafsi &Assar, 2016; Solis & Szymanski, 2016) have been mentioned as some of the barriers for digital transformation. It resulted directly from the shortage of skills to understand and prepare for overcoming the design and implementation of the digital transformation barriers, lack of digital infrastructure, weak governance, and resources in the HE sectors as behind the slow progress in the realisation of the digital transformation agenda.

The empirical literature on digital transformation in the Global South is lacking though there are concerted efforts by governments to influence the HE sectors to increase technological advancement on campuses and digitalise the university operations, systems, processes, learning and teaching as well as research. The lack of perception studies on the satisfaction and the effects of the academic and non-academic staff members as well as students is disturbing as digital transformation remains untested. Another gap in the literature is a failure to shed light on the extent and inputs performance improvement and productivity, restructuring, systems, and structures as well as curricula reform and its conversion to socio-economic benefits brought by digital transformation in the university sector. The widely shared challenges on digital capabilities amongst staff members and students remain discussed without providing scientific evidence on the interventions and initiatives to fill the void.

There are contradictions in the literature depicting how digital transformation enhances students' soft and technical skills although one of the barriers mentioned is the inadequate capability issue to apply digital tools in the HE sectors by staff members and students. Furthermore, literature has failed to provide scientific evidence on how blended learning and teaching between traditional pedagogy and digital transformation has contributed to the development of skills of learners. This silent data on the salient matter on how such blending has contributed to the personal development for both staff members and student is missing in the existing literature.

The benefits of digital transformation in universities are commended though it is unclear how it has changed the workload for the workforce and the case studies on the legal implications for such radical changes reported are missing. Similarly, the risks associated with such innovations and agile business processes, systems, practices, and structures that are influenced by digital transformation is missing in the literature.

In view of the above, the host of barriers to digital transformation in the HE sectors overshadows the gains on digitalising the university operations and the scholarships with programmes, interventions and initiatives missing in the literature to counter the barriers.

Conclusion

This study sought to investigate the existing literature debates on digital transformation in the HE sectors in the Global North and South. This study also investigates the skill sets, benefits and barriers that are brought by digital transformation. The study established that common themes exist in the current literature which defines digital transformation in line with performance improvement, smooth business processes, restructuring, systems, and practices which are mostly prevalent in the Global North. However, a plethora of challenges including funding cuts, lack of digital transformation capabilities and visionless institutions have over-shadowed technological advancements and 4IR inroads that have been made thus far. The previous challenges act against the constructs of the connectivism theory by Siemens (2004) that facilitate e-learning and open teaching and learning as it has been overshadowed by these adverse factors with direct effects on the application of digital tools in teaching and learning.

The study also found digitalization and employability skills as supporting both traditional and digital learning approaches which impacts on the students' socio-economic, cultural, and environmental benefits. However, the latter benefits have not been observed to the academic and non-academic staff members. The good intentions and strides which have been brought by the digital transformation in HE sectors have been met by a multiplicity of barriers as displayed in the existing literature. According to the results the barriers mainly include employee resistance, lack of digital knowledge, skills and innovations as well as a culture of traditional business operations as opposed to the new norm of digitalization. The latter barriers have been compounded by the lack of digital infrastructure, inadequate governance mechanisms and funding. The barriers as shown in the existing literature are silent on the salient factors that are central to the connectivism theory that promote information sharing amongst students (Mhlanga, Denhere & Moloi, 2022) and encourage students to use social media platforms and the search engines (Anderson, 2016).

It is recommended that the business processes should be mapped, universities' existing set-up be restructured, and the strategic plans be realigned and embark on a radical recurriculation of the programmes so that they are aligned to the digital transformation demands. The new literature should empirically focus on identifying the digital deficiencies of the teaching and non-teaching staff members, showing its academic performance and productivity, well-being, learning and teaching, research as well as engaged scholarship for students. It is noted that the published study results show that university leaders should allocate sufficient budget initiatives and projects that will drive the digital transformation agenda, which will directly empower all the university stakeholders with the relevant skills, and improve governance mechanisms, infrastructural development, and institutional cultural change.

While the article attempted to review the literature holistically, the dominance of the empirical studies and qualitative studies published in the Global North was the major limitation for the study as the dimensions of digital transformation can be perceived as one-sided. However, this provides an opportunity for future researchers to conduct scientific studies and test the gaps and

opportunities found in this literature paper in countries located in the Global South regarding the strides which have been made with the application of digital transformation in the HE sector.

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DÉVELOPPEMENT D'UN LEXIQUE MULTILINGUE BASÉ SUR L'ANALYSE DE SENTIMENTS POUR LES LANGUES À FAIBLES RESSOURCES

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Abstract

Le paysage multilingue de l'Afrique du Sud et de la République Démocratique du Congo (RDC) présente des défis considérables pour la traduction multilingue en raison de la rareté des jeux de données précisément étiquetés. Les approches existantes, basées sur des jeux de données monolingues et des méthodes de traduction automatique (MTA), échouent souvent à traiter les contextes de langues mixtes et les nuances de polarité des sentiments. Cette étude vise à combler ces lacunes en développant un lexique multilingue, initialement conçu pour le français, désormais enrichi avec des traductions et des scores de sentiment pour l'anglais, l'afrikaans, le sepedi et le zoulou. Un corpus de 3 000 mots et 1 000 phrases a été créé, et des techniques d'apprentissage automatique (Machine Learning), telles que les forêts aléatoires (Random Forest), les machines à vecteurs de support (Support Vectors Machine (SVM)), les arbres de décision (Decision Trees) et le classificateur bayésien (Naive Bayes), ont été appliquées sur le corpus. En outre, l'étude exploite BERT (Bidirectional Encoder Representations from Transformers), un modèle de langage basé sur les transformateurs atteignant des performances remarquables avec une précision de 99 % et une exactitude de 98 % dans la prédiction des sentiments contextuels. De plus, l'intelligence artificielle explicable (IAX) a été intégrée pour clarifier les prédictions des modèles, améliorant ainsi la confiance dans la traduction multilingue. Les résultats montrent l'utilité du lexique pour améliorer la traduction des langues à faibles ressources et l'analyse des sentiments, posant ainsi les bases de solutions d'intelligence artificiel évolutives dans des contextes linguistiquement diversifiés.

Mots-clés: informatique linguistique, analyse des sentiments multilingue, traitement automatique des langues à faibles ressources, modèles de langage à grande échelle, traduction automatique, intelligence artificielle explicable (IAX)

Introduction

Dans cette décennie marquée par la numérisation, la diversité linguistique représente à la fois un défi et une opportunité pour les systèmes d'intelligence artificielle (IA), en particulier dans l'analyse des sentiments multilingue et la traduction automatique (TA). Ces tâches jouent un rôle essentiel dans de nombreuses applications, notamment la surveillance des réseaux sociaux et les services de traduction automatisée, où la précision et l'explicabilité sont de plus en plus exigées. L'Afrique du Sud présente un paysage linguistique complexe et diversifié, caractérisé par ses onze langues officielles : l'afrikaans, l'anglais, le zoulou, le xhosa, le sepedi, le setswana, le sesotho, le xitsonga, le siswati, le tshivenda et l'isindebele (Olawale, Hendricks, & Rusi, 2024). De même, la République Démocratique du Congo (RDC) se distingue par une diversité linguistique exceptionnelle. Le pays reconnaît quatre langues officielles : le français, le lingala, le kikongo et le swahili (Bokamba, 2024). En outre, plus de 200 langues sont parlées à travers le pays, notamment le ciluba, le kinyarwanda et d'autres langues régionales (Bokamba, 2024). Cette richesse culturelle entraîne des défis linguistiques majeurs, notamment en matière de traduction, de communication et d'intégration des langues locales dans les systèmes technologiques. Ainsi, les applications d'IA en Afrique du Sud et en RDC pourraient répondre à ces défis en garantissant l'inclusivité, la précision, l'interprétabilité et la pertinence culturelle dans divers secteurs tels que l'administration, l'éducation, la politique et les affaires, où l'accessibilité linguistique est cruciale pour servir efficacement des communautés variées (Olawale, Hendricks, & Rusi, 2024; Bokamba, 2024). Cependant, les systèmes actuels d'analyse des sentiments et de traduction multilingue se concentrent principalement sur les langues bien dotées en ressources, telles que l'anglais et le français (Mabokela, Celik, & Raborife, 2022). Ces dernières bénéficient de lexiques étendus, de jeux de données étiquetés et de ressources significatives, facilitant leur intégration dans les modèles d'apprentissage automatique (Machine Learning) (Al-Quayed et al., 2024; Mabokela, Celik, & Raborife, 2022). En revanche, les langues sous-représentées d'Afrique du Sud et de la RDC sont généralement exclues, limitant la capacité de l'IA. Ces langues contiennent souvent des termes culturellement spécifiques, tels que des idiomes, des indices contextuels et des mots uniques, qui les diffèrent considérablement des langues bien dotées en ressources comme l'anglais ou le français (Mathebula, Modupe, & Marivate, 2024). Cette disparité affecte non seulement les tâches individuelles de l'IA, comme la traduction et l'analyse des sentiments, mais limite également les modèles multilingues, les empêchant de fournir un support linguistique adéquat dans des contextes diversifiés (Miah, Kabir, Sarwar, Safran, Alfarhood, & Mridha, 2024).

Notre approche qui étudie les capacités de l'IA pour inclure davantage de langues africaines sous-représentées est une tâche complexe et difficile qui nécessite une méthodologie unique. Tout d'abord, notre lexique doit être enrichis de différentes étiquettes de sentiment ainsi que de divers scores de polarité correspondant aux détails contextuels propres à chaque langue. Cela permettra aux modèles d'être davantage interprétés et de se généraliser au ton émotionnel des phrases traduite, ainsi que de classer avec précision les différents scores de sentiment à travers l'ensemble du lexique. Ensuite, les modèles d'IA doivent être conçus sur mesure pour gérer les différences structurelles et grammaticales des langues sous-représentées, qui possèdent toutes des préfixes uniques et des mots complexes propres à leur langue. Par exemple, dans la langue zoulou ainsi que dans d'autres langues bantoues, il existe un grand degré d'agglutination, ce qui signifie que ces langues combinent différents

affixes pour créer de nouveaux mots complexes exprimant des significations et des détails complexes (Olawale, Hendricks, & Rusi, 2024). Toutefois, des techniques telles que l'apprentissage profond (Deep Learning) offrent des modèles solides pour traiter les complexités linguistiques (Mabokela, Celik, & Raborife, 2022; Elmimouni et al., 2024), car elles sont capables d'apprendre à travers diverses entrées de données sur lequel elles sont entraînées (Al-Quayed et al., 2024; Zhao, Wu, Yang, Zhang, Zhang, Wang, & Li, 2024).

Cependant, des défis majeurs demeurent car l'apprentissage profond nécessite d'être correctement entraînés sur des langues non agglutinantes (Ong et al., 2025). Par conséquent, l'intégration de l'IA explicable (IAX) et les *mécanismes d'attention* dans l'apprentissage, offre de la transparence tout au long du processus de prise de décision, permettant aux différents acteurs de comprendre comment les modèles d'IA interprètent les résultats des analyses de sentiment et des traductions (Ong et al., 2025; Al-Quayed et al., 2024). Par exemple, l'IAX peut être utilisée pour mettre en évidence des mots ou anecdotes qui influencent la performance du modèle de traduction multilingues et de la prédiction des sentiments (Zhao, Wu, Yang, Zhang, Zhang, Wang, & Li, 2024). Cela permet aux analystes de découvrir d'éventuels biais ou autres inexactitudes spécifiques aux expressions uniques des langues à faibles ressources. Cette approche est crucial dans les pays linguistiquement diversifiés d'Afrique, où la capacité des systèmes d'IA à traiter des langues culturellement différentes permettra la préservation des langues (Ahammad et al., 2024). Cette étude vise donc à combler le fossé actuel de la traduction des langues à faibles ressources en développant un lexique multilingue intégrant le français, l'anglais, le zoulou, le ciluba, l'afrikaans et le sepedi. Pour chaque entrée du lexique, il existe des mots ayant une polarité sentimentale étiquetée (positive, négative ou neutre) ainsi que des valeurs d'intensité allant de -9 à 9, ce qui permet d'évaluer le sentiment à travers les langues à faibles ressources de l'Afrique du Sud et de la RDC. Notre méthodologie permet également d'employer différents modèles d'apprentissage automatique tels que, (i) les classificateur bayésien (Naive Bayes), (ii) les machine à vecteurs de support (Support Vectors Machine (SVM)) et (iii) les forêts aléatoire (Random Forest), pour tester et valider la précision des tâches de traduction. Ensuite, des techniques de validation croisée ont été appliquées pour enrichir la qualité de la traduction à travers différents groupes linguistiques, garantissant ainsi que les sorties soient culturellement et linguistiquement exactes et bien traduites. Ainsi, l'étude cherche à créer un outil d'IA inclusif capable de réaliser une analyse de sentiment précise avec des tâches de traduction multilingues en Afrique du Sud et en RDC en créant un lexique de 3 000 mots. La motivation de cette recherche est qu'il y a un grand besoin de lexiques précisément étiquetés pour les langues à faibles ressources parlées en zoulou, ciluba, sepedi et afrikaans. Le manque de données étiquetées limite l'application des systèmes d'IA à ces langues et entrave leur préservation à long terme. Par conséquent, cette étude vise donc à combler ce fossé tout en créant des données d'entraînement étiquetées pour des langues à faibles ressources tout en effectuant une analyse de sentiment sur le lexique créé. En fonction des objectifs définis, les questions de recherche potentielles sont formulées comme suit :

1. Comment un lexique multilingue peut-il intégrer précisément les traductions et l'analyse des sentiments pour l'anglais, le français, l'afrikaans, le ciluba, le sepedi et le zoulou ?

2. Quelles méthodes tiennent efficacement compte des contextes culturels dans l'attribution des scores de sentiment aux mots traduits ?

3. Comment un corpus de textes peut-il améliorer l'analyse des sentiments et l'évaluation des traductions pour les langues à faibles ressources ?

4. Quels modèles d'IA sont les plus performants dans la prédiction des sentiments et la traduction ?

5. Comment l'implémentation de modèles de langage basés sur les transformateurs (Large Language Models) avec IAX améliore-t-elle la traduction et l'explicabilité ?

En répondant a ces questions, cette étude apporte les contributions suivantes :

1. Expansion du Lexique Initial. L'étude ajoute l'anglais, l'afrikaans, le sepedi et le zoulou à un lexique initialement basé sur le français et le ciluba (Malinga, Lupanda, Nkongolo, & van Deventer, 2024).

2. Fonctions de Traduction. L'étude évalue les traductions à travers six langues, identifiant des défis tels que la perte de contexte et les différences idiomatiques tout en garantissant une meilleure traduction au niveau des phrases.

3. Implémentation de l'Apprentissage Automatique (Machine Learning). L'étude démontre la robustesse des algorithmes de forêts aléatoires (Random Forest) dans la classification des sentiments pour les langues à faibles ressources.

4. Implémentation de BERT (Bidirectional Encoder Representations from Transformers). L'étude utilise BERT et atteint 99 % de précision dans la prédiction des sentiments, tout en intégrant une IAX pour clarifier les prédictions et renforcer la confiance des utilisateurs dans l'analyse des sentiments. L'article est structuré comme suit : La littérature explore les avancées dans la création et l'implémentation de lexiques précis et l'efficacité des modèles multilingues dans le traitement du sentiment. La méthodologie détaille les techniques utilisées pour construire et évaluer le lexique. Les résultats analysent les données obtenues, et la conclusion résume les contributions de l'étude et propose des perspectives futures.

Littérature

L'analyse des sentiments, est une branche essentielle du traitement automatique du langage naturel (TALN). Elle consiste en l'évaluation automatique des opinions et émotions des individus à l'égard de produits, services ou autres entités (Yusuf et al., 2024). Cette analyse peut être abordée à différents niveaux de classification, notamment au niveau du document, de la phrase ou en se concentrant sur des caractéristiques spécifiques du texte (Yusuf et al., 2024). L'analyse des sentiments a suscité un intérêt de recherche considérable en raison de ses applications cruciales en TALN, en particulier dans les domaines des affaires et du service client (Mabokela, Celik, & Raborife, 2022). De plus, l'essor rapide des plates-formes telles que Twitter, Facebook, Instagram, WhatsApp et TikTok a amplifié cet intérêt. Ces plates-formes produisent de vastes quantités de données générées par les utilisateurs, souvent dans des langues mixtes, en particulier les langues sous-représentées associées à l'anglais ou le français. Créant ainsi des données riches et multilingues (Elmimouni et al., 2024). Twitter a été un axe majeur des recherches en analyse des sentiments en raison de son format structuré, concis et de sa base d'utilisateurs (Mabokela, Celik, & Raborife, 2022). Et le language de programation Python reste l'outil principal pour l'analyse d'opinions dans le traitement du langage naturel (Natural Language Processing (NLP)), en raison de ses bibliothèques polyvalentes et de sa facilité d'utilisation (Figure 1).

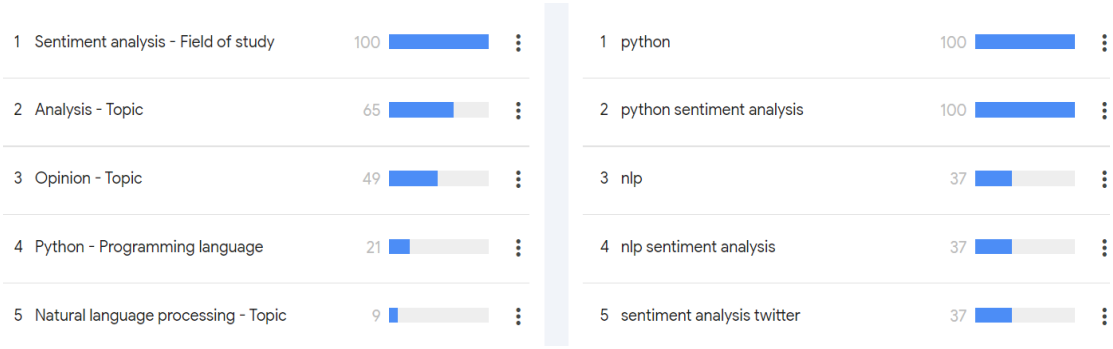


Figure 1: L'intérêt mondial pour l'analyse de sentiment au fil du temps, tel que suivi par Google Trends (2004–présent)

Cependant les défis lier a l'Analyse des Sentiments Multilingue (ASM) demeurent. Bien que l'ASM pour les langues à faibles ressources évolue avec l'apprentissage profond, peu de méthodes généralisées existent pour ces langues (Yusuf et al., 2024; Elmimouni et al., 2024; Mabokela, Celik, & Raborife, 2022). L'analyse de sentiment a traditionnellement fait d'énormes progrès dans les langues à ressources élevées, telles que le mandarin et l'arabe, grâce à la disponibilité de grands ensembles de données annotées et de modèles d'apprentissage automatique sophistiqués (Shoba, Sasithradevi, & Deepa, 2024). Cependant, atteindre le même niveau de développement pour les langues à ressources limitées présente des défis plus importants. Ces langues, souvent parlées par de plus petites populations, manquent des corpus étendus nécessaires à la création de modèles performants. Par conséquent, elles font face à des limitations dues à la rareté des données linguistiques, des outils et des ressources informatiques (Shoba, Sasithradevi, & Deepa, 2024; Ong et al., 2025). Dans cet article, le terme « langues à faibles ressources » désigne les langues ayant des ressources linguistiques ou un soutien technologique limités.

Avancées dans l'Implementation des Lexiques Multilingues. Des lexiques multilingues ayant des modèles linguistiques pré-entrainés ont été proposés comme des solutions potentielles pour améliorer la traduction dans les langues à ressources limitées (Mukwevho, Rananga, Mbooi, Isong, & Marivate, 2024). Ces lexiques peuvent être cruciaux dans l'ajustement des modèles ou même pour l'analyse de sentiment basée sur des règles lorsque les données sont rares (Mathebula, Modupe, & Marivate, 2024). De plus, l'exploitation de l'IAX peut aussi fournir des informations sur le processus de prise de décision des modèles, rendant les prédictions et traductions plus transparentes et fiables, notamment dans des contextes culturellement divers où les expressions de sentiment peuvent varier (Thangaraj, Chenat, Walia, & Marivate, 2024). Cela dit, nous pouvons constater que le développement de lexiques multilingues pour les langues à ressources limitées, est un domaine en pleine expansion, avec des défis importants mais aussi un potentiel considérable (Malinga, Lupanda, Nkongolo, & van Deventer, 2024; Thangaraj, Chenat, Walia, & Marivate, 2024; Mathebula, Modupe, & Marivate, 2024; Mabokela, Celik, & Raborife, 2022). Pour les recherches futures, plusieurs stratégies pourraient être envisagées. Une direction prometteuse est l'utilisation de grands modèles pré-entrainés comme GPT (Generative-Pre-trained Transformer) (Malinga, Lupanda, Nkongolo, & van Deventer, 2024), qui peuvent être affinés sur de petits ensembles de données spécifiques à un domaine pour améliorer les performances de langues à ressources limitées (Mathebula, Modupe, & Marivate, 2024). De plus, la combinaison de techniques supervisées, non supervisées et d'apprentissage profond, ainsi que la création de

lexiques multilingues étendus, pourrait offrir des solutions efficaces pour résoudre la rareté des données.

Modèles Multilingues d'IA pour l'Analyse de Sentiment dans les Langues à Ressources Limitées

Les modèles d'IA basés sur l'apprentissage automatique, tels que le BERT multilingue (mBERT) et le XLM-R (Cross-Lingual Language Model - RoBERTa), ont montré des résultats prometteurs dans les tâches d'analyse de sentiment à travers différentes langues, y compris les langues à ressources limitées (Zhao, Wu, Yang, Zhang, Zhang, Wang, & Li, 2024). Ces modèles sont entraînés sur d'énormes ensembles de données contenant plusieurs langues, leur permettant d'apprendre des représentations partagées qui peuvent être transférées aux contextes à faibles ressources (Zhao, Wu, Yang, Zhang, Zhang, Wang, & Li, 2024). Cependant, malgré les avantages de ces approches, leur performance sur les langues à ressources limitées reste sous-optimale en raison des différences linguistiques et de la disponibilité limitée de données annotées. Nos récents travaux suggèrent qu'un ajustement de ces modèles sur des données contextuellement spécifiques aux langues à ressources limitées peut aider à améliorer leurs performances (Malinga, Lupanda, Nkongolo, & van Deventer, 2024). Toutefois, des progrès supplémentaires sont nécessaires pour combler l'écart technologique entre les langues à ressources élevées et celle à ressources limitées (Malinga, Lupanda, Nkongolo, & van Deventer, 2024). Car les modèles des traitement de ces types de langages sont basés sur l'apprentissage profond, fonctionnant comme des boîtes noires, rendant difficile la compréhension des processus sous-jacents à leurs traduction, prédictions, et classifications (Danilevsky, Dhanorkar, Li, Popa, Qian, & Xu, 2021). C’est ainsi que l’ IAX peut aider à comprendre les modèles boîte noire comme mBERT qui peuvent être défini comme des modèle linguistiquement basé sur des transformateurs (Huang, 2024).

Ces modèles utilisent une approche bidirectionnelle dans leurs modélisation, ce qui leurs permettent d'être entraîner pour comprendre le texte dans les deux directions — avant et arrière (Huang, 2024). Cette capacité bidirectionnelle distingue mBERT des modèles linguistiques traditionnels unidirectionnels (Huang, 2024). mBERT utilise également une approche de Modélisation de Langue Masquée (MLM) qui permet de masquer aléatoirement certains mots dans une phrase, ce qui permet au modèle d'être formé pour prédire les mots masqués (Huang, 2024). La MLM permet à mBERT d'apprendre le contexte de manière non linéaire, ce qui rend la technique extrêmement robuste et fiable pour comprendre les relations complexes entre les mots et les phrases (Huang, 2024). De plus, son algorithmique utilise une prédiction en phrase suivante, ce qui permet au modèle de déterminer la fluidité logique des phrases, l'aidant à capturer les relations au niveau de la phrase (Huang, 2024). Cette capacité est essentielle pour que l’algorithme traite efficacement des tâches linguistiquement complexes. La Table 1 résume les points essentiels de chaque étude sélectionnée dans cette section. Elle compare nôtre recherche, en mettant en évidence les méthodes utilisées, les limites observées et les recommandations proposées.

Méthodologie

La méthodologie comprend les éléments clés suivants: (i) *Expansion du Lexique Malinga, Lupanda, Nkongolo, & van Deventer (2024)*, consistant à enrichir le lexique initial en intégrant des nouveaux mots pour des traductions supplémentaires (Figure 2); (ii) *Scores de Sentiment Générés par l'IA*, où des algorithmes avancés d’IA calculent les scores de sentiment afin d’évaluer le ton émotionnel des mots et des

phrases du lexique, offrant ainsi une base quantitative solide pour les analyses et traductions ultérieures (Figure 2); (iii) *Analyse des Sentiments basée sur des modèles de Langage de Grande Taille (Large Language Models (LLMs))* pour identifier les sentiments liés à des aspects spécifiques dans les textes, fournissant des perspectives détaillées grâce à une analyse des nuances contextuelles (Figure 2); et enfin, (iv) *l'Évaluation des LLMs*, qui examine la performance dans l'analyse des sentiments en utilisant des métriques telles que la précision, le rappel, et le score F1 pour mesurer l' efficacité de traduction (Al-Duwais, Al-Khalifa, & Al-Salman, 2024).

Table 1 : Comparaison des méthodes, limites et recommandations des articles sélectionnées

	Méthode	Limites	Recommandations
(Al-Duwais, Al-Khalifa, & Al-Salman, 2024)	Reconnaissance d'entités nommées en arabe avec pré-entraînement linguistique.	Spécifique à la langue arabe.	Performances sur d'autres langues.
(Miah, Kabir, Sarwar, Safran, Alfarhood, & Mridha, 2024)	Analyse de sentiment, traduction en anglais avec Twitter-Roberta, BERT, & GPT-3.	Spécifique à la langue anglaise, & erreurs de traduction.	Performances sur les langues a faible ressources.
(Mughal, Mujtaba, Kumar, & Daudpota, 2024)	Analyse de sentiment basée sur DeBERTa, PaLM, & GPT-3.5-Turbo.	Complexité des modèles.	Méthodes d'annotation.
(Kopanov, 2024)	Détection d'entités géospatiales via SpaCy, XLM-RoBERTa, & GPT-3.5.	Les données Telegram limite la généralisation des résultats.	Optimisation des modèles.
Notre étude	Développement d'un lexique multilingue. Tester le lexique avec: BERT, IAX, GPT, V2, VADER, SVM, Random Forest, Naive Bayes, et Decision Tree.	Manque de jeux de données et difficulté à traiter les nuances de sentiments.	Création des lexiques pour les langues a faible ressources.

Expansion du Lexique

La Figure 2 décrit le processus visant à étendre et affiner le lexique multilingue.

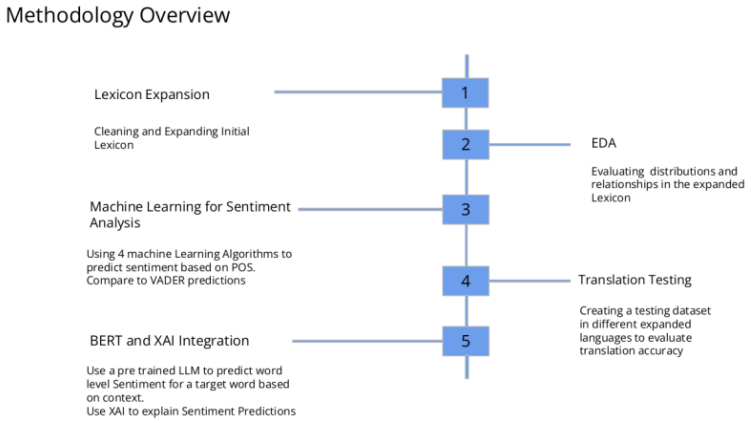


Figure 2: Méthodologie garantissant l'analyse multilingue

Elle décrie l'ajout des scores de sentiment pour différentes langues, suivi d'une visualisation des données pour analyser les tendances des sentiments à travers les langues. Le lexique initial contenait un peu plus de 3 000 mots en français et en ciluba, avec un score de sentiment attribué, une catégorie grammaticale (Part of Speech, (POS)) et une polarité (neutre, négative ou positive) (Figure 3 et Figure 4).

Translation Examples

Sentence	Source Language	Target Language	Translated Text
I want food.	english	zulu	mina funa ukudla
Have you eaten?	english	zulu	hamba wena udleke
Thank you.	english	sepedi	re a leboga
I want food.	english	sepedi	ke o nyaka dijo
Thank you.	english	french	merci
Have a good day	english	french	avoir une bonnejournée
Come to uncle Josh.	english	ciluba	kuya ku maseba josh
Waiting to dance to accompany you.	english	ciluba	kuindia kujamaa kushindikiza wena
Thank you.	english	afrikaans	dankie
Have a good day	english	afrikaans	hê 'n goeie dag
Come to uncle Josh.	english	afrikaans	kom na oom josh

Sentence	Source Language	Target Language	Translated Text
Ek vertrou haar	afrikaans	zulu	mina thembeka ake
Ek vertrou haar	afrikaans	sepedi	ke tshepho yena
Ek vertrou haar	afrikaans	english	I trust her
Bestuur na die stad.	afrikaans	english	drive to the city

Sentence	Source Language	Target Language	Translated Text
kubalulekile ukuzinakekela	zulu	english	it's important to take care of oneself
Ngiyabathanda abantu abazinanakekelayo	zulu	sepedi	ke a ba rata basadi bao ba kgathalag
kubalulekile ukuzinakekela	zulu	afrikaans	dit is belangrik om jouself te versorg
wenza okufunayo	zulu	afrikaans	maak wat jy wil hê

Figure 3: Processus de traduction multilingue

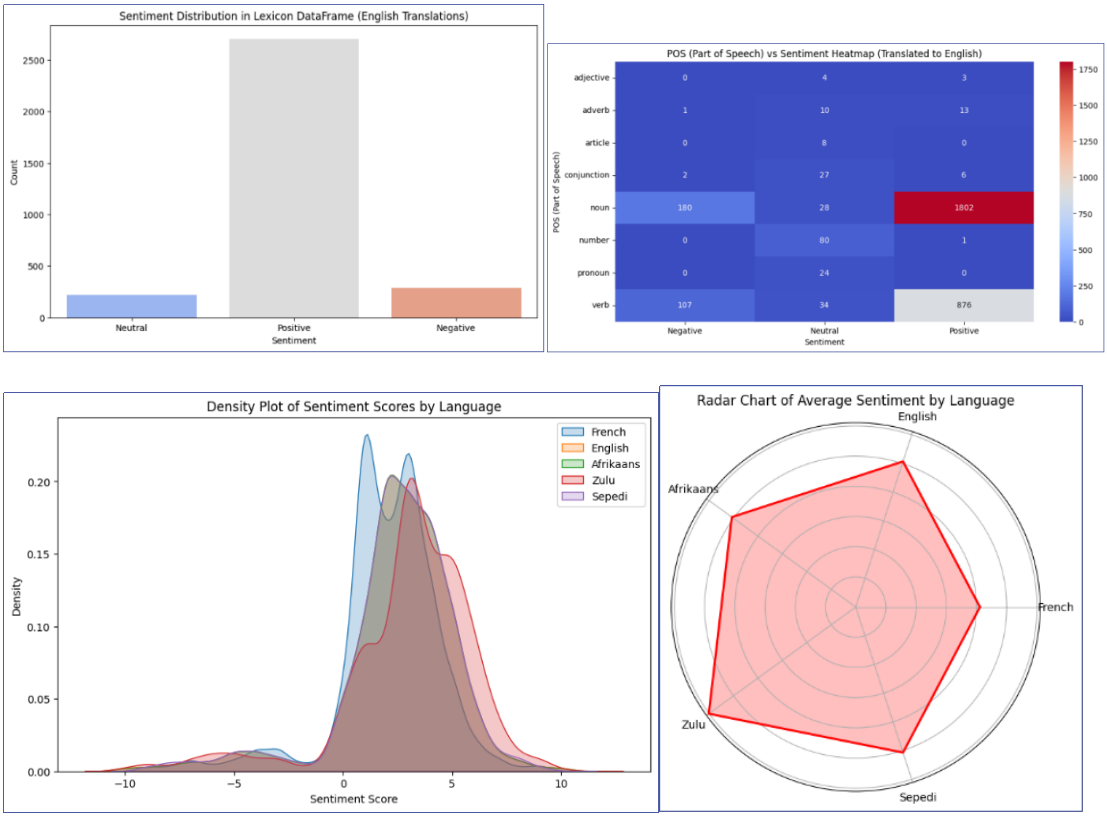


Figure 4: Le lexique multilingue

Pour identifier d'éventuelles fautes d'orthographe, le lexique a été soumis à ChatGPT 0-1 Preview (Miah, Kabir, Sarwar, Safran, Alfarhood, & Mridha, 2024). Ce model est doté de capacités avancées de raisonnement et capable de traiter de grandes quantités de texte, pour identifier des erreurs potentielles dans les mots en français avant qu'elles ne se propagent lors du processus de traduction en anglais (Figure 3). Les erreurs identifiées ont été corrigées manuellement dans le lexique à l'aide de Microsoft Excel. Les mots présentant la même polarité et catégorie grammaticale, ont été supprimés de l'ensemble de données, et tous les espaces en début ou fin de ligne ont été retirés. Cela a permis de produire un lexique propre prêt à être étendu (Figure 4). Le lexique a été élargi à la fois en colonnes et en cellules. Tout d'abord, Google Translate a été utilisée pour traduire les mots en français vers l'anglais (Malinga, Lupanda, Nkongolo, & van Deventer, 2024), langues parlée par l'auteur, ce qui lui a permis d'identifier d'éventuelles erreurs. Ensuite, 250 mots couramment utilisés en anglais mais absents du lexique ont été ajoutés pour créer un ensemble plus complet. Google Translate a ensuite été utilisée à nouveau pour traduire les mots anglais, y compris ceux ajoutés, dans trois langues sud-africaines: l'afrikaans, le sepedi et le zoulou, ce qui a permis d'étendre le lexique non seulement en termes de langues mais également en nombre de mots (Figure 4).

Scores de Sentiment Générés par l'IA

Pour mieux capturer les nuances de sentiment pouvant varier selon les langues en raison de leur signification culturelle, le lexique étendu a été soumis à ChatGPT 0-1 afin de générer des scores de sentiment spécifiques à chaque mot pour chaque langue (Kopanov, 2024). Cette nouvelle version du LLM est capable de traiter ces langues, et

il a donc été hypothétiquement établi qu'elle pourrait attribuer des scores de sentiment aux mots (Malinga, Lupanda, Nkongolo, & van Deventer, 2024). Un nouveau lexique a été donc créé, contenant les scores de sentiment par langue, pour comparer avec le lexique étendu initial qui utilisait un seul score pour toutes les langues. Des traductions ont été effectuées à partir de phrases créées à l'aide du lexique étendu. Une fois les phrases créées, elles ont été traduites de la langue source vers une langue cible choisie par l'utilisateur (Figure 3). Après traduction, une analyse de sentiment a été réalisée pour mieux comprendre le sentiment de chaque phrase (Figure 5).

	sentence	source_language	target_language	translated_text
0	Ek vertrou haar	afrikaans	zulu	mina thembeka ake
1	Ek vertrou haar	afrikaans	sepedi	ke tshepo yena
2	Ek vertrou haar	afrikaans	english	i trust her
3	Bestuur na die stad.	afrikaans	english	drive to the city

Table 2: Sentiment Analysis Results

	total_score_avg	word_scores_avg	sentiment_avg	total_score_v2	word_scores_v2	sentiment_v2	vader_compound	vader_sentiment
0	2.600000	ek:0; vertrou:0; haar:2.6	positive	2.600000	ek:0; vertrou:0; haar:2.6	positive	0.0000	neutral
1	2.600000	ek:0; vertrou:0; haar:2.6	positive	2.600000	ek:0; vertrou:0; haar:2.6	positive	0.0000	neutral
2	2.600000	ek:0; vertrou:0; haar:2.6	positive	2.600000	ek:0; vertrou:0; haar:2.6	positive	0.0000	neutral
3	4.666667	bestuur:0; na:0; die:0.0; stad:4.666666666666667	positive	4.666667	bestuur:0; na:0; die:0; stad:4.666666666666667	positive	-0.5994	negative

Figure 5: L'analyse de sentiments

Chaque mot du lexique disposant d'un score de sentiment est utilisé dans cette analyse. Deux principales méthodes d'analyse de sentiment ont été employées: une méthode de moyenne simple des scores et une logique progressive plus avancée (Nkongolo Wa Nkongolo, 2023). Nous avons aussi remarquer que des mots répétés apparaissent plusieurs fois dans le lexique avec les mêmes traductions, mais des scores de sentiment différents en fonction du contexte. Cela est dû au fait que certains mots, selon leur contexte d'utilisation, peuvent véhiculer des sentiments distincts (Nkongolo Wa Nkongolo, 2023). L'analyse de sentiment calcule le sentiment d'une phrase en additionnant les scores des premiers mots ou expressions correspondant dans le lexique, puis en effectuant une moyenne, sans tenir compte des sentiments des mots restants. Pour mieux intégrer les variations de sentiment des mots dans des contextes différents, une méthode avancée est appliquée. Cette technique, nommée V2 (Figure 5), détermine s'il existe un, deux ou plusieurs mots identiques avec des scores de sentiment différents (Nkongolo Wa Nkongolo, 2023). Si un seul score est trouvé, il est utilisé ; s'il y en a deux, la valeur la plus extrême est retenue; s'il y en a trois ou plus, la polarité majoritaire est moyennée pour produire un score généralisé dans la polarité dominante (positive ou négative). L'outil VADER, avec son lexique intégré qui prend en compte l'intensité des mots, est également utilisé (Nkongolo Wa Nkongolo, 2023). Cependant, l'absence de ponctuation limite son efficacité (Figure 5).

Analyse des Sentiments basée sur des Modèles de Langage de Grande Taille

La Figure 6 illustre la méthodologie utilisée dans l'analyse de sentiments appliquée aux mots pouvant adopter des sentiments différents selon le contexte dans lequel ils sont utilisés.

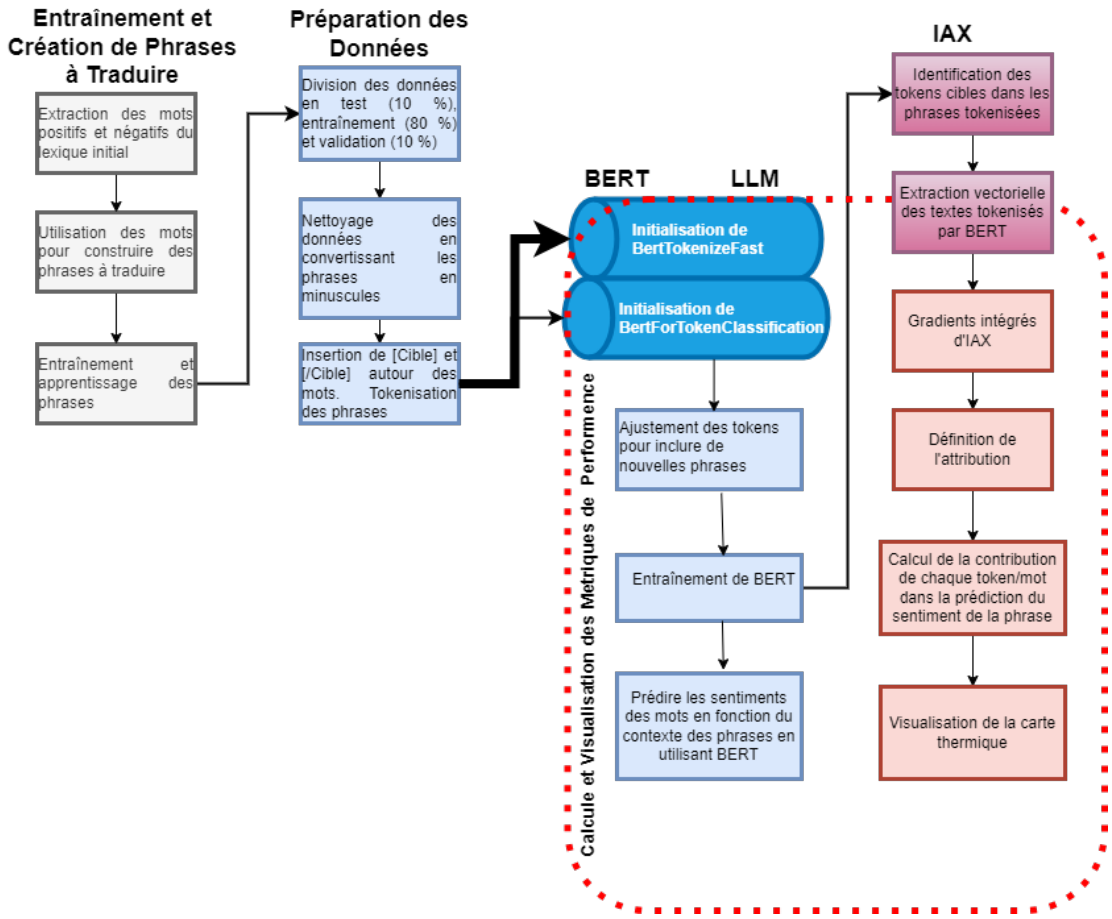


Figure 6: L'analyse de sentiments basée sur les aspects

Dans le cadre de l'analyse de sentiments basée sur les aspects (Aspect-Based Sentiment Analysis), le modèle BERT a été déployé pour classifier le sentiment d'un mot de manière contextuelle (Miah, Kabir, Sarwar, Safran, Alfarhood, & Mridha, 2024). Pour cette tâche, des mots ayant des occurrences multiples dans le lexique, avec des sentiments différents (positif ou négatif), ont été sélectionnés. Des phrases ont ensuite été générées, intégrant ces mots dans différents contextes de sentiment. Le modèle BERT, en tant que modèle de langage pré-entraîné, a été utilisé pour prédire le sentiment approprié à attribuer à un mot en fonction de son contexte (Figure 6). Le processus de formation a été géré grâce à une classe d'entraînement de la bibliothèque *Transformers de Hugging Face*, permettant d'optimiser la boucle d'apprentissage (Mughal, Mujtaba, Kumar, & Daudpota, 2024). Le modèle BERT a été entraîné pour prédire le sentiment d'un mot cible en fonction du contexte dans lequel il apparaissait dans une phrase. Lors des premières phases d'entraînement, un déséquilibre de classes a été observé (Figure 4). Les phrases neutres étaient sous-représentées par rapport aux classes majoritaires (positives et négatives). Pour corriger ce déséquilibre, les poids des classes ont été ajustés, attribuant une importance accrue aux phrases neutres afin d'assurer une classification plus équitable et de réduire la domination des autres classes.

Évaluation des Modèles de Langage de Grande Taille

Pour évaluer la performance du modèle d'analyse de sentiments basé sur BERT, des métriques d'évaluation ont été calculées et visualisées. La précision, le rappel et le score F1 ont été calculés et visualisés pour chacune des classes de sentiments (Mukwevho, Rananga, Mbooi, Isong, & Marivate, 2024). Une matrice de confusion a

été présentée, montrant les classes réelles de l'ensemble de validation et les classes prédites (Mukwevho, Rananga, Mbooi, Isong, & Marivate, 2024). Des courbes ROC ont été tracées pour visualiser comment le modèle se comporte dans la discrimination entre les classes de sentiments à différents seuils de discrimination. Afin de mieux comprendre le processus décisionnel du modèle dans *l'attribution du sentiment* à un mot en fonction de son contexte, la technique post-hoc *Integrated Gradients* a été implémenter comme IAX. Et c'est la bibliothèque *Python Captum* qui a été utiliser dans cette optique (Malinga, Lupanda, Nkongolo, & van Deventer, 2024). En tant que méthode post-hoc, elle est appliquée après que les prédictions ont été faites pour expliquer le raisonnement derrière celles-ci (Mabokela, Celik, & Raborife, 2022). Pour chaque phrase de test, le mot cible a été marqué à l'aide des tokens *[Target]*, ce qui permet de *concentrer l'attention* sur le mot cible dans le calcul des attributions dans la phrase (Mabokela, Celik, & Raborife, 2022). Les entrées correspondant à la *phrase tokenisée* ont été extraits de la *couche vectorielle de BERT*, et le *calcul du gradient* a permis d'attribuer à chaque token de la phrase une influence dans la prédiction du sentiment du mot cible. Les attributions ont été visualisées à l'aide de *cartes thermiques* pour montrer les *scores d'attribution* de chaque mot dans la phrase (Mabokela, Celik, & Raborife, 2022). Les tokens avec des scores d'attribution plus élevés indiquent qu'ils jouent un rôle important dans la détermination du sentiment du mot cible (Malinga, Lupanda, Nkongolo, & van Deventer, 2024; Mukwevho, Rananga, Mbooi, Isong, & Marivate, 2024; Mabokela, Celik, & Raborife, 2022).

Résultats et Évaluation des Modèles

La matrice de performance met en évidence les forces et les faiblesses des modèles Random Forest (foret aléatoire), SVM (machine a vecteurs de support), Decision Tree (arbre décisionnel) et Gaussian Naive Bayes (GNB) (classificateur naïve-Bayes Gaussien) (Table 2).

Table 2 : Comparaison des algorithmes de d'apprentissage automatique Vs. BERT

Model	Accuracy (exactitude)	Precision	Recall (rappel)	F1 Score
Random Forest	66%	61%	66%	56%
SVM	65%	61%	65%	56%
Decision Trees	65%	60%	65%	56%
Gaussian Naive Bayes (GNB)	60%	54%	60%	54%
BERT	-	98%	100%	99%

Random Forest se distingue avec la meilleure exactitude (0,66) et le meilleur score F1, montrant sa robustesse face aux déséquilibres de classe grâce à sa méthode d'ensemble, qui améliore sa généralisation et sa cohérence. SVM suit de près avec une exactitude de 0,654. Ce modèle gère avec succès les limites complexes, bien qu'il puisse avoir des difficultés avec des classes fortement déséquilibrées, car son optimisation binaire limite son adaptabilité à de nombreuses fréquences de classes. Le GNB, avec une exactitude la plus basse (0,599), est freiné par sa simplicité et son indépendance aux caractéristiques textuelles (Table 2). La performance de ce modèle en fait un choix moins optimal pour des tâches nécessitant une traduction ou

classification nuancée. Les compromis entre la précision et le rappel (Recall) suggèrent que SVM et Decision Tree sacrifient légèrement la précision pour un rappel plus élevé, ce qui est utile dans les cas où la capture des vrais positifs est prioritaire (Table 2). Random Forest offre généralement la performance la plus équilibrée à travers les métriques, en faisant le choix préféré pour cette tâche (Figure 7).

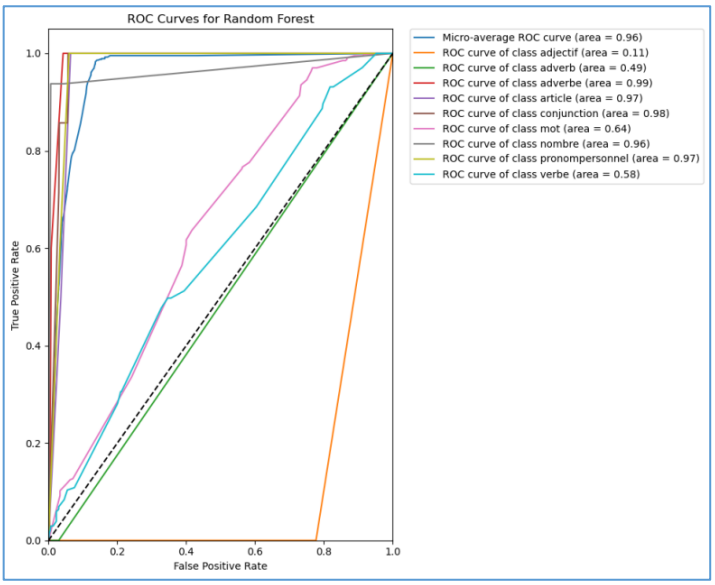


Figure 7: La performance du Random Forest

Évaluation de BERT

Les deux tables (Table 2 et Table 3), présentent les métriques de précision obtenues par le modèle BERT surpassant ceux de l'apprentissage automatique illustrer dans la Table 2 et Figure 7.

Table 3 : Analyse de sentiments de BERT

Sentiment	Precision	Recall	F1 Score	Support
Negatif	98%	100%	99%	151
Neutre	0%	0%	0%	3
Positif	100%	100%	100%	154
Précision	-	99%	-	308
Précision Moyenne	66%	67%	66%	308
Précision Pondérée	98%	99%	99%	308

La Table 3 démontre l'analyse de sentiments, et en ce qui concerne le sentiment négatif, le modèle BERT présente une précision élevée de 0,98. Cela indique que BERT a correctement identifié les points de données négatifs 98 % du temps (Table 3). Le sentiment négatif a un rappel de 1, ce qui signifie que le modèle a correctement identifié tous les cas de sentiment négatif à 100 % (Table 3). Le score F1 est la moyenne harmonieuse de la précision et du rappel (Nkongolo Wa Nkongolo, 2023).

Un score F1 de 0,99 indique que le modèle BERT a très bien identifier des sentiments négatifs (Table 3). Le modèle a correctement identifié 151 sentiments négatifs comme étant négatifs (Figure 8). Le score du sentiment neutre a une valeur de 0 dans toutes les métriques. Cela indique que le modèle n'a pas réussi à classifier des valeurs comme neutres (Figure 8). Cependant, il n'y avait que 3 cas de sentiment neutre dans le modèle. Cela pourrait suggérer qu'il est nécessaire d'inclure davantage de cas neutres, ou que le résultat d'un sentiment de zéro est peu fréquent (Table 3). Le sentiment positif a un score de 1 dans toutes les métriques, indiqua une performance parfaite pour le sentiment positif (Table 3). BERT a correctement identifié les 154 cas de sentiment positif. Dans l'ensemble, la performance du modèle suggère que BERT peut contextuellement distinguer les valeurs de sentiment positif et négatift tout en ayant des difficultés avec le sentiment neutre, probablement en raison de la petite taille de l'échantillon (Table 3). La moyenne pondérée élevée indique un modèle performant (Figure 8 et Table 3).

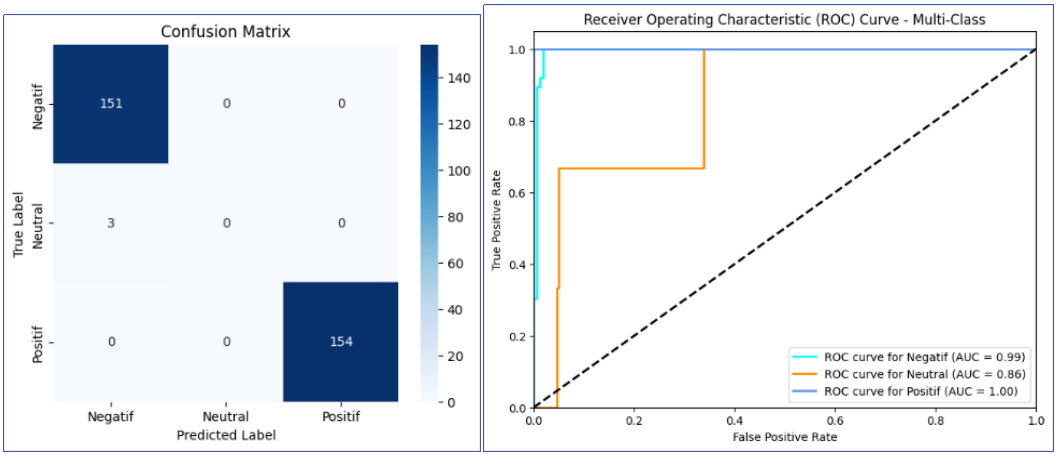


Figure 8: La performance de BERT

La courbe ROC pour la performance du modèle BERT est présentée dans la Figure 8. Cette courbe montre le taux de vrais positifs par rapport au taux de faux positifs. L'aire sous la courbe (AUC) indique la performance du modèle, avec des valeurs plus élevées indiquant une meilleure performance du modèle. La courbe négative a un AUC de 0,99, ce qui indique que le modèle peut presque parfaitement identifier les valeurs de sentiment négatif (Figure 8). L'AUC pour les classes neutres est de 0,86, indiquant que le modèle a plus de difficulté avec le sentiment neutre en raison du nombre réduit d'échantillons neutres dans les données. L'AUC du sentiment positif est de 1, ce qui indique que le modèle classe parfaitement les valeurs de sentiment positif (Figure 8).

Gradients Intégrés d'IAX. Quatre phrases ont été sélectionnées au hasard pour être traitées avec les *gradients intégrés* afin d'identifier l'attribution ou l'influence des différents mots dans la prédiction du sentiment de la phrase. Ces phrases sont présentées dans la Table 4.

Table 4 : Analyse de sentiments de BERT

Phrase Taguée (annotée)	Prédiction	Confidence	Attributions	Convergence
[TARGET] accuse [/TARGET] was instrumental in organising the event.	Positif	63%	0.08	-0.84
[TARGET] earth [/TARGET] is the third planet from the sun.	Negatif	93%	0.09	1.80
[TARGET] accuse [/TARGET] has been involved in multiple community projects.	Negatif	70%	0.05	1.00
[TARGET] earth [/TARGET] provides the necessary resources for life.	Positif	83%	0.00	-2.91

La carte thermique de la Figure 9 montre les attributions pour quelque phrases illustrer dans la Table 4. Cette carte indique que les attributions les plus élevées sont pour les mots "*accuse/accuser*", "*event/événement*" et "*earth/terre*", tandis que les autres mots ont une attribution/influence d'environ 0,5.

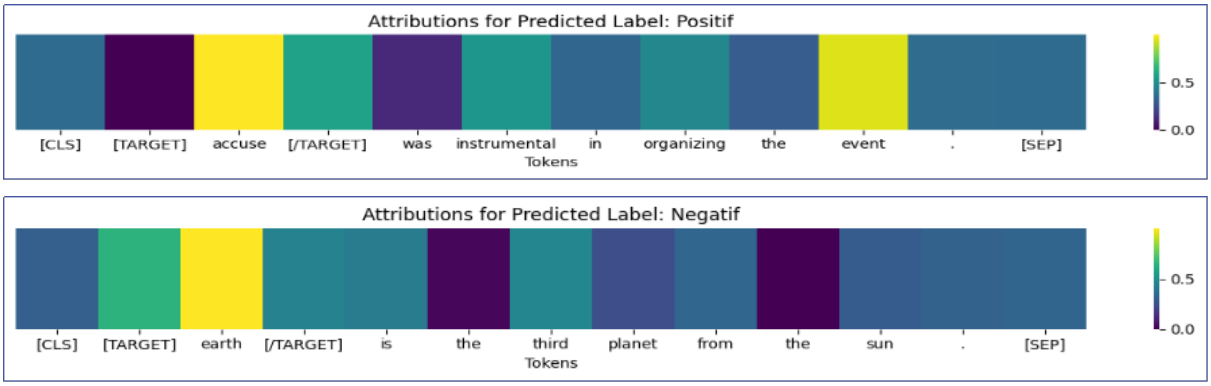


Figure 9: La carte thermique de BERT

Discussion

Notre discussion tente de répondre aux questions de recherche posées dans l'introduction. Voici comment chaque question est abordée :

1. Comment un lexique multilingue peut-il intégrer précisément les traductions et l'analyse des sentiments pour l'anglais, le français, l'afrikaans, le ciluba, le sepedi et le zoulou ?

Les résultats démontrent comment le lexique multilingue a été élargi pour inclure plusieurs langues (anglais, afrikaans, zoulou, sepedi), en soulignant que des défis ont été rencontrés concernant les nuances contextuelles, les expressions idiomatiques et les homonymes. Bien que les traductions aient été généralement précises, certaines phrases ont révélé des compromis, en particulier les phrases longues où le contexte joue un rôle important.

2. Quelles méthodes tiennent efficacement compte des contextes culturels dans l'attribution des scores de sentiment aux mots traduits ?

Notre recherche aborde le défi de traduire des phrases tout en préservant le sens contextuel. Elle démontre que les traductions étaient relativement précises, mais ne correspondaient pas toujours aux nuances culturelles des phrases originales, en particulier pour des termes spécifiques à un contexte culturel ou des conjonctions absentes. Cela souligne la nécessité d'un lexique plus équilibré ayant de règles linguistiques supplémentaires.

3. Comment un corpus de textes peut-il améliorer l'analyse des sentiments et l'évaluation des traductions pour les langues à faibles ressources ?

Nous avons présenter l'extension du lexique et l'importance d'ajouter des mots supplémentaires pour les traductions, notamment pour des langues à faibles ressources où certaines conjonctions sont souvent absentes. L'utilisation de modèles d'apprentissage automatique a aussi permis de mieux comprendre et analyser les sentiments à travers ce corpus élargi, afin de combler les lacunes dans les traductions.

4. Quels modèles d'IA sont les plus performants dans la prédiction des sentiments et la traduction ?

Les modèles Random Forest et BERT sont spécifiquement mentionnés. Random Forest est décrit comme robuste pour détecter la polarité des sentiments, tandis que BERT a surpassé les autres modèles avec une précision de 98 % ou 99 %, notamment grâce à sa capacité de traitement bidirectionnel, ce qui est essentiel dans l'analyse contextuelle des sentiments.

5. Comment l'implémentation de modèles de langage basés sur les transformateurs (Large Language Models) avec IAX améliore-t-elle la traduction et l'explicabilité ?

Notre étude mentionne l'intégration de l'IAX qui améliore la fiabilité des modèles en clarifiant les prédictions. Cela permet de renforcer la confiance dans l'analyse des sentiments multilingues, ce qui est crucial dans les tâches de traduction, notamment pour les langues à faibles ressources. Nos résultats confirment que l'utilisation de modèles de langage de grande taille améliore l'analyse contextuelle des sentiments. Comparativement a Chunyao (2024) qui crée un lexique bilingue utilisant des techniques d'alignement automatique pour modéliser les correspondances linguistiques, nous enrichissons un lexique multilingue en intégrant des étiquettes de sentiment. Chunyao (2024) a aussi utiliser un modèle *Seq2Seq avec attention* pour améliorer la qualité des traductions, tandis que nous explorons BERT tout en mettant l'accent sur l'explicabilité des modèles via les techniques de *gradients intégrés*. Nous avons également aborder la structuration et l'équilibre du lexique en termes de polarité des sentiments pas comme Emmanuel, A., et al. (2024) qui propose *Twi-2-ENG*, un corpus bilingue basé sur des traductions humaines, tandis que notre approche est multilingue et automatisée par l'IA. La méthode d'Emmanuel, A., et al. (2024) repose sur des linguistes et *Sketch Engine*, alors que la notre automatise la traduction et l'analyse des sentiments. Notre étude intègre aussi l'explicabilité des modèles, absente chez Emmanuel, A., et al. (2024). Enfin, nous visons une automatisation complète du lexique, alors qu'Emmanuel, A., et al. (2024) soulignent encore des limites à ce niveau.

Conclusions

Cette étude aborde les défis de l'analyse des sentiments dans la traduction des langues à faibles ressources. Elle élargit un lexique multilingue en exploitant des techniques avancées d'apprentissage automatique et des modèles de langage de grande taille. Random Forest a excellé dans la classification des sentiments propres à chaque langue, tandis que BERT a atteint une précision remarquable dans les prédictions nuancées, soutenues par l'IAX. Ces avancées améliorent l'analyse des sentiments pour les langues à faibles ressources, offrant des solutions d'IA évolutives pour des applications multilingues. Nos résultats mettent en évidence le potentiel des outils pilotés par l'IA pour la gouvernance, l'éducation, la politique et les affaires en Afrique.

Utilisation du Code et du Lexique

Toute personne souhaitant utiliser le code et son le lexique doit adresser une demande formelle à l'auteur. Les demandes d'utilisation doivent être envoyées par e-mail à l'adresse suivante : mike.wankongolo@up.ac.za.

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DIGITAL FRAMEWORK TO ADDRESS THE CHALLENGES FOR MANAGEMENT OF WASTEWATER STORAGE FOR THE MININING INDUSTRY

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Abstract

The handling of wastewater poses a significant adversity with broad ramifications affecting mining operations. This study intends to develop an integrated digital solution framework that will enhance the efficient management of wastewater storage in the mining sector, with a special focus on Platinum Group Metals Mining. Mining remains one of the biggest threats to water safety especially in water-scarce countries like South Africa. The research adopted qualitative methods and secondary data analysis of the literature was conducted and emerging themes were identified. The findings of the study reveal that the utilisation of technologies such as big data and AI can improve efficiency in the water management processes. In addition, technology fails because of softer problems, not the solution failing. Mining wastewater treatment is hindered by legal and regulatory compliance, which affects operations. The study contributes to the body of knowledge by providing a conceptual framework that improves the overall management and compliance of wastewater management. The conceptual framework promotes the use of digital technologies in wastewater management across the mining industry.

Keywords: wastewater storage management, digital technologies, operational efficiency, compliance, sustainability

Introduction

The restricted water resources in South Africa significantly exacerbate challenges for mining businesses (Tapela, 2018), particularly in the management of wastewater (Simate & Ndlovu, 2014). Pollution in South Africa resulting from mining operations is significantly elevated, with both coal mining (Simpson et al., 2019) and gold mining (Chetty et al., 2021; Agboola et al., 2020; Verlicchi & Grillini, 2020), contaminating local water supplies beyond the years of operations. In many cases, this has resulted in acid mine drainage, which is also recognised to provide health risks to doorstep communities of most mining operations (Yuan et al., 2022). The mining industry, reliant on water in their operations, faces increasing pressure to manage and store effluent effectively as clean water becomes a scanter. The complex characteristics of wastewater management underscore the urgent need for investment in efficient technology and methodologies (Litvinenko, 2020). In Chile, mining businesses improved their operational efficiency and competitiveness, and further digital technologies adoption by the mining industry surpassed other industries, which is not the case in other countries (Castillo-Vergara et al., 2024). Other studies found a disinclination by the mining sector in the adoption of digital solutions as a result of high early expenditures, integration challenges and a lack of skilled workforce (Crabbe et al., 2022; Sishi & Telukdarie, 2020). Mining operations by prioritising innovation and leveraging digital technologies in their operations whilst addressing the environmental hazards associated with mining operations have an opportunity to realise the benefits (Crabbe et al., 2022). The mining industry must use efficient wastewater storage systems to maintain operational efficacy and preserve its social license to operate.

Wastewater storage is a factor in the efficient management of wastewater management in any facility that treats or handles effluents (West & Brye, 2019). Effective management of wastewater storage is crucial for the mining industry, as emphasised by Chetty et al. (2021) and Tumane et al. (2021) as it profoundly influences environmental protection, regulatory compliance, and operational efficiency. Effective wastewater management ensures the secure storage of wastewater, prevents pollution of adjacent land and water sources, and mitigates environmental issues associated with mining operations. Mining operations encounter obstacles such as outdated infrastructure (Sishi & Telukdarie, 2020), regulatory constraints (Ediriweera & Wiewiora, 2021; Jain et al., 2021; Mafodi & Pretorius, 2023), and the need for more storage capacity which includes tailings. These challenges may be addressed by enhancing the management and optimisation of wastewater storage practices via the use of digital technologies that offer real-time data analytics, and automated controls. The benefits of these digital solutions have been realised in other processes such as integration into Lean Six Sigma for improvement projects (Pongboonchai-Empl et al., 2024), manufacturing by multinationals in the environmental and social sustainability (Garrido-Baserba et al., 2020) and Ghanaian construction industry (Maqbool et al., 2023). Some of the digital technologies and innovative solutions that deliver such outcomes are digital twins, sensors, artificial intelligence, IoT, integrated digital models mixed reality and machine learning. These technologies improve operational efficiency and responsiveness while promoting sustainable practices that comply with environmental regulations. This ultimately ensures the industry's long-term viability and demonstrates a commitment to responsible resource management.

Literature Review

Digital solutions in water management may address operational inefficiencies in the mining industry emanating from stringent water management requirements of the mining operations (Tumane et al.,2021). There are mining operations that are incorporating digital solutions in their operations (Onifade et al., 2023), however, there have been struggles experienced by others since technology is not the panache of operational inefficiencies (Ediriweera & Wiewiora, 2021).

The literature study results indicated the challenges and inefficiencies in wastewater storage management in the mining industry. These challenges and inefficiencies are categorised into Financial and Cost Barriers, Technology and Infrastructure Limitations, Data Management and Security Concerns, Resistance to Change, Lack of Skilled Labour and Technical Expertise, Regulatory and Administrative Hurdles, and Market and Environmental Challenges. These categories highlight the various challenges the mining industry encounters when trying to implement effective digital solutions for managing wastewater.

Financial and Cost barriers

Numerous organisations have difficulties in implementing newer wastewater treatment technologies due to substantial upfront costs (Jain et al., 2021; Cammarano et al., 2023; Crabbe, 2022; Onifade et al., 2023). The study of Ediriweera and Wiewiora (2021), emphasises how these high initial expenses may impede the adoption of these technologies, since the economic benefits may not be readily apparent, creating doubt and suspicion over the financial viability and return on investment of such projects. This explains the reluctance of mining operations' hesitance to invest in new technologies because of substantial expenses and unpredictable profits (Ediriweera & Wiewiora, 2021; Onifade et al., 2023; Pekmez, 2020; Zhironkina & Zhironkin, 2023). Advocates encourage that the use of technology may enhance production efficiency and cost-effectiveness similar to other industries like telecommunication and manufacturing, hence enhancing the company's profitability, whilst detractors caution against substantial initial expenditures and unpredictable economic results (Dirnberger et al., 2023).

Technology and Infrastructure limitations

The constraints of current technology and infrastructure contribute to the reluctance of digital solutions (Crabbe et al., 2022; Cammarano et al., 2023; Ediriweera & Wiewiora, 2021; Litvinenko, 2020; Marszowski & Iwaszenko, 2021; Mafodi & Pretorius, 2023). Further, according to Bi et al. (2022), legacy systems sometimes inhibit innovation and are incompatible with newer technology solutions. The mining industry is affected by outmoded equipment and procedures that prevent the integration of modern technologies that may improve operating safety and efficiency. Thus, organisations may need to spend heavily on infrastructure modernisation and educating staff to use new technologies, which is the argument presented by detractors of technology (Dirnberger et al., 2023). Crabbe et al. (2022) identified a gap in their study of technology discrepancies based on geographical circumstances, such as the availability of a skilled workforce and access to financial resources. These inconsistencies may generate deficiencies in technology adoption, hence exacerbating the challenges associated with modernising mining operations.

People change management and skills development

In any technological deployment project, people are pivotal to the success of any endeavour, and the softer issues determine the success of technology projects (Kotter & Cohen, 2012, p. 8). To address some of these softer issues, the two major interventions necessary for successful technology adoption are skills development and the advocacy of change agents (Mokganya et al., 2024). Requisite skills within the workforce are a precursor for successful digital solution deployment (Mafodi & Pretorius, 2023; Lumadi & Nyasha, 2024). A parallel activity that is aligned across the leadership of the organisation was found to be equally critical since it creates cohesion within the organisation Mokganya et al. (2024). Mokganya et al. (2024) further emphasised organisational culture is paramount and is the responsibility of the organisational leadership. A culture of creativity and cooperation, especially in transformative initiatives such as digital technology adoption, mitigates organisational resistance to change, implied by Mutanga et al. (2021) and Yudhistyra and Srinuan (2024).

Legislative and regulatory challenges

Legislative and regulatory modifications, along with bureaucratic procedures, may present substantial obstacles to mining operators in the use of technology as explained by Litvineko (2020). According to Ediriweera and Wiewiora (2021), collaboration with external stakeholders, especially governmental bodies, is essential for overcoming these challenges. Moreover, the elevated health and safety regulations in mining provide additional challenges, mining industry is required to undergo rigorous testing procedures for new technologies (Ediriweera & Wiewiora, 2021; Crabbe et al., 2022), which complicates technology adoption. Moreover, discrepancies in data formats and the absence of standardisation across several platforms might obstruct efficient data administration and analysis, hindering the assimilation of new technologies (Yudhistyra & Srinuan, 2024).

Research Methodology

The research problem entails examining the effectiveness of digital solutions in addressing the ongoing challenges of wastewater storage management within the mining sector, with an emphasis on improving operational efficiency, ensuring adherence to regulations, and fostering sustainability. The study employed a qualitative, exploratory approach to firstly understand the challenges and inefficiencies in utilisation of digital technologies in the management of wastewater by the mining industry and lastly, what the various technologies utilised in the management of wastewater as well as the mining industry. A systematic literature review was conducted by searching the EBSCOhost database, together with Google Scholar for articles from 2020 to 2024. For the first-round wastewater management was the search string. Articles excluded were those written in non-English, duplicate articles and book chapters. In filtering, articles were screened based on the digital technologies applied in wastewater management and digital technologies utilised by the mining industry. During the systematic literature review, existing literature was reviewed to synthesise available knowledge, which is inherently complex owing to the fragmented characteristics of current research as well as the interdisciplinary nature of the topic (Snyder, 2019).

The literature review method employed in this study established a thorough basis for comprehending the present condition of digital solutions in wastewater storage management within the mining sector. This method not only identifies current

knowledge deficiencies but also establishes a foundation for future research endeavours focused on improving operational efficiency and sustainability in wastewater storage management.

Discussions

The digital solutions that were prevalent in the papers reviewed are grouped as indicated into the following categories data collection and monitoring; data management and analysis; simulation and visualisation and integration and operational management.

Data collection and monitoring

In wastewater management, data collection for timely information gathering and monitoring shows an improvement in operational efficiency and regulatory compliance (Blumensaat et al., 2019; Guerra et al., 2019). Data analysis may help companies improve wastewater storage and treatment by revealing trends, anomalies, and informed decisions (Blumensaat et al., 2019; Jain et al., 2021). Sampling collection to meet regulatory criteria in wastewater treatment plants requires accurate data collection (Blumensaat et al., 2019). A virtual sensor network using unmanned vehicles and a combination of sensors is another tool suggested for monitoring and data collection for wastewater treatment facilities (Blumensaat et al., 2019). This approach allows real-time analysis and sample collection, improving overall monitoring. Wastewater specialists struggle to create effective monitoring systems due to a lack of current data, and pollutant load dynamics that vary between dry and rainy weather, complicating data collection (Rahman et al., 2021). The recent advances in ICT, online sensors, and autonomous energy supply make ubiquitous wastewater sensing viable, even in distant and underground places (Guerra et al., 2019; Shahmoradi et al., 2020). The study of Jain et al. (2021) advocates for the use of water quality monitors using nanomaterials, these sensors can identify trace chemicals and analyse wastewater matrices quicker, addressing the complexity and unpredictability of this type of environment. Digitalisation and online monitoring are crucial for sustaining operations amid interruptions which was the case during COVID-19 (Rahman et al., 2021). Data collection and monitoring can be perceived as one of the basic layers in digital solution provisioning for wastewater storage management.

Data management and analysis

Data management and analysis are essential in wastewater management, big data, and analytics (Kannan et al., 2024). It is used to convert raw data into useful insights in decision-making by operational teams (Jain et al., 2021). Due to the large datasets that require storage, cloud computing enables efficient storing and processing which is a precursor to the big data analytics process (Kagan et al., 2021). In addition, the use of generative AI in data analysis enables organisations to forecast results, streamline operations, and refine decision-making processes, so augmenting the efficiency and efficacy of wastewater systems (Garrido-Baserba et al., 2020). Ghahramanieisalou and Sattarvand (2024) encourage the use of advanced analytics together with generative AI since it has the potential to foster collaboration across various industries. Artificial intelligence solutions are being developed to aggregate and analyse data from wastewater systems, facilitating resource recovery and source separation which can benefit mining businesses (Sarc et al.,2019). Further, Sarc et al. (2019) propagate the use of AI to optimise water operations and extract vital information on health and lifestyle patterns from wastewater data. Despite these promising benefits, the study of Boikanyo and Gomwe (2024) as well as Garrido-Baserba et al. (2020) cautions how

the integration of AI into overall business systems is complex, resource-intensive and time-consuming. A dichotomy in the practical operations of the mining business, in the need to be innovative and efficient whilst also mitigating disruptions from disruption of operations.

Simulation and visualisation

Simulation and visualisation tools help understand and manage wastewater systems by accurately simulating the scenarios and associated data related to the wastewater storage management process as part of the wastewater management processes, that is the various scenarios help to improve comprehension and process for a system that is depicted. Digital twin technology replicates physical assets in real time, enabling operators to evaluate performance and predict issues. Robots combined with Geographic Information Systems (GIS) improve data collection and analysis, while Augmented Reality (AR) and Mixed Reality (MR) provide new ways to visualise complex data and situations, improving training and decision-making. These advanced tools enable proactive management, helping stakeholders solve problems and boost efficiency.

Mining applications such as automated geological mapping and rockfall trajectory modelling necessitate GIS technology to collect, evaluate, and interpret geographic data (Ghahramanieisalou & Sattarvand, 2024; Cammarano et al., 2023). Technologies deliver precise 3D models and comprehensive data integration to facilitate environmental analysis and decision-making (Ghahramanieisalou & Sattarvand (2024)). Robotics in digital technology include autonomous robots and unmanned aerial vehicles (UAVs) that execute tasks with differing degrees of human involvement, by augmenting automation and efficiency (Ghahramanieisalou & Sattarvand, 2024).

Robotics includes autonomous robots and UAVs that perform tasks with varying degrees of human input. These technologies automate and optimise mining and manufacturing processes. Tian et al. (2024) acknowledged an opportunity for collaboration between industrial robots and humans, to improve aspects of productivity and safety, which are critical to any business operations such as mining.

Digital twin technology provides real-time simulation, monitoring, and optimisation via the creation of virtual representations of physical systems. Data collected by the various technologies is used to develop and assess models for decision-making and predictive maintenance (Ghahramanieisalou & Sattarvand, 2024; Tian, Yu, & Gu, 2024). The benefit of digital twins, they can facilitate dynamic decision-making and risk assessment in mining via the integration of geotechnical analysis, fleet management, and risk evaluation, as explained in the studies of Cammarano et al. (2023).

According to Ghahramanieisalou and Sattarvand (2024), Augmented Reality (AR) and Mixed Reality (MR) technologies superimpose digital information onto the physical environment, allowing immersive experiences that enhance perception for operating teams, with the value of enhancing training, visualisation, and operational efficiency. These technologies afford the various mining teams to enhance their understanding of complex systems and processes such as wastewater management.

Integration and operations management

Optimising wastewater management requires seamless coordination between systems and processes via integration and operations. Specifically, the streamlining of management and resource distribution across the many operational units, while concurrently guaranteeing the prompt provision of goods and services. The automation of activities enhances operational efficiency by reducing human involvement and mistakes.

In most instances, Enterprise Resource Planning (ERP) systems are the backbone of back-office processing of most operations such as finance, human resources, and materials management (Sishi & Telukdarie, 2020), that is ERP systems oversee mining capital and resources. Industry 4.0 and ERP are being explored to create semi-autonomous mines characterised by real-time efficiency and communication (Sishi & Telukdarie, 2020). Sishi and Telukdarie (2020) identified two major flaws in ERP systems, their inability to interface with emerging technologies for better process results and control as well as their limitation in presenting data to lower-level teams.

Mining Supply Chain Management enhances the flow of materials and information from extraction to delivery. System integration enhances efficiency. The integration of Supply Chain Management with Enterprise Resource Planning enhances data accuracy, decision-making, resource allocation, and process optimisation. Mining companies need connections for adaptability and profitability. IoT and Big Data-enabled supply chain management solutions may enhance mining efficiency and sustainability by increasing supply chain visibility and control. Supply chain management systems streamline data and supplies. Enterprise Resource Planning enhances data precision and decision-making efficacy. In contemporary supply chain management systems, the Internet of Things and Big Data enhance visibility and control, hence enhancing efficiency and sustainability. Onifade et al. (2023) advocate how automation enhances resource allocation and minimises work, hence increasing the benefit to operational efficiency. In the case of wastewater management, it assists in conserving, reducing non-production water, and preserving infrastructure. The overall benefit is that of enhancing safety, productivity, and environmental impact that could be caused by human intervention, reducing expenses and augmenting revenues.

Proposed digital framework for management of wastewater storage

The deployment of a comprehensive digital solution should firstly enable the collection and monitoring of large volumes of data; secondly, perform data management and analysis of data; thirdly leverage visualisation tools by simulation and lastly integrate the various tools into back-office systems. This assumes the already existing networking connectivity and back and front office infrastructure. Figure 1 depicts the layout of the proposed digital framework for the management of wastewater storage.

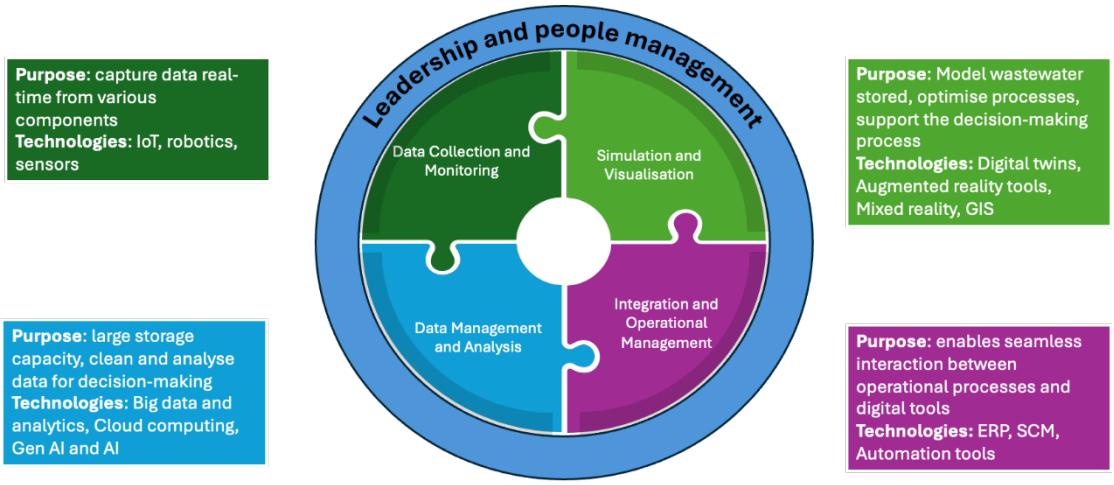


Figure 1 Proposed digital solution framework for the management of wastewater storage

Critical Success Factors of Digital Solution Deployment

Training and Skill Development: Comprehensive training prepares workers with the requisite skills to operate sophisticated equipment proficiently, which is vital for the successful integration of technology in mining operations.

Positive Employer-Employee Relations: Fostering robust connections between employers and workers, along with obtaining executive sponsorship, is essential for the successful execution of technical innovations. Such partnerships establish a supportive atmosphere that facilitates the adoption of technical advancements.

Investment in Infrastructure and equipment: Adequate financing is essential for procuring sophisticated equipment and establishing the appropriate infrastructure. This investment is essential for the effective implementation and integration of technology in the mining industry. A strong emphasis on research and development is essential for the effective deployment of new technologies. It promotes innovation and adaptability to the requirements and problems of the mining sector.

Effective Communication: Clear and consistent communication throughout the organisation is crucial for technology deployment. It promotes reciprocal comprehension and enables the dissemination of innovation among all parties involved. Addressing Resistance to Change: Formulating strategic methods to mitigate resistance to change is essential for the smooth integration of new technology. This entails aggressively involving stakeholders and efficiently resolving their issues.

Operational Readiness: Equipping mining operations to adopt new technologies requires staff training and the establishment of systems and infrastructure that facilitate modifications in processes. Guaranteeing operational preparedness is essential for the effective use of technology.

Stakeholder Engagement: Involving many stakeholders in the technology adoption process is crucial, as it enhances transparency and helps in recognising issues and possibilities for ongoing development.

Conclusions

The storage of wastewater is essential for reducing the hazards linked to wastewater management in mining operations. Digital solutions may be efficiently deployed to mitigate the problems and inefficiencies associated with wastewater storage. Many mining businesses are not beginning from a blank slate but are incorporating new technology into their established processes. Various sectors, including manufacturing, telecommunications, and travel, have seen substantial enhancements after their digital transitions. Nonetheless, there are cases of enterprises being undermined by such attempts, suggesting that organisations should undertake these projects with prudence. Achieving staff alignment and delivering sufficient assistance are essential for success. Transformative initiatives of this kind need cooperation between technology and people.

Additional studies are necessary for a comprehensive knowledge of the critical success factors in this kind of transformational project by business organisations. Despite many technologies, a significant gap persists in determining which solutions integrate successfully to achieve desired goals. Moreover, creating frameworks that enable integration will enhance the progression of knowledge in this domain since it will aid in guiding the implementation steps. Thorough qualitative and quantitative interdisciplinary research is expected to substantially augment the current gaps in knowledge. Further, there is a vacuum in literature evaluations that thoroughly examine the significance of digital technologies in addressing wastewater management. As a result, the absence of thorough investigations impedes the comprehension and use of these technologies in the various industries where wastewater management is critical. Collaboration between large- and small-scale miners as well as government entities will go a long way.

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DIGITALIZATION EFFECTS ON BUSINESS PERFORMANCE: EMPIRICAL EVIDENCE FROM GHANA

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Abstract

The convergence of digitization and business operations has reshaped the global business landscape, promising significant advantages for enterprises. Thus, this study examines the impact of digitalization strategies on business performance. Leveraging the digitalization literature, a conceptual framework was developed which was evaluated with survey data of 200 digital businesses in Accra, Ghana selected via purposive sampling and analyzed through the partial least squares structural equation modeling (PLS-SEM). The findings indicate that there is a significant positive relationship between Digital Payment Strategies and E-Commerce and business performance with improvements in operational efficiency, customer engagement, and financial outcomes. However, there is no significant relationship between Digital Marketing and Collaborative Tools and business performance. The study recommends businesses should prioritize secure digital payment strategies and expand e-commerce capabilities with robust security measures, through secure data-sharing practices. Policymakers should create supportive environments emphasizing digital security and privacy, enabling successful digital transformations.

Keywords: Digitalization, Business Performance, Digital Payments, Digital Marketing, Collaboration, E-commerce, Ghana.

1.0 INTRODUCTION

The union of corporate operations and digitization has lately transformed the worldwide landscape of businesses. Leveraging contemporary technology to create value for companies has been the focus in the modern digital era, which offers a plethora of benefits (Navarrete et al., 2021; Calderon-Monge & Ribeiro-Soriano, 2023). Morgan (2023) asserted that digitization remains a key focus, as almost 70% of organisations are either actively pursuing or preparing digital initiatives, and 21% of firms consider these transitions to be doable. The numbers show varied adoption rates across sectors, but they also show large expenditures in technology (40 percent of 2019 tech spending). However, only 7% of digitally changed organisations have completely executed their reforms, even if there are recognised advantages, such as new business models for 60% of these companies. Notably, a key to success is a better customer experience, which may lead to financial benefits and happier customers. Still, problems and opposition show that there is a persistent need for technological, customer-centric, and organisational culture-based strategic alignment (LaBerge, Smaje & Zemmel, 2022).

Digitalization profoundly influences enterprise performance. By integrating digital technologies into various aspects of operations, organisations can enhance efficiency, innovation, and competitiveness (Martínez-Caro et., 2020; Truant, Broccardo & Dana 2021; Cheng, Ho, & Huang, 2022). This transformation enables streamlined processes, faster decision-making, improved customer experience, and access to vast amounts of data for informed strategies (Samoilenko, 2022). Digital tools optimise resource utilisation, reduce costs, and foster agility in adapting to market changes. Moreover, digitalization facilitates new business models and revenue streams, opening avenues for growth and market expansion (Hassanien, 2021). Factors such as infrastructure, digital literacy, cybersecurity, and regulatory environments can influence the effectiveness of digitalization in driving enterprise performance (Wang, Guo & Chang, 2023).

The literature alludes to the fact that there has been some empirical evidence regarding a positive and significant relationship between digitization and business performance in countries like Germany, Italy, the USA, and China (Martínez-Caro et al., 2020; Guo & Xu, 2021; Liu & Chiu, 2021; Truant et al., 2021; Cheng et al., 2022; Hautala-Kankaanpää, 2022). Digitalization is becoming an integral part of products and services, and it is also helping to support corporate business operations more and more and helps boost company performance. However, there is a lack of comprehensive studies examining the implementation and utilization of digitalization in businesses in developing countries like Ghana, as the existing literature on the impacts of digitalization is contradictory (Guo & Xu, 2021; Cheng et al., 2022; Hautala-Kankaanpää, 2022). Despite the apparent effects of digitalization on business performance, the findings show that the use of digital technologies to assist day-to-day operations is still in its early stages (Cheng et al., 2022 & Hautala-Kankaanpää, 2022). Additionally, most of these studies were done in advanced countries where there is a conducive environment for digitalization with digitalization infrastructure being favourable to businesses (Guo & Xu, 2021; Liu & Chiu, 2021; Truant et al., 2021; Cheng et al., 2022). This study thus aims to fill this gap by considering Ghana, where digitization is now picking up. The study therefore seeks to investigate the impact of digitalization on enterprise performance in Ghana by specifically addressing the question: What is the extent of digitization strategies relating to business performance?

By addressing a major information vacuum about how digitization affects company performance in Ghana, this study significantly adds to the current literature. This study adds to the existing body of knowledge by providing a more nuanced view of the relationship between digitalization initiatives and business performance, with a focus on the ever-changing digital environment in Ghana. Important ramifications for digital policy and practices in Ghana stem from this study's results. The research offers policymakers, business leaders, and stakeholders practical insights by studying how regulatory frameworks and incentive schemes encourage the adoption of digital technologies. With these findings in hand, Ghanaian businesses would be better equipped to use digital technology, which will boost their performance and ensure their success in the long run.

2.0 LITERATURE REVIEW

2.1 Digitalization

Digital transformation involves transforming physical items or data into digital formats, with digitization being the first step. It involves creating money, improving processes, and evolving businesses using digital technology and digitized data (Burkett, 2017). Digital transformation aims to improve business operations by moving from a physical to a digital format. Organizations should develop digital strategies outlining their major future investments in digital technology, covering all aspects of alignment with company goals (Chaffey, 2023). Gartner (2023) defines digitalization as an approach that aims to improve the business model, not just its activities. Practical considerations like data and resource management are essential during technological implementation, and evaluating digital transformation plans is a common component of digital strategy. According to Burkett (2017), digitalization is all about incorporating digital technologies into different parts of a company or society to improve operations, make new things, fulfill customers' evolving needs, and generate value. Efficient, effective, and innovative use of digital tools and technologies like cloud computing, artificial intelligence, big data analytics, and the Internet of Things (IoT) is what it is all about. In simple terms, digitalization is defined as the pervasive use of digital technologies and data across all sectors of society and the economy (Eurofund, 2022). Several areas of our daily existence and the way we will work in the future are being influenced by the rapid pace of change brought about by the simultaneous digital and green transitions (Dieffenbacher, 2023).

2.2 Business Performance

Business performance assesses how well an organisation has met its goals and ambitions (Terpiłowski, 2022). It includes a wide range of indicators and key performance indicators (KPIs), including growth, operational efficiency, customer happiness, market share, profitability, and innovation (Team, 2023). If you want to know how well your company's plans, operations, and management are doing, you need to look at these metrics (Jenkins, 2022). It helps with decision-making for long-term success by revealing the company's competitiveness, health, and adaptability to changing market circumstances. Digitalisation is one of the ways of defining operational paradigms, improving customer experiences, and optimising processes are three ways in which digitalization efforts significantly affect company success (Hautala-Kankaanpää, 2022). To develop company models, simplify processes, and engage with consumers, these tactics include using digital technologies (Bortoluzzi, Chiarvesio, Romanello, Tabacco, & Veglio, 2022; Li, Song, & Zhou, 2022). By becoming digital, businesses have access to

mountains of data, which helps with decision-making and encourages creativity. Efficient digital strategies lead to lower costs, more agility in reacting to market changes, and improved efficiency (Kohtamäki, Parida, Patel, & Gebauer, 2020). The advent of new income sources and commercial prospects is another common outcome of digitization. Digital technologies used throughout all areas of a company result in increased efficiency, new ideas, and competitiveness. As a result, businesses may improve their performance via digitalization initiatives that optimise processes, raise customer happiness, and enable sustainable development in an increasingly digital world (Kohtamäki et al., 2020).

2.3 Conceptual framework and hypotheses formulation

The conceptual framework of the study was developed from the literature. From the literature, digitalisation, and digital strategies have a significant relationship with business performance (Wang et al., 2023; Calderon-Monge & Ribeiro-Soriano, 2023; Rachinger et al., 2018; Li, Song, & Zhou, 2022; Team, 2024; Abou-Foul, Ruiz-Alba, & Soares, 2020). Hence, the researcher conceptualises the study as shown in figure 1.

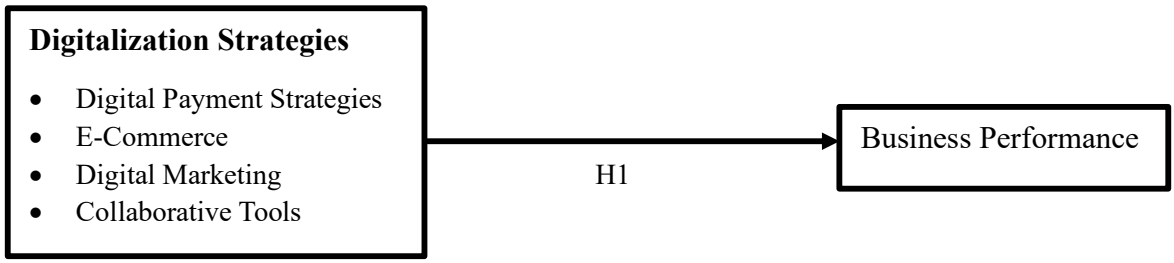


Figure 1: Conceptual Framework

2.3.1 Relationship between Digitalisation Payment Strategies and Business Performance

Kwabena, Qiang, Wenyuan, Qalati, and Erusalkina (2019) argue that payment differentiation strategies help SMEs perform well. Similarly, Rey and Limos-Galay (2023) also established that digital payment strategies support business performance positively. Businesses that adopt digital payment strategies are more likely to align with these external pressures, leading to increased legitimacy and trust among stakeholders. This alignment can positively impact business performance by enhancing the company's reputation and reducing the risk of non-compliance with regulatory requirements (Wright, 2012; Sukharev, 2015). Additionally, social exchange theory suggests that the use of digital payment strategies can enhance the quality of interactions between businesses and their customers. By providing a convenient and secure payment method, businesses can build trust and loyalty among customers, leading to increased sales and repeat business. Overall, the adoption of digital payment strategies is likely to have a positive impact on business performance by enhancing legitimacy, trust, and customer relationships. It is therefore hypothesized that:

H1a: The adoption of digital payment strategies is positively related to business performance

Šaković et al. (2020) considered e-commerce as a digitalization strategy, but they discovered a negative relationship between e-commerce as a digitalization means and business performance. Martini et al. (2023) later discovered a positive relationship. By embracing e-commerce, businesses can enhance their legitimacy and adaptability in the digital age, leading to improved business performance. Additionally, social exchange theory suggests that e-commerce activities can enhance the quality of interactions between businesses and their customers (Markovsky & Cook, 2019). By providing a seamless online shopping experience, businesses can build trust and loyalty among customers, leading to increased sales and repeat business. Overall, increased e-commerce activities are likely to have a positive impact on business performance by enhancing legitimacy, adaptability, and customer relationships. It is therefore hypothesized that:

H1b: Increased e-commerce activities lead to improved business performance

Homburg and Wielgos (2022) considered digital marketing as one of the strategies that support the performance of businesses. Jung and Shegai (2023) established a positive relationship between digital marketing and firm performance. By adopting digital marketing strategies, businesses can enhance their legitimacy and competitiveness in the digital marketplace, leading to improved business performance. Additionally, social exchange theory suggests that digital marketing can enhance the quality of interactions between businesses and their customers. By providing relevant and engaging content, businesses can build trust and loyalty among customers, leading to increased sales and brand advocacy. Overall, the use of digital marketing is likely to have a positive impact on business performance by enhancing legitimacy, competitiveness, and customer relationships. It is therefore hypothesized that:

H1c: The use of digital marketing positively impacts business performance

Shannak (2013) suggested, based on his empirical study, that effective use of collaborative tools like email, Zoom, and teams, among many others, can boost the performance of firms. Hence, there exists a positive relationship between using collaborative tools and business performance. According to institutional theory, businesses that utilise collaborative tools are responding to external pressures, such as the need for greater collaboration and communication in a globalised marketplace. By adopting collaborative tools, businesses can enhance their legitimacy and effectiveness in working with internal and external stakeholders, leading to improved business performance (Hidayanto & Setyady, 2014). Additionally, social exchange theory suggests that collaborative tools can enhance the quality of interactions between businesses and their stakeholders. By facilitating communication and knowledge sharing, collaborative tools can improve decision-making and innovation, leading to increased efficiency and competitiveness. Overall, the utilisation of collaborative tools is likely to have a positive impact on business performance by enhancing legitimacy, collaboration, and stakeholder relationships. It is therefore hypothesized that:

H1d: Utilising collaborative tools enhances business performance.

3.0 RESEARCH METHODOLOGY

This study adopted the quantitative approach with a survey method. The target population was all businesses within the Greater Accra Region with employees between 10 and 100. The study considered the Greater Accra Region due to the prevalence of digitalization of businesses in the region. Considering Accra's central role in Ghana's digital transformation initiatives, this method

guaranteed a thorough comprehension of the effects of digitization on business performance in the city.

3.1 Sampling Technique and Sampling Size

A purposive sampling technique was utilized to select respondents based on specific criteria relevant to the research study (Palinkas et a., 2015; Heath, 2023) from a list obtained from the Ghana Enterprise Agency (GEA) and the Registrar General's Department, a trustworthy database of regionally registered enterprises. Companies were picked from this pool according to factors like the company's size and industry, their involvement in digitization efforts, and their openness to taking part in research. The respondents were carefully selected based on business managers with useful and relevant experience in the study.

3.2 Data Collection Method and Instrument Development

3.2.1 Data Collection Instrument Development

The questionnaire for this study is in three (3) sections. The first section covers personal information and business information such as gender, role, years in business, number of employees, and industry is gathered in the firm profile information section. Section two considers the digitalization strategies (digital payment techniques, e-commerce, digital marketing, and collaborative tools). The third section covered business performance. The questions were adapted from (Kpessa-Whyte & Dzisah, 2022; Jayachandran, 2023) and measured on a 5-point Likert scale with endpoints “1= Strongly Disagree and 5 = Strongly Agree”.

3.2.2 Data Collection Method

The data obtained for this research came from an online survey that included closed-ended questions. Selected respondents were sent to the online survey via email or other online survey platforms. Respondents were asked to fill out the survey whenever it was most convenient for them by providing them with a link to it. Follow-ups were done to ensure a high response rate. In all, valid samples of 200 respondents were obtained which was used for the study.

3.3 Data Analysis Method

The demographic profiles of the respondents were analyzed with SPSS 24. However, the inferential statistics were done with the Partial Least Squares Structural Equation Modeling (PLS-SEM) via SmartPLS 4.

4. RESULTS AND DISCUSSION OF FINDINGS

4.1 Profile Analysis of the Respondents

This section presents the findings from the respondent profile analysis (Table 1), providing insights into the demographic and operational characteristics of the businesses sampled for the study.

In terms of gender distribution among respondents, the results show a slight majority of females (53%), which is relevant for understanding the gender dynamics within the business environment.

The sectoral distribution reveals that half of the businesses operate in the services sector (48.5%), followed by manufacturing (30.5%) and agriculture (21.0%). This indicates a strong orientation towards service-based businesses, which may affect how digitization strategies are implemented and their subsequent impact on business performance.

Regarding business size (number of employees), the results indicate that medium-sized enterprises, with 51-100 employees, are predominant (40.5%), which suggests a market characterized by established businesses. This has implications for the study's examination of how digitization strategies influence business performance, as the needs and capacities of medium-sized enterprises might differ significantly from those of smaller or larger firms.

Table 1: Profile Analysis

Variable	Level	No. Responses	Percent (%)
Gender	Male	94	47.0
	Female	106	53.0
	Total	**200**	**100**
Sector of Business	Services	97	48.5
	Manufacturing	61	30.5
	Agriculture	42	21.0
	Total	**200**	**100**
Number of Employees	< 10 Employees	21	10.5
	10-50 Employees	65	32.5
	51-100 Employees	81	40.5
	100+ Employees	33	16.5
	Total	**200**	**100**
Years in Operation	1-5 years	35	17.5
	6 - 10 years	68	34.0
	10+ years	97	48.5
	Total	**200**	**100**
Respondent's Role	Manager	40	20.0
	Owner	32	16.0
	Supervisor	103	51.5
	Other	25	12.5
	Total	**200**	**100**
Digital Payment Channels Company Frequently Use	MTN Momo	95	47.5
	Telecel Cash	50	25.0
	Visa/Master Cards	37	18.5
	AT Money	6	3.0
	Zee Pay	6	3.0
	G-Money	6	3.0
	Total	**200**	**100**

Concerning business longevity, half of the businesses have been in operation for over 10 years (48.5%), indicating a mature market presence. This maturity suggests that these businesses might have more established digitization strategies, which could influence their performance outcomes. The findings highlight the importance of considering business experience in analyzing the effectiveness of digitization strategies.

Regarding respondents' roles in the business, the majority were supervisors (51.5%) followed by managers (32%) and then owners (16%). This indicates that quite a lot of the representatives were those in higher positions in their businesses.

Finally, the analysis of digital payment channels reveals a strong preference for MTN Momo (47.5%), suggesting its dominance in the market. This preference underscores the relevance of mobile money platforms in digitization strategies and their potential impact on business performance, particularly in sectors where such payment methods are prevalent.

4.2 Inferential Statistics

The study used the 2-step approach method for analysing the data through PLS-SEM. The first approach is the evaluation of the measurement model.

4.2.1 Internal Consistency and Reliability Analysis

Reliability is assessed using Cronbach's Alpha, while validity is evaluated through Composite Reliability and Average Variance Extracted (AVE). The results demonstrate strong internal consistency across all constructs, with Cronbach's Alpha and Composite Reliability values exceeding the commonly accepted threshold of 0.70 (Hair et al., 2013; Privitera, 2017).

Table 2: Reliability and Validity Results

Construct	Indicators	Outer Loadings	Cronbach's Alpha	Composite Reliability	Average Variance Extracted	Variance Inflation Factor (VIF)
Business Performance (BP)	BP1	0.871	0.948	0.954	0.636	4.977
	BP2	0.710				2.579
	BP3	0.717				2.331
	BP4	0.826				3.395
	BP5	0.776				2.976
	BP6	0.793				2.800
	BP7	0.811				3.428
	BP8	0.812				3.238
	BP9	0.825				3.202
	BP10	0.820				3.350
	BP11	0.762				2.943
	BP12	0.851				3.346
Collaborative Tools (CT)	CT1	0.863	0.860	0.900	0.644	2.467
	CT2	0.722				1.611
	CT3	0.844				2.185
	CT4	0.712				1.550
	CT5	0.858				2.366
Digital Marketing (DM)	DM1	0.877	0.882	0.914	0.681	2.676
	DM2	0.726				1.670
	DM3	0.852				2.415
	DM4	0.817				2.046
	DM5	0.845				2.242
Digital Payment Strategies (DPS)	DPS1	0.886	0.851	0.899	0.691	2.391
	DPS2	0.825				2.009
	DPS3	0.747				1.630
	DPS4	0.859				2.008
E-Commerce (E)	E1	0.880	0.868	0.910	0.717	2.535
	E2	0.787				1.885
	E3	0.867				2.350
	E4	0.849				2.220

4.2.2 Indicator Loadings and Multicollinearity Test

The indicator loadings and multicollinearity tests (Table 2) were conducted to evaluate the strength and reliability of the constructs in the study. For the Business Performance (BP) construct, indicator loadings ranged from 0.710 to 0.871, with variance inflation factors (VIF) between 2.331 and 4.977, indicating acceptable levels of multicollinearity. Collaborative Tools (CT) demonstrated strong indicator loadings from 0.712 to 0.863 and VIF values between 1.550 and 2.467, showing minimal multicollinearity concerns (Hair, 2014; Hair et al., 2017).

Digital Marketing (DM) had indicator loadings ranging from 0.726 to 0.877, with VIF values from 1.670 to 2.676. Digital Payment Strategies (DPS) showed robust loadings from 0.747 to 0.886, with VIF values between 1.630 and 2.391, indicating a solid construct. E-Commerce (E) had indicator loadings between 0.787 and 0.880, with VIF values from 1.885 to 2.535.

4.2.3 Convergent Validity Results

Additionally, the AVE values (Table 2) for each construct confirm adequate convergent validity that has values above 0.5 acceptable thresholds, indicating that the constructs accurately represent the underlying theoretical concepts they are intended to measure (Hair et al., 2013; Hair et al., 2017). These findings affirm the robustness of the measurement model.

4.2.4 Discriminant validity results

Discriminant validity was assessed via the Fornell-Larcker criterion as shown in Table 3. Fornell and Larcker (1981) declare that to achieve discriminant validity, a construct's AVE should be greater than its correlation with all other constructs. As shown in Table 3, discriminant validity was attained via the Fornell-Lacker (1981) criterion as the numbers in bold (square root of AVE) were all greater than the correlation with other constructs.

Table 3: Discriminant Validity based on Fornell-Larcker Criterion

Fornell-Larcker Criterion	**BP**	**CT**	**DM**	**DPS**	**E**
Business Performance (BP)	**0.798**				
Collaborative Tools (CT)	0.787	**0.803**			
Digital Marketing (DM)	0.752	0.845	**0.825**		
Digital Payment Strategies (DPS)	0.628	0.784	0.698	**0.831**	
E-Commerce (E)	0.735	0.857	0.805	0.862	**0.846**

4.2.4 Assessment of Structural Model

After the assessment of the measurement model was the assessment of the structural model. The assessment of the structural model includes the coefficient of determination (R^2), the predictive relevance (Q^2), the direct path coefficient, and the indirect path coefficient (Hair et al., 2017). Table 5 presents the summaries.

Table 5: Assessment of Structural Model

Construct	**R Square**	**R Square Adjusted**	**Q^2**
Business Performance (BP)	0.755	0.736	0.589

From Table 5, the Adjusted R Square value is 0.736, indicating that approximately 73.6% of the variance in Business Performance can be explained by the predictors (Digital Payment Strategies, E-Commerce, Digital Marketing, and Collaborative Tools) in the model. This suggests a strong model fit, as a high adjusted R Square value signifies that the model has good explanatory power.

The Q^2 value is 0.589, which is derived from the blindfolding procedure used to assess the model's predictive relevance. A Q^2 value greater than zero indicates that the model has predictive relevance, meaning it can effectively predict values for Business Performance beyond the sample used in the study (Hair et al., 2017).

Overall, these metrics demonstrate that the structural model for Business Performance has a high explanatory and predictive power, reinforcing the model's effectiveness in capturing the relationships between variables and providing reliable insights into Business Performance.

4.6 Path Coefficients Analysis

Table 6: Path Coefficients Results

Hypotheses	Paths	Coefficient (B)	T Statistics (|O/STDEV|)	P Values	Outcome
H1a	DPS -> BP	0.164	3.163	0.002	Supported
H1b	E -> BP	0.147	3.273	0.001	Supported
H1c	DM -> BP	0.092	1.156	0.249	Rejected
H1d	CT -> BP	0.094	1.036	0.301	Rejected

The coefficient for Digital Payment Strategies (DPS) to BP is 0.164, with a statistically significant T statistic of 3.163 ($p<0.05$). This suggests that DPS has a positive and significant impact on BP, indicating that effective digital payment strategies can enhance business performance (H1a). Similarly, E-Commerce (E) shows a significant positive effect on BP with a coefficient of 0.147 and a T statistic of 3.273 ($p<0.05$), emphasizing the importance of robust e-commerce strategies in driving business success (H1b). Thus, hypotheses H1a and H1b are supported.

Contrarily, Digital Marketing (DM) (H1c) and Collaborative Tools (CT) (H1d) have weaker and statistically insignificant effects on BP, with coefficients of 0.092 and 0.094, respectively, and p-values above the 0.05 threshold. These findings imply that, while digital marketing and collaborative tools might contribute to BP, their effects are not strong enough to be considered significant in this model. Thus, hypotheses H1c and H1d are rejected.

4.7 Discussion of Findings

The findings of this study reveal several important relationships between Digital Payment Strategies, E-Commerce, Digital Marketing, Collaborative Tools, and Business Performance (BP). These results align with, as well as diverge from, existing literature, providing a nuanced understanding of how these factors interact to influence business success.

4.7.1 Digital Payment Strategies (DPS) and Business Performance (BP)

The positive and significant impact of Digital Payment Strategies (DPS) on BP, as indicated by a coefficient of 0.164 and a statistically significant T-statistic of 3.163 ($p<0.05$), is consistent with prior research. Studies by Kwabena et al. (2019) and Rey and Limos-Galay (2023) support this finding, arguing that digital payment strategies are crucial for enhancing business performance.

Social exchange theory supports this, positing that DPS enhances customer relationships by providing secure and convenient payment methods, leading to better business performance.

4.7.2 E-Commerce (E) and Business Performance (BP)

E-commerce also shows a significant positive effect on BP, with a coefficient of 0.147 and T-statistics of 3.273 ($p<0.05$), reinforcing findings by Martini et al. (2023) who identified a positive relationship between e-commerce and business performance. Institutional theory suggests that businesses engaging in e-commerce are responding to technological advancements and consumer preferences, enhancing their legitimacy and adaptability. Social Exchange theory further supports this by highlighting how e-commerce improves customer relationships through better online shopping experiences, leading to increased sales and customer loyalty (Markovsky & Cook, 2019).

4.7.3 Digital Marketing (DM) and Business Performance (BP)

The study found that Digital Marketing (DM) had weaker statistically insignificant effects on BP with a coefficient of 0.092 and T-statistics of 1.156 ($p>0.05$). This contrasts with the literature, where Homburg and Wielgos (2022) and Jung and Shegai (2023) identified a positive relationship between digital marketing and firm performance, especially when moderated by firm size.

4.7.3 Collaborative Tools (CT) and Business Performance (BP)

The study found that Collaborative Tools (CT) had weaker statistically insignificant effects on BP with a coefficient of 0.094 and T-statistics of 1.036 ($p>0.05$). This is in contrast with Shannak (2013) and Hidayanto and Setyady (2014) who found that collaborative tools could boost firm performance. The insignificant results in this study could be attributed to different contexts, sample sizes, or other moderating variables not captured in this model.

5. CONCLUSIONS AND RECOMMENDATIONS

This study sought to evaluate the impact of Digitalization Strategies (Digital Payment Strategies, E-Commerce, Digital Marketing, and Collaborative Tools) on Business Performance. The findings reveal that there is a significant positive relationship between digitization strategies and e-commerce on business performance. Companies that adopt advanced digital tools and processes witness improvements in operational efficiency, customer engagement, and financial outcomes. This finding underscores the vital role of integrating technology into core business operations to drive enhanced performance and competitive advantage.

5.1 Implications

The study's findings have key implications for research, policy, and practice. From a research perspective, the positive relationship between digitization strategies and e-commerce and business performance encourages further exploration into how specific digital tools influence operational outcomes across various industries.

In terms of policy, government agencies, regulators, and policymakers in the digitalization domain must provide policies emphasizing the need for supportive regulations and incentives

that promote digital adoption. Governments should focus on creating a conducive environment for businesses by offering tax incentives, subsidies, and digital infrastructure investments, facilitating a smoother digital transformation process.

For practice, the results highlight the importance of digital payment strategies and e-commerce in enhancing the impact of digitalization on business performance. Businesses should foster partnerships and collaborative networks with suppliers, customers, and other stakeholders to maximize the benefits of their digital initiatives. Implementing a well-rounded digitization strategy, supported by both policy frameworks and active stakeholder engagement, will enhance business performance and foster long-term growth.

5.2 Limitations and suggestions for further studies

This study is purely quantitative and used a survey method of companies in the Greater Accra region in Ghana. Thus, generalizing it for the entire Ghana is not possible. Future studies can do a survey of all Ghanaian companies. Also, future studies can do a qualitative study to get more insights into the constructs (Digital Marketing and Collaborative Tools) that were not supported.

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EXPLORING EMPLOYEE AND CUSTOMER ANXIETY ABOUT AI: REACTIONS TO STARBUCKS' USE OF TECHNOLOGY

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Abstract
Artificial Intelligence (AI) is reshaping business operations, customer interactions, and workplace culture. This paper examines Starbucks' adoption of AI, particularly its Deep Brew system, which enhances operational efficiency and personalised experiences. While AI brings clear benefits to service delivery, it also raises concerns. Employees express anxiety over job security and skill relevance, while customers worry about data privacy and the authenticity of interactions. Applying the Technology Acceptance Model (TAM), this study finds that perceived usefulness and ease of use influence stakeholder reactions. It highlights the need for ethical practices, transparency, and retraining programs to address human-centric concerns. Starbucks provides a valuable case study in balancing technological innovation with trust, inclusion, and sustainability.

1.0 Introduction

Opening Statement on the Rise of AI in Business

The integration of artificial intelligence (AI) across industries has sparked significant debate, especially regarding its impact on employees and customers (Cramarenco et al., 2023; Malik et al., 2021). A prominent example is Starbucks, a global coffee leader serving over 100 million customers in 78 markets. To stay competitive, the company adopted AI tools such as Deep Brew in 2019 to enhance operational efficiency and personalisation (Akcam, 2022; Kotorchevikj, 2022). This move led to a customer base of 18 million by the end of 2019, a 6% same-store sales growth in the U.S., and a 20% reduction in customer wait times. While AI offers advantages like process optimisation and improved communication (Aldoseri et al., 2023; Mateo & Redchuk, 2022), concerns persist regarding its effects on employees and customers (Du & Xie, 2020; Luo et al., 2019). This study explores these concerns in the Starbucks context, focusing on employee anxieties over job displacement and technological shifts, as well as customer apprehensions around data privacy, personalisation, and authenticity of experience.

Job loss remains a central fear in AI adoption. Employees worry their skills may become obsolete or replaced by machines (Huang & Rust, 2018), and question whether training and resources will be sufficient (Autor et al., 2023). The World Economic Forum (2020) projects 85 million jobs may be lost and 97 million created by 2025, highlighting the dual impact of AI on employment. Simultaneously, AI-driven personalisation raises ethical concerns. Kang and Namkung (2019) note the delicate balance between privacy and service quality, while a PwC (2021) survey found that 52% of consumers oppose AI-enhanced services due to data concerns. Furthermore, AI risks distancing customers from staff, challenging Starbucks' brand authenticity.

The tension between employee and customer concerns underscores the complexity of integrating AI in customer-focused business models. Starbucks aims to harness AI to streamline workflows and enhance customer satisfaction while mitigating fears of depersonalisation and job loss. This paper critically investigates the implications of AI adoption at Starbucks, drawing on theoretical and empirical insights to examine both employee and customer perspectives. Nalini (2024) notes that AI is transforming industries by reshaping operations, customer engagement, and workforce dynamics. In service industries, this transformation presents a dual narrative, efficiency gains alongside psychological and ethical challenges (Dwivedi et al., 2021). As a global service brand, Starbucks serves as a crucial case study for understanding the promises and pitfalls of AI integration in a service-driven environment (Morandini et al., 2023).

Artificial Intelligence (AI)

AI refers to the simulation of human intelligence by machines, enabling them to learn, make decisions, and solve problems autonomously (Jarrahi, 2018). In business, AI enhances operational efficiency, automates processes, and improves customer experience (Rahman, 2024).

Employee Anxiety

Employee anxiety reflects the fear and uncertainty workers face over job displacement, outdated skills, and difficulties adapting to AI technologies (Ghamghami, 2024). This concern often stems from the perception that AI may replace or diminish human roles.

Customer Anxiety

Customer anxiety pertains to concerns about data privacy, trust, and the authenticity of AI-mediated interactions (Castillo et al., 2021). These fears include the potential misuse of personal data and the erosion of genuine human engagement.

Reactions to AI
Reactions to AI encompass the spectrum of employee and customer responses to its integration. Employees may feel both empowered and insecure, while customers often appreciate convenience yet remain cautious about privacy and authenticity (Huang & Gursoy, 2024).

1.1 Relevance of Starbucks as a Case Study

Starbucks is a perfect example where AI is used in customer service to reach globally and also innovate. Starbucks is widely known as the main driving force of the coffee industry (Forbes, 2021). The company has adopted AI to create a better customer experience by introducing orders over a mobile phone and personalised marketing (Forbes, 2021). This interaction procedure provides a specific case to demonstrate the difficulties employees and people face with job stability, personalisation, and privacy. It is also noted by Martinroll (2021) and Pandey et al. (2021) that the strong brand identity of Starbucks, together with the focus on human interaction, provides a detailed insight into the impact of technological innovations on employee morale and customer satisfaction, which, in turn, can directly affect the service space.

1.2 Key Research Questions and Hypotheses

Research Questions:

1. How does the use of AI in Starbucks affect employee perceptions of job security and work quality?
2. How do customers perceive AI-driven services in terms of personalisation, trust, and privacy?

Tentative hypotheses.

$H_{0:}$ There is no significant relationship between employee perception of job security and the perceived usefulness of AI in Starbucks

H_1: There is a significant relationship between employee perception of job security and the perceived usefulness of AI in Starbucks

H_0: There is no significant relationship between employee perception of AI and the perceived ease of use of AI at Starbucks

H_1: There is a significant relationship between employee perception of AI and the perceived ease of use of AI at Starbucks

1.3 Structure of the Paper

This paper is structured as follows: following a review of the relevant literature, the study methodology will be outlined, with findings from the data collection process presented. An analysis of the implications of AI integration for both Starbucks employees and customers will follow, concluding with a discussion of key insights. The paper will also detail specific AI technologies used by Starbucks, including mobile ordering, predictive algorithms for sales forecasting, and automated customer service.

1.4 Theoretical Framework

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), developed by Davis (1989), offers a useful framework for examining the psychological and technological dimensions of AI adoption in service environments (Mostafa Al-Emran, 2023). TAM centres on two key constructs, perceived usefulness and perceived ease of use, which influence an individual's willingness to adopt new technologies (Madi et al., 2024). In the context of Starbucks' AI integration, TAM helps explain how both employees and customers interact with systems such as predictive ordering and personalised recommendations. For employees, usefulness may relate to workload reduction, while ease of use reflects how seamlessly AI tools integrate into daily routines. For customers, it involves how AI enhances convenience and customisation (Doğan & Niyet, 2024; Zhang, 2024). TAM is valuable for its ability to distil complex technological interactions into measurable psychological constructs, aiding firms like Starbucks in addressing resistance and anxiety (Momani et al., 2018). However, its limitations lie in its narrow focus, which may not fully capture modern AI's ethical, emotional, and contextual dimensions. Contemporary applications require consideration of algorithmic transparency, emotional intelligence, and sociocultural factors (Rehman et al., 2024).

1.5 Conceptual Review

Employee Anxiety in the Age of AI

The integration of AI into workplaces such as Starbucks has triggered concerns about job displacement, skill obsolescence, and the evolving nature of work. Employees experience dual pressure: adapting to new technological tools while fearing redundancy. Empirical research by Autor et al. (2023) shows that AI adoption often leads to role restructuring, with a rising expectation for employees to acquire new competencies to remain relevant. Bessen (2020) similarly noted that technological advancement inevitably results in some degree of job loss, as machines begin to replace human labor in certain functions. Pektaş (2024) reinforced this perspective by highlighting that although technology contributes to economic growth, it often does so at the cost of employment stability. Bersin (2023), referencing a Goldman Sachs report, projected that generative AI could affect 300 million jobs globally, with 7% potentially eliminated. Complementing this, a University of Pennsylvania study estimated that AI will significantly impact 87% of existing occupations.

Nevertheless, not all developments point to complete replacement. Russ (2022) reported that Starbucks is leveraging AI to streamline operations, such as improving the efficiency of cold beverage preparation and rerouting digital order measures designed to ease staff workloads rather than eliminate roles. Despite these operational benefits, anxiety persists. Starbucks employees, whose roles often hinge on personal interaction and customer engagement, may feel threatened by the encroachment of machines into these human-centric spaces. These concerns underscore the need for strategic retraining initiatives and transparent communication, fostering a workplace culture that emphasizes human-AI collaboration rather than competition.

Customer Perspectives: Trust, Privacy, and Authenticity

From the customer's perspective, the deployment of AI reshapes traditional service dynamics, particularly concerning trust, data privacy, and the authenticity of interaction. Reis et al. (2020) noted that AI service delivery exists within a layered psychological and technological ecosystem. Customers' responses to AI are increasingly nuanced, shaped by evolving expectations and emotional engagement (Sheoran & Vij, 2021; Puntoni et al., 2021). Trust emerges as a foundational element in AI-mediated interactions. Afroogh et al. (2024) emphasized that customers prefer AI systems that demonstrate consistent, predictable, and ethically sound behavior. Privacy concerns have also evolved. Mols and Pridmore (2020) argued that privacy is no longer a binary issue but a fluid negotiation involving trade-offs between data sharing and perceived service value. Authenticity, as Akdilek et al. (2024) explained, extends beyond technical competence, customers seek AI systems capable of emotionally aware communication that replicates the empathy of human interactions. Liu-Thompkins et al. (2022) further supported this, noting that users increasingly favor AI interfaces that are "transparently artificial yet empathetically designed."

At the same time, widespread anxiety around data control persists. Mary (2018) reported that 91% of American consumers feel they have lost control over their personal information, while Husain (2024) found that 73% of U.S. respondents are more concerned about privacy today than in previous years. Rooij (2022) underscored the urgency of exploring the antecedents of trust and privacy concerns in the context of AI to mitigate associated risks and enhance customer satisfaction. In Starbucks' case, AI systems often analyse purchase histories and preferences to offer tailored experiences. While such personalization enhances convenience, it also increases the risk of data misuse and leakage (Gupta, 2024). PwC (2021) found that over 50% of consumers harbor reservations about AI-based customer services, largely due to these privacy concerns. Additionally, many customers feel that AI interactions lack warmth and emotional depth, rendering the service experience mechanical and impersonal.

1.6 Research Gap

Despite the expanding body of literature on artificial intelligence (AI) in customer service and employee experiences, there remains a notable gap in empirical studies that simultaneously address the divergent perspectives of employees and customers within a single case study in the service industry. Most existing research tends to examine either the implications of AI on employee workflows or its impact on customer experiences in isolation, resulting in a fragmented understanding of how AI adoption affects all key stakeholders. Moreover, limited scholarly work focuses on how service-oriented businesses like Starbucks can effectively implement AI technologies while balancing concerns over data security and employee apprehension.

Few studies offer a comprehensive analysis that integrates customer and employee responses to AI deployment within the same organizational context. This study seeks to bridge this gap by critically examining the reactions of both Starbucks employees and customers to AI applications. By exploring their fears, expectations, and experiences, this research aims to provide a more holistic understanding of the socio-technological dynamics. The findings will offer practical insights for service organizations, enabling them to foster trust, mitigate anxiety, and ensure a smoother, more inclusive AI implementation process that aligns with operational goals and human concerns.

2.0 Methodology

2.1 Rationale for Methodology

This study adopts a mixed-methods approach, combining a Systematic Literature Review (SLR) and a survey to ensure a comprehensive and balanced investigation into stakeholder responses to AI implementation at Starbucks. Integrating qualitative and quantitative methods leverages the strengths of both paradigms, providing a nuanced understanding of the psychological, organizational, and technological implications of AI on employees and customers. The SLR component offers a rigorous and structured method for synthesizing existing research, enabling the identification of theoretical linkages, contradictions, and thematic patterns related to AI-induced anxiety and acceptance. As emphasized by Ammirato et al. (2022), the systematic approach enhances the reliability and reproducibility of literature-based findings by following a transparent and replicable protocol. In the context of this study, the SLR serves to establish a foundational understanding of how AI influences cognition and behavior among both employees and customers within service-oriented settings like Starbucks.

Complementing the literature review, the survey component collects real-time, empirical data from Starbucks employees and customers. This allows the study to assess contemporary perceptions of AI, specifically focusing on reactions, concerns, and acceptance levels. While the SLR highlights prevailing theories and long-term trends, the survey captures current attitudes and lived experiences. This dual strategy enables triangulation, enhancing the validity of findings by cross-verifying insights obtained through different methodological lenses. Moreover, the survey incorporates key constructs from the Technology Acceptance Model (TAM), namely, Perceived Ease of Use (PEOU) and Perceived Usefulness (PU), to frame stakeholders' attitudes toward AI technologies. By anchoring the investigation in TAM, the study not only evaluates the technical dimensions of AI adoption but also uncovers psychological factors that influence stakeholder adaptation, trust, and engagement. In sum, the mixed-methods design strengthens the robustness of the study, offering a multidimensional exploration of how AI is reshaping human-technology relationships within Starbucks and the broader service industry.

2.2 Literature Search Strategy

Databases and Search Engines

This research will use multiple academic databases to ensure a complete review of the pertinent literature through the terminology and the problems it relates to (Ammirato *et al*., 2022). The databases include Google Scholar, PubMed, SpringerLink, ScienceDirect, and Emerald Insight.

Search Terms and Keywords

The query will be framed using a set of search items incorporating AI, employee and customer anxiety, technology adoption, and Starbucks to make a comprehensive summation.

Table 1 highlights the search terms

Search Term 1	Boolean Operator	Search Term 2	Boolean Operator	Search Term 3
"Artificial Intelligence"	AND/OR	"employee anxiety"	AND/OR	"job security"
"AI"	AND/OR	"customer concerns"	AND/OR	"data privacy"
"Starbucks"	AND/OR	"Technology"	AND/OR	"personalization"
"Deep Brew"	AND/OR	"AI integration"	AND/OR	"automation"
"AI adoption"	AND/OR	"customer experience"	AND/OR	"service industry"

Inclusion and Exclusion Criteria

Inclusion and exclusion criteria set the boundaries for the systematic review (Purssell & McCrae, 2020). The inclusion and exclusion criteria can be seen in Table 1.

Table 1: Inclusion and exclusion criteria

Inclusion Criteria	Exclusion Criteria
Studies published in peer-reviewed journals or reputable conference proceedings.	Articles not published in English.
Literature published between 2013 and 2024 to capture contemporary discussions on AI and its impact.	Studies focusing on AI in industries unrelated to the service sector.
Studies that discuss employee or customer reactions to AI in the service industry, with a specific focus on job security, data privacy, and customer experience.	Research that does not discuss the impact of AI on employee or customer experiences.
Empirical studies, reviews, case studies, and meta-analyses	Opinion pieces or editorials without empirical data.

2.3 Survey Strategy

A questionnaire-based survey was conducted for Starbucks employees and customers to explore perceptions of AI use. For employees, the focus was on job displacement, perceived benefits, job security, and data privacy. For customers, the key issues included AI-driven personalisation and trust in how Starbucks uses their data. A total of 50 participants were targeted, comprising 25 employees (from various roles and experience levels) and 25 customers (across age, gender, and visit frequency). Ultimately, 41 responses were received. The survey provided valuable insights into key stakeholder groups' diverse views on AI adoption.

2.4 Data Extraction and Analysis

Data Extraction Process (SLR)

After the relevant studies were found, a standard data extraction table was used to extract the required data. This table will record pertinent information from the selected study and will be structured as arranged in Table 2.

Table 2: Data Extraction Process

S/N	Authors	Participants	Interventions	Comparisons	Study Design/ Methodology	Findings
1	Author(s), publication year, and country	The people or entities included in the study.	The specific actions, programs, treatments, or strategies that researchers are studying in the included studies	Key results associated with the focus of the study (employee and customer anxiety, job security, data privacy, and AI-driven personalization)	Recognised limitations of included studies to assess the quality of evidence	Results gotten from the studies analysed.

2.5 Thematic Analysis

Thematic analysis will be used to identify recurring patterns in the data (Terry & Hayfield, 2020). This involves coding key findings, developing themes (e.g., automation concerns, data privacy), and interpreting them within Starbucks' AI context to align with or contrast existing research.

2.6 Statistical Analysis (Survey)

Survey responses will be analysed using descriptive and inferential statistics, following Makar and Rubin (2018). Descriptive stats will summarise trends in job security, privacy, and experience. Inferential tools, such as Pearson correlation, will compare customer and employee views and examine links like AI exposure vs. job insecurity.

2.7 Survey Instrument Details
The survey captures TAM's Perceived Ease of Use (PEOU) and Perceived Usefulness (PU). For example, employees rated statements like "AI improves my job performance" on a 9-point Likert scale. This helps assess perceptions of AI tools like Deep Brew.

2.8 Validity and Reliability
Content validity is ensured through expert reviews and established TAM constructs. A pilot test will evaluate reliability using Cronbach's Alpha, targeting ≥0.7. The SLR supports overall validity by triangulating data sources for richer insights.

2.9 Sampling Strategy
Using purposive sampling, 50 participants, 25 employees and 25 customers were selected for their direct interaction with Starbucks' AI. Demographic variety ensures diverse viewpoints and allows subgroup analysis.

2.10 Methodological Limitations
The dual approach (SLR and survey) requires time and resources. Aligning qualitative and quantitative findings may be difficult, especially when divergent themes arise, requiring careful interpretation.

2.11 Ethical Considerations
Informed consent, voluntary participation, and anonymity were upheld throughout. Ethical standards also guide the SLR, ensuring transparent selection, review, and fair reporting of studies (Purssell & McCrae, 2020).

3.0 Data Analysis
The data analysis section presents the results of the analysis. This section comprised the survey and systematic literature review analyses as stated in the methodology section. It further discusses the results as they pertain to the research questions.

3.1 Demographic Analysis
Table 1 ***(See appendix)*** presents the distribution of respondents across different age groups. The majority of participants (63.4%) are aged 18-30, indicating that this demographic is the most represented in the sample. Those aged 31-50 account for 34.1% of the respondents, while individuals under 18 comprise a small fraction at 2.4%.

Table 2 ***(See Appendix)*** illustrates the gender distribution of the respondents, showing that the majority are female, comprising 65.9% of the sample, while males account for 34.1%.

Table 3 ***(See Appendix)*** highlights the respondents' status, revealing that 63.4% of the majority visit Starbucks occasionally, while 14.6% are regular customers. Among Starbucks employees, 14.6% are full-time workers, and 7.3% are part-time employees.

Table 4 ***(See Appendix)*** summarises respondents' experience with AI technologies, showing that the majority, 73.2%, have an intermediate level of familiarity. Beginners account for 22.0%, while those with no experience make up a small proportion at 4.9%.

3.2 Descriptives
Table 5 presents the Perceived Ease of Use results (see Appendix). All statements scored above 3.00, indicating satisfaction. Mean scores ranged from 4.88 to 5.76, reflecting positive perceptions of the system's ease of use. The highest score, 5.76, for "It is easy for me to become skilful at using the system," highlights strong agreement with skill development,

while the lowest score, 4.88, for "I find the system easy to use," still exceeds the benchmark. Additional scores for learning ease (5.44), achieving desired outcomes (5.22), interaction clarity (5.27), and flexibility (5.41) further confirm the system's user-friendliness.

Table 6 presents the Perceived Usefulness results (see Appendix). Mean scores ranged from 4.39 to 5.49, showing that participants generally perceive the system as beneficial. The highest score, 5.49, for "I find the system useful in my job," indicates strong agreement, while the lowest score, 4.39, for "Using this technology enhances my effectiveness," still reflects moderate agreement. Other scores, including 4.88 for task performance, 5.27 for ease of work, and 4.90 for timesaving, further support the system's perceived usefulness.

3.3 Correlation Analysis

Table 7 (See Appendix) shows a statistically significant positive relationship between Perceived Ease of Use (PEOU) and Customer Perception, with a Pearson correlation coefficient of 0.573 and a p-value of 0.000 ($p < 0.05$). This suggests a moderate to strong association, confirming that as customers find AI technologies easier to use, their overall perception of these technologies improves.

Table 8 (See Appendix) reveals a statistically significant positive relationship between Perceived Usefulness (PU) and Employee Anxiety, with a Pearson correlation coefficient of 0.546 and a p-value of 0.000 ($p < 0.05$). This indicates a moderate positive correlation, suggesting that as employees perceive AI technologies as more useful, their anxiety levels related to these technologies tend to increase.

3.4 Discussion of Findings of Quantitative Analysis

How Does the Use of AI in Starbucks Affect Employee Perceptions of Job Security and Work Quality?

The quantitative analysis reveals that employees generally view AI technologies at Starbucks as both useful and user-friendly. High mean scores for statements such as "Using this system improves my performance in tasks" (mean = 4.88) and "Using this system saves me time compared to manual methods" (mean = 4.90) indicate that employees recognize the efficiency and productivity benefits of AI. These positive perceptions align with Starbucks' goals of improving operational performance through AI integration. However, the analysis also highlights a more nuanced response: while employees acknowledge AI's utility, there is a moderate positive correlation between perceived usefulness and anxiety about job security ($r = 0.546$, p-value < 0.05). This suggests that as employees find AI more useful, their anxiety regarding the potential loss of human labor increases. This dual response illustrates a central paradox of AI adoption in the workplace: while AI can improve productivity and ease job tasks, it also raises concerns about redundancy, particularly in roles that AI can fully automate.

The data further suggests implications for work quality. The high mean for ease-of-use statements such as "It is easy for me to become skilful at using the system" (mean = 5.76) indicates that AI technologies are user-friendly and that employees can adapt quickly, which could enhance their technical skills and overall work quality. These findings are consistent with those of Hilary Russ (2022), who reported that AI is being leveraged at Starbucks to streamline operations, especially in high-demand situations like the production of cold drinks. This can help reduce employee stress and workload. However, as emphasized by Autor et al. (2023), this integration of AI also creates a dual pressure for employees, who must adapt to new technologies while fearing the potential for job displacement. As such, AI may lead to

the restructuring of roles, requiring employees to acquire new competencies to remain relevant in the workforce.

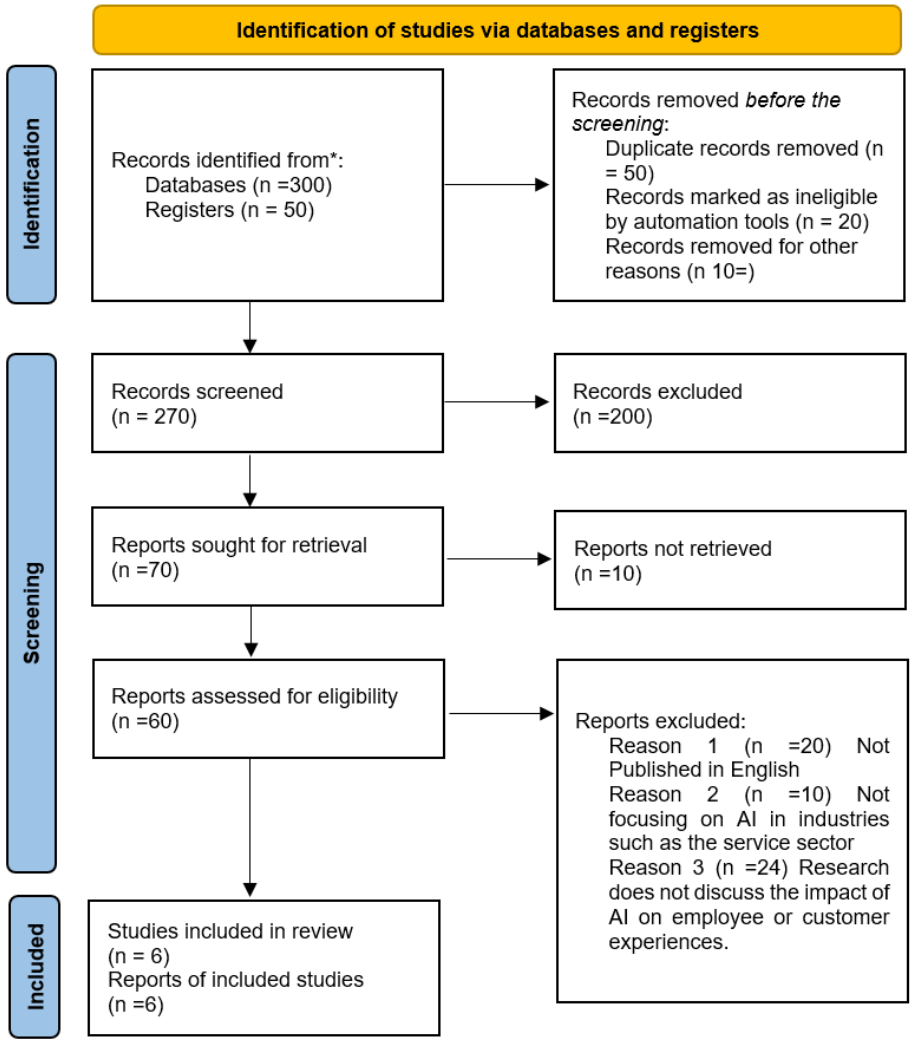
How Do Customers Perceive AI-Driven Services in Terms of Personalisation, Trust, and Privacy?

The customer analysis shows that AI technologies in Starbucks are largely perceived as intuitive and easy to engage with, as evidenced by the significant positive correlation between perceived ease-of-use (PEOU) and customer perception ($r = 0.573$, p-value < 0.05). This suggests that customers are more likely to appreciate AI-driven services when these technologies are perceived as user-friendly and seamless. Furthermore, a high percentage (73.2%) of customers familiar with AI at an intermediate level show that familiarity with AI usage positively influences their interaction with Starbucks' AI services. Personalisation emerges as a critical element in customers' experiences with AI. Customers believe that AI enhances their service experiences, especially in areas like personalised recommendations or seamless service delivery. The strong positive correlation between customer perceptions and AI functionality suggests that AI helps tailor services to individual preferences, which is crucial for customer satisfaction.

Trust in AI is another key factor that affects customer perceptions. The analysis finds that customers generally trust the AI systems used by Starbucks, with high scores for the clarity and transparency of the interaction ("The interaction with the system is clear and understandable," mean = 5.27). This indicates that, overall, customers trust the AI-driven processes at Starbucks. However, as noted in the literature review by Gupta (2024), trust in AI systems can be undermined if the systems are opaque or fail to function properly. Moreover, Kang and Namkung (2019) point out that AI's role in potentially separating the customer-staff interaction could challenge the authenticity of Starbucks' human-centered brand. This is an important consideration for Starbucks, which prides itself on its personal customer experience. The balance between leveraging AI for efficiency and maintaining the personal touch that defines its brand identity will be key to navigating this challenge.

3.5 Systematic Literature Review

3.5.1 PRISMA FLOW CHART



3.5.2 Thematic Analysis Table (Included Characteristics)

The data extraction contained crucial sections obtained from the data gathered for the systematic review. The table presented details of the journals and publications gathered for the review **(See Appendix for full details).**

Authors	Participants	Interventions	Comparisons	Methodology	Findings

3.6 Data Analysis

The study employed Braun and Clarke's six-step framework for thematic analysis. The data analysis process involved familiarisation with the texts, followed by coding and categorisation, transcription, and theme organisation. After identifying recurring patterns, four major themes emerged. These themes were rigorously reviewed and defined to ensure coherence with the research questions and coded data. This approach facilitated a systematic comparison of findings across studies, focusing on Employee and Customer Anxiety About AI.

3.7 Emerging Themes

Author/date	Themes
Mirwan et al., (2023)	• Customer Trust and Privacy Concerns • Perceived Value of Personalization
Bhargava et al. (2020)	• Perceived Threat to Job Security • Impact of AI on Job Satisfaction and Work Dynamics • Customer Trust and Privacy Concerns • Perceived Value of Personalization
Akdim and Casaló (2023)	• Perceived Threat to Job Security • Impact of AI on Job Satisfaction and Work Dynamics • Customer Trust and Privacy Concerns • Perceived Value of Personalization
Kyaw (2023)	• Perceived Threat to Job Security • Impact of AI on Job Satisfaction and Work Dynamics • Customer Trust and Privacy Concerns • Perceived Value of Personalization
Sipos (2024)	• Customer Trust and Privacy Concerns • Perceived Value of Personalization
Li et al. (2023)	• Customer Trust and Privacy Concerns

Source: Authors' Generated (2024).

3.8 Discussion of Qualitative Analysis

Theme 1: Perceived Threat to Job Security

The integration of AI into service industries, such as Starbucks, has significantly raised concerns among employees regarding job security. Bhargava et al. (2020) note that the introduction of Robotics, AI, and Automation technologies creates uncertainty among low-skilled workers, who fear being replaced by automation, especially in tasks that are repetitive or less complex. This fear can increase turnover intentions, cynicism, and even depression. The dual nature of AI is particularly notable here: while AI technologies are often seen as tools that enhance human effort, employees still perceive them as a potential threat to job security. The fear of job loss may stem from the perceived automation of routine tasks, which could diminish the need for human labor in certain areas. AI technologies, particularly those involved in task automation, often evoke concerns about redundancy. This aligns with Akdim and Casaló's (2023) view that AI is seen both as a threat and as a complement to human functions. AI-driven devices can automate routine work, allowing employees to focus on higher-value tasks, which may ultimately enhance job satisfaction. However, without clear communication and appropriate engagement, employees may still view these technologies as potential job replacements. The findings of this study echo Kyaw (2023), who suggests that employees may fear job loss when they fail to recognize AI as a complementary technology. This indicates the need for organizations to help employees understand the role of AI in augmenting rather than replacing their tasks. In line with Mostafa Al-Emran's (2023) conclusions, fostering a sense of perceived usefulness and ease of use in AI can help mitigate

these fears, ensuring that employees accept technological innovations as part of their work environment.

Theme 2: Impact of AI on Job Satisfaction and Work Dynamics
The integration of AI into Starbucks has mixed effects on job satisfaction and work dynamics. Bhargava et al. (2020) argue that AI can increase job satisfaction by removing low-value, repetitive tasks from employees' roles, allowing them to focus on more engaging, higher-value activities. This shift could lead to improved productivity, efficiency, and accuracy. However, there is a counterpoint: AI-driven automation may reduce the scope for cooperation and career development, as automation can potentially diminish the range of tasks that employees can perform. Akdim and Casaló (2023) add that while AI enhances operational efficiency and frees up employees to focus on more meaningful tasks, it also presents challenges in terms of adaptation. Employees may need significant cognitive effort to adapt to new AI systems and workflows. If not managed properly, this transition could lead to dissatisfaction. Kyaw (2023) notes that providing opportunities for employees to increase their capabilities through training and learning tools can help improve career satisfaction in the long term. At Starbucks, AI tools like Deep Brew, launched in 2019, have been used to improve personalization and operational efficiency (Kotorchevikj, 2022). These investments in AI-driven technology demonstrate that AI integration does not necessarily lead to a decrease in job satisfaction, as long as employees are given proper support and the technology is transparently integrated into their workflows.

Theme 3: Customer Trust and Privacy Concerns
AI-driven services at Starbucks raise important issues regarding customer trust and privacy. As AI systems increasingly capture and analyze customer data, concerns regarding data privacy have become more pronounced. Mirwan et al. (2023) highlight that customers often worry about their information being used in unintended ways or being shared with third parties. This concern is amplified by the 'always-on' nature of AI technologies, which some view as a form of surveillance. To build trust, transparency in how data is collected and used, along with strict adherence to privacy regulations (such as GDPR), is essential. As discussed in the literature review, while AI systems at Starbucks analyze customer purchase history and preferences to provide personalized experiences, this practice also increases the risk of data leakage and misuse (Gupta, 2024). Akdim and Casaló (2023) emphasize the importance of ethical practices in data management, including opt-out mechanisms and clear explanations of data usage, to build customer trust. Sipo (2024) discusses the balance between personalization and privacy, noting that excessive personalization can harm a brand if it infringes on users' privacy. Starbucks must, therefore, ensure that its use of AI respects customers' privacy while offering personalized services. This requires careful deliberation and a transparent approach to how customer data is handled.

Theme 4: Perceived Value of Personalization
Personalization powered by AI is a key driver of customer satisfaction and loyalty at Starbucks. According to Bhargava et al. (2020), AI enables highly personalized customer experiences, such as tailored offers and product recommendations, which can significantly enhance customer engagement and loyalty. This level of personalization not only meets customers' needs more effectively but also improves their overall experience at Starbucks. Akdim and Casaló (2023) highlight that hyper-personalization, facilitated by generative AI, has become a competitive advantage in many industries. Customers appreciate tailored recommendations that align with their unique preferences, as it enhances their perception of service quality. However, excessive personalization can raise concerns about privacy, as

discussed earlier. Sipos (2024) warns that aggressive personalization can harm a brand if it crosses boundaries into users' personal privacy. Therefore, Starbucks must strike a balance between personalizing services and respecting customer privacy. Liu-Thompkins et al. (2022) add that customers judge AI services not just based on their functional capabilities, but on how well they respect and navigate complex human contexts. This suggests that Starbucks' AI systems must be empathetic in their interactions, ensuring that personalization is not perceived as intrusive or manipulative. Transparent and respectful AI interactions will be key to maintaining customer trust and loyalty in the long run.

3.9 Implications of the Research for Theory and Practice

This research has significant theoretical and practical implications. Theoretically, it expands the application of the Technology Acceptance Model (TAM) to AI adoption in service industries like Starbucks. It highlights that 'perceived usefulness' and 'ease of use' from TAM are not just technological aspects but also psychological factors that influence employee anxiety and customer trust. This enriched understanding emphasizes the interaction between human emotions and technological acceptance in a dynamic environment. Practically, transparency, retraining programs, and data protection emerge as critical factors for Starbucks. By fostering a nurturing culture through reskilling programs and open discussions about AI’s complementary role, employees can overcome job insecurity while improving productivity and work quality. Additionally, ethical AI practices, such as transparent data use and providing customers with opt-out options, will help build trust while maintaining the benefits of personalization. Starbucks must also minimize cognitive stress for employees adapting to AI systems and avoid alienating customers with excessive personalization. Balancing AI-driven operational efficiency with customer and employee well-being will ensure that Starbucks remains true to its brand identity and values.

4.0 Conclusion

This research explored the integration of AI at Starbucks, specifically examining its effects on employee perceptions of job security and work quality, as well as customer views on personalization, trust, and privacy. The study aimed to highlight the dual role of AI as both an enabler of operational efficiency and a potential source of anxiety and ethical dilemmas. The findings reveal a complex balance of benefits and challenges: while AI technologies like Deep Brew improve efficiency and enhance personalized customer experiences, they also increase concerns among employees about job security and among customers regarding data privacy. These dynamics suggest that AI adoption must be balanced with a focus on human centrality.

On the whole, Starbucks employees perceive AI as beneficial for improving performance and work quality, reflected in high scores for perceived usefulness and ease of use. However, these advantages are tempered by anxieties about job displacement in areas prone to automation. Workers also expressed concern about losing the interpersonal interactions that are integral to Starbucks' brand identity. For customers, AI-driven personalization enhances their experience, fostering greater loyalty. Yet, these benefits are counterbalanced by privacy concerns, with many customers worried about the potential misuse of personal data. The findings emphasize the need for Starbucks to address these issues proactively. Recommendations include ensuring transparency in communication, offering retraining programs for employees, implementing strong data protection measures, and maintaining the human aspects of customer interactions. These actions should form the foundation of Starbucks’ AI strategy, providing actionable insights while staying within legal and ethical boundaries.

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INFLUENCING MOBILE BANKING CONTINUANCE USE INTENTION THROUGH ARTIFICIAL INTELLIGENCE: THE MODERATING ROLE OF CUSTOMER SATISFACTION

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Abstract

The fourth industrial revolution has stimulated a paradigm shift from traditional in-person banking methods to the use of self-service artificial intelligence enabled mobile banking apps. This study examines the relationship between artificial intelligence mobile banking app attributes, trust, continuance use intention and the moderating role of customer satisfaction. Quantitative data was collected from 505 South African users of mobile banking apps. Partial least squares structural equation modelling was used to analyse data. Trust of mobile banking apps was found to be positively influenced by perceived intelligence and perceptions of AI service delivery, while the influence of perceived anthropomorphism was insignificant. Trust of mobile banking apps was found to have an insignificant effect on continuance intention. Mobile banking app satisfaction was found to moderate the relationship between trust and continuance use intention. The results of this study offer valuable insights to marketers of banking services who intend to leverage on the power of artificial intelligence to create sustainable competitive advantage.

Keywords: mobile banking apps; intelligence; continuance use intention; trust; South Africa.

1. Introduction and background

In recent years, the banking sector has undergone significant transformation driven primarily by the rapid adoption of artificial intelligence enabled mobile banking apps (Souiden et al., 2020; Chougule & Dudekula, 2024). Mobile banking has emerged as a pivotal and innovative marketing tool, reshaping the competitive landscape of banking services and products (Zhang et al., 2018). This dynamic environment necessitates continuous adaptation by banks, highlighting the critical need for modernisation within the rapidly evolving technological landscape (Souiden et al., 2020). This shift has revolutionised traditional banking methods, paving the way for more efficient, accessible and user-friendly banking experiences (Zhang et al., 2018; Chougule & Dudekula, 2024). In South Africa, the context of this study, the use of artificial intelligence enabled banking aps is a growing trend. Recent advancements, such as Investec Bank's Programmable banking service and the introduction of PayShap by the South African Reserve Bank and BankservAfrica, exemplify the ongoing efforts to enhance digital banking services (Investec, 2022; Baker & McKenzie, 2023). The consequences of this shifting landscape have led to an environment where banking products and services have become increasingly undifferentiated, thereby heightening competition in the banking industry (McKinsey Global Banking report, 2019).

Despite high adoption rates of mobile banking services, the long-term profitability and consumer retention associated with their use is hindered by the inability to sustain continuous engagement among Millennials and Gen Z consumers, which are identified as the most lucrative segments (Chougule & Dudekula, 2024). There is also an indication that the number of inactive users on mobile banking apps is growing, which is a worrying sign of disengagement (Moenjak, 2024; Bank Administration Institute, 2020). In developing economies such as South Africa, despite the introduction of artificial intelligence enabled mobile banking apps, the number of consumers who still prefer in-person banking services remain high (Investec, 2022; BusinessTech, 2023). Low transaction completion rates on mobile banking apps, the growing prevalence of cyber-crime and low levels of digital literacy are identified as factors that constrain the use of artificial intelligence enabled mobile banking apps (Investec, 2022; BusinessTech, 2023). With this background in mind, this study examines the relationship between artificial intelligence mobile banking app attributes, trust, continuance use intention and the moderating role of customer satisfaction.

Although previous studies (e.g., Rahman et al., 2021; Suhartanto et al., 2021; Yussaivia et al., 2021; Lee & Chen, 2022) confirmed the important role of artificial intelligence (AI) in the adoption and usage of mobile banking applications, very little is known in the context of South Africa. Although several studies were conducted in South Africa on the use of mobile banking applications (e.g., Van Deventer, 2020; Thusi & Maduku, 2020; Koenaite et al., 2021), there is still a dearth of studies that focus on the role of artificial intelligence. This study contributes to literature by closing this research gap. South Africa is a strategic emerging market owing to its membership to the growing influential trading bloc, BRICs, thus this study has the potential to significantly contribute in the marketing of financial services. Specifically, this study addresses the following objectives:

1) to examine the extent to which artificial intelligence factors influence consumer trust of mobile banking apps,

2) to ascertain the relationship between trust and continuance use intention of mobile banking apps, and

3) to examine whether mobile banking app satisfaction moderates the relationship between trust and continuance use intention.

The next section reviews literature on artificial intelligence, trust and customer satisfaction and continuance use intention of mobile banking apps.

2. Literature review

2.1 Artificial intelligence and mobile banking apps

Artificial intelligence (AI) has revolutionised mobile banking by enhancing user experience through intelligent machine performance and human-like behaviour (Prentice et al., 2020). In the context of the banking industry, the evolution from conventional to intelligent mobile banking apps represents a significant advancement in AI, showcasing its potential to deliver anthropomorphic and intelligent services (Lin et al., 2021; Moussawi et al., 2018). Consumers now expect AI to provide services comparable to human interactions, fostering trust and satisfaction in mobile banking applications (Lu et al., 2019). AI applications, such as personal assistants, spam filters, and self-driving cars, illustrate the practical implementation of AI algorithms in various domains (Mills, 2018). Designed to think and act like humans while maintaining logical decision-making, AI has begun to make decisions on behalf of users (Hong, Choi & Williams, 2020).

AI-powered mobile banking apps improve user interactions by providing timely and accurate responses, personalising services, and emulating human emotions and behaviours (Lin et al., 2020; Payne et al., 2018). These apps utilize intelligent algorithms to manage data, analyse user emotions, and employ natural language processing to offer customised financial services (Zhu, 2018). AI has significantly enhanced the sophistication and human-like qualities of mobile banking services, enabling financial institutions to offer innovative and personalized experiences to their customers (Jiang, 2018).

2.2 Perceptions of AI service delivery in mobile banking apps

Artificial intelligence (AI) has revolutionised mobile banking by enhancing user experience through intelligent machine performance and human-like behaviour (Prentice et al., 2019). AI applications, such as personal assistants, spam filters, and self-driving cars, showcase AI's practical use across various domains (Mills, 2018). Designed to think and act like humans, AI now makes decisions on behalf of users (Hong et al., 2020). AI-powered mobile banking apps improve user interactions by providing timely responses, personalising services, and emulating human emotions and behaviours (Lin, Chi, & Gursoy, 2020; Manser Payne, Peltier, & Barger, 2018). These apps use intelligent algorithms to manage data and offer customized financial services (Zhu, 2018). The shift from conventional to intelligent mobile banking apps highlights AI's potential to deliver anthropomorphic and intelligent services (Lin et al., 2021; Moussawi et al., 2018). Consumers expect AI to provide services comparable to human interactions, fostering trust and satisfaction (Lu et al., 2019).

Anthropomorphism, attributing human characteristics to non-human entities, enhances user interaction and acceptance in AI-enabled technology (AIET). In mobile banking apps, anthropomorphism involves human-like physical, behavioural, and emotional traits to enhance user experience and build trust (Lin et al., 2021). However,

understanding its impact on users' functional perceptions and psychological states requires further research. Integrating anthropomorphic features in AIET enhances user interaction and plays a crucial role in the acceptance and continuous use of mobile banking applications.

2.3 Artificial intelligence, mobile banking apps and consumer behaviour

AI's integration into mobile banking apps enhances user experience through anthropomorphic and intelligent service delivery, fostering trust and satisfaction among users. This intersection of human-like technology and user psychology is essential for understanding and improving digital service delivery in the financial sector. Trust is a fundamental element in human-AI interaction, particularly in mobile banking. Trust is defined as the dependability promised by the service provider to foster a favourable relationship (Ejdys & Gulc, 2020). Without trust, significant social links are at risk (Ryan, 2020). Consumers expect trustworthy mobile apps that act in their best interests (Sankaran & Chakraborty, 2021). Incorrect levels of trust may result in misuse or neglect of the technology (Jacovi et al., 2021).

Trust lowers perceived risk, facilitating consumer behaviours (Pitardi & Marriott, 2021). The degree of anthropomorphism is crucial in determining whether people will trust and use a product (van Pinxteren et al., 2019). Mobile banking apps with AI exhibit anthropomorphism, reflecting emotions in interactions and altering attitudes and beliefs about services (Pillai & Sivathanu, 2020). By fostering emotional ties, AI in mobile banking apps wins users' trust and strengthens their relationship with the technology (Lee & Chen, 2022).

Customer satisfaction in mobile banking services is paramount as the demand for nonface-to-face transactions surges (Shankar et al., 2021). Technological advancements have transcended mere functionality, enhancing user enjoyment and well-being (Kasilingam & Krishna, 2020). Satisfaction is defined by how well a product or service meets consumer expectations, reflecting the fulfilment of customer needs (Kaur et al., 2021). Positive user experiences cultivate brand loyalty and satisfaction (Garzaro et al.,
2020). Interactions during service delivery significantly affect customer satisfaction (Wang et al., 2019). The rise of mobile payments and e-wallet services further drives the continuous use of mobile banking apps (Handarkho, 2021; Yu et al., 2018). Understanding the factors that contribute to the continuous use of mobile banking applications is crucial for banks to achieve continuous customer engagement and loyalty.

2. 4 Hypotheses development and conceptual framework

This study is supported by the extended Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2012). The Unified Theory of Acceptance and Use of Technology (UTAUT2) is an integrated model that identifies factors that influence the acceptance and usage of technological innovations. The utility of the UTAUT2 emanates from its flexibility and accommodate other factors that have the potential to improve its predictive power (Venkatesh et al., 2012). The UTAUT2 was applied in this study because it has been extensively utilised to predict the adoption and usage of numerous technologies such as mobile payments (Hsiao & Chen, 2018) and e-learning systems in China (Zhu & Dai, 2019). Drawing from the UTAUT2, perceived artificial intelligence, perceived anthropomorphism and perceptions of artificial intelligence

service delivery are identified as factors that influence consumers' trust in a mobile banking app. In turn, trust under the moderating influence of customer satisfaction, is expected to influence mobile banking app continuance use intention.

2.4.1 Perceived artificial intelligence and trust in a mobile banking app

Perceived artificial intelligence refers to the subjective belief that AI systems possess human-like intelligence and capacities (Miller et al., 2020). This study applies the construct of perceived AI to measure millennials' and Gen Z's inclination to trust AI in mobile banking apps. Perceived intelligence has become a significant attribute for AIpowered systems as cognitive and reasoning capacity in processing data has become a key factor that influences their adoption and continued use (Hossain et al., 2020). From a business standpoint, perceived AI measures consumer's assessment of technology's capacity to act as a digital tool to facilitate decision making and improve users' online experience (Seeber et al., 2020).

In the context of mobile banking, trust in AI-powered mobile banking is crucial for effective service interactions. Key attributes like autonomous effectiveness, natural language processing and user support bolster user confidence (Lin et al., 2021). Previous research (e.g., Gupta et al., 2019; Sarkar et al., 2020) found that consumers are more likely to trust and persist in using intelligent and user-friendly apps to share personal information and engage in business transactions. By understanding users' experiences, addressing their queries and providing them with guidance and value, AI can help consumers complete business transactions (Lin et al., 2021). Thus, the following hypothesis is proposed:

H_1: *Perceived AI positively influences trust in a mobile banking app*

2.4.2 Perceptions of AI service delivery and trust

Perceptions of AI service delivery measures the extent to which AI-powered mobile banking app assists in improving customer satisfaction (Balapour et al., 2020). The introduction of AI-powered mobile banking apps has significantly transformed how services are developed, provided and evaluated (Mbama et al., 2018; Dahl et al., 2020). AI-powered mobile banking apps, through digital servitization, have given consumers more flexibility over how, when and where services are delivered (Adapa et al., 2020). Users of AI-powered mobile banking apps rate them based on their ease of use, security of transaction data and perceived usefulness (Chi et al., 2020). Also, in the context of banking services, addressing privacy and security concerns through AI-powered mobile banking apps can enhance satisfaction and loyalty, driving continuous engagement with mobile banking apps (Malaquias & Hwang, 2019). It is therefore hypothesised that:

H_2: *Perceptions of AI service delivery influences trust in a mobile banking app*

2.4.3 Perceived anthropomorphism and trust

Anthropomorphism refers to the integration of human-like physical characteristics, behavioural and emotional intelligence functions and roles in service delivery oriented machines (Prentice et al., 2019). The use of anthropomorphism in mobile banking apps was found to favourably influence consumers' attitudes, contentment and emotional connection to the provider's brand (Araujo, 2018). Consumers perceive a mobile banking app as being similar to an average human when it successfully

completes a banking task (Lin et al., 2021). As a result, when consumers perceive mobile banking apps as intelligent and useful, they are more inclined to trust them (Lee & Chen, 2022).

AI in mobile banking apps enhances user trust by exhibiting human-like qualities and autonomous behaviours, making the apps reliable and efficient (Lee & Chen, 2022). Intelligent systems minimise errors and improve service quality thereby fostering consumer confidence (Moussawi & Koufaris, 2019). Despite the benefits of anthropomorphism infused AI technology, prior research (e.g., West et al., 2018; De Cicco, Silva & Alparone, 2020) has indicated that not all consumers are likely to interact with AI mobile banking apps and accept the services offered. Perceptions of lack of individualised personal touch and limited options of customisation were identified as constraining factors. Based on the foregoing discussion, it is hypothesised that:

H_3: *Perceived anthropomorphism positively influences trust in a mobile banking app*

2.4.4 Trust, Mobile Banking App satisfaction and Continuance use intention

As non-physical transactions grow, traditional banks face challenges in increasing customer satisfaction and loyalty through mobile banking services (Shankar et al., 2021). Critical issues in enhancing customer satisfaction include addressing financial queries and resolving technical issues promptly (Shankar & Datta, 2018). Delayed responses or unfriendly service can lead to dissatisfaction (Oh & Kim, 2022). Seamless communication is vital for building consumer trust in mobile banking apps (Gomachab & Maseke, 2018). When consumers trust a mobile banking app, they prefer to frequently use it, develop loyalty to it and the possibility of switching behaviour to other apps is minimised (Baabdullah et al., 2019). To achieve this, Lee and Lee (2020) emphasise the importance of developing simple and practical mobile applications that integrate with existing services to encourage continuous use.

Initial adoption of a mobile banking app is a precursor to ongoing usage, which is significantly influenced by user satisfaction and trust developed over time through repeated interactions (Ashraf et al., 2020; Humbani & Wiese, 2019). Continuous use is crucial, as retaining customers is more cost-effective than acquiring new ones (Yuan et al., 2019). Satisfied users are more likely to persist in using the app (Kizgin et al., 2018). Satisfaction serves as a key indicator of ongoing use and success in information systems and e-commerce (Gomachab & Maseke, 2018). Hence, it is posited that:

H_4: *Trust positively influences mobile banking app continuance use intention*

H_5: *Mobile banking app satisfaction moderates the relationship between trust and continuance use intention*

Based on the posited hypotheses, Figure 1 presents the conceptual model that guides this study.

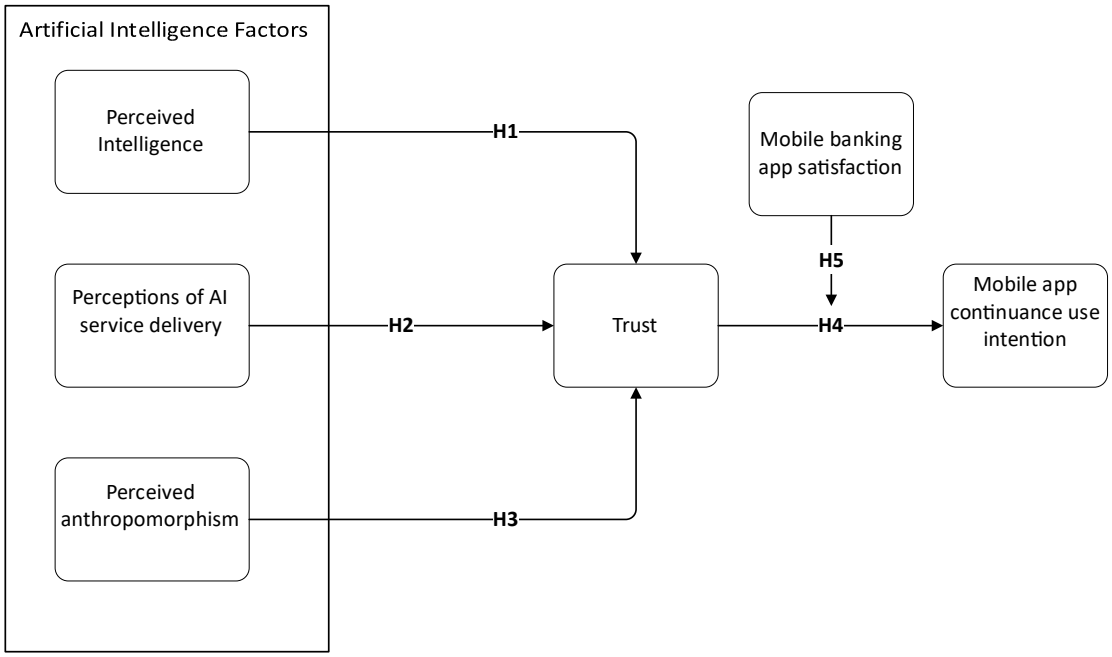


Figure 1: Conceptual model

3. Materials and methods

3.1 Sample and population

The target population for this study consisted of South African Millennial and Gen Z consumers who use mobile banking apps. The two cohorts were selected because they are known to be technologically savvy as they grew up in the digital era (Combs & Twachtman, 2019; Kumawat & Baskaran, 2023). Thus, respondents belonging to the millennial and Gen Z cohorts were considered as the ideal target population for this study.

3.2 Measurement scales

All constructs were operationalised using validated scales that were adapted from previous studies. Perceived intelligence was measured using a 5-item scale that was adapted from Lee and Chen (2022). A 4-item scale developed by Payne et al. (2018) was used to measure perceptions of AI service delivery. To measure, perceived anthropomorphism, a 5-item scale that was developed by Lee and Chen, (2022) was utilised. A 4-item scale adapted from Lee and Chen, (2022) was used to measure trust in mobile banking app. To assess mobile banking app satisfaction, a 4-item scale developed by Haq and Awan (2020) was used. The outcome variable, mobile banking app Continuance use intention was measured with the aid of a 4-item scale that was developed by Ukpabi et al. (2018). All measurement scale items utilised a 5-point likert scale denoted by (1) strongly disagree and 5 (strongly agree). As recommended by Saunders et al. (2019), prior to the main survey, a pilot study was conducted to assess the suitability of the questionnaire with 30 respondents who were not part of the main study. Using the results of the pilot study, minor corrections were effected to the questionnaire.

3.3 Data collection procedures

A reputable South African research company was contracted to collect data using an online survey. Respondents were recruited from online mobile banking apps of five South African commercial banks. Ethical Clearance H22/10/17 was granted by the University of the Witwatersrand's School of Business Sciences. Purposive sampling was used to select respondents. To ensure the recruitment of relevant respondents, a screening question was included to identify active users of online mobile banking apps who belonged to the Millennial and Gen Z cohorts. Only individuals who have used online mobile banking apps three months prior to data collection were considered for the online survey. Data was collected for a period of three months and 505 questionnaires were valid for analysis.

4. Data analysis

SPSS version 26.0 and Smart PLS 4 were used to analyse data. SPSS was used for descriptive statistics, computing the Cronbach's alpha coefficient and correlation analysis. SMART PLS 4 was used to validate the measurement and structural models as well as to test posited hypotheses.

4.1 Sample profile

A total of 505 questionnaires were valid for analysis. Table 1 shows the distribution of respondents in terms of gender, cohort, and number of mobile banking apps, monthly income and education level.

Table 1 sample profile

Demographic characteristic	Frequency	Percentage
Gender	Female	302
	Male	178
	Non-binary	15
	Prefer not to say	10
Cohort	Gen Z	268
	Millennial	237
Education level	High School	178
	Diploma	49
	Bachelor's Degree	110
	Postgraduate Degree	164
	PhD	4
Monthly income	Less than R10k	163
	R10k -R25k	97
	R26k -R45k	124
	R46 +	121
Number of mobile banking apps	1	234
	2 +	148
	3 +	119
	Missing	4

4.2 Data normality and common method variance

The Kolmogorov–Smirnov (K– S) and Shapiro–Wilk (S–W) tests were conducted to assess the distribution of data. The K–S and S–W results were statistically insignificant ($p > 0.05$), which is an indication that the data was normally distributed (Hair et al., 2019). The Harman's single-factor test was computed to check the possible effect of common method variance. The un-rotated exploratory factor analysis resulted in a total explained variance of 45.3 percent which is below the acceptable cut-off point of 50 percent (Podsakoff et al., 2012). This shows that common method variance was not a problem in this study.

4.3 Measurement model

The measurement model was assessed to test the reliability and validity of scale items. The reliability of the scales was confirmed as the Cronbach's alpha (CA) and composite reliability (CR) were all above the recommended threshold 0.7 (Hair et al. 2020). Convergent validity was also evident as all factor loadings were above the recommended cut-off point of 0.5. The fitness of the measurement model was confirmed with the aid of goodness-of-fit indices: X2 /df = 2.63, CFI= 0.920, TLI = 0.912, RMSEA= 0.048 (Bagozzi & Yi, 2012). Table 2 provide indicators of reliability and convergent validity.

Table 2 Reliability and convergent validity

Constructs	Items	Factor Loadings	CA	CR	AVE
Continuance use intention	CUI1	0.970	0.953	0.970	0.880
	CUI2	0.979			
	CUI3	0.966			
	CUI4	0.831			
Perceived intelligence	PI1	0.727	0.873	0.910	0.720
	PI2	0.884			
	PI3	0.909			
	PI4	0.865			
Perceptions of AI service delivery	PSD1	0.962	0.970	0.980	0.920
	PSD2	0.957			
	PSD3	0.960			
	PSD4	0.952			
Perceived anthropomorphism	PA1	0.871	0.942	0.940	0.770
	PA2	0.838			
	PA3	0.916			
	PA4	0.944			

Trust	PA5	0.825	0.966	0.970	0.900
	TR1	0.966			
	TR2	0.918			
	TR3	0.965			
	TR4	0.942			
Mobile banking app satisfaction	STA1	0.968	0.978	0.950	0.840
	STA2	0.861			
	STA3	0.874			
	STA4	0.961			

Discriminant validity - Fornell and Larcker criteria

The Fornell and Lacker criterion was used to test discriminant validity. Discriminant validity exists when the square root of the average variance of a construct is greater than its correlation with any other construct (Fornell & Larcker, 1981). As shown in Table 3, the results of the analysis indicate the attainment of discriminant validity because the square root of the average variance extracted (AVE) for all constructs is greater than the correlation coefficients (Fornell & Larcker, 1981). Table 3 provides the correlation matrix and discriminant validity indicators.

Table 3 correlation matrix and discriminant validity
Fornell and Larcker criteria

Construct	Perceived intelligence	Perceptions of AI service delivery	Perceived anthropomorphism	Mobile banking app satisfaction	Trust	Continuance use intention
Perceived intelligence	**0.938**					
Perceptions of AI service delivery	0.680**	**0.849**				
Perceived anthropomorphism	0.397**	0.327**	**0.959**			
Mobile banking app satisfaction	0.599**	0.600**	0.418**	**0.949**		
Trust	0.600**	-0.630**	0.375**	-0.625**	**0.877**	
Continuance use intention	0.510**	0.615**	0.313**	06793**	-0.434**	**0.918**

**. Correlation is significant at the 0.01 level (2-tailed). Square root of average variance extracted in bold

4.3 Structural model and hypotheses testing

Prior to hypotheses testing, the fitness of the structural model was confirmed. As recommended by Bagozzi and Yi (2012), the fitness of the structural model was

assessed using goodness-of-fit indices: X2 / df = 2.63, CFI= 0.902, TLI = 0.903, RMSEA =0.050 (Bagozzi &Yi, 2012). The possibility of multi-colinearity was also assessed by computing the tolerance values and variance inflation factors for independent variables. The tolerance values were all below 1 and the variance inflation factor was below 10 which show that multi-colinearity was not an issue in this study
(Hair et al., 2019). Table 4 shows hypotheses testing results.

Table 4 Hypotheses testing results

Path	**Beta**	**T statistics**	**Pvalues**	**Decision on the Hypothesis**	**R-square value**
Perceived intelligence -> trust	0.188	1.933	0.043	Supported	0.544
Perceptions of AI service delivery -> trust	0.171	3.841	0.000	Supported	
Perceived anthropomorphism -> trust	0.007	0.241	0.810	Rejected	
Trust -> Continuance use intention	0.012	0.277	0.606	Rejected	0.123
Moderation effects					
Mobile banking app satisfaction x trust -> Continuance use intention	0.134	2.154	0.031	Accepted	

The results of the path model presented in Table 4 indicate that trust of mobile banking apps is positively influenced by perceived intelligence ($\beta = 0.188$; $p < 0.05$) and perceptions of AI service delivery ($\beta = 3.841$; $p < 0.001$). Perceived anthropomorphism was found to have an insignificant effect on consumers' trust of mobile banking apps ($\beta = 0.007$; $p>0.05$). Perceived intelligence, perceptions of AI service delivery and perceived anthropomorphism managed to explain 54.4 percent variance of consumers' trust of mobile banking apps. Trust of mobile banking apps was found to have an insignificant effect on continuance intention ($\beta = 0.012$; $p>0.05$). Mobile banking app satisfaction was found to moderate the relationship between trust and mobile banking app satisfaction.

5. Discussion of results

Perceptions of AI service delivery emerged as the major factor that positively influences millennials' and Gen Z's trust in AI mobile banking apps. This result is consistent with that reported in previous studies (e.g., Adapa et al., 2020; Miller et al., 2020; Payne et al., 2021). This result suggests that users of AI powered mobile banking apps perceive that the use of such technology has the potential to improve service delivery. This result plays a key role as it supports the acceptance of AI powered mobile banking apps. In support of this result, Adapa et al. (2020) point that AI mobile banking app give consumers more flexibility over how, when and where services are consumed with the ability to play a key role in the co-creation of services.

According to Payne et al. (2021), marketers of banking services may leverage on this result by improving the technical efficiencies, improving security and maintaining higher levels of consumer trust.

Perceived artificial intelligence emerged as the second major factor that influences millennials' and Gen Z's trust in AI mobile banking apps. This result aligns with that reported in previous studies (e.g., Lin et al., 2021; Milana & Ashta, 2021; Payne et al., 2021). This result suggests that users of AI powered mobile banking apps perceive them to possess human-like intelligence and capacities that address their needs. Concurring with this result, Payne et al. (2021) state that the value of AI is linked to how consumers view and feel about other aspects, such as technical readiness, security and trust. A mobile banking app is perceived to be intelligent when it is regarded as safe including the advantage to safeguard users from cyber-attacks.

Perceived anthropomorphism was found to have an insignificant influence on millennials' and Gen Z's trust in AI mobile banking apps. This result concurs with that of previous studies where the act of attributing human characteristics to AI-enabled technologies was found to have its own inherent limitations (e.g., Han, 2021; Lim et al., 2021; Lee & Chen, 2022). Although AI mobile banking apps play a central role in enhancing service delivery, the role of human beings in the provision of banking services remains paramount. In support of this view, Han (2021) note the limitations of anthropomorphic features in providing customised services, building emotional connections and relationship building (Lee & Chen, 2022; Lin et al., 2023). This result underscores the need to adopt a blended approach that utilises AI mobile banking apps supported by physical human interface.

Trust was found to have an insignificant influence on mobile banking app continuance use intention. This result which was also reported in previous studies (Sankaran & Chakraborty, 2021; Jacovi et al., 2021) suggests that millennials' and Gen Z's have low level of trust in AI mobile banking apps. A study by Sankaran and Chakraborty (2021) reports that consumers expect apps to act in their best interest. Low levels of trust were found to trigger misuse or neglect of technology. Thus, fostering trust is crucial for the adoption and continuous use of mobile banking applications. Lastly, mobile banking app satisfaction was found to moderate the relationship between trust and continuance use intention. This result suggests that customer satisfaction remains a critical goal of every market exchange. Enhancing customer satisfaction should be the desired outcome for AI mobile banking apps

6. Theoretical implications

This study contributes to literature by proposing a model that explains factors that influence the continued use of mobile banking apps among Millennials and Gen Z consumers. Drawing from the propositions of the UTAUT2, the proposed model managed to explain a respectable variance in trust of AI mobile banking apps of 54 percent. As far as we can establish, this one of the few studies in South Africa to examine the influence of the relationship between artificial intelligence mobile banking app attributes, trust, continuance use intention and the moderating role of customer satisfaction.

The proposed model incorporates novel constructs such as perceived artificial intelligence, AI service delivery, anthropomorphism, and satisfaction in mobile banking. By bridging the research gap in existing literature, this study significantly advances knowledge in mobile banking innovation, retail bank marketing, and consumer behaviour. The insights gained are particularly valuable in an era of heightened market competition, providing a robust foundation for future research and practical applications in technology adoption and user retention strategies..

7. Managerial implications

Perceptions of AI service delivery and perceived artificial intelligence emerged as the major factors that influence Millennials' and Gen Z's trust of AI mobile banking apps. Thus, when formulating value propositions to market AI mobile banking apps, marketers of banking services may need to accentuate their ability to improve service delivery as well as their unique problem solving capabilities.

This study noted the limitations of humanised anthropomorphism as a tool to enhance consumer trust. This result challenges the banking sector in South Africa to adopt a blended approach that incorporates AI mobile banking apps and a human interface in order to address the diverse needs of customers. This will go a long way in differentiating mobile banking services as the use of mobile banking apps has been blamed for standardising banking services (Chan & Lee, 2023). To enhance the potency of AI mobile banking apps, there is a need to develop AI mobile banking apps that provide a distinctive and exciting experience with higher levels of innovation and personalisation that captures the interest of Millennials and Gen Z consumers.

The results of this study also underscored the need to formulate strategies to build consumer trust in the use of AI mobile banking apps. In emerging markets such as South Africa with low levels of digital literacy, there is a need to invest in roust customer education programs in order to empower them to use AI mobile banking apps. To address the higher levels of perceived risk, users of AI mobile banking apps also need to be educated on strategies to deal with the growing menace of cyber-crime.

8. Limitations and further research

This study has some limitations worth noting. Firstly, focusing on Millennials and Gen Z restricts the findings' generalisability to other age groups. Future research should include broader demographics for wider applicability. Secondly, reliance solely on surveys limits insights. Incorporating mixed methods would provide a more comprehensive understanding of mobile banking app usage. Thirdly, the cross-sectional design precludes understanding changes over time. Longitudinal studies are recommended to track users' behavioural change over time. Lastly, social desirability bias might have influenced responses, affecting the findings' authenticity. Mitigating this bias through the use of more objective methods such as observations is recommended.

9. Conclusion

This study examines the relationship between artificial intelligence mobile banking app attributes, trust, continuance use intention and the moderating role of customer satisfaction. Perceptions of AI service delivery and perceived artificial intelligence emerged as the major factors that influence Millennials' and Gen Z's trust of AI mobile banking apps. Thus, when formulating value propositions to market AI mobile banking apps, marketers of banking services may need to accentuate their ability to improve service delivery as well as their unique problem solving capabilities. This study noted the limitations of humanised anthropomorphism as a tool to enhance consumer trust. To enhance the potency of AI mobile banking apps, there is a need to develop AI mobile banking apps that provide a distinctive and exciting experience with higher levels of innovation and personalisation that captures the interest of Millennials and Gen Z consumers. In emerging markets such as South Africa with low levels of digital literacy, there is a need to invest in roust customer education programs in order to empower them to use AI mobile banking apps. To address the higher levels of perceived risk, users of AI mobile banking apps also need to be educated on strategies to deal with the growing menace of cyber-crime.

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INSTITUTIONAL FACTORS AFFECTING PUBLIC TRUST IN GOVERNMENT DIGITAL SERVICES IN DEVELOPING COUNTRIES

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Abstract

Governments in developing countries are grappling with poor service delivery. The slow economic growth has exacerbated these challenges. With the hope that government digital services may augment the government capacity to solve the service delivery challenges, many governments are resorting to providing the digital services to the public. However, the return on such investments is low, mainly because the uptake of the services in developing countries is relatively low. Institutional factors play a pivotal role in building public trust in government digital services. Therefore, this study aimed to answer the question 'What are the institutional factors affecting public trust in government digital services in the developing countries?'. The study employed exploratory methodology using a single case study of Western Cape Education Online Admission System with an inductive approach to theory development. The system was deployed by the Western Cape Department of Education in South Africa to place learners in public schools. We used purposive and snowball sampling techniques to select participants. We collected the data through the semi-structured interviews from parents and admission clerks in the public schools in the province. The study found that public service quality, public systems integrity, responsiveness, transparency and accountability are the institutional factors affecting public trust in government digital services in developing countries: This study made a practical contribution by providing governments with research-based findings that can be used as input into the legislations and institutional policies aimed at improving public trust in government digital services. This study makes a theoretical contribution to the ongoing discourse on public trust to accelerate the digital transformation of the public services, aimed at addressing poor service delivery and low uptake of the digital services in the developing countries.

Keywords: Public trust, digital services, government, developing countries, South Africa

Introduction

Public trust is the confidence citizens have in public institutions that the institutions will use the public resources to deliver public value. Public trust has the potential to strengthen the relationship between citizens and the government (Beshi & Kaur, 2020). Over the past few years, public trust in the developing countries has declined substantially due to corruption, poor service delivery, and inefficiency of government (Janssen et al., 2018). In most cases, the decline of public trust manifests in poor voter turnout, lack of citizen participation and engagement in government affairs and persistent service delivery protests in countries with functional democracy. The public trust decline is also evident in the citizens engagement with the government digital services; in the main the digital services have failed to address the needs and solve the problems of the public (Kumar et al., 2021; Lee-Geiller & Lee, 2019). We define government digital services as the Information and Communication Technology (ICT) enabled public services that are delivered over the Internet and accessed through digital platforms such as websites, portals and mobile applications(Mergel, 2019).

The digital economy has transformed the way people interact, work and do business. This has forced private businesses and government to transform the traditional services into digital services to accelerate efficiency, effectiveness and relevance (Agyei-Ababio et al., 2023). The digital services are considered as a powerful tool to improve government efficiency, effectiveness, transparency and accountability (Janssen et al., 2021). Consequently, there is a plethora of studies on the relationship between public trust in government digital services and adoption thereof (Janssen et al., 2021). However, most of these studies are from technological and adoption perspectives. Granted, these studies are critical in advancing knowledge in the relationship between public trust and adoption of governmental digital services. However, there remains a need for further research to examine how institutional arrangements, rules and socio-political environment influence public trust in government digital services in the developing countries. Developing countries are gradually transitioning into the digital interconnected space, albeit at a slow pace, underscoring the importance of this study to bridge the knowledge gap.

Despite the declining public trust in government digital services, governments continue to accelerate efforts to provide digital services, evidenced by a growing investment in the ICT infrastructure projects aimed at delivering quality and equitable digital services to the public(Nurdin, 2021). However, the return on such investments is low primarily because the adoption in developing countries remains low and inconsistent (Mayedwa, 2023; Pérez-Morote et al., 2020). As the digital services are inherently impersonal, public trust in them becomes increasingly important to encourage adoption (Abdulkareem & Mohd Ramli, 2022).

This study examines institutional factors affecting public trust in government digital services in the developing countries. This study sought to respond to the question:

What are the institutional factors affecting public trust in government digital services in the developing countries?

The study employed exploratory methodology using a single case study of Western Cape Education Department (WCED) online admission system, in South Africa with an inductive approach to theory development. WCED used the system to place learners in primary school and in high schools in the province. South Africa is an ideal case for the study because although it is a developing country, it has a relatively hight adoption of digital technologies (Donati, 2023).

We used purposive and snowball sampling techniques to select participants. We collected the data through the semi-structured interviews from parents and admission clerks in the Western Cape public schools. This study makes a theoretical contribution to the ongoing discourse on public trust in government digital services, focusing on the role played by the institutional environment, to accelerate the digital transformation of the public services in developing countries. Furthermore, this study intended to make a practical contribution by providing governments with research-based findings that may be used as an input in the institutional policies and strategies aimed at enhancing public trust in government digital services which may assist in improving uptake of the digital services.

Literature Review

Government digital services in the developing countries

Government digital services are ICT-enabled tools to transform traditional government services into online government services. Digital services are delivered through online platforms such as websites, web-portal and mobile devices (Mergel, 2019). Increasingly, the public administration landscape is characterised by the digitalisation of the manual government processes and services to improve service delivery efficiency and effectiveness, accountability, transparency and responsiveness of government (Agostino et al., 2022).

As digital access to government services is now recognized as a human right in the digital era, governments must ensure that all citizens have quality and equitable access to these services (Ntika & Chigona, 2024). Globally, digitalization and effective employment of ICT play a pivotal role in connecting people, businesses and government in real time to drive economic and human development, as well as effective governance (Jamil, 2021). Countries that lag in the digitalization of public services face the challenge of digital divide which perpetuates the inequalities. Hence, the 2030 Sustainable Development Goals (SDG) of the United Nations demand the development of a vibrant ICT sector, the connected and inclusive information society (Ntika & Chigona, 2024).

Building a safe, conducive and transparent ICT regulatory environment bolsters public trust in, and credibility of, government digital service in the developing countries (Tan & Taeihagh, 2020). Despite the conducive regulatory environment and opportunities ushered in by the rapid development of ICT and digital services, the developing countries have not been able to benefit from, and participated fully, in the digital economy. This is due to a myriad of challenges such as inadequate ICT infrastructure, poor levels of education and lack of digital skills (Khumalo, 2022). The situation is dire in the rural communities where government operations are characterised by outdated information on government websites, slow email transmission, ineffective communication platforms, all of which stunt the service delivery and erode public trust in government digital services (Fashoro & Barnard, 2021; Khumalo, 2022; Mahwai et al., 2023; Terrance, 2023). In Addition, the government introduced the Protection of Private Information (POPI) Act as a South African law that regulates the handling of the citizens' private information to ensure people's right to privacy (Mbonye, 2024). One of the main tenets of the POPI Act is that it prohibits institutions from sharing customers information with other institutions or individuals.

Government digital services, as the extension of public services, are meant to contribute to addressing the challenges government face by improving efficiency and effectiveness of the public services. However, rather than solving these issues, they have often carried over existing

problems, leading some members of society to perceive them as creating more difficulties than solutions (Lee-Geiller & Lee, 2019).

Public Trust

Public trust is the confidence that government will use the public resources to deliver public goods and services that respond to the needs of the citizens (Abdulkareem & Mohd Ramli, 2022). The decline of public trust in government has been a cause for concern for researchers, evidence by the plethora of research on this subject. The research on public trust in government digital services has become increasingly important in the digital age as lack of public trust negatively affects the adoption of government digital services (Dmour, 2021). When the public trusts government digital services, they become willing to be exposed to the potential risks of the digital space in exchange of expected benefits to be derived from the exchange (Barbosa & Mota, 2022).

The impersonal nature of the digital services necessitates the implementation of strategies and awareness campaigns aimed at building public trust in government digital services to ensure adoption and continuous usage of these services (Belanche et al., 2014). Public trust in government and in technology drives the adoption and continuous usage of digital services (Alzahrani et al., 2017). However, the degree of trust in the digital service is directly linked to the degree of trust in institution that develop and implement the digital service, hence why building institutional trust must precede building the digital service trust (Ejdys, 2018).

When public trust fails, citizens lose confidence in government's ability to deliver quality and equitable public services, resulting in citizens disengagement and implementation of digital services that that fail to meet the needs and solve the problems of the citizens (Festenstein, 2020; Kumar et al., 2021). In which case, lawlessness, protests, become the order of the day (Kumar et al., 2021).

Factors affecting public trust in government digital services

The gap between public expectation and government digital services affect public trust in government digital services (Alkraiji & Ameen, 2022; Lee-Geiller & Lee, 2019). Therefore, this study is necessary to investigate and explain institutional factors affecting public trust in government digital services in developing countries.

Good Governance

Good governance affects public trust in digital services. Good governance practises include accountability, transparency, inclusivity, equitability, responsiveness and human rights (Jameel et al., 2019; Seyedsayamdost & Vanderwal, 2020). The concept of good governance was launched by the World Bank as an intervention to address the perpetual underdevelopment of some states, despite having adopted neoliberal adjustment policies (Mazhar & Goraya, 2020).

Institutions that uphold good governance principles in action are more likely to be trusted by the public than those that do not. There is a likelihood of public trust in government institutions and in digital services where government actively holds official accountable for misconduct or negligence in delivering essential services to citizens. Key to accountability is ensuring that actions taken by government are visible to the public (Hartanto & Siregar, 2021). Poor implementation of good governance erodes public trust in government's ability to deliver public value (Kamal & Batool, 2021).

Quality of information and digital services

Quality of information and digital services refers to the accuracy, reliability, relevance, and completeness of the service. Furthermore, the design of the service and the ease of use enhance information and digital service quality perception (Aftab & Myeong, 2022). Key to the provision of quality information and digital services is the ICT infrastructure which enables government to deploy effective and efficient digital services, and access to digital skills which enable the citizens to engage with government online (Afieroho et al., 2023). Although developing countries suffer from poor ICT infrastructure, some governments have achieved commendable successes despite 'doing more for less'. For example the South African government has been increasingly leveraging the ICT infrastructure to provide public with cost-effective channels of engagement such as SMS, emails, voice calls, and social media (Bouzguenda et al., 2019). The provision of multiple channels of user engagement is critical in ensuring inclusive participation and real-time dissemination of public information (Chan et al., 2021). While the government aims to offer high-quality public information and digital services, rural government operations are marked by slow internet connectivity, outdated website content, delayed email transmission, and ineffective digital services. These challenges create a negative public perception of government digital services, resulting in the erosion of public trust (Nokele & Mukonza, 2021). Consequently, a significant number of citizens feel that government digital services bring more problems than solutions (Mesa, 2023).

To overcome these challenges, government needs to prioritise the rural development by developing targeted policies, providing sufficient budget to address the ICT connectivity challenges, and providing access to digital skills. These interventions may unlock rural digital economy and enhance public trust in government's digital services(Seadira, 2019).

Inclusive Governance

Inclusive governance is the inclusion of government services' users, including marginalized and minority groups, in the planning, design and deployment of government digital services. Inclusive governance is the decentralization of governance processes whereby the citizens' input form part of the decision-making and management of government affairs (Annahar et al., 2023). In South Africa, inclusive governance is not widely enforced policy stance despite its potential to address the low adoption of government digital services in the country. The common practice is the 'top-down' approach' whereby the government decides on the services and processes that must be automated without public input. This practice is fundamentally flawed, as it imposes the preferences of government officials and politicians onto the citizens, resulting in most of government digital initiatives failing to meet their objectives in the developing countries (Gcora & Chigona, 2019).

Research Methodology

We adopted a qualitative research design and a single case study of WCED online admission system with an inductive approach to theory development. The choice of the case study was premised on its widespread use and relevance to this study.

Data Collection

We adopted purposive and snowballing sampling techniques to select diverse participants and to collect rich and relevant data for this study. We collected data through the semi-structured interviews from 20 participants. The respondents included parents and admission clerks as

depicted in Figure 1. Admission Clerks are administrative professionals who handle student applications, enrolment procedures, and related documentation in educational institutions. They are essential in facilitating a seamless admissions process while keeping accurate institutional records. To maintain confidentiality, we used pseudonyms for the respondents; We coded parents and admission clerks with the prefix "Par" and Admission clerks as "Admin_clerk" respectively.

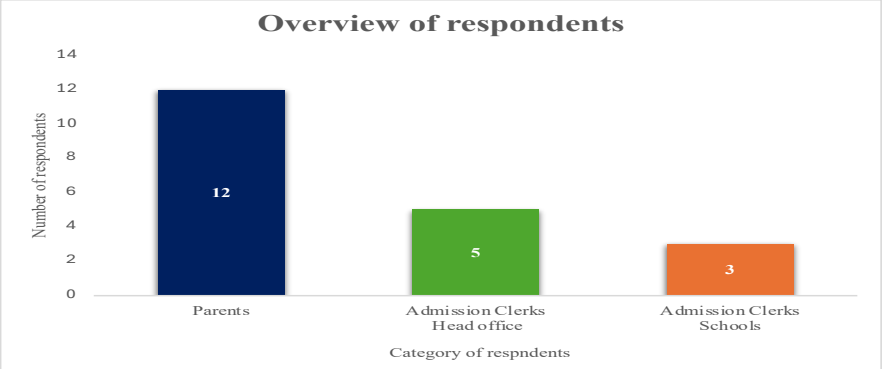


Figure 1:Research sample

Data Coding and Analysis

We adopted a manual thematic analysis technique guided by (Braun & Clarke, 2006) six phases: i) Familiarization with the data, ii) Generating initial codes, iii) Searching for themes, iv) Reviewing themes, v) Defining and naming themes, vi) Producing the report. The inductive coding was employed through the identification of emerging themes and patterns from the data we collected. The manual process involved transcribing the interviews verbatim and reading the transcripts multiple times to identify recurring themes and then categorising the responses into predefined codes.

We ensured data validity and reliability through data triangulation by cross-checking specific information within and across each category of participants. For instance, we compared the responses from admission clerks at the head office with those from admission clerks at schools. Additionally, we cross-checked certain data between parents and admission clerks' responses.

Ethical considerations

We obtained ethical clearance from the University of Cape Town and WCED. Individual consents were obtained from participants prior to any data collection. To maintain confidentiality, we used pseudonyms for the respondents.

Case Study Description

South Africa is a middle-income developing country with a young democracy that was attained in 1994 (Swilling et al., 2016). South Africa is made up of nine provinces, each responsible for managing and administering education based on the provincial needs albeit operating within the national framework. Western Cape Province is one of the nine provinces in South Africa. It plays a prominent role in South Africa due to the population growth rate of 12% which surpasses the national growth, and the significant contribution of 14% to the national GDP (Partridge, 2021).

Education in South Africa is the responsibility of the department of higher education (DHE) and the department of basic education (DBE). DBE is responsible for the education of Grade R to Grade 12, and adult literacy programmes, while DHE is responsible for university and other

post-school education and training (Department of Basic Education, 2024). In South Africa, basic education is split into primary school (Grade 1 to 7) and High School (Grade 8 - 12). After completing the primary school, learners must apply to a High School wherein admissions are based on grades obtained in primary schools.

WCED operates within the frameworks set by the national department of basic education (DBE) in terms of policy and curriculum guideline. However, it has the anatomy to manage and administer education according to the needs of the provincial department (WCED Annual Report, 2022/23). The western Cape province has a total of 1,754 schools, 83% of which are public schools. (Statista, 2022)

We selected WCED Online Admissions system as the single case study for this study. WCED Online Admissions is an online system that is used for applications and registration of Grade 1, the beginning of primary school, and Grade 8, the begging of high school in public schools in the Western Cape province, in South Africa. WCED online admissions system was piloted in 2019 and has since been implemented in all public schools in the province. Although the implementation of the online learner admission system, such as the WCED online admissions system, has made the learner enrolment process efficient and transparent, it has also highlighted the varying levels of digital skills in the province. Parents who are digitally literate could apply in the comfort of their own homes, while those lacking digital skills had to take the long route of manual applications (Shabangu, 2024; Sibanda & Beckmann, 2021). To close the digital gap, the department catered for parents who could not use the system by operating a functional call centre and walk-in centre at the WCED head office, to ensured that parents have a complete control over their digital profiles.

The admission clerk confirmed that “those who cannot use the system, we give them our call centre line and our emails, so that they can call us or email us anytime to track their application or they can come to the department or to the nearest district office to go and track the application”

South Africa is one of the technologically advanced countries in the African continent, with relatively strong mobile infrastructure and more than 50% internet users, as a percentage of the population (Donati, 2023). Despite South Africa's influence in the African continent, government has been struggling to improve the socio-economic conditions of its citizens, as hoped for in the dawn of democracy. Consequently, the country is characterised by high levels of unemployment, poor education outcomes and heavy dependence on government for basic services (Pasara & Garidzirai, 2020; Swilling et al., 2016). In addition, the digital gap further exacerbates the inequality levels in the country (Manda & Backhouse, 2017).

Findings and Discussion

The aim of the study was to examine and explain institutional factors affecting public trust in government digital services in the developing countries. We identified the following themes:

- Public service quality
- Public systems integrity
- Good governance practises such as responsiveness, accountability and transparency
- Inclusive governance

The themes are discussed in the subsequent sub-sections.

Public service quality

Although government is not in the business of designing services to obtain competitive advantage, government institutions compete for service excellence and provision of citizen-centred services. The findings show that people trusted the WCED Online Admissions system more than digital services provided by other provincial governments in South Africa due to service excellence.

"We tried in the Eastern Cape government, it went on for months, where we kept going back and forth. They kept sending us from pillar to post. We came to the Western Cape, they could pick up what was wrong, and they fixed things for us within a week, so I think somehow because of my experience with the Western Cape Government, and that was not the only problem that made me trust Western Cape Government Systems more" (Par_4).

Although the government aims to deliver high-quality public services, rural government offices face inefficiencies due to inadequate ICT infrastructure and limited digital expertise among employees. In contrast, urban government offices experience fewer such challenges, as these areas attract both local and foreign investments, attracting highly skilled professionals (Nokele & Mukonza, 2021).

Public Systems Integrity

Trust in government can be enhanced through the legitimacy of government decisions and public systems' integrity (Modise & Modise, 2023). The public systems integrity can be ensured by including legislations and policies aimed at reducing unethical behaviour, theft and fraud which may lead to harm to the public (Moon et al., 2024).

The findings show a positive relationship between the integrity of public systems and public trust. The public believed that the government did not sell their private data for profit maximization. The implementation of the POPI Act assured users of the government digital services that government systems are trustworthy.

“… I wanted to apply for a post in education. So, I entered that application for jobs and then had to resubmit my information as if they did not know me.... So, my conclusion was that the information you put there is not sharable in other spaces” (Par_1).

Other respondents believed that their private information was safe, and it could not be manipulated as there was username and password which were only accessible to the online account holder.

The goal of the public systems integrity is to defend the public interest by ensuring that human rights are maintained, and the public sector officers reflects integrity in the performance of everyday duties (Sajari et al., 2023).

Good Governance

Institutions that demonstrate good governance are more likely to gain public trust than those that fail to do so. Confidence in government institutions and digital services are strengthened when officials are held accountable for misconduct or service failures. Transparency, accountability and responsiveness play a vital role in enhancing public trust and creating public value. (Kamal & Batool, 2021; Hartanto & Siregar, 2021)

The findings confirm that there is a positive relationship between public trust and good governance. The respondents noted that transparency, responsiveness, and accountability affected their trust in WCED Online Admission system. The respondents who received timely updates on their application status and other relevant communications were satisfied with the WCED Online Admissions system. However, some users found the system unresponsive, leading them to abandon it and opt for manual applications instead. Below are the varying accounts of the participants on the responsive, accountability and transparency of WCED Online Admissions system.

Responsiveness

Effective response requires the availability of multiple channels of citizen participation and an efficient feedback loop.

"The system was responsive, especially when they contacted me about the error that I had done, and they fixed it" (Par_10).

Although a significant number of respondents applauded the system for being responsive, there were a few users that were dissatisfied with level of responsiveness from the system. The dissatisfaction was more prevalent with users who submitted late applications due to mid-year relocations.

"I applied late and did everything while I was still in Kwazulu-Natal. The system kept saying that the status was pending and then I came to Cape Town in January, still there was no response on the system" (Par_3).

"I ended up ditching the online application and physically going to the school. To my surprise, my child got to school without the system indicating that my child has been accepted" (Par_3).

Responsiveness to the public queries is key to building public trust in government digital services. Responsiveness can be effected through digital and traditional mechanisms to ensure inclusivity (Jameel et al., 2019; Seyedsayamdost & Vanderwal, 2020)

Accountability and Transparency

Accountability and transparency require government to make a concerted effort to get the public involved in or aware of government decisions. A considerable number of parents felt that the WCED lacked transparency about the criteria they use to place learners in schools.

"I think the main issue for me is that the Western Cape government cannot tell me the criteria used by schools to accept our kids" (Par_12).

"They do not give the criteria, so the parents just apply and apply, maybe the child does not even meet the criteria in all those schools, the learners end up not getting accepted in all those schools" (Admin_Clerk 7).

The department of education was also criticized for lack of accountability:

"No one wanted to be responsible for placing my son in a school I did not apply to" (Par_4).

Instead, parents were not given unsatisfactory answers at the point of service, as a result, some parents ended up ditching the online application and opted for manual application process.

Trust in government institutions and digital services strengthens when officials are held accountable for misconduct or service delivery failures. Transparency is essential for

accountability, ensuring that government actions remain visible to the public (Jameel et al., 2019; Seyedsayamdost & Vanderwal, 2020)

Inclusive governance

A significant number of respondents indicated that if they were involved in the planning and design of the digital service, they would have trusted it even more.

“If the public was involved in the design and creation of this system or consulted during the creation phase, I am sure it would have helped. You know, you also feel like you are part of it. It would also create that interest, and we would have that trust on the system” (Par_12).

Inclusive governance seeks to ensure that the decisions made, and services delivered, are based on the public inputs and needs. This would contribute towards the public buy-in and would translate into high uptake of the system. Therefore, inclusive governance has been recognised as part of the solution to solve persistent challenges with service delivery, as it creates a shared space for collaboration and engagement (Bouzguenda et al., 2019).

It is, therefore, recommended that governments should adopt inclusive governance as a design principle to ensure that government does not take decision without the input of the citizens as direct users of government digital services. Inclusive governance would empower citizens and give them confidence that government digital services are designed with them and not for them. Citizens, as users of government digital services, may help to improve the quality of the public services and identify problems with the existing digital services, thereby improving trust in Government digital services (Ntika & Chigona, 2024).

The provision of multiple channels of user engagement is pivotal to achieving inclusivity of all social groups in government affairs. It ensures that government meet people where they are, without restricting them to one communication mechanism which may exclude some members of the society (Chan et al., 2021). WCED provided multiple channels of engagement to improve inclusion and trust in government digital services. Such channels included cell phones, email, website, walk-in and call centres. This indicated the government's commitment to responsiveness.

“We have a query box, we always check every day that it must be up to date, that we must answer all the queries and questions from the parents” (Admin_Clerk 4).

“We add both the email and the cell phone number; we would use both methods of communication” (Admin_Clerk 1).

In addition, the department has a functional call and walk in centres which are accessible to the public.

"We have a call centre; parents call us” (Admin_Clerk_2).

“The walk-in centre is where we capture the applications ourselves, on behalf of the parents” (Admin_Clerk_2).

Citizens, as users of public services, may help to improve the quality and quantity of public services, and identify problems with the existing digital services thereby improving user experience and satisfaction(Ma & Wu, 2020).

Conclusion

The aim of this study was to examine and explain institutional factors affecting public trust in government digital services in the developing countries. The findings show that institutional factors, such as public service quality, public systems integrity, good governance and inclusive governance, have a positive relationship with public trust in government digital services. In addition, POPI Act and ethical code of conduct legitimises government institutions, resulting in enhanced public trust in government digital services and public value.

However, it was noted that in some cases, public perceptions of trust were based on limited understanding of cyberspace. For instance, some users assume that password-protected systems are inherently secure. This aligns with the findings of Magunje and Chigona (2024).

Weak enforcement of governance standards can undermine public trust by compromising government system's quality and integrity. To address the current challenges, governments must enforce compliance with good governance standards, provide digital skills to the citizens so that they can navigate the digital space confidently. In addition, government needs to invest in awareness campaigns aimed at providing in-depth understanding of how institutional factors affect public trust in government digital services if the objective of increasing uptake of the digital services and closing the digital gap in the developing countries are to be achieved.

Limitations and future study recommendations

One of the limitations of the study was that it used a single case study from a single institution and a single country. Future studies may consider multiple case studies from different government institutions across different developing countries. This would provide a holistic view of the factors affecting public trust in government digital services in developing countries. A future study may also consider a comparative study using quantitative methods. The future study recommendations would ensure increased validity and reliability of the findings.

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JUSTIFICATIONS FOR RE-SHARING NON-CONSENSUAL PORNOGRAPHY ON SOCIAL MEDIA PLATFORMS

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Abstract

The progression of social media has afforded the creation and sharing of content to the masses. Benefits but also new social ills, such as the sharing of non-consensual pornography, have been entangled on social media platforms. Efforts by the South African government in 2019 saw an amendment to the Films and Publications Act (No. 65 of 1996) to make it illegal to share sexually explicit photos and/or videos of others without their consent. The move has been futile. The main objective of the current study was to investigate the justifications used by social media users from varying platforms for re-sharing non-consensual pornography. Using the neutralisation theory as a lens, this interpretive study used a qualitative approach, employing semi-structured interviews with real-life vignettes as the stimulus. Findings revealed that social media users rely on neutralisation techniques, such as denial of the victim, denial of responsibility, and appeal to higher loyalties to justify the behaviour. The study elucidated the complex phenomenon of re-sharing and its harm to individuals regardless of gender.

Keywords: cyberbullying, cybercrimes, Film and Publications Act, neutralisations, non-consensual pornography, social media.

Introduction

Mobile internet usage in South Africa has significantly increased, reaching over 100 million mobile connections by 2023, with over 25 million users also subscribing to social media platforms (SMPs) (Kemp, 2023). This increased internet access exacerbates the problem of non-consensual pornography (NCP). Platforms, such as **X** (formerly Twitter) and Facebook, also known as Meta, continue to be used as channels for disseminating explicit content without the consent of those depicted. Although it is illegal to share NCP in some countries, including South Africa, distribution and re-sharing of NCP continues (Mahlatsi, 2020). NCP occurs when an individual distributes sexually explicit images of another individual without the consent of at least one person depicted in the image (Falduti & Tessaris, 2023; Musoni, 2019). Reasons behind the distribution of sexually explicit videos and images vary from failed relationships seeking to humiliate, harass, and punish former partners (Branch et al., 2017; Soomro & Hussain, 2019) to cases where perpetrators, not romantically or socially acquainted, gain access to and distribute intimate images through hacking (Clevenger & Navarro, 2021; Franks, 2015). In 2020, the United Kingdom (UK) Revenge Porn Helpline, a government service for reporting revenge porn, reported approximately 9 000 NCP cases through its helpline, with around 40% reported by women (see Ward, 2020). While statistical data on NCP cases in South Africa is limited, there have been numerous instances of NCP involving prominent figures, including high-profile politicians, on social media platforms.

Sharing of NCP has adverse consequences on its victims and their families, affecting them both reputationally and psychologically. Victims have reported losing their employment or being forced to leave their work after photographs were shared or fearing that those images might be published (Cannon, 2015; Huber, 2023). While many studies have focused on the effects of NCP, there is limited literature on why the perpetrators commit such an action. The perpetuation of sexually related violence and cyber aggression (including NCP) often correlates with moral disengagement (Martínez-Bacaicoa et al., 2024; Page & Pina, 2018). Moral norms can be selectively mutated to lessen cognitive dissonance while one is participating in unethical behaviour (Pina et al., 2021). Justification takes two forms – subjective or objective. Studying justifications has the potential to assist in policy and legal reforms, and to engage in intervention campaigns to minimise the scourge of NCP. The question asked in the study therefore was:

How do social media users justify the re-sharing of non-consensual pornography?

Justifications for continuing to re-share NCP by individuals unfamiliar with the victim remain unexplored. We employed an interpretive qualitative approach to investigate the phenomenon from the view and meaning participants attach to it.

The study collected primary and secondary data to triangulate and decrease researcher biases. We collected primary data using semi-structured interviews with 12 participants. The respondents were given real-life vignettes as a stimulus. Secondary data was also used in the form of **X** comments, posts, and reposts. These were collected on two identified trending Twitter cases of non-consensual pornography. We employed the neutralisation theory to guide the exploration of justifications used by social media users.

In South Africa, easy access to broadband infrastructure has led to significant but steady economic growth per household. Factors, such as the availability of broadband infrastructure, electricity, and smartphones by most South Africans, have been proved significant indicators

of good quality of life for citizens (Mhlanga & Beneke, 2021). These factors make South Africa an ideal case for studying the phenomenon.

There is a shortage of literature on NCP, and the current study therefore contributes to the existing literature on this form of cyberbullying by shedding light on how social media users use neutralisations to partake in delinquent behaviour. Exploring these neutralisations helps to understand the harmful nature of re-sharing NCP inflicts on the victims. This study further contributes to the literature on digital ethics, cyberbullying, cybercrimes, and gender studies with empirical evidence and critical insights.

Literature review

This paper reviews the literature on NCP, its prevalence, its influence on the victims, and the role of social media. The section closes with a discussion on the law on NCP in South Africa.

Pornography defined

With no universally accepted definition of pornography, numerous attempts have emerged from various scholars. Some have focused on financial gains from the distribution of sexually explicit material (see Huer, 1987). Others focus on the intention to arouse sexual interest using sexually explicit material (see Carroll et al., 2017). A definition we found to be encompassing – and which was therefore adopted for the current study – describes pornography as sexually explicit images or videos that show sexual activities, such as penetration and masturbation (see Campbell & Kohut, 2017).

Sexting is a common concept born out of pornography. Sexting is an exchange of nudes and sexual photographs through a text message, social networking service, or e-mail, usually in the context of a romantic relationship (Halder & Jaishankar, 2014). Partners, usually in long-distance relationships, typically use this to maintain a level of intimacy and connection (Dodaj & Sesar, 2020). Sexting is sometimes a vehicle through which young people gain the acceptance and attention of a potential partner (Agnew, 2021; Lippman & Campbell, 2014).

Revenge pornography versus consensual pornography

The term ‘revenge pornography’ is commonly used to describe the dissemination of sexually explicit images of another person without their consent. When the relationship ends, one of the partners may distribute images of their ex-lover out of revenge and spite (Soomro & Hussain, 2019). The images are often acquired through sexting and, therefore, consensually created and shared with the partner. The term 'revenge pornography' usually suggests that the person distributing the images seeks revenge as a response to perceived wrongdoing by the victim, thereby sharing explicit images and videos of the victim. The term ‘non-consensual pornography’ (NCP) refers to images and videos obtained through voyeurism, sexting, and hacking (Franks, 2017). The distribution of sexually explicit images without consent has been investigated under various terms (revenge pornography, image based sexual abuse [IBSA], technology facilitated sexual violence [TFSV]). Some of these terms capture the creation and distribution of these pornographic images, while others broadly include other behaviours, such as harassment. The term NCP is however preferred to the other terms.

Subjective justifications versus objective justifications

Subjective justifications are anchored in explanatory reasons for when mistakes affect what a person believes in the way they act. Objective justifications focus on "guiding reasons" and could easily be discriminatory (Gardner, 1996:1). For example, an individual can re-share pornographic material in a moment of excitement. Once the risks are pointed out with that action, they must however provide personal views and opinions or feelings on why the act was committed. An objective justification would include a person strictly using the guidance of rules or practices within their community to re-share or not to re-share material they have received in their inbox.

Motivations for distributing non-consensual pornography online

A study by Hall and Hearn (2019) explored an online website, MyEx.Com, which posts NCP. The study focused on male perpetrators, and texts accompanying the sexually explicit images were analysed. The study found that men believed that the victims deserved to be exposed for varied reasons. The main reason men shared sexually explicit photos of their exes was that they believed the partner was cheating on them. Posting their images online was therefore a way of gaining their power back. Similar findings appear in a study by Lee and Downing (2019), which explored the perception of individuals engaging in sending NCP to friends. The results indicated that the motivation behind sharing of NCP was either to bully or to show off, or out of revenge. A similar study by Mandau (2020) explored the experiences of young adults viewing and sharing NCP, and the way gender interactions influence these experiences.

The results showed that, amongst males, sharing and viewing of NCP could be a means of climbing up the masculine ladder (Mandau, 2020). In this manner, they are ranked as superior in society to other males. Patriarchy plays a major role in enabling these acts of bravery towards other males sharing and viewing NCP (Mckinlay & Lavis, 2020). These males would further justify that society expects of them and supports them to perform in the manner they do (Mshweshwe, 2020).

Although these studies explored the motivations for sharing NCP, the justifications for re-sharing NCP remain unexplored. Previous studies exploring the justifications for sharing NCP merely focused on revenge pornography shared by a male with the intent to cause harm to the ex-partner.

Social media platforms

The inception dates of social media (SM) go back to 1996, with Six Degrees being the first to launch globally, and MySpace, Facebook, and many others following years later. Over the years, there have been constant improvements in SM platforms to keep up with the internet (Cataldo et al. 2022). With all these developments, there is however still an ongoing debate on the actual inception of the term 'social media' and its functional and theoretical definition (Carr & Hayes, 2015). To debunk the debates a theory exists that the terms 'social media' and 'commercial platforms' to engage on both personal and business levels were realised in 1994 in Tokyo, on a platform called Matisse (Aichner et al. 2021).

The growth of social media has been characterised by both challenges and benefits. The challenges have ranged from their lack of governance in various sectors (Obar & Wildman, 2015) to the growth of fake news (Hakak et al. 2020) and the lack of regulation of sharing

sexually explicit material via the internet. Some individuals have benefitted highly from using SM for intimacy and communication (Thorhauge, Demant, & Krogager, 2020).

Currently, South Africa has over 25 million active social media users. This represents 43% of the total population (Kemp, 2023). Facebook, Twitter and WhatsApp are the most used platforms by South Africans. The usage of SM has a plethora of benefits. Platforms, such as WhatsApp, have been used in education to bridge the communication gap among students, and between students and lecturers leading to positive learning outcomes (Mpungose, 2020). Social media have also been used in healthcare as a medium and vehicle of communication and outreach (Mwaura, Carter, & Kubheka, 2020).

The law on non-consensual pornography in South Africa

In South Africa, two overlapping laws criminalise NCP: the Cybercrimes Crimes Act (CCA) (No. 19 of 2020) and the Films and Publications Amendment Act (No. 65 of 2019), (Van der Linde, 2021).

Table 1 describes the two acts.

Table 1: Descriptions of laws criminalising NCP in South Africa

Act	Description
Cybercrimes Act of 2020, section 16(1)	"Any person ("A") who unlawfully and intentionally discloses, using an electronic communications service, a data message of an intimate image of a person ("B"'), without the consent of B, is guilty of an offence."
Film and Publications Amendment Act (No. 11 of 2019), section 18F(1)	"No person may expose, through any medium, including the internet and social media, a private sexual photograph or film if the disclosure is made (a) without the consent of the individual or individuals who appear in the photograph or film; and (b) to cause that individual harm."

Both acts make provision for NCP as a criminal offence. The CCA however goes further and makes provision for simulated images. Simulated images would include instances where someone's face can be digitally edited into a sexually explicit image (Mashinini, 2021; Van der Linde, 2021). One criticism raised against the revenge pornography clause in the CCA is that it solely imposes legal repercussions on the initial offender who initially spreads the explicit sexual images. At the same time, any subsequent sharing by third parties lacks substantial accountability (Musoni, 2019).

Theoretical framework

The neutralisation theory is commonly utilised in criminology research to understand the justifications of individuals behind delinquent behaviour better (Maruna & Copes 2005). It

suggests that delinquents maintain a strong bond to conventional society despite their involvement in deviant criminal behaviour and actively work to perceive themselves as good individuals (Sykes & Matza, 1957). Although the neutralisation theory was developed to study criminal behaviour, it has since been used in studies that seek to explore behaviour that is deemed not acceptable based on social norms. Moral beliefs act as impediments to engaging in criminal activity (Siponen et al. 2012). To escape moral responsibility for a criminal act and thereby avoid facing adverse societal consequences (Sakala & Chigona, 2020), one needs to display the absence of criminal intent by using neutralisation techniques (Sykes & Matza, 1957).

Neutralisation techniques used to justify actions, summarised in Table 2, include the denial of the victim, denial of injury, denial of responsibility, condemnation of condemners, and appeal to higher loyalties (Sykes & Matza, 1957). These five neutralisation techniques are disengagement tools that enable people to justify behaviours considered deviant. By disengaging themselves from the consequences of their actions, people can justify unacceptable behaviour without much distress.

Table 2: Neutralisation techniques

Technique	Explanation
Denial of victim	The offender maintains the belief that the victim deserves the action committed against them. The delinquent manipulates the victim's perception and asserts that the mistreatment towards the victim is warranted (Sakala & Chigona, 2020).
Denial of responsibility	The offender argues that circumstances are responsible for their actions. Offenders often shift the blame to circumstances 'beyond their control' (Harris & Daunt, 2010).
Denial of injury	This technique is used to nullify the feeling of remorse toward the victim. The offenders justify their behaviour by indicating that breaking the law does not impact anyone (Liddick, 2013).
Condemnation of condemners	This is an attention-shifting strategy employed by individuals to divert attention, rationalising their deviant actions by blaming those who criticise or condemn them (Wong et al., 2023).
Appeal to higher loyalties	This involves individuals engaged in deviant behaviour justifying their actions by portraying them as contributions to the greater good or aligning with a higher-order ideal (Cheng, Li, Zhai, & Smyth, 2013).

The neutralisation theory was applicable in this study because it aims to investigate people's awareness of their moral compulsion to determine 'right and wrong' with situations presented to different individuals (Sykes & Matza, 1957).The theory can also be employed in different scenarios where individual actions are not aligned with held social beliefs (Maruna & Copes, 2005). Moral beliefs act as impediments to engaging in criminal activity (Siponen, Vance, & Willison, 2012). To escape moral responsibility for a criminal act and avoid adverse societal

consequences (Sakala & Chigona, 2020), one needs to display the absence of criminal intent by using neutralisation techniques (Sykes & Matza, 1957).

Methodology

The current study adopted the interpretive research paradigm to investigate the justification for re-sharing NCP. We found this paradigm appropriate as it allowed us to seek deep insights into the NCP of individuals with the use of vignettes.

Data collection

The current research included both primary and secondary data sources. Primary data was acquired through a mixture of semi-structured face-to-face interviews and WhatsApp calls. An interview request was sent to all potential participants at a church that and also active on various social media platforms. Some interviews were conducted in person, and others via an online platform (Teams or WhatsApp calls). Secondary data in the form of Twitter comments, posts and reposts was also used. These were collected on two identified trending Twitter cases of non-consensual pornography. The data collection instrument provided a real-life vignette to the respondents. This vignette was used as stimulus and a guide for the questions. Vignettes are often used as stimulus and encourage participants to communicate their opinions openly (Sampson & Johannessen, 2020). While vignettes are commonly hypothetical situations, real-life vignettes have been used in research, and they help decrease idealised responses compared to fictionalised vignettes (Barter & Renold, 2000). In the current study, using scenarios of which participants were aware assisted in getting much richer data.

Sampling technique

The target population was adults between the ages of 18 and 45 from a religious background. The participants comprised four females and eight males. This number of participants was appropriate to utilise the available time and resources effectively. Initially, we intended to have one focus group; however, several participants were uncomfortable sharing their views with the group. The main issue was that most of the targeted population were ‘religious’, and conversing on a sex-related topic could be perceived as invasive.

The study used purposive sampling to select the participants. This decision was informed by previous studies that have found that NCP sharing is most prevalent among individuals between the ages of 18 and 45 who use social media frequently to help answer the research question (Branch et al., 2017). Participants therefore comprised individuals within this age group who used social media, as they were most likely to provide information to answer the research question.

Data analysis

A thematic approach was used to analyse the data using the five neutralisation techniques. We familiarised ourselves with the data collected by reviewing notes from individual semi-structured interviews and listening to the recordings. The data was then coded using the guidance of the primary research question and categorised in the neutralisation theoretical framework constructs. This was done using NVivo 12 software.

Ethics

All participants were informed of the objectives of the study in a language they understood. Participants were informed of their right to withdraw from the study at any given moment should they not feel comfortable continuing. Consent was obtained from participants before the interviews, as NCP is a sensitive topic that may have a psychological impact on participants. Participants therefore received information about free counselling services offered by organisations, such as Lifeline, the South African Depression and Anxiety Group (SADAG), and the Counselling Hub. This was to ensure that they get adequate assistance in dealing with any trauma after the interviews that may resurface when conversing about NCP. Further, we obtained ethical approval from XX University (name removed for the sake of blind peer-review process).

Non-consensual pornographic X cases

This section presents two recent vignettes that were given to the sample. The backstories behind these cases are videos of alleged infidelity within marriages of two separate people participants had the opportunity to watch. Comments from these cases were observed, and are included in the findings.

Case One: DJ Lungile

In late September 2022, a well-known celebrity critic account (@MusaKhawula) shared a video on **X** featuring a prominent disc jockey (DJ). To maintain anonymity, we will refer to the DJ as 'DJ Lungile'. In the video, DJ Lungile was observed exiting a shower in a state of nudity, with his private parts exposed. While the celebrity critic account posted the video, reports suggest that the original sharing of the video was attributed to an individual with whom the DJ was allegedly having an affair.

Case Two: Zandile

At the beginning of November 2022, an NCP video trended on **X** depicting a middle-aged woman. On the video, the woman could be seen touching and/or rubbing her exposed private parts, seemingly on a video call with someone (this is often referred to as 'phone sex'). The woman was identified as a public servant and a political leader – a local government speaker. Even though the name of the woman was disclosed on **X**, to protect her identity, we will refer to her as 'Zandile'. It is alleged that the intimate video originated from an (ex)partner with whom she was having an extra-marital affair. It was also alleged that the (ex)partner shared the video after a failed attempt to extort money from her not to release the video.

Findings

The platforms the participants used and on which they were active were Facebook, WhatsApp, Instagram, **X**, and LinkedIn. Although there are five neutralisation techniques, social media users only employed three of them. Of the five, these three were the most common to emanate from the framework. Using these techniques, social media users could detach themselves from the consequences of their actions, thereby justifying their behaviour with less emotional distress.

Perception of sharing

A few **X** users pointed out that it is wrong to re-share NCP. Some went as far as asking users to stop sharing the video for likes and laughs. Moreover, the dangers of sharing the NCP video with the victim should be pointed out. It was only for private consumption, and was not meant to be shared online. Please note that all direct quotations are reproduced verbatim and unedited.

> I do not think anyone would want to see their video trending, even if they created it themselves. [P7]

The denial of responsibility

X users and participants employed the technique of denial of responsibility in cases of NCP. They denied responsibility for making a video viral through sharing and re-sharing, instead placing the blame on others. The common sentiment was that the person who recorded the video should bear the responsibility.

> She created the content. As the rule states … content created shall be content circulated. Nobody will be held liable for something consented into. She knew exactly what's gonna happen to the footage the moment she agreed to be taped. So, it's really not our problem. [**X** user]

Denial of responsibility has also been evident in cases of 'revenge porn' where the perpetrators distanced themselves from the crime. Instead, they blamed the victim or used other excuses to shift the blame (Sugiura & Smith, 2020). This form of neutralisation further exacerbates the emotional and mental distress victims experience. The pervasive reach of internet platforms also worsens the implications of revenge porn (Yin, 2022).

Responsibility for deviant behaviour is often shifted,

> [T]he person who did DJ Lungile wrong is the one who took the video, Musa did what he always does, and any gossip page would've done the same thing. [**X** user]

This line of thought absolved Musa (**X** username) of responsibility despite being the original disseminator of the video because they did not record the video. While **X** users were outright denying and shifting responsibility for re-sharing, the interview participants were more apologetic and empathetic about re-sharing. It is difficult to ascertain whether their reaction stemmed from a genuine response to issues, such as NCP, or whether other influences, such as social desirability, were at play. Various factors, including societal norms and expectations, might have influenced their expressed sentiments regarding NCP, making it challenging to attribute their responses solely to their genuine feelings about the issue.

Denial of victim

The denial of victim neutralisation technique was the one mostly used for re-sharing NCP. Most participants mentioned how victims of NCP should assume some responsibility for videos and/or images of a sexual nature ending up online.

> In this day and age, one should know that there is a slight chance that your nude photo can end up on the internet. The best way is to avoid sending nudes

> altogether. I actually do not understand the notion of sex tapes and all that. People should be careful. [P3]

The respondents also condemned the victims for sharing sexually explicit pictures with lovers on the basis that one never knows what might happen should things not work out.

> [W]hen the honeymoon phase ends anything can happen. One should always be careful of what they share with their partners, nudes can damage your reputation. [P7]

Appeal to higher loyalties

There were a few instances where the appeal to higher loyalties neutralisation technique was used to justify the sharing and re-sharing of NCP. The data from the case of Zandile and DJ Lungile showed that some justify their unethical behaviour by appealing to higher loyalties. The stories behind their NCP videos involved allegations of infidelity within their respective marriages.

> Karma has a way of dealing with people who are doing nasty things in their marriages. How do you do such at that age? [**X** user]

This demonstrates that SM users believe that, because the victims were allegedly cheating on their spouses, they deserved what happened to them.

On several occasions, SM users appealed to higher loyalties, a technique identified in the literature as justifying behaviours by prioritising moral obligations over adhering to the law (Costello, 2000). There were instances where certain SM users argued that, since victims in the **X** cases were supposedly involved in extramarital affairs, this warranted their victimisation. By raising a sense of duty or commitment to a higher cause, such as fidelity in a relationship, these individuals divert attention from the actual harm inflicted on the victims of NCP, perpetuating the cycle of victimisation. Moreover, the appeal to higher loyalty often exploits the established power dynamics (Van Baak et al., 2023), particularly evident when personal photographs are weaponised against the vulnerable.

Other findings: Gender, age and sexual sharing

X posts and comments on the two different cases of NCP show that there is a difference in how victims of NCP are perceived, mostly based on gender and age. The observed videos were of prominent figures of different ages and genders. On the NCP video where DJ Lungile was depicted, comments were mostly sympathising with him on the perceived ‘humiliation’ he might be facing:

> Where do we draw the line? That video is violating every bit of privacy he is entitled to. There are certain things that we should not entertain or keep quiet about – this is one of those thing! [**X** user].

Moreover, some comments from users focused on how there will not be consequences for the wrongdoer (the person who shared the video) because the video does not depict a woman, suggesting that women get more attention in cases such as these and comparing this to how men often do not get attention in cases of gender-based violence (GBV):

> Let's agree; the society does not sympathise to both genders the same. For instance, when it comes to abuse issues, it's always women whom are prioritised. [**X** user]

Discussions

In this section, we interpret the findings related to the research question.

Gender, age and patriarchy

We noted variations in how victims are perceived based on age and gender. The secondary data showed that women experience higher levels of victimisation, and age is also a factor used to criticise behaviour that is considered inappropriate by women. Older women are supposed to be role models and "should not be engaging in things kids engage in" [**X** user]. Women are more likely to be victimised through NCP due to societal expectations (Kakungulu-Mayambala et al., 2021; Ringrose & Harvey, 2015) and poverty. Poverty as a factor is further fostered in South Africa with the practice of customary laws that inhibit women from economic growth and equal opportunities compared to men (Mpunzana & Mofokeng, 2023). Women and girl children are driven to participate in sexual acts and are viewed as commodities while being sexually exploited by men (McVey, Gurrieri, & Tyler, 2020). Furthermore, in a patriarchal society, men are likely to blame females when their nude photographs are leaked, as they consider them to be promiscuous (Mckinlay & Lavis, 2020). This is done under the umbrella of carefully curated patriarchal rules that enforce rules unknown to women through domestic violence and the pretext of culture (Mshweshwe, 2020).

Sexual double standards

The finding of patriarchy is also consistent with the phenomenon of sexual double standards (SDS). SDS suggests that individuals expect behaviours linked with increased sexual activity from men rather than from women (Zaikman & Marks, 2017). Women are expected to conduct themselves in an acceptable manner or they will be criticised using a factor, such as age, to discriminate against them. This is in line with the finding that older women are supposed to be role models and "should not be engaging in things kids engage in" [**X** user]. On the contrary, males who are highly sexual receive more positive perceptions than their female counterparts in any sexual matter (Endendijk, Van Baar, & Deković, 2020). Women are therefore viewed as commodities that generate income in markets not for themselves but for men (McVey et al. 2020).

Males as victims

Findings also show that men feel that male victimisation does not get equal attention. In the case involving a man (DJ Lungile), results showed that men believe that, when it comes to crimes or violations, such as NCP, men do not get the necessary attention or sympathy. Such views are often held in GBV scenarios, where men express how such cases involving men get less attention than women (Thusi & Mlambo, 2023). While this may be true, Thobejane and Luthada (2019) argue that statistics on male abuse are under-documented due to them not reporting it, often because of patriarchal reasons that often perpetuate that men should not cry. Society often positions men as the primary perpetrators due to their gender roles, and the

media commonly promote the idea that it is unacceptable for masculine men to display vulnerability, particularly concerning male victimisation (Majola, Mkhize, & Udoh, 2023).

Conclusion and r**ecommendations**

There is a dearth of literature on NCP in the South African context. The current study contributes to the existing literature on this form of cyberbullying by shedding light on how SM users employ neutralisations to partake in delinquent behaviour. Although there are laws, such as the Cybercrimes Act (CCA) (No. 19 of 2020) and the Films and Publications Amendment Act (No. 65 of 2019), which prohibit re-sharing of NCP, people still justify committing this crime. We suggest that there should be successful arrests and convictions for people that break these laws, in the hope that it will deter would-be offenders.

Exploring the neutralisations helps to gain a deeper understanding of the harmful nature of re-sharing. There were limitations in recruiting participants from a local church who were Christians because of the stigma associated with 'religious' people discussing an issue, such as NCP, which is perceived as invasive and graphic. The current study yielded crucial results in encouraging change of policy and legal reforms, and educational initiatives to minimise the effect this behaviour has on its victims. Although there are laws in place to protect against sharing and re-sharing of NCP, this behaviour continues to be an issue. The current study also noted the difference in how victims are treated based on demographic profile, and future studies could pursue this area.

Based on the findings we recommend the following:

- Educational initiatives for all genders, because we noted that NCP affects all genders. The difference is in the number of reported cases and the publicity that they can garner.
- Publicity on successful convictions could be a deterrent for would-be offenders.
- Consistent reviewing of policies and ensuring that there are updates that keep up with the pace of internet growth globally.

Limitations

We encountered the following limitations:

- Recruiting participants: Initially, the study intended to collect the data using focus groups. When the researcher started with one focus group, several participants were uncomfortable sharing their views in the group. The main issue was that most of them were 'religious', and conversing on a topic related to sex could be perceived as invasive. This challenge was then mitigated by changing the data collection method to individual interviews.
- Target population: For ethical reasons, the target group was limited to individuals between 18 and 45 years of age. This was limiting as there are active SM users below the age of 18 years who have been both victims and perpetrators. There are also adults over the age of 45 years that would have been ideal to include in this study, however, the majority of participants at the local church fell within the 18–45 age group. Further, an assumption was made that individuals above the age of 45 will be more conservative, as discussions of sexuality within the Christian community, personal discomfort, or potential concerns about how their contributions might be perceived by

others within their religious circle. We recommend that future studies target other age groups in terms of this phenomenon.

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THE INFLUENCE OF DIGITAL NUDGING ON CYBERSECURITY BEHAVIOUR AMONG UNIVERSITY STUDENTS

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Abstract

In a world defined by technological advancements and digital interconnectivity, incidences of cyber criminality are on the rise. Unhygienic cybersecurity practices and behaviours are among the main factors contributing to the increase in cybercrime. As a result, institutions are implementing digital nudging mechanisms to encourage users' cybersecurity behaviour. Nudging is a way of changing users' behaviour to minimise the risk of cybersecurity incidents. The current study investigated the influence of digital nudging on cybersecurity behaviour among university students to provide insight and understanding of the significance of digital nudging in encouraging cybersecurity behaviours. The study adopted a qualitative research strategy, employing thematic analysis to extract insights from semi-structured interviews with a diverse sample of students from the University of Cape Town. Our findings show that digital nudging harnessed through a password strength meter and update reminders, pop-up messages, and warning of suspicious emails. It was further found that auto-logout warnings influence students' cybersecurity behaviours. In addition, the use of hybrid nudges is more effective than a single approach in shaping students' choices and decision-making, resulting in behavioural and attitude change.

The study provided valuable insights and understanding into how digital nudging influences university students' cybersecurity behaviour. We expect the findings of this study to assist cybersecurity practitioners, policymakers and universities to devise effective digital nudging tools to enhance their cybersecurity postures.

Keywords: cybercrime, cybersecurity, cybersecurity behaviour, digital nudging, students, university.

Introduction

Recent years have seen an increase in cybersecurity incidents in different spheres of life. Most cybersecurity incidents are attributed to poor cybersecurity behaviour and non-compliance with cybersecurity measures (Varela-Vaca et al., 2019). Non-compliance with cybersecurity policies has become one of the growing concerns for many organisations. Verizon's 2023 Data Breach Integrated Report (DBIR) showed that 74% of cybersecurity incidents involved a human element. About 70% of cybersecurity incidents are linked to human negligence, with the 2015 IBM cybersecurity index reporting that approximately 95% of these incidents are attributable to human error (Ali et al., 2021). Digital nudging is one of the measures organisations implement to encourage compliance with cybersecurity policies and change the cybersecurity behaviours of users. Digital nudging is the application of subtle and personalised design elements, delivered through digital interfaces, to influence individuals' behaviour predictably while still maintaining freedom of choice (Zimmermann & Renaud, 2021). Conceptually, digital nudges are implemented by integrating various design features, such as visual prompts, in online environments to support cognitive heuristics and biases with which users engage during decision-making (Thaler & Sunstein, 2008). Human–computer interaction specialists theorise that, by manipulating the contextual decision-making environment through visual cues, the design architect can influence users' choice selection and behaviour (Acquisti et al., 2018; Zimmermann & Renaud, 2021).

Traditionally, digital nudging has been implemented to promote the usage of public transportation (Zimmermann et al., 2023), encourage healthy dietary choices (Laiou et al., 2021), and produce high-quality patient decisions in the health industry (Bansback et al., 2014). Digital nudging has transcended into the cybersecurity domain to promote safe cybersecurity conduct (Acquisti et al., 2018). Literature highlights the integration of:

- digital nudges to improve cybersecurity behaviours by discouraging personal information disclosure online (Kroll & Stieglitz, 2021);
- gamification to incentivise the creation of strong passwords (Ophoff & Dietz, 2019); and
- different message framing and priming to reduce phishing susceptibility (Sharma et al., 2021).

This research demonstrated the efficacy of digital nudging in encouraging positive cybersecurity behaviours by providing pertinent contextual cybersecurity information to users during the decision-making process.

The Covid-19 pandemic exacerbated incidences of cyberattacks as organisations transitioned to online work, with higher education institutions (HEIs) integrating remote learning (Halkhoree et al., 2024) into their education system. Despite the significant growth in cybersecurity incidents, users' cybersecurity behaviour remains a challenge, specifically in university settings where there is an increase in cybersecurity incidents (Hina & Dominic, 2020). Against this backdrop, the current

study aimed to investigate the influence of digital nudging on cybersecurity behaviour among university students by answering the following research question:

> How does digital nudging influence cybersecurity behaviour among university students?

This qualitative study employed a case study of the University of Cape Town (UCT) and an interpretive paradigm. Further, we used purposive and convenience sampling strategies to collect data through semi-structured interviews. The study used a deductive thematic analysis to analyse the data, and adapted a conceptual framework derived from the theory of planned behaviour (TPB) and literature as the lens for the study.

The findings contribute to the body of knowledge in the field of cybersecurity and to the research on nudging in cybersecurity to address users' cybersecurity behaviours. Exploring the influence of digital nudging on cybersecurity behaviour may assist cybersecurity practitioners and decision-makers to develop effective digital nudge interventions, ultimately leading to behavioural changed and decrease in cybersecurity incidents.

Literature review

This section presents a review of literature on cybersecurity, cybercrime and cyberthreat landscape, digital nudging and the human aspects of cybersecurity.

Cybersecurity

The need for cybersecurity is becoming more apparent as the world becomes increasingly connected. Advancement in digital technologies has created opportunities for cybercriminals to exploit individuals and organisations (Mphatheni & Maluleke, 2022). Cybersecurity is the practice of protecting computer systems and networks from unauthorised access and disruption (Kshetri, 2019). It involves a set of technologies, practices, and processes to maintain confidentiality, integrity, and availability of sensitive information (Kshetri, 2019). Cybersecurity is an interdisciplinary field that emphasises a techno-centric and human-centric approach to safeguarding information systems (Farooq et al., 2019). Techno-centric aspects of cybersecurity cover the technological and infrastructural elements, including network security, encryption, access controls, intrusion detection, and incident response (Sulaiman et al., 2022). The human-centric approach views users as an essential element in cybersecurity (Deibert, 2018), as they are often the main targets of cyberattacks (Kioskli et al., 2023).

An increasing amount of research focuses on the human-centric aspects of cybersecurity. This is because the most significant source of vulnerability in the security chain is the human element (Alanazi et al., 2022). Understanding human behaviour and extraneous factors in cybersecurity is therefore crucial. Consequently, literature reflects factors that influence users' cybersecurity compliance (Alassaf & Alkhalifah, 2021), personality and attitudes toward cybersecurity adoption (Shropshire et al., 2015), and the development of practical human-centric cybersecurity training and awareness programmes to mitigate risks (Chandarman & Van Niekerk, 2017).

Organisational contexts are seemingly pivotal in determining cybersecurity usage, with specific environments exhibiting mature cybersecurity cultures increasing the probability of adoption (Wong et al., 2022). Furthermore, varying demographics seem to engage with cybersecurity at varying rates, with younger, tech-savvy users being more susceptible to cybersecurity risks than non-tech-savvy (Farooq et al., 2019).

Cybercrime and cyberthreat landscape

The increase in cybercrime is a growing concern for individuals, governments and organisations globally. The global crime trends highlight a noteworthy surge in cybercriminal activities targeting Africa (Lim et al., 2021). Cybercrime is defined as "an act that uses computer technology to commit a crime" (Chandra & Snowe, 2020, p.1) The 2021 Africa Cyberthreat Assessment Report speculates that over 90% of African businesses operate with inadequate cybersecurity protocols to safeguard company assets (Lim et al., 2021). In addition, 'cyberthreat' refers to the risks associated with the use and adoption of technologies (Nawaz et al., 2023). A lack of cybersecurity investments, poor cybersecurity regulatory and enforcement frameworks, and cybersecurity knowledge are interconnected factors among numerous variables that determine the cybersecurity landscape in Africa (Lim et al., 2021). Figure 1 illustrates the classification of cybercrime taxonomy.

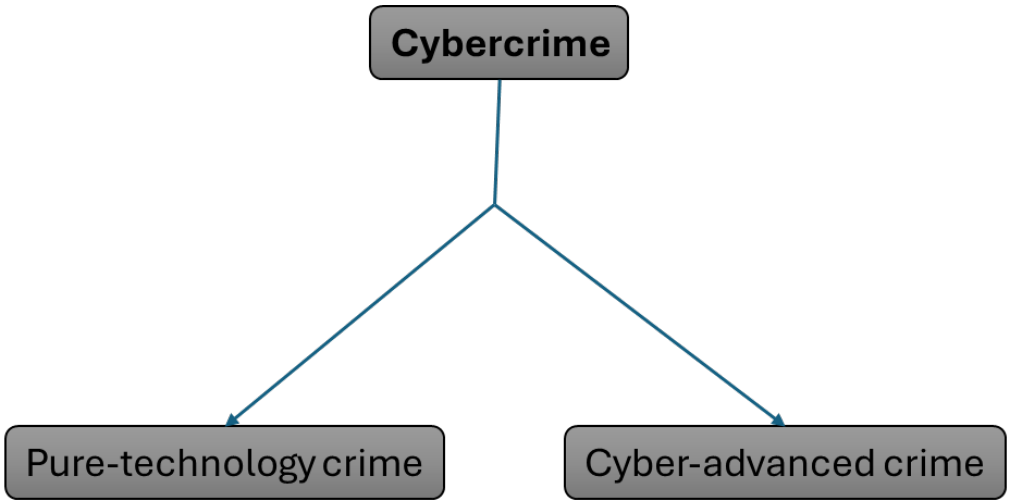


Figure 1: Classification of cybercrime taxonomy

Source: Chandra and Snowe (2020)

Cybercrime can be categorised into two types: pure-technology crime and cyber-advanced crime. Pure-technology crime targets specifically computer systems, and disrupts the confidentiality, integrity, and availability of computer systems (Chandra & Snowe, 2020). Conversely, cyber-advanced crime makes use of technology to target individuals, organisations, and governments (Chandra & Snowe, 2020).

In contrast to economically advanced nations, the cybersecurity infrastructure in most African countries remains relatively underdeveloped (Kshetri, 2019). This deficiency increases the vulnerability of information systems to various cyberthreats (Ndemo & Weiss, 2017). The principal cause of distinct cybersecurity cultures and noticeable

cyber insecurity lies in the digital divide between developing and developed nations (Gamreklidze, 2014). Several developing economies in Africa cannot invest sufficient funds to procure effective intrusion detective and preventive systems, and encryption protocols, and/or to implement threat forecasting and modelling techniques, and network forensics (Alexei, 2021). Furthermore, a shortage of qualified cybersecurity practitioners in Africa means the continent lacks human resources with the acumen to counteract cyberthreats (Kshetri, 2019). The continent is further marred by a lack of explicit and specific cybersecurity legislation. Only 28 out of 54 African countries have adopted essential cybercrime legislation, and 11 out of the 54 countries have adopted the African Union Convention on Cyber Security and Personal Data Protection (Ndubueze, 2020). Given the absence of repercussions and punitive punishment, cybercriminals target African nations (Ndubueze, 2020). Insufficient cybersecurity education and knowledge on the continent means individuals are susceptible to cyberthreats, such as phishing (Lim et al., 2021). Adequate cybersecurity awareness and education levels in African organisations are pivotal in combatting cyber victimisation (Chandarman & Van Niekerk, 2017).

South Africa is among the countries in Africa that are most frequently targeted by cyberthreats, primarily due to the high internet penetration in the country, widespread use of mobile devices, and the increasing digitisation of government services (Pieterse, 2021). Alarmingly, South Africa ranks third globally in terms of cybersecurity victims worldwide, incurring a cost of R2.2 billion a year (Lim et al., 2021). Cybercriminals have specifically exploited vulnerabilities in South African frontline services and critical infrastructure, such as the energy, water, and transportation sectors (Lim et al., 2021).

Human-centric aspects of cybersecurity

The increase in research focusing on cybersecurity behaviour is attributed to the surge in cybersecurity incidents. Individuals continue to engage in risky activities that put not only them at high risk of cyberattacks but also their institutions (Hadlington, 2017). Literature argues that the main source of cybersecurity incidents is users rather than technology (Yan et al., 2018). The increase in cybersecurity incidents requires an understanding of user behaviours to determine the appropriate measures to change their behaviours. Several organisations compiled guidelines and standards of best practices for cybersecurity to safeguard their digital assets and sensitive information. Developing a comprehensive cybersecurity policy is however only effective if individuals adhere to cybersecurity guidelines (Hina & Dominic, 2020). Cybersecurity behaviour is defined as the actions and conducts of individuals in cyberspace (Mashiane & Kritzinger, 2019). Within an organisational context, user behaviour in cyberspace is guided by policies and regulations designed to influence and shape their behaviours.

Cybersecurity behaviour is influenced by the context of the user, for instance, the workplace or home environment (Mashiane & Kritzinger, 2019). Furthermore, cybersecurity behaviour can be categorised as intentional bad, unintentional bad, unintentional good and intentional good (Mashiane & Kritzinger, 2019). ‘Intentional bad cybersecurity behaviour’ is behaviour exhibited by cybercriminals and hackers (Djajadikerta et al., 2015). ‘Unintentional bad cybersecurity behaviour’ refers to behaviour of individuals who do not intend to cause any harm or to disregard cybersecurity norms, standards and best practices. Users often deviate from

cybersecurity norms, such as not writing down passwords or repeatedly using the same password (Chu et al., 2015; Ifinedo, 2015). 'Intentional good cybersecurity behaviour' refers to users knowingly complying with cybersecurity norms, standards and best practices (Safa et al., 2015), as those users are aware of the good cybersecurity practices. 'Unintentional good cybersecurity behaviour' is found where users comply with cybersecurity norms, standards and best practices not because they intend to, but because of other reasons (Mashiane & Kritzinger, 2019). The ideal cybersecurity behaviour is intentional good cybersecurity behaviour, as these users purposefully practice good cybersecurity to protect themselves and the information of their organisations (Mashiane & Kritzinger, 2019). Changing bad cybersecurity behaviour and maintaining good cybersecurity behaviour through various means is therefore crucial.

Cybersecurity awareness, education, and training are some of the common approaches recommended to promote good cybersecurity behaviours among users. Cybersecurity awareness encompasses knowledge, self-perception of skills, practical skills, behavioural attitudes, and the interconnectedness of these elements to protect tangible and intangible resources that support cyberspace security (Chandarman & Van Niekerk, 2017). Elevating cybersecurity awareness levels reduces vulnerability to threats, improves capabilities to perform protective measures, and promotes positive attitudes toward cybersecurity (Alassaf & Alkhalifah, 2021). Cybersecurity awareness programmes are needed to maintain a culture prioritising cybersecure practices (Hina & Dominic, 2020). Human behaviour and information security culture are essential drivers for cybersecurity policy compliance in organisations that depend on information systems (Hina & Dominic, 2020). These drivers also determine cybersecurity policy compliance in universities. HEIs collect sensitive information, including student and staff personal records, research patents, and financial records. It is therefore imperative to ensure good cybersecurity behaviours within a university to protect these valuable assets.

Cybersecurity behaviour among university students

Vigilant behaviour towards cyberthreats by students at HEIs is indispensable in the fight against cybercrime. Literature suggests that people's personalities and perceptions play a crucial role in how they behave online (Ertan et al., 2020). To change the students' perceptions, attitude and behaviours to create a safer environment, various HEIs are implementing behavioural change techniques. Universities implement organisation-wide information security policies to safeguard digital assets and information technology (IT) infrastructure (Hina & Dominic, 2020). These policies are mostly derived from ISO/IEC 27000 standards and are aimed at safeguarding information systems. Several HEIs struggle with ensuring cybersecurity policy compliance among students and staff, potentially compromising the digital ecosystem of the university (Hina & Dominic, 2020). For instance, the password policy of the UCT recommends passwords that include alphanumeric characters, that users change passwords periodically, and that they avoid using the same password on different systems (University of Cape Town, 2020). A survey conducted at one of the universities in South Africa shows that 89% of students used the same password for multiple accounts, and only 31% changed their passwords periodically (Fredericks et al., 2016). Engendering an information security culture through personalised SETA programmes and appropriate leadership and governance procedures is a solution to

addressing password management and improving compliance with cybersecurity policies and guidelines (Wong et al., 2022). Addressing non-compliance with cybersecurity policy necessitates comprehensive cybersecurity awareness initiatives that educate students about the severity of cybersecurity threats and their inherent vulnerability to these threats (Wong et al., 2022). Furthermore, implementing mechanisms to penalise students for cybersecurity policy non-compliance could act as a deterrent to prevent negligent behaviours (Mtambeka et al., 2023).

It is, therefore, imperative to furnish end-users continuously with information regarding positive cybersecurity behaviours to reduce non-compliance (Acquisti et al., 2018). Research in human–computer interactions proposes the utilisation of digital nudges to guide individuals toward positive cybersecurity behaviours (Zimmermann & Renaud, 2021).

Digital nudging and cybersecurity behaviour

Digital nudging is the practice of modifying and altering specific variables in a digital decision-making architecture to guide individuals towards a desired behaviour (Acquisti et al., 2018). Fundamentally, the mechanisms of nudging are based on the theory of bounded rationality, which posits that individuals make decisions based on time constraints, mental resources, and knowledge (Thaler & Sunstein, 2008). These factors limit or restrict individuals' ability to make rational decisions. As a result, behavioural economists and psychologists have re-emphasised the concept of humans being irrational and inconsistent decision-makers due to environmental contexts and pre-existing biases (Congiu & Moscati, 2022). The result of any cybersecurity compliance decision is therefore influenced not only by rational deliberations of the available options but also by the design of the choice environment in which the decision is made. These factors can exert a subconscious influence on cybersecurity behaviour (Zimmermann & Renaud, 2021).

Digital nudging takes different forms. The dual process theory states that in the decision-making context humans operate according to one or two different cognitive systems: Type 1 and Type 2 (Thaler & Sunstein, 2008). Type 1 cognitive systems are characterised by implicit, automatic, effortless, and fast information processing that is employed when executing routine and familiar tasks (Sharma et al., 2021). Type 2 cognitive systems are characterised by slow, controlled, deliberate, and conscious information processing that is employed when executing complex tasks and routines that require reflection (Zimmermann & Renaud, 2021). Applying these concepts from the dual process theory, Thaler and Sunstein (2008) suggest that nudges are accordingly separated into Type 1 and Type 2 nudges that target primarily target the Type 1 automatic system and the Type 2 reflective system respectively. Hansen and Jespersen (2013) however argue that this classification of nudges is incomplete, as the distinction between transparent and non-transparent nudges is omitted. 'Transparency' in this context refers to the perceivability of a nudge to the decision-maker, and the nudge architect's intention or desired goal (Hansen & Jespersen, 2013). The inclusion of transparency into Thaler and Sunstein's (2008) classification created four new nudge categories, namely transparent Type 1, transparent Type 2, non-transparent Type 1 and non-transparent Type 2 (Hansen & Jespersen, 2013).

Nudge mechanisms are further categorised into six different dimensions. These dimensions are information, presentation, defaults, incentives, reversibility (error resiliency), and timing (Acquisti et al., 2018). The dimensions are interrelated, and not mutually exclusive. For instance, information through feedback nudge can be provided at various points in time, and the specific timing may affect decision-making and, ultimately, behaviour. This study adopted the classifications presented by Acquisti et al. (2018) because it is a more application-oriented categorisation of techniques than the more generalised approaches proposed by Hansen and Jespersen (2013) and Thaler and Sunstein (2008). Table 2 presents a summary of the dimensions of nudges that influence cybersecurity behaviours. These nudges exploit cognitive heuristics and biases to produce predicted behaviours (Zimmermann & Renaud, 2021).

Table 1: Dimensions of nudges used to influence cybersecurity behaviour

Dimensions	Description	Example
Information	Reduces information asymmetries and provides a realistic perspective of cybersecurity risks, e.g. education or feedback (Zimmermann & Renaud, 2021).	Privacy policy documents formatted in an easily readable and understandable manner for the user (Zimmermann & Renaud, 2021).
Presentation	Structuring the user interface to present contextual cues that help to minimise the amount of mental effort needed by the user, while also communicating the appropriate level of risk, e.g. framing, ordering, saliency, and structure (Acquisti et al., 2018).	Anti-virus warnings employ fear appeals and utilise saliency to capture the user's attention (Zimmermann & Renaud, 2021).
Defaults	Reducing the user's efforts by configuring the system in accordance with the users' expectations (Acquisti et al., 2018).	Having encryption settings enabled by default.
Incentives	Encouraging users to align their behaviour with their expressed preferences (Acquisti et al., 2018).	Rewarding users for displaying positive cybersecurity behaviours.
Reversibility	Limiting the impact of mistakes by allowing a user to reverse decisions (Acquisti et al., 2018).	Notifying users that they have to can change their privacy settings (Zimmermann & Renaud, 2021).
Timing	Nudging a user at specific points in time can produce varying behavioural outcomes (Acquisti et al., 2018).	Reminding users to run anti-virus scans after noticeable increase in traffic (Van Bavel et al., 2019).

A combination of digital nudges is considered an effective approach to influence users' behaviours. For instance, Zimmermann, Marky, and Renaud (2023) suggest the use of both the feedback nudges and additional password guidance when nudging users to create stronger passwords. UCT has implemented various nudging techniques, such as a password strength meter and an update reminder, email and pop-up messages, and notifications. The use of email nudges has gained popularity, as most

security breaches are committed through social engineering such email compromises. Figure 2 shows an example of an email message from UCT.



Figure 2: UCT email digital nudge (UCT, 2024)

Conceptual framework

This study adopted a conceptual framework derived from the TPB and literature to expound on the influence of digital nudges on students' cybersecurity behaviour. The TPB posits that attitude, subjective norms, and perceived behavioural control influence human behavioural intentions (Ajzen, 1985). Human behaviour is systematic, and follows a sequence of actions (Ajzen, 1985). We posit that digital nudges, such as a password strength meter and update reminders, pop-up messages, and notifications, warning of suspicious emails and auto-logout warnings influence good cybersecurity behaviour among university students. Further, we expect these digital nudges to change individuals' cybersecurity attitude and behaviours, leading to hygienic cybersecurity practice among university students. Figure 3 shows the conceptual framework employed for the study. 'Perceived behavioural control' refers to the extent to which users believe that they can perform a given behaviour (Ajzen, 1985).

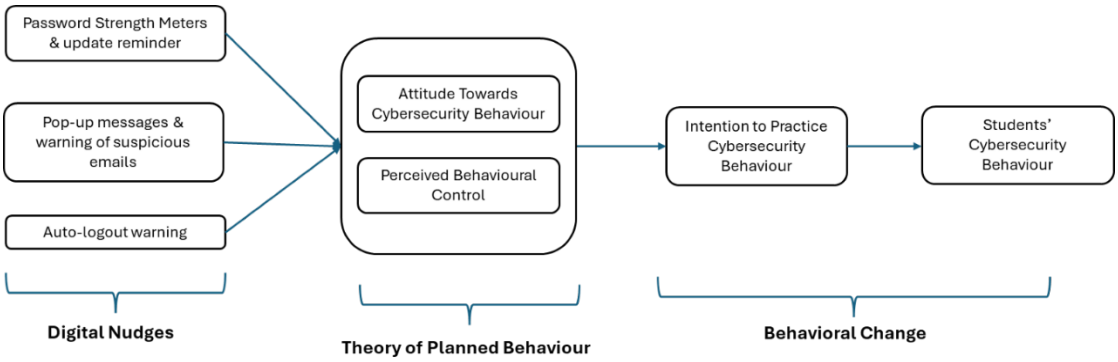


Figure 3: Conceptual framework adapted from the theory of planned behaviour

Source: Ajzen (1985)

Password strength meter and update reminder

'Password strength meter' refers to the assessment of the strength of the password created by users to ensure a stronger and secure password (Golla & Dürmuth, 2018). A password strength meter further shapes the password behaviours of users. A weak password is considered one of the poor security behaviours among users (Ertan et al., 2020). The password strength meter is often criticised for its lack of consistency and inaccuracy when creating passwords (de Carné de Carnavalet & Mannan, 2014). Despite this criticism, however, a password strength meter remains among the most effective measures assisting users to choose secure passwords. Many organisations have implemented password policies to encourage secure password behaviours by users. Furthermore, password update reminders are also common at universities

(Habib et al., 2018). Once a password is created, it is updated periodically, with the user being reminded to change it before it expires.

Passwords have been encouraged over the years as one of the main authentication methods. The biggest challenge when creating a password as an authentication method is ensuring such passwords are easy for the user to remember but difficult for other people to speculate or guess (Khern-am-nuai et al., 2017). Password security at UCT, for instance, requires that a password is at least 16 characters long, contains at least one number, one lower character, one upper character and one special character, and the password should have not been used before or should not contain easily identifiable information (University of Cape Town, 2020). This ensures that students create strong passwords that are not easily identifiable. Nudging users to create strong passwords and to update their passwords frequently are important security measures to prevent breaches. These measures can enhance users' understanding and behaviours in generating passwords (Khern-am-nuai et al., 2017). Feedback nudges can encourage users to create strong passwords by targeting the users' automatic cognitive processes, and activating biases, heuristics, and norms (Zimmermann et al., 2023). This can further result in behavioural change for the users. Literature encourages the use of hybrid nudges consisting of feedback nudges and additional password guidance as more effective than using only one of the methods (Zimmermann et al., 2023). We therefore expect nudges in the form of a password strength meter and update reminders to influence university students' attitude towards cybersecurity behaviour and perceived behaviour control.

Pop-up messages and warning of suspicious emails

Digital nudges can be in the form of an email, an SMS, a push notification, and gamification to encourage users to follow the required actions. Pop-up messages or notifications can lead users to adopt acceptable cybersecurity behaviour within a particular context (Fetherston et al., 2017). For instance, literature shows that framed message nudging significantly influences users' behaviours (Huang et al., 2018). Some universities have adopted an email nudging approach to warn students against opening random emails, particularly suspicious emails on their student email accounts. This has been considered an effective way to instil responsible security behaviours among students. We therefore expect nudging messages and notifications to trigger choices that enhance cybersecurity and lead to responsible cybersecurity behaviour among university students.

Auto-logout warnings

The auto-logout warning is a form of digital nudging where the users receive a warning message that they will be logged out for inactivity after a certain time has lapsed (Datta et al., 2022). If the user continues to be inactive on the application or system, they are automatically logged out. Organisations implement the auto-timed logout to reduce unauthorised access to information during inactivity (Shrestha et al., 2022). The system nudges users either to log out or to continue with the activities. This type of nudging is considered effective for busy users, such as students, as they can easily forget to log out of the system. We therefore expect auto-logout warning nudging to influence university students' attitude towards cybersecurity behaviour and perceived behaviour control.

Methodology

This qualitative study employed an interpretive approach using a case study of the UCT. We selected UCT on the grounds of convenience and the various digital nudges implemented to encourage the students' cybersecurity behaviour. We employed purposive and convenience sampling strategies to select a diverse sample of 13 university students, focusing on students who have experienced digital nudging. Data was collected between June and August 2023, through semi-structured interviews to gain a deep understanding of the influence of digital nudging on cybersecurity behaviours. Interviews took approximately 25 minutes. The research instrument was informed by the conceptual framework adopted for the study. We analysed the data using a thematic analysis technique and the NVivo software. This study was conducted in line with the UCT ethical standards. We obtained permission and consent from the participants to conduct interviews.

Findings and discussion

This section presents and discusses the empirical findings. The findings suggest that digital nudges such as password strength meter and update reminder, pop-up massages and warning of suspicious emails, and auto-logout warnings significantly influence university students' cybersecurity behaviour.

Password strength meter and update reminder

Password strength meter and update reminders influenced students' attitudes toward cybersecurity behaviour and their perception of behaviour control. This type of nudging resulted in students setting strong passwords and updating their passwords as required.

> I think it is a strong nudge that has attributed to the culture of setting
>
> strong passwords and the frequent changing of passwords among students.
>
> It does a great job. [Participant 4]

A password strength meter with a combination of a data-driven meter and feedback culminated in users creating secure passwords (Ur et al., 2017). Literature shows that password change behaviours are related to attitude towards security and previous security incidents (Zou et al., 2024). The frequency of nudges can change the attitude and behaviours of students toward security resulting in a secure cyber environment.

Pop-up messages and warning of suspicious emails

Pop-up messages and email shaped students' cybersecurity behaviours. An example of a pop-message on UCT PeopleSoft, the student online service, warning students about inactivity is –

> Your session is about to expire. As a security precaution, session ends
>
> after 20 minutes of inactivity. Click OK to continue your current session.

Respondents indicated that theft of their personal information and that of the institution could be jeopardised if they do not change their attitude towards cybersecurity behaviours. As a result, they became more vigilant when dealing with emails from unfamiliar sources or clicking on links. These findings are consistent with the literature that postulates that individuals exhibiting high levels of conscientiousness are associated with strong intentions of cybersecurity policy compliance and adopting protective behaviours (Warkentin et al., 2012). Conversely, some of the respondents suggested that email nudges did not influence their thoughts and opinions on malware exposure directly. They emphasised hacking as a potential consequence of adverse cybersecurity behaviour, particularly in the context of email usage.

> Opening emails from unknown senders will expose my information and that of the university to hackers, or things like that. Previously, one could easily fall victim to hackers in the absence of email and pop-up message digital nudges. [Participant 3]

> There's also digital nudging in my Gmail. I think I get certain flags, red flags, or whatever when it tells me that this is a possible scam. These nudges have made me to be very cautious to not just open any email. [Participant 13]

Respondents implied that seeing an email with the university digital nudge was enough to deter them from further reading the email, indicating that the nudge effectively altered their course of action. The email nudge further informed their perception of behavioural control thereby shaping their intention to practice cybersecurity behaviour. Although, not explicitly mentioned, individuals with inherent risk-averse qualities are likely to be inclined to engage in cybersecure behaviours to protect themselves from cybersecurity threats. Designing a digital nudge to encourage such cybersecure behaviours among risk-averse individuals could be a valuable strategy for enhancing positive cybersecurity behaviours (Acquisti et al., 2018).

Auto-logout warnings

Auto-logout warning nudges shaped the students' behaviour to log out when they are not active on the system. Respondents cited that they used to remain inactive on the system for as long as they could without any fear of cyberthreats. The auto-logout warning however always reminds them of the imminent threats in cyberspace.

> I was reckless when using my computer. I would be doing something on my computer … for instance completing an online application form or log into my students' account and leave it unattended without logging out, which is very risky. [Participant 1]

The auto-logout warning exerts pressure on students to be active on the system or to log out when not active or when they have completed a task. Auto-logout warning nudges provide a warning about positive cybersecurity behaviour. They are effective digital techniques that help shape the users' decision-making processes and approaches to cybersecurity (Mirsch et al., 2017).

Conclusion, limitations and future research

The high proliferation of technology use among university students means that many decisions are made online. As a result, they become increasingly vulnerable to cyberthreats. While literature discusses the potential of digital nudging, the influence of digital nudging on users' choice and behaviours, the influence of digital nudging on students' cybersecurity behaviours is under-explored. We therefore investigated how digital nudges, such as a password strength meter, update reminders, pop-up messages, and warning of suspicious emails and auto-logout warnings influence students' cybersecurity behaviours.

This study found that digital nudging influences students' cybersecurity behaviours and attitude by shaping their choices and decisions in cyberspace. Furthermore, digital nudging influences their beliefs in adopting protective measures against cyberthreats. These findings are consistent with the literature reporting that digital nudging influences users' choices about decisions and actions to perform (Tahaei et al., 2021). The study limitations were that it was conducted using only one university and a small sample. Generalisation of the findings should therefore be treated with utmost cautiousness. This study aimed to encourage research in the realm of digital nudging and cybersecurity. By providing insights and understanding of the influence of digital nudging on students' cybersecurity behaviour, we intended to encourage practitioners to develop effective digital nudging tools that would lead to responsible behaviours in cyberspace.

Future research could investigate the influence of digital nudging using multiple case studies of universities. Furthermore, they could examine the influence of digital nudging among university students considering different digital contexts and the characteristics of the users.

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HUMAN BEHAVIOUR IN CYBERSECURITY OF AUTONOMOUS VEHICLES: A SYSTEMATIC LITERATURE REVIEW

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Abstract
The eager advancement and integration of Autonomous Vehicles (AVs) into modern transportation systems offers promising improvements in safety, efficiency, and convenience. However, the increasing trust that humans place in these autonomous vehicles introduces significant cybersecurity challenges. Human factors, encompassing the behaviour and decision of developers, users, and organizational practices, have been identified as critical elements influencing the vulnerability of AV systems to cyber-attacks. Despite the recognition of these factors, existing literature predominantly focuses on technical aspects of AV security, often neglecting the complex role of human interaction and their contribution to cyber risks. The aim of this research is to take a glance and understand the role that human factors play in the rise of cyberattacks on self-driving cars. The study aims to provide suggestions for strengthening the cybersecurity of AVs through better organizational cultures, end-user-behaviour, and policies by identifying and analysing these elements. The results of the study revealed that consumer trust in autonomous vehicle (AV) cybersecurity is shaped by personal values, privacy concerns, and past experiences, with transparency, strong security features, and public education being key to addressing these concerns. Human factors, such as low cybersecurity awareness, over-reliance on automation, and privacy issues, contribute to vulnerabilities, especially in partially automated systems where traits like impulsivity and multitasking heighten risks. Additionally, a proactive cybersecurity culture within AV manufacturers and flexible regulatory frameworks, supported by international standards like ISO/SAE21434, are crucial for addressing these human-cantered vulnerabilities and ensuring AV system resilience.

Keywords: Autonomous vehicles, Human Factor, Vulnerability, cyber risks, human behaviour

Introduction

The advent of self-driving cars, or autonomous vehicles (AVs), heralds a transformative era in the transportation industry (Othman, 2022), promising substantial advancements in safety, convenience and efficiency. Defined by Faisal, Kamruzzaman, Yigitcanlar, and Currie (2019); Girdhar, Hong, and Moore (2023) and Othman (2022), AVs operate independently without human intervention, utilizing sensors, cameras, radars, and artificial intelligence to navigate, detect obstacles (Sharma, Singh, and Panja, 2021), and make autonomous driving decisions, such as steering, accelerating, braking, and interpreting traffic signals. However, the integration of sophisticated digital technologies into these vehicles also introduced complex cybersecurity challenges. As AVs become more prevalent, ensuring their cybersecurity against cyber-attacks is imperative. While existing literature has extensively explored the technical aspects of AV cybersecurity, such as encryption methods, network security protocols, and systems architecture, Gechter, Romet, and Fass (2019) highlight a growing recognition that human factors are essential to the field of cybersecurity, influencing the effectiveness of technical measures and the general resistance of these systems against cyberattacks.

Recent studies underscore the significant impact of human error during software development processes and end-user negligence on AV vulnerabilities. Researchers like Kasap (2022) and Sjafrie (2019) point to coding mistakes, misconfigurations, and inadequate testing by manufacturers as primary contributors of these vulnerabilities. The complex nature of AV technology demands meticulous attention to detail and rigorous testing protocols. As noted by Channon and Marson (2021) and Firoz, Seong, and Yi (2023). However, the rapid pace of AV development often leads to security oversights (Gechter, Romet, and Fass, 2019). Moreover, end-users frequently exhibit poor cybersecurity practices, such as using weak passwords, neglecting software updates, and failing to recognize phishing attacks (Giannaros, Karras, Theodorakopoulos, Karras, Kranias, Schizas, Kalogeratos, and Tsolis, 2023). This lack of awareness provides an easy entry point for cyber attackers. Girdhar, Hong, and Moore (2023) further note that the high level of trust end-users place in the safety and reliability of AVs can lead to complacency, exacerbating the risk of cyberattacks. As cyber threats evolve, current literature emphasises the importance of robust cybersecurity practices with organisations developing and deploying AVs (Cole, 2024), highlighting the need for cybersecurity measures to be enforced at every phase of the development process. Despite this, many manufacturing organisations do not prioritise cybersecurity due to costs, time, or resource allocation (Jeong, Mihelcic, Oliver, and Rudolph (2019). Cyber-attacks on AVs can range from individual incidents to organised criminal activity and state-sponsored operations (Linkov, Zamecnik, Havlíčková, and Pai, 2019), using human elements like social engineering and insider threats posing significant risks.

Existing body of literature often segregates the technical and human aspects of AV cybersecurity, lacking a comprehensive analysis that integrates these aspects. Current studies do not thoroughly explore how decisions made at various aspects of AV development impact cyber security outcomes (Kalhoro, Ayyasamy, Jebna, Kalhoro, Krishnan, and Nodeson, 2022). There is also a scarcity of research evaluating the effectiveness of user training and awareness programs in mitigating the cybersecurity risks (Schwarting, Pierson, Alonso-Mora, Karaman, and Rus, 2019). These gaps suggest a need for studies that assess the impact of these programs and identify ways to enhance user education and awareness. Moreover, while the role of human error in AV cyber security is acknowledged, there is limited empirical data quantifying the specific impact of different types of errors (Algarni and Thayananthan, 2022). Understanding the security implications of decisions made throughout the AV development and integrating best practices for security from the outset are

critical areas that require further investigation (Mueller, Cicchino, and Zuby, 2020; Firoz, Seong, and Yi, 2023). This systematic literature review aims to address these gaps by exploring the contribution of human elements in the increase of cyberattacks on autonomous vehicles. By synthesising existing research and identifying key themes and gaps, this review aims to offer a thorough comprehension of the human dimension in AV cyber security. The findings will inform strategies to help make self-driving cars more secure, ultimately contributing to the safe and reliable integration of this transformative technology into our transportation systems.

Background and significance

Autonomous vehicle history dates back almost a century, starting with theoretical concepts in the 1920s and 1930s (Cole, 2024) For example, VaMoRs, a self-driving vehicle created by Ernst Dickmanns (Kasap, 2022), was capable of autonomous driving using computer technology vision. As of late, autonomous vehicles are revolutionising transportation by enhancing safety, efficiency and convenience using advanced sensors and AI to operate without human intervention (Golbabaei, Yigitcanlar, Paz, and Bunker, 2023). Recent studies have identified technical vulnerabilities in autonomous vehicle systems, including software coding systems, insecure communication protocols (Linkov et al., 2019), and insufficient data encryption. These flaws are well documented and understood in the cybersecurity community. Regulatory bodies are working to establish frameworks and guidelines for AVs (Lütge, Poszler, Acosta, Danks, Gottehrer, Mihet-Popa & Naseer, 2021), emphasising the importance of addressing security concerns. Research suggests that end-user awareness and education can significantly enhance AV cybersecurity (Li, Huang & Qian, 2022), reducing risky behaviours that compromise cybersecurity.

The cybersecurity of autonomous vehicles is influenced by various human behaviours, including password management, software- updates, and third-party application interaction. However, there is limited understanding of how organizational culture and practices shape cybersecurity measures within these companies (Hutchinson, Strickland, Farrell & Loft, 2022). Further research is required to understand how corporate priorities, policies and training programs affect cybersecurity practices. In addition, the effectiveness of regulatory measures and user education programs in mitigating human factor-related cyber risks in AVs is unclear (Khan, Shiwakoti, Stasinopoulos, and Warren, 2023). Lastly, comprehensive strategies integrating technical solutions with human factors are not fully developed, and research is needed to create cohesive security frameworks that address both technological and human elements for robust protection. The systematic review highlights the significance of understanding human elements in the rise of cyber-attacks on autonomous vehicles, highlighting the need for comprehensive security measures based on human behaviour, decision making, and organizational practice.

Reason for the study

The addition of cutting-edge technologies has brought forth a series of cybersecurity issues (Gechter et al., 2019; Chaudhary, Gkioulos & Katsikas, 2023)**,** Human factors such as organisational structures and end-user behaviour remain largely unexplored in current research (Giannaros et al., 2023). To provide insights that guide the creation of enhanced cybersecurity solutions, the research seeks to systematically investigate the role that the human factor has played in the emergence of cyberattacks on autonomous vehicles. Without a thorough comprehension of how human factors contribute to the vulnerability of autonomous vehicles, several risks may arise, such as: Increased vulnerability, whereby If the human aspects that contribute to cybersecurity weaknesses are not identified and addressed, Saeed, Masood, and Khan, 2023) state that autonomous vehicles could remain susceptible to various forms of cyber-attacks. These attacks could result in loss of control of the vehicle, causing accidents, data breaches, or unauthorized

access of sensitive systems (Meir, Grimberg, and Musicant, 2024). Secondly, public trust in autonomous vehicles could be eroded if cyber-attacks become more common or if high profile incidents occur because of human factors (Hancock, 2019). This lack of trust could slow the adoption of autonomous technology, undermining its potential benefits (Volosin, Kálnay, Bánffi, Nyeső, Molnár, and Martos, 2024). Lastly, insufficient knowledge of human factors in cybersecurity could lead to inadequate regulatory frameworks and legal standards (Haddaji, Ayed, and Fourati, 2024; Saeed, Masood, and Khan, 2023). This could result in gaps in accountability and insufficient protection for end-users and manufacturers.

Research questions

The primary research question for this study is: -
How do human factors contribute to the increase in cyberattacks on self-driving cars, and what measures can be implemented to mitigate these risks?

The following sub-questions were derived to answer the main research question:

i. What is the consumers' perception of cybersecurity in AVs?
ii. What are the human challenges to cybersecurity in AVs?
iii. How do AV regulations enforce cybersecurity?
iv. What strategies can be implemented to improve the cybersecurity of AVs?

Research method

Given the purpose of this paper to investigate how human factors contribute to the rise in cyber-attacks on autonomous vehicles and to identify measures to mitigate these risks, a systematic literature review (SLR) approach is best suited. Booth, Martyn-St James, Clowes & Sutton (2021) claim that an SLR presents a structured, transparent, and replicable method to synthesise existing research, ensuring a comprehensive and unbiased overview of the study (Xiao & Watson, 2019). This approach is advantageous for this research topic as it allows for a thorough examination of both technological and human factors influencing AV cybersecurity, addressing a complex and multifaceted issue systematically.

The SLR process mitigates bias by systematically reporting all steps, practices, and results, thus ensuring transparency and replicability (Kraus, Breier & Dasí-Rodríguez, 2020)**.** This rigorous methodology is essential for accurately capturing the status of knowledge now and locating gaps. Donato & Donato (2019) state that the steps involved in the SLR include (i) Conducting preliminary review to understand the depth of existing literature on human factors and cybersecurity in AVs. (ii) establish a protocol outlining the SLR process (iii) define the inclusion and exclusion criteria (iv) search academic databases to identify relevant studies (v) extract the relevant information to the study; (vi) assess the quality of included studies; (vi) document included and excluded studies (vii) analyse and synthesise findings; (viii) compile synthesized information (Cumpston, Li, Page, Chandler, Welch, Higgins & Thomas, 2019)

Data sources and search terms

To explore the contribution of human factors to cybersecurity on autonomous vehicles, I conducted a systematic search using four peer-reviewed databases: EBSCOhost, ProQuest, ScienceDirect, and Google Scholar. These databases were chosen due to their extensive collection of scholarly articles and their relevance to the fields of autonomous vehicles and cybersecurity. The search period spanned from late May to September 2024, ensuring the inclusion of the most recent and relevant information. Charoenthammachoke, Leelawat, Tang, & Kodaka (2020) argue that EBSCOhost

provides high-quality, peer-reviewed articles in the fields of automation and cybersecurity. ProQuest offers a vast repository for computing and information technology research and journal articles. On the other hand, Tober (2011) states that ScienceDirect focuses mainly on scholarly journals and books published through Elsevier. In addition, Scopus provides data-rich research and journals in the domains of science, technomedicine, and social sciences. Google Scholar was also used as it provides a wide range of topics, it limits bias, by providing peer reviewed journals and non-peer-reviewed journals (Gusenbauer, 2019). As the research paper is interested in the contribution of human factors on the increase in cyber-attacks on autonomous vehicles, a PEO (Population, exposure and outcome) framework is best suited, as it provides a clear and well-structured approach for structuring and organising key elements of the research (Wong, van Oostrom, Bossuyt, Pittet, Hanzel, Samaan & Arebi, 2022; Boyle, 2017).

Databases

Table 1 below shows the columns used to enhance the quality of the search through keywords/synonyms and database terms. Keywords/synonyms are used as special words are required to attain the required articles in question.

Table 1: keyword and search queries

Database	Search query
GOOGLE Scholar	What are the consumers' perception of cybersecurity in AVs" (autonomous vehicle) AND (cybersecurity) AND (Human factor) (autonomous vehicle) AND (human behaviour)
ScienceDirect	What is the consumers' perception of cybersecurity in AVs?" (end-user behaviour) AND (user practices) OR (cybersecurity risks) AND (cybersecurity vulnerability)
ProQuest	"What are the consumers' perception of cybersecurity in AVs" (cyber risks) AND (human factor) AND (autonomous vehicle) OR (self-driving car) impact of end-user practices on AV cyber-attacks How human factors contribute to cyber-attacks on autonomous vehicles
EBSCOHost	Human AND challenges AND autonomous vehicles (cyber-attacks) AND (autonomous vehicle) AND (Human factor) (human factor) OR (behaviour) AND (self-driving car)

Inclusion and exclusion criteria

To guarantee that only pertinent articles are selected, only articles that are related to how human factors play a role in the contribution to cyber security, written in English, were included.

Additionally, peer-reviewed articles with a publication date range of 2019 to 2024, which are less biased, were included. In addition, to ensure that articles that provide no value or relevance to the review, an exclusion criterion is used to ensure reliability. Non-English reviews, non-peer-reviewed articles, Outdated publications, research having a potential prejudice and duplicate publications will not be included in the review.

Bias

It is imperative to understand and address potential bias that can impact the credibility of the findings in review (Boutron, Page, Higgins, Altman, Lundh, Hróbjartsson, & Cochrane Bias Methods Group, 2019). Avoiding bias in research is crucial for maintaining the integrity, validity, and reliability of the findings. The term 'bias' as defined by Harris & Sen, 2019) refers to systematic errors or deviations from findings due to flaws in the planning, gathering, analysing, or interpreting of the study. There are three types of bias' that can have been taken into consideration to reduce bias:

Firstly, there may be a risk of selection bias. Smith & VanderWeele (2019) state that selection bias occurs when certain types of studies or data sources are systematically included or excluded, leading to a distorted representation of evidence (Terne, Hernán, McAleenan, Reeves, & Higgins, 2019). To reduce selection bias, Wang, Qinami, Karakozis, Genova, Nair, Hata, & Russakovsky (2020) urge that researchers are urged to document and justify the criteria used for selecting studies. In addition, Smith & VanderWeele (2019) recommend the use of dual review processes, whereby independent researchers can assess each study for bias. Furthermore, to manage selection bias, clear and justified selection criteria will be applied, ensuring transparency and reducing arbitrary decision-making. A dual review process is implemented, where two independent researchers assess the studies eligibility and quality. This helps minimize individual biases and ensure a more balanced study selection. Disagreements observed were resolved through discussion or a third reviewer. These strategies enhance correctness and dependability of the results

Secondly there may be risk of confirmation bias, (Harris, & Sen, 2019) state that it refers to the tendency to favour information that confirms preexisting beliefs or contradictory evidence. In this review researchers might unconsciously seek out studies that support the hypothesis that human factors exacerbate cyber risks in autonomous vehicles (Sharma et al., 2021), potentially overlooking studies that provide alternative explanations. To reduce confirmation bias, according to Wang, Qinami, Karakozis, Genova, Nair, Hata, & Russakovsky (2020), measures such as random sampling ensure that participants are chosen randomly from the population to address selection bias. To manage confirmation bias, Harris & Sen (2019) argue that using a transparent, comprehensive search strategy to include diverse studies and incorporate a blind review process could minimise confirmation bias. In addition, assumptions can be challenged by engaging in peer feedback and open discussions (Wang et al., 2020).

Lastly, to navigate funding bias, transparency should be ensured by identifying and documenting the funding sources of all included studies (Xie and Zhou, 2022). Studies with potential conflicts of interest were critically evaluated for selective reporting or biases in results (Haffar, Bazerbachi & Murad, 2019). Conflict of interest statements are also included in the review and conducted sensitivity (Wang & Wang, 2019) analyses to assess the influence of funding on findings. Studies from diverse funding sources were incorporated in the study to minimize bias and ensure transparency in reporting (Boutron et al., 2019). By carefully disclosing funding sources and addressing conflicts, objectivity enhances the review. This approach allowed for a balanced discussion of the evidence, acknowledging the potential influence of funding on research outcomes.

Data extraction
For the systematic review, Rayyan was employed, a web-based application designed to facilitate the systematic review process. Harrison, Griffin, Kuhn, & Usher-Smith (2020) states that Rayyan offers a user-friendly platform for screening, coding, and analyzing literature, which significantly changes the efficiency and accuracy of the data extraction process. Initially, all relevant studies were imported from various databases into Rayyan and used a blind screening process to streamline the process and minimize selection bias (Haffar, Bazerbachi & Murad, 2019), Full text reviews and data extraction capabilities were used to extract information, including study design, outcome and human factors related to cyber-attacks on autonomous vehicles.

Quality appraisal and ranking
Harrison, Jones, Gardner, & Lawton (2021) state that quality appraisal and ranking are critical for a systematic review as they help ensure the validity and reliability of included studies. In our systematic literature review, a rigorous quality appraisal and ranking process were employed to ensure the credibility and relevance of the selected articles (Migliavaca, Stein, Colpani, Munn, & Falavigna, 2020). A CASP (Critical Appraisal Skills Programme) is used to carefully and meticulously review research to ascertain its reliability, usefulness, and relevance in a particular context (Long, French, and Brooks, 2020). In this study, a CASP checklist was used to determine the reliability, usefulness, and relevance of the chosen articles. The criteria asked three questions, namely: (1) Was the purpose of the study clearly stated? (2) Did the research design adequately address the study's objective? (3) Have moral concerns been considered?

For the first criteria, papers were checked for the presence of a clear statement of the aim of the research; this ensures that the goal of the research is clearly stated and relevant for the study (Zeng, Zhang, Kwong, Zhang, Li, Sun, Niu, and Du, 2015). The second criteria ensured that the research design is appropriate to address the aims of the research, ensuring that the method used is the rightful method for the research (CASP, n.d.). The last criteria was used to address whether ethical considerations have been taken into consideration. While CASP does not use a scoring system, (CASPn.d.) asserts that if 2 out of 3 questions are answered with “NO”, a poor outcome of the study is likely to be obtained.

Data analysis
Qualitative method was used in this review. Hammarberg, Kirkman & De Lacey (2016); Grossoehme (2014) state that a qualitative approach is centred on understanding phenomena through the collection and analysis of non-numerical data (Thompson Burdine, Thorne & Sandhu, 2021) such as text, interviews, and observations. This method is best suited for exploring complex, contextual, and nuanced issues, making it viable in examining the human factors influencing the increase of cyber-attacks on autonomous vehicles. Jacob (1987) claims that unlike quantitative methods, which Kamal (2019) states**,** emphasizes measurement and statistical analysis, qualitative methods are more related to meaning, experiences, understanding, and perspective. By using a qualitative approach, this systematic review can capture the rich, detailed insights needed to comprehensively understand how humans behave, make decisions, and interact with cyber security vulnerabilities in autonomous vehicles.

Thematic analysis
The data’s recurring themes have been identified, examined, and reported using a thematic analysis (Burdine, Thorne & Sandhu, 2021). It involves coding the data, identifying significant themes, and interpreting the meanings and these themes’ consequences in regard to the research question. For

instance, thematic analysis could reveal errors in human-computer interaction, organizational practices that lead to security lapses, or psychological factors influencing risky behaviour. By highlighting these themes, Migliavaca, Stein, Colpani, Munn, & Falavigna (2020) states that the review can provide a comprehensive understanding of the human factors at play, which are essential for developing a targeted intervention and policy to reduce cyber risks in autonomous vehicles.

Coding strategy

To answer the research questions in this literature review, a deductive coding strategy involves using predefined codes, and assigning the codes to new data (Proudfoot, 2023; Braun, and Clarke, 2019). In this study, data from various sources were carefully reviewed to identify emerging patterns and themes related to human factors influencing AV cyber security (Castleberry, and Nolen, 2018). For example, in addition to those listed above, specific instances of human error, user behaviour, and organizational practice were noted and coded to develop a comprehensive understanding of how these elements contribute to the vulnerabilities in AV.

Findings

Preliminary findings from the included articles showed that consumer views on AV cybersecurity are shaped by personal values, awareness of privacy risks (Volosin et al., 2023), and past experiences. Qian et al., 2023 claims that security-conscious individuals express mixed feelings, appreciating safety features but concerned about data privacy. In developed countries, heightened awareness leads to higher expectations for security, while in developing countries, concerns are more focused on operational safety (Lui et al., 2023). In sub-question 2, it was found that human factors, including low cybersecurity awareness and trust in automation, contribute to vulnerabilities (Aliebrahimi &Miller, 2023). Impulsive behaviors and multitasking impair users' ability to respond to cybersecurity threats (Linkov et al., 2019), while privacy concerns over personal data impact trust in AV systems (Atmaca et al., 2023). Organizational culture and regulatory support are critical for addressing these challenges (Garcia, 2022; Watney & Draffin, 2018).

In sub- question 3, Khan et al., 2023 states that effective cybersecurity frameworks like ISO/SAE21434 ensure security standards are met throughout the AV lifecycle. Real-time monitoring, such as the proposed eSafety Traffic Unit, and consistent enforcement across regions are essential for addressing emerging threats (Watney & Draffin, 2018). Lastly, sub question 4 highlights that multi-layered strategies, including real-time threat detection, encryption for V2X communications (Wilson, 2024), and adherence to global and local cybersecurity standards (Jin et al., 2019), are key. Collaboration with cybersecurity experts and public education can enhance trust and transparency (Khan & Quadri, 2020), fostering wider adoption of AVs (Wilson, 2024).

Discussion

The consumers perception of cybersecurity in AVS

The perception of cybersecurity in autonomous vehicles varies significantly among consumers, driven by personal values, ethical concerns, and awareness of privacy risks. Research by Qian, Yin, Huang, and Liang (2023) demonstrates that personal values like adaptability and security-oriented values play a crucial role in shaping consumers' intentions to use AVs (Aliebrahimi & Miller, 2023). Their study, using Behavioral Reasoning Theory (BRT), highlights that ethical attitude toward AVs act as mediators Garcia (2022) linking these values with consumer decisions. For instance, consumers who value openness are more receptive to AVs (Wang et al., 2023), seeing them as a progressive, environmentally beneficial technology. However, Tu and Xu (2024) assert

that security conscious consumers experience mixed feelings; while they appreciate the safety features, tempering their enthusiasm for AV adoption.

Security preferences

Maeng, Kim, and Cho (2023) further explore these security concerns, identifying communication failures and unauthorized data collection as primary worries. Consumers are particularly apprehensive about the integrity of data communication between AVs and infrastructure (Linkov et al., 2019) as potential failures could compromise navigation and increase collision risks. This study aligns with findings on data privacy (Taeihagh & Lim, 2019) showing that consumers demand transparency on data usage and expect robust security measures, like automatic software updates and security dashboards (Qian et al., 2022) to maintain trust in AV technology. Notably, consumers showed a preference for security features that offer flexibility such as password-based authentication over biometrics (Okoye, 2023) reflecting a desire for control in the event of security breaches.

Furthermore, research by Lui, Nikitas, and Parkinson (2023) points out that consumer awareness of cybersecurity threats in AVs is generally low, suggesting that targeted education could mitigate some of these concerns. Their work emphasizes the need for public education to bridge this gap (Volosin et al., 2024) recommending workshops and even specialized CAV licenses to foster a better understanding of cyber risks among users. This approach aligns with the concept of human-centric trust models described by Okoye (2023), who advocates for AV trust frameworks that prioritize human factors, including transparency in data handling and responsiveness to user preferences. Such frameworks not only promote trust in AV systems but also support a collaborative cybersecurity paradigm (Durlik et al., 2024) where user privacy and vehicle safety are equally prioritized.

Safety incidents and public familiarity with AV technology also play critical roles in shaping perceptions. Ogungbire and Pulugurtha's (2023) analysis of non-motorists' attitudes after a notable AV crash reveals that consumers' perceptions are highly sensitive to safety records. Their study finds that incidents can have both benefits and drawbacks of public opinion (Lui et al., 2020), as consumers either develop skepticism or view such events as catalysts for improving AV safety standards. Maeng, Kim & Cho (2021) claim that this dual response underscores the complexity of trust-building, where consumers may view AVs cautiously, particularly if past experiences with data breaches have already heightened their security awareness. In addition, research by Volosin et al. (2023) shows that individual traits, such as trust in technology and readiness to adopt it, significantly influence consumer attitudes toward AVs. A common thread across these studies is that trust in AV cybersecurity depends on transparency, reliability, and robust cybersecurity practices (Ogungbire and Pulugurtha, 2023) that directly address consumer concerns about privacy and control. Addressing these factors through targeted policy and design interventions can not only build trust but also reduce consumer reluctance, paving the way for broader AV adoption.

Regional and economic differences

Lastly, from a developed versus developing countries' perspective, consumer perception of cybersecurity AVs exhibit notable differences rooted in technological familiarity, infrastructure, and regulatory environments. In developed countries, where digital infrastructure is more advanced and data protection regulations are robust, as seen in the European GDPR framework, consumers tend to be more aware of cybersecurity risks, which influences higher expectations for stringent data privacy and security protocol (Lui et al., 2023). This awareness also translates to confidence in regulatory bodies to hold AV manufacturers accountable, especially concerning data handling

practices and consumer rights. In contrast, in developing countries, where digital infrastructure may be less mature, cybersecurity concerns often take a secondary role to issues like affordability and technological accessibility.

As Maeng et al (2023) suggest, consumer concerns are generally centered on tangible security measures, such as reliable communication channels in CAVs, which directly impact safety and operational efficiency. However, Aliebrahimi and Miller (2023) argue that as mobile internet penetration grows in these regions, consumer awareness around cyber risks is also increasing, which leads to a cautious approach towards AV technology and a demand for clear cybersecurity assurance (Volosin et al., 2023). This contrast underscores the need to address consumer cybersecurity concerns differently across varied economic landscapes, ensuring AV technology's adoption considers local awareness levels and regulatory strength. In conclusion, consumer perception of cybersecurity in AVs is shaped by a contribution of personal values, awareness, and past experiences with technology. For widespread adoption, the AV industry must prioritize transparency in data practices, offer flexible security solutions, and enhance public awareness, creating a trust foundation that addresses ethical, economic and cybersecurity expectations.

What are the human challenges to cybersecurity in avs?

Human factors present significant challenges to the cybersecurity of autonomous vehicles (Ogungbire and Pulugurtha, 2023) particularly as these vehicles become increasingly integrated into our daily lives. The discussion of human-related issues in AV cybersecurity focuses on the interplay of user knowledge (Bustamante, 2022) behavior, privacy, organizational culture, and the complex interaction between AVs and other road users. Each of these factors contribute to a landscape in which human-centered vulnerabilities can compromise the safety and reliability of AV systems.

Cybersecurity knowledge and situational awareness

A lack of cybersecurity awareness among AV users can critically impact their response to cyber threats. Aliebrahimi and Miller (2023) claim that users with higher cybersecurity awareness-especially those familiar with specific attack methods such as "man-in-the-middle" attacks-were better able to identify and respond to simulated cyber-attacks in a controlled AV environment as described by Wilson (2024). However, a troubling trend was observed among users with high trust in automation as they often delayed intervention, expecting the vehicles systems to manage threats autonomously. This suggests that (Bustamante, 2022) despite technical advancements, effective cybersecurity requires user education to cultivate a proactive approach to recognizing and addressing threats (Standton, 2016). The challenge lies in equipping users with the awareness needed to supplement AV security measures, bridging the gap between user reliance on automation and the need for informed vigilance.

Impact of user behavior on cybersecurity vulnerabilities

Human behavior introduces a level of unpredictability into AV cybersecurity. According to Linkov et al. (2019), certain personality traits, such as impulsivity and extra-version Maeng, Kim, and Cho (2023), correlate with a higher likelihood of cybersecurity lapses. These behaviors can impair users' ability to recognize or appropriately respond to cyber threats, particularly in scenarios requiring split-second decisions. Furthermore, Watney and Draffin (2018) assert that users engaged in multitasking during AV operation may experience cognitive overload, which reduces their capacity to detect and react to attacks. This is especially concerning in partially automated AV systems (Level 2) (Ramons, 2022) where user intervention is occasionally required. To mitigate these behavioral vulnerabilities, training programs designed to minimize distraction and enhance cybersecurity awareness could help users maintain an alert stance when needed.

Privacy and trust concerns
Privacy concerns play a significant role in shaping user trust in AV technology. Research by Atmaca et al. (2023) indicates that users with higher education levels and cybersecurity knowledge express increased concern over data privacy in AVs. The integration of AV systems with data-rich networks introduces substantial privacy risks, including the potential for data exfiltration and misuse of sensitive personal information such as trip data and driving trends. These privacy fears can erode trust in AVs (Wilson, 2024) hindering widespread adoption of autonomous vehicles. To address this challenge, manufacturers must emphasize transparent data protection practices, ensuring that cybersecurity measures such as data encryption, anonymization, and user consent are effectively communicated to users Jin et al. (2019). A concerted focus of privacy safeguards not only aligns with regulatory standards but also fosters a sense of security among AV users.

Organizational and regulatory challenges
Organizational culture and regulatory support are crucial in addressing human factors in AV cybersecurity. Garcia (2022) emphasizes that AV manufacturers with a proactive cybersecurity culture are better equipped to enforce security protocols, promote awareness, and prioritize user safety. Such a culture supports effective incident response (Wann, 2024) and reduces vulnerabilities arising from human error or insider threats. Regulatory frameworks also play an essential role, as stated by Watney and Draffin (2018), who advocate for balanced regulation that encourages innovation while upholding cybersecurity standards. Flexibility within regulatory frameworks allows manufacturers to integrate best practices without stifling technological advancements (Wang et al., 2024), while ensuring that security protocols evolve alongside the technology. This dual emphasis on organizational culture and adoption regulation lays the groundwork for a robust cybersecurity environment that addresses human challenges effectively.

Human-av interaction in complex environments
The complex dynamics between AVs and human road users introduce unique cybersecurity risks in urban environments. As Wann (2024) discusses, Avs must be able to interpret human drivers, pedestrians, and cyclists, who often act unpredictably. Unlike human drivers, Chen (2023) claims that AV systems rely on static machine vision and sensor data, which can be exploited if these systems fail to accurately interpret real-time human behavior (Khan et al., 2023; Wilson, 2024). Cybersecurity measures, therefore, need to account for these interpretive gaps, potentially by improving AV systems' ability to process and respond to nuanced road interactions. Enhancing AVs' contextual awareness of human behavior (Wann, 2024) would reduce the risk of cyber manipulations that capitalize on AVs current limitations in complex urban settings.

How do autonomous vehicle regulations enforce cybersecurity?

Comprehensive cybersecurity frameworks (crfs) for avs
To enforce cybersecurity in autonomous vehicles, comprehensive cybersecurity regulatory frameworks (CRFs) play a central role. A principle-based approach within CRFs, as stated by Khan et al. (2023), promotes flexibility and adaptability, allowing AV regulations to evolve with emerging cyber threats without restricting innovation. Unlike rigid, rule-based frameworks (Wann, 2024) this adaptable approach is better suited to address the complexity of cyber risks unique to AV ecosystems. Effective CRFs also prioritize a stakeholder-focused strategy, assigning clear cybersecurity responsibilities to automakers (Wilson, 2024) infrastructure providers, network operators, and consumers. Standards such as ISO/SAE 21434 exemplify this by ensuring that each

stakeholder has defined roles that cybersecurity measures are embedded throughout the AV lifecycle, from development to operation.

Cybersecurity enforcement mechanisms and standards
Cybersecurity enforcement mechanisms are further supported by both national and international regulatory standards. Frameworks such as ISO/SAE21434, the NIST Cybersecurity Framework, and the United Kingdom's automated and Electric Vehicles Act (AEVA) 2018 provide comprehensive compliance guidelines that ensure AV systems meet essential security standards before deployment. This regulatory consistency builds consumer trust and enhances AV safety (Bustamante, 2022) by guaranteeing that vehicles adhere to security benchmarks across various jurisdictions. Certification processes also play a critical role in enforcing cybersecurity (Khan and Quadri, 2022), as they validate that AV systems comply with standards prior to market entry. In addition, the proposed eSafety Traffic Unit (eSTU) (Ramons, 2022) would add an extra layer of protection through real-time monitoring, enabling rapid updates to counter emerging threats and fostering a proactive approach to cybersecurity enforcement.

Institutional and legislative support for cybersecurity
Institutional and legislative support for AVs in cybersecurity is evident through the involvement of federal and national agencies (Wilson, 2024). In the U.S., the national Highway Traffic Safety Administration (NHTSA) and the department of Homeland Security (DHS) provide valuable regulatory guidance, though their policies are largely voluntary. Watney and Draffin (2018) argue that a cohesive, federally enforced framework could further strengthen the cybersecurity enforcement, promoting uniformity across provincial and national jurisdictions (Standton, 2016). The current fragmented regulatory landscape, with varying standards across regions, often leads to inconsistencies in enforcement. In addition, Channon & Marson (2021) A cohesive legislative approach would reduce confusion and ensure that cybersecurity requirements are applied consistently across the AV industry, fostering regulatory cohesion and improving the overall landscape (Khan and Quadri, 2022).

Integration of cybersecurity into av deployment and operation
Finally, cybersecurity integration into AV development and operations is crucial for minimizing vulnerabilities. Standards such as SAE J3016 and ISO26262 encourage a "backed in" approach (Ramons, 2022) to cybersecurity, embedding security measures into the software and system architecture of AVs from the design phase (Khan et al., 2023). This proactive approach mitigates vulnerabilities by addressing them at the earliest stages of development. Additionally, Bustamante (2022), argues that data privacy and vulnerability management remain vital components of AV cybersecurity. Regular assessments (Bustamante, 2022), timely updates, and strict data protection policies ensure that consumer data is safeguarded against cyber-attacks (Heinze, 2024), especially in vehicle-to-infrastructure (V2X) communications. Together, these mechanisms-embedded security, proactive vulnerability management, and data privacy protections-form an integrated approach that enhances the resilience of AV against cyber risks.

What strategies can be implemented to improve cybersecurity of AVs

Cybersecurity threats in autonomous vehicles
Autonomous vehicles are exposed to complex cybersecurity threats, particularly due to their reliance on interconnectivity and data- driven decision-making. Jin et al. (2019) describes how "attack vectors" like spoofing and denial-of-service (Dos) disrupt AV operations, posing significant safety risks. Man-in-the-middle and eavesdropping attacks, which exploit vulnerabilities in vehicle-

to-everything (V2X) communications, are concerning (Standton, 2016). As autonomous vehicles depend on real-time data, these threats highlight the critical need for robust security measures that can mitigate risks in dynamic high stakes' environments.

Cybersecurity strategies for autonomous vehicles
Addressing AV cybersecurity requires a multi-layered approach. Bustamante (2022) emphasizes the importance of real-time threat detection through machine learning, allowing AV systems to monitor and respond to unusual patterns of data flow (Wilson, 2024). Network segmentation is another key strategy, as isolating critical vehicle components can prevent attacks from spreading across networks (Bustamante, 2022). Securing communications is essential, and Jin et al. (2019) recommends cryptographic measures- such as encryption and digital signatures-to protect V2X communications, minimizing unauthorized access and data manipulation (Jin et al., 2019). By implementing these measures, a framework for rapid detection, containment, and mitigation of cyber threats is created.

Standards and regulatory measures
To ensure consistency and reliability in AV cybersecurity, adherence to international standards like ISO21434 is vital. Wilson (2024) argues that following this standard can establish a unified cybersecurity baseline across manufacturers, Similarly, Khan and Quadri (2022) recommend the development of security frameworks aligned with global best practices to guide AV manufactures in implementing resilient security protocols. Government-mandated guidelines and industry-specific audits further enforce these standards (Jin et al., 2019), ensuring that cybersecurity measures evolve with emerging threats.

Collaboration and partnership
Collaboration with cybersecurity experts and technology vendors is essential in fortifying AV systems against potential threats. Khan and Quadri (2020) stress the value of industry partnerships and consultations with cybersecurity specialists to address evolving threats effectively. Regular third-party audits (Standton, 2016) and continuous improvement in security measures through vendor partnerships bolster the overall cybersecurity posture of AVs (Bustamante, 2022), ensuring proactive identification and response to vulnerabilities.

Consumer trust and transparency
In addition to technical security, consumer trust is essential for the uptake of driverless cars. Wilson (2024) suggests that public awareness and education campaigns can enhance understanding of AV safety and cybersecurity measures (Bustamante, 2022), fostering consumer confidence. Wilson (2024) asserts that transparent data handling policies further contribute to consumer trust by addressing concerns about data privacy and security. Such transparency, combined with educational efforts, can help bridge the knowledge gap, alleviating public concerns around AV cybersecurity (Jin et al., 2019).

Conclusion
Finally, the incorporation of self-driving cars into contemporary transportation networks introduces both significant opportunities and challenges, particularly in the domain of cybersecurity. As this technology evolves, consumer perceptions and human factors play pivotal roles in shaping the broader acceptance and security of AVs. Consumer trust in AV cybersecurity is heavily influenced by personal values, awareness of privacy risks, and past experiences, with transparency in data handling and security features being crucial for fostering confidence. Notably, regional and economic disparities must be addressed to tailor cybersecurity approaches to different market

contexts, ensuring that both developed and developing nations adopt AV technologies in a safe and informed manner.

Human factors further complicate the cybersecurity landscape, with challenges arising from user behavior, knowledge gaps, and the complex interactions between AVs and other road users. To mitigate these vulnerabilities, user education, proactive cybersecurity cultures within organizations, and effective regulatory frameworks are essential. Comprehensive cybersecurity regulations, including principle-based approaches and global standards, can help ensure the consistent application of security measures across the AV ecosystem, enhancing resilience against emerging threats. Ultimately, the path to secure and widely adopted AVs requires a multi-faceted strategy that integrates robust technical solutions, consumer engagement, and international cooperation. By prioritizing transparency, education, and collaboration, the AV industry can address cybersecurity challenges, ensuring the safe, secure, and sustainable deployment of autonomous vehicles

Limitations

In this systematic literature review, several limitations should be noted. Firstly, the study may be constrained by the availability and scope of accessible sources, which could restrict the range of perspectives and recent findings on the topic. Additionally, potential biases in the selection criteria, such as publication language or focus, may limit the generalization of the findings. Given the pace of technological and industry developments, some information in the reviewed literature might also be outdated, which poses challenges in assessing current relevance.

Future research

Future research should delve deeper into the connection between human behavior and susceptibility of AV systems to cyber-attacks. This includes studying personality traits, cognitive overload, impulsivity and multitasking tendencies, which may contribute to lapses in cybersecurity awareness and delayed responses to threats. Understanding how certain behavioral patterns influence user interactions with AV systems can inform the design of training programs and user interfaces that promote better cybersecurity practices. Secondly, given the lack of cybersecurity awareness identified among AV users, future studies should explore the effectiveness of various educational interventions aimed at increasing users' ability to detect and respond to cyber threats. Research could focus on the design of user-friendly cybersecurity training programs, the role of public awareness campaigns, and the potential for certification programs or specialized licenses for AV users. Evaluating the long-term impact of these interventions on user behavior and security outcomes will be critical for enhancing the security posture of AV systems.

Thirdly, research could also focus on how the organizational culture of AV manufacturers influences cybersecurity practices and human factors. Investigating the impact of organizational readiness, culture, and internal training on employee behavior and cybersecurity risk management can help identify how best to address insider threats, human error, and communication breakdowns within AV companies. Furthermore, examining the regulatory and policy-driven incentives for manufacturers to prioritize human-centered cybersecurity strategies could enhance both design and operational practices. Lastly, as the perception of cybersecurity in AVs varies across regions with different technological and regulatory environments, comparative research could explore how human factors influence cybersecurity vulnerabilities in developed versus developing countries. This research would help understand how varying levels of digital literacy, access to technology, and regulatory oversight affect user behavior and trust in AVs. Such studies could inform the development of regional-specific strategies to mitigate human-related risks in cybersecurity.

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UNLOCKING BLOCKCHAIN POTENTIAL: THE ROLE OF ORGANIZATIONAL READINESS, TRUST, AND PERFORMANCE OUTCOMES IN SUPPLY CHAIN MANAGEMENT

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Abstract

While blockchain technologies have generated enthusiasm in the professional literature, more research into how organizations ready themselves for blockchain adoption and what the performance impacts may be is needed. Building on emerging blockchain research, this study links organizational readiness and trust with blockchain adoption and use. Using data collected from 344 supply chain professionals, the results confirm the usefulness of organizational readiness in explaining blockchain adoption and performance. While trust in supply chain partners did not influence blockchain adoption for all companies in our sample, post hoc analysis revealed that it did influence technology adoption in manufacturing and construction industries.

Keywords: Blockchain; technology adoption; supply chain; organizational readiness; trust.

Introduction

The blockchain has been hailed as a "game changer" for business and industry (Coresight Research, 2018) with potential applications in areas such as agri-business (Tian, 2016), the record industry (O'Dair & Beaven, 2017), defense (Alcazar, 2017), banking (Cocco et al., 2017; Lipton, 2018), land registry (Lemieux, 2016), health care (Haleem et al., 2021), video game development (Anderson, 2018), real estate (Veuger, 2018) and construction (Heiskanen, 2017).

The blockchain is a distributed, digital ledger that is duplicated and shared across a public or private computer network and used for recording and validating transactions (Fosso Wamba et al., 2019). When a new transaction is added to the ledger it is verified and validated by other members of the network following a consensus process. Blockchain technologies have the potential to eliminate the cost and delays of intermediaries (Fosso Wamba et al., 2019), minimize the risk of fraud (Kshetri, 2018), improve the traceability of products (Tian, 2016), and increase transparency during production and fulfillment for supply chain partners, regulatory bodies and customers (Bocek et al., 2017; Casey & Wong, 2017).

A growing number of authors argue that blockchains will "reshape" (Iansiti & Lakhani, 2017, p. 5) and "revolutionize" (Underwood, 2016, p. 15) the economy. Yet recent surveys have shown that while many organizations are planning blockchain initiatives, few executives believe they have the required knowledge or that sufficient trust exists among supply chain members to undertake them (Queiroz et al., 2019). The strategic value of blockchain is also yet to be observed (Kohli et al, 2021). More research into how organizations ready themselves for blockchain adoption and what the performance impacts may be at individual, firm and supply chain levels is needed.

This study contributes to the emerging blockchain literature by exploring how organizational readiness and trust influence the adoption of blockchain technologies in the supply chain and the impact that adoption has on performance. It responds to recent calls for more empirical studies reporting on the main challenges associated with the implementation of blockchain technologies and the effects on supply chain performance of adoption (Cole et al., 2019; Queiroz et al., 2019). More explicitly, this study intends to answer the following research questions:

RQ1: How does organizational readiness influence blockchain adoption in the supply chain?

RQ2: How does trust in supply chain members influence blockchain adoption?

RQ3: What are the individual, firm and supply chain performance outcomes of blockchain adoption?

To address our research questions, we draw on the blockchain, technology adoption and organizational change literatures to develop a research model that links organizational readiness with blockchain adoption, firm performance and supply chain outcomes.

The paper is organized as follows. The first section introduces the blockchain and examines how organizational readiness and trust in supply chain partners may influence blockchain adoption. We then present the research model and hypotheses. The research methods used for data collection and analysis are then discussed, followed by a presentation of results. The paper concludes with a discussion of the implications of our findings for research and practice and possible avenues for future research.

Literature review

Blockchain technologies

Blockchain technologies hold promise for supply chains. Each step of the production process from the procurement of raw materials through to delivery of the end consumer is recorded in an online digital ledger shared by the different actors within a supply chain. Each transaction is verified by other members following a consensus protocol and once consensus is reached, the transaction is added as a block of data to the historical chain. In this way "transactions are secure, trusted, auditable, and immutable" (Underwood, 2016, p. 15).

The decentralized, disintermediated nature of the blockchain could resolve problems of disclosure between entities with competing interests, encourage data sharing and transparency and provide each member of the network with greater and timelier visibility of total activity (Casey & Wong, 2017).

However, blockchain adoption presents several organizational and technical challenges. Organizational issues include managing changing relationships with supply chain partners and encouraging information sharing. At a technical level, the blockchain requires a mastery of encryption protocols, management of off-chain data storage solutions as the blockchain grows, and compliance with data security and privacy laws (Pisa, 2018). Companies need to have the appropriate technical and organizational skills and sufficient trust in supply chain partners to adopt and develop blockchain technologies.

Organizational readiness

Organizational readiness has often been conceptualized in the technology adoption literature as the availability of organizational resources. Iacovou et al (1995) were the first to define organizational readiness for technology adoption as "the availability of the needed organizational resources for adoption", and more specifically the financial resources and technological knowledge. While resource availability is a necessary condition for effective organizational change, a number of other factors also influence organizational readiness (Lokuge et al., 2018).

The organizational change literature proposes a broader, multi-faceted view of organizational readiness. Organizational readiness is defined as an individual's beliefs regarding both the extent to which change is desirable and the organization's capacity to undertake that change (Armenakis et al., 1993). Readiness is seen as a cognitive precursor to resistance and adoption behaviors.

Organizational readiness varies as a function of how much individuals value change and how favorably they view their collective capability to implement it (Weiner, 2009). Individuals commit to change when they believe that it is needed, important, beneficial or worthwhile. For example, Purchase and Dooley (2010) found that perceived task improvements increased the intention to adopt and use e-procurement systems in the supply chain. Change commitment has been captured by other constructs in the innovation adoption literature such as relative advantage (Rogers, 1995, p. 213) and perceived usefulness (Davis, 1989). It is therefore hypothesized that:

H1. Perceived usefulness will be positively related to blockchain technology adoption.

Organizational readiness also depends on members' beliefs in the organization's collective capacity for change. One measure of an organization's capacity for learning and innovation is its "absorptive capacity" (Cohen & Levinthal, 1990), its ability to value, assimilate, and apply new knowledge to create new capacities and promote organizational change (Zahra & George, 2002). Organizations with greater absorptive capacity have a greater collective potential for

change. For example, Abareshi and Molla (2013) surveyed of 279 Australian logistics and transport operators and found that absorptive capacity played a key role in implementing green logistics practices. It is therefore hypothesized that:

H2. Absorptive capacity will be positively related to blockchain technology adoption.

Gauging and developing organizational readiness and commitment to change is a critical part of the change process (Turner, 1982). When organizational readiness is high, "organizational members are more likely to initiate change, exert greater effort, exhibit greater persistence, and display more cooperative behavior" (Weiner, 2009). The result is more successful change and evolution. Creating readiness for change involves actions destined to influence the attitudes, intentions and behaviors of individuals. Consequently, readiness can be influenced by beliefs among employees that organizational leaders are committed to the proposed change (Holt et al., 2007; Yang et al., 2015).

Management support can generate a shared sense of readiness for change (Dale & Hayward, 1984). Top management support refers to whether or not executives can provide the necessary resources and an organizational climate favorable for adoption. Top management support has been found to be positively related to innovation adoption (Lee & Kim, 2007; Ngai et al., 2012; Teo et al., 2009). It is therefore hypothesized that:

H3. Top management support will be positively related to blockchain technology adoption.

The blockchain represents a fundamental shift in the way organizations manage activities internally and cooperate along the supply chain (Iansiti & Lakhani, 2017; Kshetri, 2018). Successful adoption and use implies significant organizational change and thus requires a high level of organizational readiness.

Trust in the supply chain

The blockchain also represents a fundamental shift in the way organizations cooperate with one another along the supply chain and trust and agreement amongst supply chain partners may be an early obstacle to adoption (Kshetri, 2018; Wang, Han, et al., 2019). Studies have consistently highlighted the critical role of trust for supply chain management performance (e.g. Handfield & Bechtel, 2002; Panayides & Venus Lun, 2009; Zaheer et al., 1998) and for the successful deployment of inter-organizational systems between supply chain partners (e.g. Chae et al., 2005; Fu et al., 2014; Hart & Saunders, 1997).

Trust also needs to be high for members of the supply chain to be willing to share sensitive, commercial data in the distributed ledger (Francisco & Swanson, 2018). Inter-organizational trust is a pre-requisite condition for supply chain members to collaborative effectively and share confidential business data (Hung et al., 2011; Verdecho et al., 2012). Not surprisingly, Wang, Han, et al. (2019) found that in academic and practitioner literature "trust is the most influential factor driving interest in the blockchain within supply chain management" (p. 71). We therefore hypothesize that:

H4. Trust in supply chain stakeholders will be positively related to blockchain technology adoption.

Blockchain outcomes

Blockchain adoption and use could have several individual, firm and supply chain impacts. At the individual level, blockchain technologies may have a positive influence on job performance and productivity by eliminating the need for manual transaction reconciliations and providing more timely access to transaction data. The use of the blockchain provides managers with improved visibility across supply chain processes, improved product

traceability (Tian, 2016) and transparency during procurement, production and fulfillment (Bocek et al., 2017; Casey & Wong, 2017). Blockchain can also provide the opportunity to simplify, digitalize and streamline slow, lower tier manual processes (Wang, Singgih, et al., 2019). It is therefore hypothesized that:

H7. Blockchain adoption will be positively related to job performance.

At the firm level, the adoption of blockchain technology is expected to have a positive influence on decision making, management control and costs. Some observers predict that the short-term value of blockchain may be in its capacity for cost reductions (Carson et al., 2018). The decentralized and distributed nature of the blockchain removes the need for costly, often manual reconciliation processes between trading partners (Fosso Wamba et al., 2019) and can reduce the costs of fraud and counterfeiting (Kshetri, 2018). It is therefore hypothesized that:

H5. Blockchain adoption will be positively related to cost savings.

Non-cost advantages could also accrue to an organization through blockchain adoption and use, such as improved data management and greater information quality, timeliness and accuracy (Aste et al., 2017). It is therefore hypothesized that:

H6. Blockchain adoption will be positively related to operating benefits.

The adoption of blockchain technology is also expected to have a positive influence on supply chain performance including improvements in cost, speed, dependability, risk reduction, sustainability and flexibility (Kshetri, 2018). Both individual and firm outcomes including operational cost savings, improved job performance and the non-financial operational benefits of deploying blockchain technologies are expected to lead to improvements in overall supply chain performance. It is thus hypothesized that:

H8a. Firm level cost saving will be positively related to supply chain performance.

H8b. Individual job performance will be positively related to supply chain performance.

H8c. Firm level operating benefits will be positively related to supply chain performance.

Finally, blockchain adoption may also improve supply chain transparency through changes in operational work processes and data management. Every new transaction is added as a new block to an historical chain and remains visible to all authorized parties across the network. Such end to end supply chain visibility can mitigate supply chain risk and increase confidence in the supply chain (Christopher & Lee, 2004). Improved information flows may also enable new kinds of analytics that improve decision making and supply chain management (Abeyratne & Monfared, 2016). We expect blockchain adoption to influence supply-chain transparency through job performance and operational benefits such as changes to data management. It is therefore hypothesized that:

H9a. Blockchain adoption will positively influence supply chain transparency through job performance.

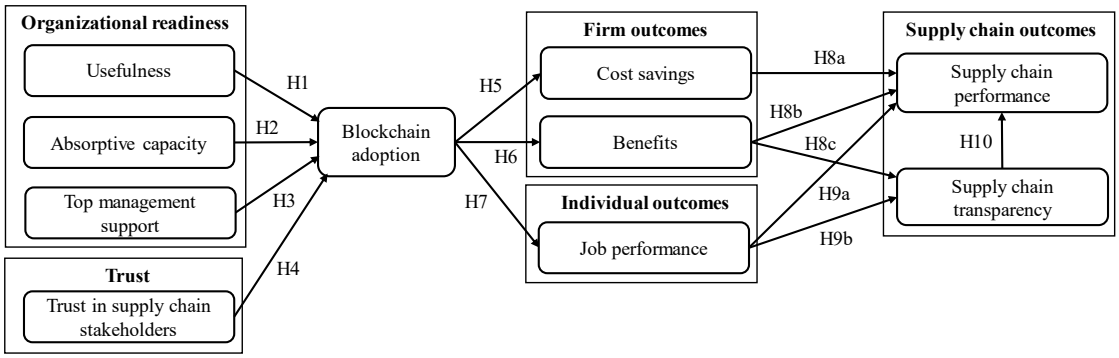
H9b. Blockchain adoption will positively influence supply chain transparency through operating benefits.

Improvements in supply chain transparency are expected to improve supply chain management and relationships with supply chain partners (Casey & Wong, 2017; Lambert & Enz, 2017) and customers (ex. Wolfond, 2017) and thus supply chain performance. Bartlett et al. (2007) notably found an initiative to improve information exchange and visibility between the manufacturer Rolls Royce and their suppliers improved visibility across capacity planning, material ordering and inventory management and supply chain performance vis-à-vis schedule adherence. It is therefore hypothesized that:

H10. Supply chain transparency will be positively related to supply chain performance.

To summarize, the conceptual framework for our hypotheses is presented in figure 1.

Figure 1: Research model



Research methods

Data collection

A questionnaire survey was used to study the adoption and performance outcomes of blockchain technologies. The instrument consisted of 47 questions including 42 questions on the ten constructs of the proposed research model and five questions about respondent's demographic characteristics. A pilot study was undertaken prior to final data collection with 22 experts working on blockchain projects to assess questionnaire readability and construct validity and reliability. Data collection using the final questionnaire was managed by a market research service provider. An invitation letter explaining the overall objectives of the study was sent to supply chain professionals working in organizations with at least three years experience with the blockchain.

Out of the 974 individuals that agreed to participate in the study, 344 returned valid questionnaires (response rate of 35%). The majority of respondents were aged between 26 and 33 years old (51%), and over two-thirds of respondents were men (70% men, 30% women).

Measures

All variables were measured using a seven-point Likert scale ranging from ‘strongly disagree’ to ‘strongly agree’. Scales were drawn from prior literature and adapted to suit the context of the study.

The four items used to measure top management support (TMGS) were taken from Soliman and Janz (2004). The items used to measure absorptive capacity (ABCA) were taken from Lin (2014) and the questions used to measure perceived usefulness (PU) were taken from Venkatesh et al. (2003). Four items used to measure trust of supply chain stakeholders (SCTRU) were taken from Queiroz and Wamba (2019).

The items used to measure blockchain adoption (BADOP) were taken from Kim and Garrison’s (2010) study of inter-organizational system adoption in the supply chain. Three items used to measure cost savings (CSAV) were adapted from (Oliveira et al., 2014) and the items used to measure job performance (JPERF) were adapted from Chung et al. (2014). The five items used to measure non-financial operating benefits (BENFT) were adapted from Kim and Garrison (2010). The four items used to measure supply chain transparency (SCTRAN) were adapted from (Hussein et al., 2018), and the ten items used to measure supply chain performance (SCPERF) were adapted from Qrunfleh and Tarafdar (2014).

Data analysis and results

Measurement model

SmartPLS 3.0 (Ringle et al., 2015) was used to estimate the measurement properties of our model. The study applied nonparametric bootstrapping (Chin, 2010; Efron & Tibshirani, 1994) with 5000 replications to obtain the standard errors of the estimates (Hair et al., 2016) and a path weighting scheme to estimate the structural model relationships.

Reliability and validity analyses were conducted to evaluate the quality of the measures used. The Cronbach alpha statistic was computed to evaluate the internal reliability for each construct. All values are above the recommended acceptable level of 0.70 (Nunnally & Bernstein, 1994) indicating adequate internal consistency.

The convergent validity of each construct was evaluated by inspecting the outer loadings of each individual item and the average variance extracted (AVE). The individual item loadings are all close to or above 0.7 on their respective constructs and the average variance extracted of each construct is above the 0.5 threshold (Fornell & Larcker, 1981) indicating adequate convergent validity of the instrument items.

The results of construct and indicator reliability, and convergent validity tests are summarised in table 1.

Table 1: Measures of internal consistency reliability and convergent validity

	Loadings	Cronbach α	AVE
Perceived usefulness (PU)	0.81 - 0.86	0.847	0.686
Absorptive capacity (ABCA)	0.79 - 0.84	0.821	0.651
Top management support (TMGS)	0.75 - 0.84	0.811	0.637
Trust in stakeholders (SCTRU)	0.79 - 0.88	0.857	0.700
Blockchain adoption (BADOP)	0.85 - 0.88	0.821	0.737
Job performance (JPERF)	0.85 - 0.86	0.818	0.733
Cost saving (CSAV)	0.84 - 0.85	0.800	0.715
Benefits (BENFT)	0.80 - 0.86	0.889	0.693
Supply chain performance (SCPERF)	0.69 - 0.82	0.925	0.597
Supply chain transparency (SCTRAN)	0.79 - 0.82	0.865	0.649

A full collinearity test was conducted following the procedure outlined by Kock and Lynn (2012) to test for common method variance. All variance inflation factors (VIF) statistics were below 3.3 confirming that the model was free of common method bias.

Once we confirmed that construct measures were reliable and valid and that the model was free of common method bias, we then assessed the relationships between constructs in our structural model and its predictive capabilities.

Structural model

Prior to interpreting path coefficients, we checked for collinearity between predictor constructs. All variance inflation factor (VIF) statistics are below 5 indicating acceptable levels of collinearity (Hair et al., 2011)

We next examined the magnitude and strength of the paths of the structural model and then its overall explanatory power. Standardized paths should be around 0.20 and ideally above 0.30 and be directionally consistent with expectations to be considered meaningful (Chin, 1998). The loadings on all significant structural paths were close to or above 0.20 indicating that the model had sufficient predictive power. The results of the structural model are presented in table 2.

Table 2: Results of the structural model

Paths	Path coefficient	Standard deviation	t statistic	p-value
PU → BADOP	0.411	0.070	5.851	0.000
ABCA → BADOP	0.306	0.061	5.044	0.000
TMGS → BADOP	0.115	0.056	2.070	0.038
SCTRU → BADOP	0.076	0.063	1.200	0.230
BADOP → CSAV	0.615	0.045	13.597	0.000
BADOP → BENFT	0.639	0.041	15.512	0.000
BADOP → JPERF	0.649	0.048	13.560	0.000
CSAV → SCPERF	0.150	0.076	1.974	0.048
BENFT → SCPERF	0.322	0.079	4.078	0.000
JPERF → SCPERF	0.246	0.063	3.884	0.000
BENFT → SCTRAN	0.491	0.059	8.288	0.000
JPERF → SCTRAN	0.269	0.065	4.110	0.000
SCTRAN→ SCPERF	0.199	0.058	3.420	0.001
BADOP → BENFT → SCTRAN	0.314	0.045	6.939	0.000
BADOP → JPERF → SCTRAN	0.174	0.047	3.690	0.000

Results

The path between “perceived usefulness” and “blockchain adoption” was significant ($\beta = 0.411$, $p < 0.001$), supporting hypothesis H1. The path between “absorptive capacity” and “blockchain adoption” ($\beta = 0.306$, $p < 0.001$) was also significant, supporting hypothesis H2, as was the path between “top management support”, and “blockchain adoption” ($\beta = 0.115$, $p = 0.038$), supporting hypothesis H3.

The path between “trust in supply chain stakeholders” and “blockchain adoption” ($\beta = 0.076$, $p = 0.230$) was not significant at the 5% level.

The path between “blockchain adoption” and “cost savings” was significant ($\beta = 0.615$, $p < 0.001$), supporting hypothesis H5. The path between “blockchain adoption” and “benefits” was also significant ($\beta = 0.639$, $p < 0.001$), supporting hypothesis H6. The path between “blockchain adoption” and “job performance” was significant ($\beta = 0.649$, $p < 0.001$), supporting hypothesis H7.

The path between “cost savings” and “supply chain performance” was significant ($\beta = 0.150$, $p = 0.048$), supporting hypothesis H8a. The paths to “supply chain performance” from “benefits” ($\beta = 0.322$, $p < 0.001$) and “job performance” ($\beta = 0.246$, $p < 0.001$) were both significant, supporting hypotheses H8b and H8c.

The indirect paths to “supply chain transparency” from “block chain adoption” through “benefits” ($\beta = 0.314$, $p < 0.001$) and “job performance” ($\beta = 0.174$, $p < 0.001$) were also both significant, supporting hypotheses H9a and H9b. Finally, the path between “supply chain transparency” and “supply chain performance” was significant ($\beta = 0.199$, $p = 0.001$), supporting hypotheses H10. The results of all hypothesis tests are presented in table 3.

Table 3: Results of hypothesis tests

Hypothesis	Results
H1: PU has a positive significant effect on BADOP.	Supported
H2: ABCA has a positive significant effect on BADOP.	Supported
H3: TMGS has a positive significant effect on BADOP.	Supported
H4: SCTRU has a positive significant effect on BADOP.	Not supported
H5: BADOP has a positive significant effect on CSAV.	Supported
H6: BADOP has a positive significant effect on BENFT.	Supported
H7: BADOP has a positive significant effect on JPERF.	Supported
H8a: CSAV has a positive significant effect on SCPERF.	Supported
H8b: BENFT has a positive significant effect on SCPERF.	Supported
H8c: JPERF has a positive significant effect on SCPERF.	Supported
H9a: BENFT has a positive significant effect on SCTRAN.	Supported
H9b: JPERF has a positive significant effect on SCTRAN.	Supported
H10: SCTRAN has a positive significant effect on SCPERF.	Supported
H10: SCTRAN has a positive significant effect on SCPERF.	Supported

The coefficient of determination (R2) was computed to assess the model's overall explanatory power. The analysis revealed that the structural model explained 61%, 38%, 42%, 41%, 65% and 50% of the variation in blockchain adoption, cost savings, job performance, organizational benefits, supply chain performance and supply chain transparency respectively, suggesting that the structural model provided adequate explanatory power (Hair et al., 2016). In addition to evaluating the model's predictive accuracy with the R2 statistic we also calculated Stone-Geisser's Q2 value to assess the model's predictive relevance. Predictive relevance measures how well the path model can predict the originally observed values. The Q2 values for BADOP and SCPERF both exceed 0.35 indicating strong predictive relevance and the other endogenous constructs exhibit medium levels (0.26 to 0.30) of predictive relevance (Hair et al., 2016).

Discussion

The objective of this study was to extend our understanding of blockchain technology adoption and its impact on individual, organizational and supply chain performance. The analysis of data collected from 344 supply chain professionals provided overall support for our research model.

The results reveal that organizational readiness, as measured by perceived usefulness, absorptive capacity and top management support influences the adoption of blockchain technologies. Perceived usefulness (β = 0.411) and absorptive capacity (β = 0.306) more strongly influence blockchain adoption than top management support (β = 0.115). This result is consistent with the conceptualization of organizational readiness in the change literature as an essentially two-dimensional construct. One explanation for this result is that the influence of top management support may vary depending on the quality of influence strategies, change agent trustworthiness or credibility and interpersonal and social dynamics at work during the readiness creation process (Armenakis et al., 1993).

The study also confirmed that the adoption of blockchain technologies positively impact performance at the individual, firm and supply chain levels. Blockchain adoption had a strong positive effect on firm level performance measures, notably cost savings (β = 0.615) and organizational benefits (β = 0.639), and on individual job performance (β = 0.649). In turn, supply chain performance was moderately influenced by organizational benefits (β = 0.322) and job performance (β = 0.246). Cost savings however had relatively little influence on supply chain performance (β = 0.150). Firm level benefits (β = 0.491) and individual job performance (β = 0.269) both had a moderate positive influence on supply chain transparency. In turn, supply chain transparency had a weak effect on supply chain performance (β = 0.199). Overall, supply chain performance is accurately predicted by the model (R2 = 0.65).

Contrary to expectations, no significant relationship was found between trust in supply chain stakeholders and blockchain adoption (β = 0.076, p = 0.230). This result is consistent with the work of Queiroz and Wamba (2019) who only found partial support for the relationship between trust in supply chain partners and behavioural expectation to adopt blockchain technologies, and no relationship between trust and behavioural intention to adopt. One explanation could be that blockchain is not perceived as necessary if the level of trust between supply chain partners is already high. For example, Singh and Teng (2016) found that in a supply chain dyad, inter-organizational trust is negatively associated with transaction costs and positively related to relational governance and performance. Firms may not feel the need for blockchain technologies when costs and difficulties of dealing with supply chain partners are low. A second explanation could be that the blockchain is also appropriate in low trust environments (Carson et al., 2018) as it provides an infrastructure that allows for trust in transactions to be maintained without the need for trust in a central authority or in any particular participant (Weber et al., 2016). A third explanation for this result could be that the role of trust between supply chain partners differs between industries. The impact of trust on supply chain performance has been found to vary according to different supply chain configurations (Capaldo & Giannoccaro, 2015). “Ring” and “small world” interdependence patterns, typically resulting from just in time production strategies demonstrated the highest beneficial effect of trust on supply chain performance. These structures involve a high level of synchronization and collaboration (Wan et al., 2022) that requires significant trust between supply chain partners. Two industries that have adopted just in time production strategies are manufacturing (Fullerton & McWatters, 2001) and construction (Aloini et al., 2012). These industries also typically seek high levels of relational stability, namely a tendency to work with a small number of firms per specialty; a specificity that requires and reinforces trust

between supply chain partners (Eccles, 1981; Yang et al., 2008). Trust in supply chain stakeholders may play a more important role in blockchain adoption for manufacturing and construction companies than for other industries in our data set.

Post hoc exploratory analysis

Following the recommendations of Hollenbeck and Wright (2017) we undertook a post hoc exploratory analysis of group differences using multi group analysis in PLS-SEM. Respondents in the manufacturing and construction industries were grouped together (n = 136) and compared to a second group comprised of respondents in all other industries (n = 208). Based on the previous discussion we expect trust in supply chain partners to be more positively related to blockchain adoption in the manufacturing and construction industries than in other industries. The results confirm our expectation: there is a significant difference in the path coefficients between trust in supply chain partners (SCTRU) and blockchain adoption (BADOP) for the two groups ($\beta 1 - \beta 2 = 0.301$, $p < 0.01$). The trust construct has a significantly greater positive effect on blockchain adoption in manufacturing and construction industries than in other industries.

Implications for theory

The present study makes some important theoretical contributions. Firstly, this study draws on the organizational change literature and confirms the importance of readiness for change as a precursor of blockchain adoption. Our results show that organizational readiness goes beyond the availability of resources (Iacovou et al., 1995) and other measures of facilitating conditions (Venkatesh et al., 2008) and should include measures of change commitment and change efficacy.

Secondly, our results confirm that blockchain adoption has performance impacts at multiple levels in organizations. We found that blockchain adoption affects individual job performance, firm level cost savings and non-financial benefits as well as both supply chain transparency and performance.

Thirdly, our post hoc exploratory analysis revealed differences in blockchain adoption between industries. Trust in supply chain partners had a stronger positive influence on blockchain adoption in manufacturing and construction industries than in other industries. The influence of supply chain interdependence patterns on blockchain adoption is an interesting avenue for future research.

Implications for practice

Our results have several managerial implications. Firstly, our findings may guide practitioners and managers that plan to adopt blockchain technologies. Managers should prepare targeted interventions to gauge and improve organizational readiness. For example, Armenakis et al. (1993) suggest building a program for creating employee readiness for change based on the extent to which employees are ready and the urgency of the change. Creating organizational readiness for blockchain adoption is a key management responsibility.

Secondly, our findings confirm that blockchain adoption strongly and positively affects individual job performance, cost savings, data management and decision making. While business models are yet to be transformed by blockchain technologies (Carson et al., 2018), the digitisation of supply chain processes through blockchain adoption appears to bring tangible, localized benefits.

Limitations and future research directions

The present study is limited in several ways. First, the study uses three measures as proxies for organizational readiness: perceived usefulness, top management support and absorptive capacity. Future studies could consider conceptualizing organizational readiness as a higher order formative construct.

Secondly, the study follows a cross-sectional approach which only allows the collection of data about the phenomena under study at one moment in time. Future research could use a longitudinal approach to understand change in the nomological network over time, or a mixed-methods approach that uses both qualitative and quantitative research methods.

Thirdly, unobserved heterogeneity was not assessed in this study (Becker et al., 2013). Future research should consider this issue during the data collection and analysis process.

Conclusions

Our study builds on the emerging literature on blockchain and the change management literature to develop a research model that links organizational readiness and trust in supply chain partners to blockchain adoption in the supply chain and to blockchain outcomes at the individual, the firm and the supply chain level.

The findings contribute to the growing body of knowledge on the adoption, use and impact of blockchain diffusion in the supply chain and provide managers with a number of thinking points to successfully ready employees for change and deploy blockchain technologies within their organizations.

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Track 6 - Marketing

DIGITAL CONSUMERISM IN AFRICA: A CONCEPTUAL EXPLICATION AND DIRECTION FOR FUTURE STUDIES

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Abstract

Digital transformation permeates virtually every aspect of our lives and has significant implications for global marketing transactions. Its relevance cuts across various sectors of the economy and permeates both private and public sectors. In the consumption context, digital transformation is now evident in various types of products and services consumed and at each stage of the consumer decision-making process from need recognition to the post-purchase evaluation stage. Although digital penetration is relatively lower in Africa than in most other parts of the world, it is noteworthy that the impact of technology in the continent continues to grow which is evident in the number of consumers that embrace it to fulfil their value-oriented transactions such as through mobile devices and connections to various social media platforms. Consequently, this conceptual paper focuses on a situation audit of digital transformation among consumers in Africa. Given that Africa is diverse in its dynamics in various ways including culture and consumer behaviour, the prevalence of a digital divide in the continent is evident. In addition to other challenges, the digital divide in various ways such as those in relation to gender, age, and consumers' health poses a great challenge to digital consumerism in the continent. Hence, the paper indicates strategic directions on having inclusive strategies in place to widen the scope of digital usage in African countries. This will strengthen the usage level to the threshold where all consumer segments including women, the elderly, and people with disabilities have appropriate access to digital opportunities for their marketplace interactions such as ensuring financial inclusion. The implications of this study are reasonably wide, transcend African countries and have global relevance, especially in addressing the Sustainable Development Goal (SDG) 5 (Gender equality) SDG 11 (Reduced inequalities) and SDG 12 (Responsible consumption and production).

Keywords: Digital Consumerism, Digital Divide, Africa, Consumer Behaviour, Digital Transformation, Sustainable Development Goal (SDG)

Introduction

The economic growth in Africa is projected to be 4% for 2025-26, which is a considerable improvement from 3% projected for 2024 and 2.4% recorded for 2023 (Wordbank Group, nd). The role of digital transformation in this is increasing year after year. We now hear of the increasing use of terms like artificial intelligence, mobile technological gadgets, and digitalisation in various ways. Although there are some peculiarities about the African context such as cultural differences, consumer behaviour in that context is also influenced by technology in one form or another. Nonetheless, there is a digital divide between consumers in various contexts in the African context based on different demographical factors. The main objective of this paper is to unpack the inequality in the use of digital technology among African consumers and pinpoint the strategic direction in addressing this to ensure the digital divide is addressed. The rest of this paper is arranged as follows. Following this introduction is the segment on the general overview of the intersection between technology and consumption. This is followed by a general outlook of the global economic system, Africa context, and digital consumers in Africa. The discussion, managerial implication, and conclusion end the paper in consecutive order.

Technology and consumption: A Conceptual overview

The impact of digital transformation is evident in virtually all human endeavours globally. It now intertwines with our everyday lives, influencing how we work, live, and communicate as we now hear of Internet of things, artificial intelligence, robotics, nanotechnology, and many others (Ojo, 2022; Gbadamosi, 2024). It is described as widely infiltrating in that it reorganises various facets of social economic engagements (Beyene et al, 2024). As of February, 2025, the number of global internet users is stated to be 5.56 billion (See Table 1), representing 67.9 percent of the world's population (Petrosyan, 2025). This further widens the scope of the radical change in the global transaction and consumerism. This radical change has manifested in various ways. Although it happens in varying forms across different contexts, the ever-increasing access to mobile devices is a good example on this (Mackey, 2018). Mobile phone has been specifically described as a kind of 'happy object' because it plays a symbolic role in how consumers integrate in civic and consumer culture (Mackey, 2018). The emerging technologies covering things like blockchain, artificial intelligence, and the internet have been facilitating huge changes in many organisations, nations, and societies (Ojo, 2022). Moreover, the great explosion of online digital video channels. (OVDCs) attracts huge investments and attention. An example of this is YouTube which has over 2 billion users while viewers watch around 1 billion hours long of video on YouTube per day on their television (Zote, 2024). For example, it is regarded as very popular among young consumers of Generation Y and Generation Z as they use longer time on the OVDCs through their various mobile devices (Duggett, 2020). This is not surprising as literature indicates that these youths use digital media for empowerment (Mackey, 2018).

The use of digital media permeates numerous contexts including business and health sector. Just like other social media channels, the initial thoughts about YouTube were that it was for entertainment. However, it has now grown into marketing communications platform where it has been used strategically by many parties such as influencers and celebrity endorsers to promote goods and services (Duffett, 2020). Its role as catalyst in transforming public organisations are evident in various forms such as we notice in e-government and e-governance which facilitate the delivery, management, and evaluation of public programmes (Melitski et al., 2010). While some establishments may worry about the cost of investment into technology such as in the case of teleradiology, it is important to note that it often result to cost savings in the long run (Schoeman and Haines, 2023). For instance, digital healthcare

can address the inefficiencies associated with the traditional healthcare system and solve the issue of limited access to in-person medical consultations (Udenigwe and Yaya, 2022). Hence, digital health can lead to better patient experience and better health outcomes, and better value of care for the hard-to-reach vulnerable patients (Jones et al., 2020). Moreover, when considered from the field of laboratory medicine, it introduces the prospect of using artificial intelligence to enhance clinical decision-making covering issues like disease monitoring, and patient safety (Erasmus and Ondoa, 2023). In the study of Schoeman and Haines (2023), conducted in the South African context, it is found that teleradiology is perceived as having the potential to influence personal, societal, and operational functioning positively. Obviously, whether in Africa or other parts of the world, digitalization offers many benefits. For instance, the internet and digital media serve as a democratic platform to voices that have been historically underrepresented and can quickly find a large audience in unprecedented ways (Knox, 2020). It fuels economic growth through the effective use of natural resources and human capital (Abending and Duan, 2021). Furthermore, it is noted that mobile and Internet banking offer speedy and good delivery channels for traditional and new banking products (Mukalayi and Inglesi-Lotz, (2023).

In a study on IT Education and workforce participation in the context of Kanyan women, Atieno (2015) notes that having practical skills combined with the instrumental value, ICT is greatly prized and that the opportunities associated with ICT education are resulting into women's empowerment in the IT sector. The significant benefits of digital technology for refugee communities is also noteworthy and highlighted in the work of Mansour—Ille and Starks (2023) where it is stated that having an effective regulatory system to govern digital work could support them in navigating remote working. From a different perspective, social media can be an effective tool to encourage collaboration across various segments, especially young consumers who may be marginalised in relation to citizenship and human rights (Mackey, 2018). Having an understanding of the dynamics of the digital economy is noteworthy. In digital economy, digital technology innovation is the main driving force and integrates internet technology with the real world (Cheng and Huang, 2022). Moreover, the information and communication technology is significantly beneficial to small businesses in various sectors of the economy including those operating in the informal sector (Etim and Daramola, 2023). Emphatically, the opportunity for internet usage varies. This is known as digital divide which can be based on various factors such as countries and other demographical factors. Apart from the differences in the country, the digital divide is also prevalent in relation to other demographical factors such as age and gender. For instance, in a research examining the gender divide of internet users in 186 countries, the result shows that countries with the highest internet penetration were mainly in Europe while those with lower internet penetration were in West Asia, and Central Asia, and Africa (Wang and Lin, 2024).

The Dynamics of Digital Consumerism in Africa

From the broad role of technology, it is logical to deduce the evolving dynamics of digital consumerism. Consumers' needs for goods and services are changing as evident in the type of goods and services demanded these days (Gbadamosi, 2024). This change affects consumers' decision-making process which encapsulates the need recognition, search for information concerning the planned purchase, evaluation of alternatives, purchase, and the post purchase evaluation (Engel et al, 1968). Evidently, globalisation is bringing the African continent to the world in significant and spectacular form**.** As noted by Diagne (2019), the digital economy serves as an instrument for amplifying and accelerating job creation possibilities among African youths. It is interesting to note that smartphones outsell computers in sub-Saharan Africa in a ratio of four to one which aids connectivity and social media usage,

especially among young consumers (Mackey, 2018). It has been noted that 80% of Facebook users in Africa gain access to their account through mobile phones which emphasise growth and popularity and explains why Facebook has its first office in South Africa to enhance its growth in sub-Saharan Africa (Mackey, 2018). In a study focusing on digital health and Artificial intelligence in Africa, Erasmus and Ondoa (2023) reiterate that the development of the digital data laboratory medicine field brought about the use of AI for aiding decision-making in clinical settings, prediction and monitoring of diseases and patient safety. According to them, artificial intelligence leads to the integration of symptom profiles, health records, and patient demographic data that can result in better prediction and effective recommendations in relation to various diagnoses. Following from this, it is clear that individual patients can find their health records, track their health concerns over time, and even compare treatment received as well as the medical options they have (Baur et al., 2001; Wallington, 2008). These are some of the benefits associated with digitalisation thriving and making waves in Africa. By and large, in a study on international trade and economic growth in Africa, Abendin and Duan (2021) found that, with the use of the pooled ordinary least squares (POLS), trade has a positive effect on economic growth when there is interaction of the digital economy.

Accordingly, the education and training needs of African consumers are expected to reflect the present digital economy (Nordhagen et al., 2019). It is expected this will aid Africa in meeting its needs and international demands (Nordhagen et al., 2019). Statistically, the contribution of digital technology especially mobile services is approximately 8% of sub-Saharan Africa's Gross Domestic Product (GDP) and contributes around 3,2 million jobs as well as tax contribution income of about £16 billion (The GSMA, 2022; Beyene *et al;,* 2024). This is a considerable figure. The digital economy in sub-Saharan Africa covers many issues including the digital literacy, the digital ecosystem, the digital Gig economy, and Research and Development. Ultimately, it is revolutionizing industries, economies, societies, and governments (Beyene et al., 2024). It has been documented that in sub-Sahara Africa countries like Rwanda, Kenya, and Ghana over 40% of agricultural platforms take mobile-money payments which indicates that the rapid technological diffusion in developing countries has transformed the way financial services are offered (Kudamaa et al., 2021; Mukalayi and Inglesi-Lotz, 2023). So, most emerging countries, especially those in the Pacific Asia, South Asia, and Sub-Saharan Africa have embraced financial technology as aided by mobile phones to foster poverty reduction and economic growth (Mukalayi and INglesi-Lotz, 2023).

However, there are some challenges mitigating the development of full internet usage and opportunities which include poor or lack of internet access which tends to restrict access to digital livelihood opportunities (Hunt et al, 2017; Mansour-Ille and Starks, 2023). The effect of the digital divide in sub-Saharan Africa is another considerable challenge. For example in Nigeria, while 86% of women are mobile users, the percentage of men mobile owners is 89%; and in Mozambique, only 47% of women are mobile users while men are approximately 64% and the divide is made worse socioeconomic issues such as poverty and illiteracy (Alozie, and Akpan-Obong, 2017; GSMA, 2021). A greater level of challenge is when these problems are exacerbated by disabilities as Udenigwe and Yaya (2022) advocate that it is imperative to gain a good understanding of the intersectionality of literacy, gender, and disabilities for a proper understanding of maternal healthcare phenomenon.
The discussion of digital consumerism in Africa will involve examining the discourse of culture as a phenomenon. Meanwhile, it is necessary to note that digital platform is very consequential to how we view culture and the distinction between viewing it as socialization,

communication, and community compared to viewing it as a tool of expression which is a rather narrow perspective (Hyllan and Kleppe, 2024). Despite the increasing rate of digital presence in Africa, the key ICT indicators in Africa remain below the average at the global level and there is still wide variations between rural and urban areas in the continent in relation to internet penetration (Knox, 2020).

Youth market and digital consumerism.

The youth market is notably dynamic as it experiences many changes as a result of technology and globalisation high demand for quality food, changes in disposable income, and increases in their rural-urban migration (Ngomane et al., 2022). As it is a common global trend, young consumers' presence in the digital economy in Africa is the most prominent. They explore digital media as a powerful tool for empowerment in re-appropriating digital form of communication (Mackey, 2018). They are known to be digital natives in the typology distinguishing between them and those who are older (digital immigrants) and not in their generation and may not have adequate knowledge of the dynamics of technology and its usage (Hanlon, 2019). The young consumers are identified so because they are born in the digital era and have considerable opportunities to know a lot about how it works. Mackey (2018) highlights that young consumers also known as 'born digital' use technology as primary mediators of human-to-human interactions. Among the evidence of this is the claim of the popularity of the YouTube platform among Generation Z who are often tagged as digital natives (Duffett, 2020) as they spend longer hours watching videos (Duffett, 2020) and exploring the internet. There is literature evidence that shows that digital learning has a positive impact on early childhood dynamics (Nhi et al., 2021). YouTube marketing communication is noted as very functional as a catalyst at the initial level of young consumers' hierarchy of effect model (Duffett,2020). Nevertheless, in developing countries, the bandwidth is slow and expensive and some young consumers find YouTube intrusive (Duffett, 2020). The use of mobile phones and digital technology has been linked as useful to pedagogy to deepen children's learning and involvement (Hannaway, 2024). On the other hand, digital technology has its challenges in relation to young consumers in Africa (Ayisi et al., 2024) which include misinformation (Diepenveen and Pinet, 2022), cyberbullying (Park et al., 2014) exposure to extreme content (Schmuck et al., 2022); and disinformation, malinformation (Howard et al., 2021).

Global economy, Globalisation, and Digitalisation

The global economy is underpinned by several factors including consumption, production, innovations, digitalisation. In the consumption context, there has been growing concern about unhealthy processed food in many parts of the world (Nordhagen et al., 2019). Apart from food and consumption, Information technology (IT) has been a core aspect of global economic activities over the years as it injects new vitality into the global economic system (Cheng and Huang, 2022). A study indicates that the digital economy impacts trade negatively to influence economic growth ((Cheng and Huang, 2022). Meanwhile, due to the increasing rate of digitalisation, there has been a shift from conventional financial arrangements to digitalize money (Ojo, 2022). It is noteworthy that digitalisation has played a significant role in boosting the introduction and use of cutting-edge issues around environmental sustainability thereby supporting the government in planning, procuring, building, and operating climate-resilience infrastructure (Beyene et al, 2024). A study by Beyene et al (2024) on the determinants of digital technology development in sub-Saharan African countries found that there are non-technological elements that shape the landscape of digital technology in sub-Saharan Africa and these include globalisation, fulfilment of basic human needs, favourable digital ecosystems, and economic condition. Hence, in spite of the

growth in the use of digital technology globally, the rate of its adoption is not uniform with developing countries such as Africa being behind (Malephhane, 2022).

Africa, consumption, and Technology usage

Africa is notably a fertile continent in many ramifications ranging from the endowment of natural resources, human resources, and innovations including digital technology. The continent has a current population of approximately 1.53 billion representing 18.3% of the world population (Wordometer, 2024). It has numerous great opportunities relating to various consumer segments (Lappeman et al., 2019; Sani et al., 2024; Hilson *et al.,* 2025). While the continent was noted for a period of stagnation ranging from 1960s to 1980, there have been significant and impressive outlooks afterwards (Olubode, 2004; Sieff, 2008). It is also important to note that the sub-Saharan African region is diverse in economic performance with some countries as high-income, others are upper-middle, lower-middle, and low-income countries. Meanwhile, the most recent economic update of the region shows that sub-Saharan growth for the year 2024 is projected to be 3% which is a positive growth from the 2.4% recorded for the year 2023, and the projected growth for 2025-26 is even far higher at 4% (World Bank Group (nd)). Many efforts are being made to position the continent as a significant contributor in the world economic system. For example, the African Continental Free Trade Area (AfCFTA) is built for the purpose of transforming all of the associated economies through the opening of many new opportunities for the continent (Diagne, 2019). From the skill development perspective, delivering training that meets international standards on the African continent will enable the young population to put that into practice in the markets both in the continent and outside (Diagne, 2019). Among the relevance of the youth population is the growth of mobile devices in developing countries which prompts the popularity of brands of online video digital channels (OVDC) among them (Bolton et al., 2013; Zhang et al., 2017). Nonetheless, there are many issues of concern about the continent which also link to its economy and growth. An example is the regional crisis in which many of the forefronts are in the continent (Glas, 2018). Similarly, the economic growth of the continent was noted as slower than expected as a result of weaknesses in the economic weaknesses in Nigeria, South Africa, and Angola (World Bank, 2019). Besides, the continent is still behind in the pursuit of some Sustainable Development Goals(SDG) such as SDG 5 around gender equality as some women and girls are still disadvantaged and marginalised in Africa including in the area of digital finance (Ojo, 2022). This also covers the disparity in access to ICT, especially in developing countries which is tagged ‘digital divide’ (Atieno, 2015).

Table 1: Number of global internet users

	Year	Number of internet users
1	February 2025	5.56 billion
2	October 2024	5.52 billion
3	July 2024	5.45 billion
4	October 2023	5.37 billion
5	July 2023	5.28 billion
6	July 2022	5.14 billion
7	July 2021	4.91 billion
8	July 2020	4.63 billion
9	July 2019	4.18 billion
10	July 2018	3.85 billion

Source: Statista & Kumar (2025)

Table 2: Age and Gender divide in internet usage in Africa

Segments and statistics of internet usage in Africa	
Age	
Young (15-24)	*Old (25>)*
53%	34%
Gender	
Male	*Female*
45%	34%

Source: Adapted from Petrosyan (2024) Statista

Discussion, implications, and conclusion

The world is now digital. The increasing number of global consumers now embrace the use of technology to address their needs. As shown in Table 1, over 5 billion consumers are now connected to the internet in one form or another. This reflects as consumers undergo the decision-making process beginning with need recognition. The goods and services purchased these days are markedly different from what used to be the pattern of consumption as a result of an increase in digitalisation. Increased use of technology products such as mobile phones, significant presence on social media platform, and the increasing rate of interaction with the Internet of Things (IoT) are some of the examples that demonstrate this development. As shown in the table, this is also evident in Africa to an extent as 570 million of consumers are reported to be internet users as of 2022 (Galal, 2024) and this number is projected to increase to 964.1 million by the year 2029 (Statista, 2025). Although the continent is characterised by some challenges, the integration of Artificial intelligence (AI) and digitlaisation into laboratory and diagnostic services has improved disease monitoring, clinical decision-making, and patient safety in Africa (Erasmus and Ondoa, 2023). Apart from the nature of the goods and services bought, the sources of obtaining information about these products have also increased. Consumers need information on a number of issues such as prices, quality, and availability. Consumers are also inundated by options of where to obtain such information as a result of digitalisation. Typically, the sources of this information can be categorised as commercial and non-commercial. The increased use of digital technology has widened the sources on both sides of the divide. With the large number of sources of information, there is a need for consumers to evaluate the alternatives that emerge from this. Digitalisation helps significantly in this process. Questions such as which brand to choose, which quality level, which model, and at what prices, are some of the issues addressed at the stage of evaluation of alternatives. As an example, the online reviews offered by other consumers serves as a good source of digital aid in evaluating alternatives available. The experience of prior consumers of the product to be bought is often documented in the reviews to guide potential consumers in evaluating alternative. The gradual increase of digitalisation in Africa also pinpoint the usefulness of this opportunity for African consumerism. Similarly, at the stage of making the decision of the purchase, digitalisation is significantly relevant. Products admired or screened to be bought could be in any country in the world, digitalisation implies that such could be ordered online and bought, and delivered to the consumer which is different from the experience some decades before now. The decision-making process does not end at the stage of the purchase but also extents to the stage of post-purchase evaluation when the consumers compares the experience of using the product to the expectation they had before the purchase. Digitalisation has made this more expeditious as noticed in the rate at

which businesses connect with their consumers to gauge their experience of using their products and services. By and large, the use of digital technology in Africa has also influenced how consumers engage with the marketing system via these stages and contributed to the key role Africa in the global economic system.

Given the cases, the following propositions which are also an indication of directions for future studies on this subject are listed.

- P1: Enhancing digital consumerism in Africa is predominantly influenced by consumers' personal circumstances.
- P2: Digital divide in Africa is caused by external factors beyond the control of the individual consumers.
- P3: The main inhibitors of improved digital consumerism in Africa are inadequate infrastructural facilities.
- P4: Value co-creation between consumers and businesses would be dominant in improving digital consumerism in Africa.

Although the current paper is enlightening in various ramifications, it also highlights avenue for future studies especially in relation to addressing the stated propositions. Given that the paper is conceptual, there is a need to confirm the key issues discussed through empirical studies in which data will be collected from consumers in the continent on the dynamics of digital economy, digital consumerism, and digital divide in the continent and the direction for ameliorating the current challenges. Given the diversity of the continent, such studies should be conducted in phases so that patterns between the findings can be compared for a more robust explication of the phenomenon.

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DYNAMIC SERVICE CALIBRATION IN DIGITAL TRANSFORMATION: A MULTI-PLATFORM ANALYSIS OF COMPLEX FINANCIAL SERVICES

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Abstract

Digital transformation in complex service environments presents unique challenges that existing theoretical frameworks struggle to explain. Through the analysis of customer reviews across various digital platforms, this study investigates how traditional and digital-native financial service providers address diverse service requirements. We find that successful digital transformation necessitates a dynamic calibration of channel integration and social presence based on interaction stakes, temporal context, and provider-customer dynamics. Current theories, which presume stable integration requirements and binary presence needs, inadequately account for the observed service patterns. We tackle these limitations by developing the Digital Service Calibration (DSC) model, which introduces three theoretical mechanisms: stakes-based calibration, temporal evolution, and provider-customer alignment. The model advances theory by elucidating how integration requirements vary with interaction stakes, how presence needs to evolve over time, and how service outcomes emerge from provider-customer interaction. We propose new theoretical constructs—calibration resonance, friction, and learning—that facilitate sophisticated analysis of digital service dynamics. Our findings suggest that organisations must cultivate new capabilities for dynamic service calibration, including real-time stakes assessment and adaptable delivery infrastructure. The study contributes to digital transformation theory by demonstrating that successful service delivery requires continuous calibration rather than static optimization, while providing practical guidance for organisations navigating complex service environments.

Keywords: Digital transformation; Service calibration; Channel integration; Social presence; Financial services; Digital innovation

Introduction

Digital transformation in financial services has revealed a fundamental theoretical limitation in our understanding of service delivery. While existing theories conceptualize digital service provision as primarily a challenge of channel integration (Verhoef et al., 2015) or social presence management (Lu et al., 2016), emerging evidence suggests a more complex dynamic at play. Insurance services, where providers must balance digital efficiency with human connection across varying interaction stakes, reveal the inadequacy of current theoretical frameworks for explaining successful digital transformation.

The challenge extends beyond simple integration of digital and traditional channels. Our analysis of customer reviews across multiple platforms reveals systematic variation in how service requirements evolve based on interaction stakes, temporal context, and provider-customer dynamics. Traditional insurers struggle with technically fragmented but emotionally responsive service delivery, while digital-native insurers achieve technical seamlessness but struggle with emotional complexity. This pattern suggests fundamental limitations in both channel integration theory's assumption of stable integration requirements (Brettel et al., 2010) and social presence theory's binary conceptualization of presence needs (Lombard & Jones, 2015).

Three critical theoretical gaps emerge from this context. First, while channel integration theory explains coordination across service platforms (Verhoef et al., 2015), it cannot account for how integration requirements systematically vary with interaction stakes and emotional intensity. Second, although social presence theory suggests varying channel effectiveness for different interactions (Lu et al., 2016), it fails to explain how presence requirements evolve both within service episodes and across relationship lifecycles. Third, existing frameworks provide limited insight into how providers and customers jointly navigate service complexity, particularly in environments combining routine and high-stakes interactions.

To address these gaps, we analyze how traditional insurers and insurtech firms manage service delivery across multiple digital platforms. Our investigation reveals patterns of service calibration—dynamic adjustment of channel integration and social presence based on interaction context—that existing theories struggle to explain. This observation led to the development of the Digital Service Calibration (DSC) model, which introduces three theoretical mechanisms: stakes-based calibration, temporal evolution, and provider-customer alignment.

The DSC model advances theory in several ways. First, it extends channel integration theory by explaining how integration requirements vary systematically with interaction stakes and temporal context. Second, it advances social presence theory by introducing graduated presence requirements and explaining their evolution over time. Third, it provides new theoretical constructs—calibration resonance, calibration friction, and calibration learning—that enable a more sophisticated analysis of digital service dynamics. For practitioners, our model suggests the need for fundamental reconsideration of digital transformation strategies. Rather than focusing solely on technical integration or digital capability development, organizations must develop new capabilities for dynamic service calibration. This includes mechanisms for real-time stakes assessment, temporal learning systems, and flexible service delivery infrastructure.

The paper proceeds as follows: First, we review pertinent literature on channel integration and social presence in digital services. Then, we detail our methodological approach before presenting our empirical findings. Finally, we develop the DSC model and discuss its implications for theory and practice.

Theoretical Framework

Our investigation of digital transformation in insurance services is guided by two complementary theoretical perspectives: channel integration theory and social presence theory. Rather than testing these frameworks, we use them as analytical lenses to understand emerging patterns in digital insurance service delivery and to elaborate theory based on rich qualitative evidence.

Channel Integration Theory: Channel integration theory provides insight into how organizations coordinate multiple service touchpoints in digital environments (Verhoef et al., 2015). The theory suggests that customer experience quality depends on seamless coordination across channels, with integration effectiveness shaped by information consistency, process transparency, and operational synchronization (Lemon & Verhoef, 2016). In financial services, channel integration becomes particularly salient as customers navigate between digital self-

service and human-assisted channels during complex transactions (Kumar & Ramachandran, 2021). However, insurance contexts reveal potential boundaries of current channel integration theory. Insurance services combine routine interactions (e.g., policy renewals) with emotionally charged episodes (e.g., accident claims), challenging the assumption of stable integration requirements across service interactions (Wilson & Daugherty, 2023). Moreover, while existing theory emphasizes operational integration, insurance services highlight the need for emotional continuity across channel switches, particularly during high-stakes interactions (Lu et al., 2016).

Social Presence Theory: Social presence theory offers a complementary lens, explaining how communication channels vary in their ability to convey human warmth, understanding, and connection (Lombard & Jones, 2015). The theory suggests that channel effectiveness depends on its ability to transmit social and emotional cues, with richer channels generally better suited for emotionally charged interactions (Kumar & Benbasat, 2022). This perspective is particularly relevant for understanding when and why digital channels may succeed or fail in insurance contexts. Insurance services present unique challenges to social presence theory. The industry combines extended periods of routine digital interaction with intense episodes requiring high social presence, challenging traditional assumptions about stable presence requirements (Lu et al., 2016). Additionally, the emergence of insurtech firms introduces questions about how different service models achieve social presence through primarily digital channels (Singh et al., 2019).

Theoretical Integration and Research Questions

The intersection of these theoretical perspectives suggests several key areas for investigation in digital insurance services. Rather than testing predetermined hypotheses, we explore the following research questions:

> RQ1: How do traditional insurers and insurtech firms differ in their approaches to channel integration during emotionally charged service episodes?

This question builds on channel integration theory's emphasis on coordination while exploring how emotional intensity influences integration patterns. It examines how different service models handle the transition between routine and high-stakes interactions.

> RQ2: How do social presence requirements vary across different insurance service touchpoints, and how do providers adapt their channel strategies accordingly?

Drawing on social presence theory, this question explores the dynamic nature of presence requirements in insurance services, examining how providers modulate presence levels across different interaction types.

> RQ3: How do channel integration and social presence interact to shape customer experience in digital insurance services?

This synthetic question explores the interplay between our theoretical lenses, seeking to understand how integration and presence jointly influence service outcomes.

Theoretical Framework for Analysis

Building on our research questions, we develop a sensitizing framework that guides our qualitative analysis of digital transformation in insurance services. At its core, this framework suggests that successful digital transformation requires sophisticated orchestration of multiple service dimensions. The first critical dimension is adaptive channel integration, where firms must develop the capability to modify integration patterns based on interaction context and emotional intensity. This adaptiveness becomes particularly salient in insurance contexts where service requirements can shift dramatically between routine and high-stakes interactions (Kumar & Ramachandran, 2021). The second key dimension involves dynamic presence management, where providers strategically modulate social presence across different service episodes and touchpoints. This dimension responds to emerging evidence that presence requirements vary systematically across the insurance service journey (Lu et al., 2016). The framework suggests that successful providers develop sophisticated capabilities for adjusting presence levels as interaction requirements evolve. These dimensions come together through context-sensitive alignment, where providers match channel configurations and presence levels to specific interaction requirements. This alignment mechanism helps explain why technically sophisticated integration sometimes fails to produce desired service outcomes, particularly when emotional stakes are high (Schneider & Kokshagina, 2021). Rather than serving as a predictive model, this framework provides an analytical lens for interpreting patterns in our qualitative data while remaining open to emerging insights that may elaborate or challenge existing theory.

Our study advances theory in several significant ways. First, we extend channel integration theory by revealing how integration requirements systematically vary with emotional intensity in financial services. While existing theory emphasizes technical integration capabilities (Verhoef et al., 2015), our framework suggests that emotional intensity fundamentally shapes integration requirements, particularly in high-stakes service contexts. This extension helps explain previously puzzling patterns where superior technical integration fails to produce superior service outcomes. Second, we advance social presence theory by demonstrating how presence requirements fluctuate across different service episodes and provider types. Current theoretical frameworks treat presence as a relatively static requirement (Lu et al., 2016), but our analysis reveals systematic variation in presence needs across the service journey. This theoretical refinement helps explain why digital-first service models sometimes struggle with complex emotional interactions despite strong technical capabilities. Third, we develop an integrated theoretical perspective that explains how channel integration and social presence jointly shape digital service effectiveness. While existing theories treat these dimensions separately, our framework reveals their dynamic interaction in shaping service outcomes. This integration provides new theoretical tools for understanding digital transformation success and failure patterns in complex service environments. Our theoretical framework remains flexible enough to incorporate emerging patterns and unexpected findings from our rich qualitative data, enabling theoretical elaboration rather than mere testing of existing frameworks.

Research Methodology

Research Design: Our study adopts an interpretive qualitative approach, combining thematic analysis (Braun & Clarke, 2006) with comparative case analysis (Eisenhardt & Graebner, 2007) to understand how traditional and insurtech firms navigate digital transformation challenges. This design aligns with recent calls for richer, context-sensitive investigations of digital service evolution (Huang & Rust, 2021). The interpretive approach enables us to examine how channel integration and social presence manifest across different service models while remaining sensitive to emergent patterns and theoretical insights (Gioia et al., 2013).

The South African insurance market provides an ideal research context for several theoretically significant reasons. First, the market's combination of established insurers and digital-native insurtechs creates natural variation in service models, enabling theoretical insights into different approaches to digital transformation (Kumar & Ramachandran, 2021). Second, the market's high digital adoption rates alongside persistent traditional service elements generate tension between digital and human channels, making transformation dynamics particularly visible (Singh et al., 2019). Third, the presence of multiple review platforms facilitates theoretical triangulation of customer experiences across different interaction contexts (Villarroel Ordenes et al., 2019).

Data Collection and Sampling: Our dataset comprises customer reviews collected between January 2023 and April 2024 from five digital platforms: Google Reviews (412), Facebook (145), Twitter (89), Instagram (38), and HelloPeter (542). Following Villarroel Ordenes et al. (2017), we selected these platforms because they attract different types of service experiences and emotional intensities, enabling theoretical coverage of varied customer-firm interactions. We employed theoretical sampling (Glaser & Strauss, 1967) to ensure coverage of theoretically significant dimensions. This approach led us to sample across service models (traditional vs. insurtech), interaction types (claims, queries, complaints), emotional intensities (routine to high-stakes), and channel combinations (digital-only vs. hybrid). This sampling strategy aligns with recent methodological recommendations for digital service research (Marić et al., 2024) and enables theoretical saturation across key dimensions. Data collection followed a systematic protocol preserving rich contextual information. For each review, we captured temporal context (timestamp), service characteristics (episode type, channels involved), relationship history (previous interactions), and resolution pathways. This protocol draws on established approaches to digital service research (Lemon & Verhoef, 2016) while incorporating recent methodological advances in social media analysis (Villarroel Ordenes et al., 2017).

Data Analysis: Our analytical approach followed the Gioia methodology (Gioia et al., 2013), which enables systematic theory development while maintaining qualitative rigor. The analysis proceeded through three interconnected stages, each building on established qualitative research principles while incorporating recent methodological innovations in digital service research.

First, we conducted open coding to identify emergent concepts, with two researchers independently coding 200 reviews. Through constant comparison and researcher discussion, we developed 127 first-order codes capturing specific aspects of customer experiences. This process followed established protocols for qualitative data analysis (Braun & Clarke, 2006) while maintaining sensitivity to digital service contexts. Second, we engaged in axial coding to identify theoretical categories explaining patterns in first-order codes. This process was informed by our theoretical framework but remained open to emergent themes, following recommendations for theory elaboration research (Fisher & Aguinis, 2017). Through iterative discussion and comparison, we consolidated the first-order codes into 24 second-order themes that captured key theoretical constructs. Finally, we developed aggregate theoretical dimensions through constant comparison between data, emerging patterns, and existing theory. This process revealed four key dimensions: channel integration patterns, social presence dynamics, service model differences, and transformation tensions. These dimensions emerged through systematic comparison across provider types, interaction types, channel combinations, and platforms, following established comparative case analysis procedures (Eisenhardt & Graebner, 2007).

We employed multiple strategies to ensure research quality, drawing on established guidelines for qualitative research rigor (Lincoln & Guba, 1985). Our approach to triangulation encompassed data sources (multiple platforms), investigators (multiple coders), theoretical perspectives (multiple theoretical lenses), and methods (thematic and comparative analysis). This comprehensive triangulation strategy aligns with recent recommendations for digital service research (Zeithaml et al., 2020). Reliability was established through systematic coding protocols, regular research team meetings, and maintenance of a detailed analysis audit trail. Inter-coder reliability achieved a Cohen's kappa of 0.83, exceeding recommended thresholds for qualitative research (Neuendorf, 2017). Validity was enhanced through member checking with industry experts, negative case analysis, and rich contextual description, following established qualitative research guidelines (Pratt et al., 2020).

Findings

Our analysis reveals distinct patterns in how traditional insurers and insurtech firms manage digital service delivery across multiple platforms. We present these findings organized around the four aggregate dimensions that emerged from our analysis: channel integration patterns, social presence dynamics, service model differences, and transformation tensions. Tables 1-3 provide more detail on the analytical processes and structure.

Channel Integration Patterns

The data reveals fundamental differences in how traditional insurers and insurtechs approach channel integration. Traditional insurers typically maintain separate channels that customers must actively navigate between. For instance, Discovery's customers frequently report having to repeat information when moving from app-based claim initiation to phone-based processing: "I submitted everything on the app but had to explain it all again when they called" (Discovery Review 142). This separation creates friction during complex service episodes, particularly during claims processing where customers often need to switch channels multiple times.

In contrast, insurtech firms demonstrate more technically seamless but emotionally disconnected integration. Naked Insurance customers praise the smooth technical handoffs between channels: "Everything flows from the app to email to WhatsApp naturally" (Naked Review 73). However, this seamlessness breaks down during emotionally charged interactions. Multiple customers describe feeling "lost in the system" during accident claims, despite the technical integration functioning properly.

Pineapple Insurance's approach reveals a third pattern: integrated but inflexible channel design. While their platform provides smooth technical integration, customers report inability to deviate from predetermined service paths: "The app works perfectly until you need something unusual, then there's no way to get human help" (Pineapple Review 28).

Social Presence Dynamics

Our analysis uncovers varying patterns of social presence across different service episodes. Traditional insurers maintain high social presence through dedicated human agents but struggle with consistency. Momentum customers frequently reference specific agents who provided exceptional service: "Sarah understood my situation immediately and handled everything

personally" (Momentum Review 91). However, this personalization comes at the cost of service delays and inconsistency. Insurtech providers demonstrate more consistent but lower-intensity social presence. Naked's customers report feeling "efficiently processed" rather than "personally served." This difference becomes particularly apparent during emotionally charged claims: "The process was quick but felt robotic when I was stressed about my accident" (Naked Review 45). The data also reveals temporal patterns in social presence requirements. During routine interactions, customers of all providers express satisfaction with low social presence. However, during critical incidents, traditional insurers' higher social presence capabilities become distinctly advantageous: "When my house flooded, I needed someone who understood my panic" (Discovery Review 203).

Service Model Differences

Clear distinctions emerge between traditional and insurtech service models in handling complex interactions. Traditional insurers show greater flexibility in deviating from standard processes when situations require it. Discovery and Momentum customers frequently mention instances of "rule-bending" to address unique circumstances: "They found a way to help even though my situation didn't fit their usual criteria" (Momentum Review 167). Insurtech firms demonstrate superior efficiency in standard processes but struggle with exceptions. Naked and Pineapple customers consistently praise routine service speed: "Claim approved in 3 minutes flat" (Naked Review 88). However, this efficiency diminishes sharply when cases require deviation from standard protocols: "Once you're off their script, everything grinds to a halt" (Pineapple Review 52).

Transformation Tensions

Our analysis reveals ongoing tensions in how providers balance digital efficiency with human connection. Traditional insurers show evidence of reluctant digitization, maintaining human touchpoints even when digital channels might suffice. This manifests in customer complaints about unnecessary calls: "Why did they need to call when I'd submitted everything digitally?" (Discovery Review 234). Insurtech firms display opposite tensions, facing pressure to add human elements to their digital-first models. This appears most prominently in complex claims handling: "They needed to stop hiding behind the app and get a human involved" (Naked Review 124). These tensions intensify during high-stakes interactions, where the limitations of both models become more apparent. The data also reveals an emerging pattern of channel switching behavior, where customers actively manage these tensions themselves. Many customers report using digital channels for routine matters while actively seeking human interaction for complex issues: "I use the app for everything except claims. For those, I make sure I get a person" (Momentum Review 183).

Cross-Platform Variations

Our multi-platform analysis reveals distinct patterns in how service experiences are reported across different channels. HelloPeter reviews tend to capture more complex service breakdowns, providing rich detail about channel integration failures. Google Reviews more commonly capture routine interactions, while social media platforms (Twitter, Facebook, Instagram) tend to capture immediate service reactions and emotional responses. These platform-specific patterns provide important context for understanding service dynamics. For instance, the same service episode might be characterized as "efficient" in a Google review but "impersonal" on Twitter, revealing the multifaceted nature of digital service experiences.

Table 1: Thematic Map of Service Calibration Dimensions

Primary Dimension	Secondary Elements	Tertiary Elements	Supporting Evidence
Stakes Assessment	Emotional Intensity	- Customer Stress	"During the accident I needed immediate human help" (DR156)
		- Service Urgency	"Emergency situations require different handling" (NR234)
	Interaction Complexity	- Process Deviation	"Standard process couldn't handle my situation" (PR167)
		- Exception Handling	"No way to handle unique cases" (MR189)
Channel Integration	Technical Integration	- Platform Coordination	"Systems don't talk to each other" (DR234)
		- Data Consistency	"Information gets lost between channels" (NR167)
	Process Flexibility	- Service Adaptation	"Can't adjust to different needs" (PR203)
		- Workflow Modification	"Rigid processes that can't change" (MR156)
Presence Management	Human Touch Points	- Emotional Support	"Need human understanding sometimes" (DR298)
		- Complex Problem Solving	"Some issues need human intervention" (NR234)
	Digital Automation	- Efficiency Gains	"Digital works great for simple things" (PR187)
		- Process Standardization	"Automated handling of routine matters" (MR167)

Table 2: Data Structure of Service Calibration Patterns

First-Order Concepts (Representative Quotes)	Second-Order Themes	Aggregate Dimensions
"App works perfectly until emergency" (NR156)	Stakes-Based Integration Gaps	Stakes Calibration
"Need human touch during claims" (DR234)		
"Technical integration fails when stressed" (PR187)		
"System can't adjust to unique cases" (NR203)	System Flexibility Issues	
"No flexibility in digital process" (PR167)		
"Stuck in automated workflow" (DR298)		
"Different needs over time" (MR187)	Temporal Evolution Patterns	Temporal Evolution
"Relationship evolved" (DR234)		
"Changed how I use channels" (PR156)		
"Learning to work with the system" (NR145)	Customer Adaptation Strategies	Provider-Customer Alignment
"Found best way to get help" (DR167)		
"Strategic channel choice" (MR234)		

Table 3: Integration of Service Calibration Elements

Service Context	Traditional Insurers	Insurtech Firms	Key Pattern
Routine Interactions	Channel separation with manual integration	Automated integration with limited flexibility	Stakes-based variation in integration needs
Emergency Service	High touch with coordinated channels	Technical integration with presence gaps	Presence requirements vary with stakes
Complex Claims	Flexible but fragmented integration	Seamless but rigid integration	Trade-off between flexibility and seamlessness
Relationship Evolution	Gradual adaptation of service patterns	Static technical optimization	Temporal dimension of service calibration
Customer Learning	Supported channel navigation	Self-directed platform mastery	Different approaches to customer adaptation

Discussion

Our findings advance our understanding of digital transformation in complex service environments by elaborating how channel integration and social presence dynamically interact in insurance services. We develop three key theoretical insights that extend current theory and offer new perspectives on digital service delivery.

Dynamic Channel Integration in High-Stakes Services

Our findings extend channel integration theory by revealing how integration requirements fundamentally shift with interaction stakes. While existing theory conceptualizes channel integration as a relatively stable organizational capability (Verhoef et al., 2015), our analysis reveals a more dynamic phenomenon we term "stakes-sensitive integration." This construct explains how successful channel integration in insurance services requires continuous modulation based on interaction complexity and emotional intensity.

Traditional insurers and insurtechs demonstrate contrasting approaches to this challenge. Traditional insurers maintain flexible but fragmented channel integration, preserving ability to adjust service pathways but creating friction during channel transitions. Insurtechs achieve technical seamlessness but sacrifice adaptability, particularly during high-stakes interactions. These patterns suggest that channel integration theory must be revised to account for services where integration requirements vary systematically with interaction stakes.

The emergence of customer-driven channel management strategies, where customers actively navigate between digital and human channels based on perceived interaction stakes, suggests a new theoretical perspective on channel integration. Rather than viewing integration solely as an organizational capability, our findings indicate it should be conceptualized as a dynamic interaction between provider capabilities and customer integration strategies. This reconceptualization helps explain why technically superior integration systems may still fail during complex service episodes.

Our empirical evidence reveals a critical limitation in current channel integration theory. For example, Naked Insurance's technically sophisticated integration failed during high-emotion claim scenarios: "Everything broke down when I needed to explain the trauma of my accident" (NR156). Similarly, Discovery's intentionally fragmented but adaptable approach showed surprising effectiveness during complex claims: "They seamlessly shifted from app to personal contact when they realized the complexity of my situation" (DR234). These patterns suggest that channel integration theory must expand beyond technical seamlessness to incorporate emotional complexity.

Graduated Social Presence in Digital Services

Our analysis extends social presence theory by demonstrating how presence requirements operate on a continuum rather than as binary states. While existing theory emphasizes presence or absence of social cues (Lu et al., 2016), our findings reveal what we term "presence graduation" – systematic variation in social presence requirements across different service episodes and emotional states.

Traditional insurers maintain high but inconsistent social presence, creating strong emotional connections during critical episodes but struggling with presence consistency. Insurtechs achieve consistent but low-intensity presence, effectively handling routine interactions but failing to scale presence during emotional escalation. This pattern suggests that social presence theory should be expanded to consider both presence intensity and presence adaptability as distinct theoretical dimensions.

The temporal patterns in presence requirements we observed suggest another theoretical refinement. Rather than stable presence preferences, customers demonstrate dynamic presence needs that evolve both within single service episodes and across the customer relationship lifecycle. This finding indicates need for a more temporally sensitive conceptualization of social presence in digital services.

The temporal nature of presence requirements emerges clearly in our data. Pineapple customers demonstrated distinct presence preferences across their service journey: "I was happy with the chatbot for basic queries, but when my claim got complicated, I needed that human connection" (PR187). This temporal variation challenges static conceptualizations of social presence, suggesting need for more dynamic theoretical models.

Towards a Digital Service Calibration (DSC) Model

Our findings point to the need for a new theoretical framework that explains how organizations successfully manage digital transformation in complex service environments. We propose the Digital Service Calibration (DSC) model as a comprehensive theoretical framework that extends both channel integration and social presence theories while offering new insights into digital transformation dynamics.

Limitations of Existing Theoretical Frameworks

Current theoretical frameworks demonstrate significant limitations in explaining digital service delivery in complex environments. Channel integration theory (Verhoef et al., 2015) assumes relatively stable integration requirements, failing to account for how integration needs vary with interaction stakes. For instance, our data shows how technically perfect integration can fail during emotionally charged moments: "The seamless app experience became a barrier when I desperately needed human understanding after the accident" (NR167). Similarly, social presence theory (Lu et al., 2016) treats presence as a relatively static requirement, overlooking how presence needs evolve both within single service episodes and across customer relationships.

These theoretical limitations become particularly apparent in three areas. First, existing frameworks cannot explain the observed pattern of customers actively managing channel usage based on perceived interaction stakes: "I consciously use different channels depending on how complex or emotional my need is" (DR234). Second, current theory offers limited insight into why technically superior digital integration sometimes produces inferior service outcomes: "Everything was perfectly connected but somehow made me feel more distant from the company" (PR156). Third, existing frameworks struggle to explain the temporal evolution of service requirements: "My channel preferences completely changed as my insurance needs got more complex" (MR189).

Theoretical Foundations of the DSC Model

The DSC model builds on three theoretical streams while addressing their limitations. First, it extends channel integration theory by introducing dynamic integration requirements that vary with interaction stakes. Second, it advances social presence theory by conceptualizing presence as a graduated requirement rather than a binary state. Third, it incorporates temporal dynamics from relationship marketing theory (Morgan & Hunt, 1994), explaining how service requirements evolve over time.

Our empirical evidence suggests that successful digital service delivery requires continuous calibration across three dimensions. Stakes Dimension: The stakes dimension captures how service requirements vary with interaction complexity and emotional intensity. Our data shows systematic variation in channel and presence requirements based on perceived stakes: "For routine renewals, the app is perfect, but for claims, I need different types of interaction" (DR312). This dimension explains why technically identical integration can produce different outcomes depending on interaction stakes. Temporal Dimension: The temporal dimension explains how service requirements evolve both within episodes and across relationships. We observe distinct patterns of temporal evolution: "My relationship with the insurer has completely changed over time - what worked initially doesn't work now" (MR276). This dimension addresses the limitation of static service models in current theory. Provider-Customer Interaction Dimension: This dimension captures the dynamic interaction between provider capabilities and customer strategies. Our data shows active customer participation in service calibration: "I've learned to strategically choose channels based on what I need to accomplish" (PR198). This dimension explains service outcomes as emergent properties of provider-customer interaction rather than solely provider capabilities.

Core Mechanisms of the DSC Model: The DSC model proposes three core mechanisms through which service calibration occurs:

1. Stakes-Based Calibration Mechanism: This mechanism explains how providers assess and respond to varying interaction stakes. We observe distinct calibration patterns across providers. Traditional insurers demonstrate flexible but resource- intensive calibration: "They quickly escalated to senior staff when they realized the complexity of my situation" (DR345). Insurtechs show efficient but sometimes rigid calibration: "Their system couldn't adjust when my case didn't fit their standard patterns" (NR234).
2. Temporal Evolution Mechanism: This mechanism explains how service patterns evolve over time through provider learning and customer relationship development. Our data shows systematic evolution: "Over time, they learned exactly when I need digital efficiency versus human touch" (MR387). This mechanism addresses the static limitations of current theory.
3. Provider-Customer Alignment Mechanism: This mechanism explains how service outcomes emerge from dynamic provider-customer interaction. We observe distinct alignment patterns: "It's like a dance - we've learned how to work together across different channels" (DR412). This mechanism extends beyond current theory's provider-centric focus.

Model Dynamics and Interactions: The DSC model proposes that these mechanisms interact dynamically, creating distinct service patterns:

1. Calibration Resonance: When mechanisms align properly, providers achieve what we term "calibration resonance" - optimal matching of service delivery to customer needs.

Our data shows clear examples: "They somehow know exactly when to shift from digital to human interaction" (MR456).

2. Calibration Friction: Misalignment between mechanisms creates "calibration friction," evident in cases where technical integration conflicts with emotional needs: "The more they tried to keep everything digital, the more frustrated I became" (PR267).
3. Calibration Learning: Over time, providers and customers develop what we term "calibration learning" - improved ability to achieve and maintain resonance: "We've both learned when different approaches work best" (DR389).

Model Validation and Boundary Conditions: Our data suggests several boundary conditions for the DSC model:

1. Service Complexity: The model appears most relevant for services combining routine and high-stakes interactions. Pure transactional services may require simpler frameworks.
2. Market Maturity: The model's effectiveness depends on market digital maturity and customer digital literacy.
3. Regulatory Environment: Regulatory constraints may limit certain calibration possibilities, particularly in financial services.

Implications

Theoretical Implications: The DSC model advances digital transformation theory in several significant ways. First, it reconceptualizes digital transformation as a dynamic calibration process rather than a linear technological progression. This shift addresses fundamental limitations in current theoretical frameworks that treat digital transformation as primarily a technological challenge. The model's emphasis on continuous calibration across stakes, temporal, and interaction dimensions opens new theoretical pathways for understanding digital service evolution. Second, our findings fundamentally challenge existing assumptions about channel integration in digital services. While current theory emphasizes technical integration capabilities (Verhoef et al., 2015), the DSC model reveals how integration requirements systematically vary with interaction stakes and temporal context. This theoretical advancement explains previously puzzling phenomena, such as why superior technical integration sometimes produces inferior service outcomes. Third, we advance social presence theory by introducing the concept of graduated presence requirements. This extends beyond current binary conceptualizations of presence (Lu et al., 2016) to explain how presence requirements evolve both within service episodes and across relationship lifecycles. This theoretical refinement helps explain observed patterns of presence variation that existing frameworks struggle to address. Fourth, the DSC model introduces several new theoretical constructs that enable more sophisticated analysis of digital service dynamics. Concepts such as calibration resonance, calibration friction, and calibration learning provide new theoretical tools for understanding how digital service capabilities develop and evolve. These constructs offer building blocks for future theoretical development in digital service research.

Methodological Implications: Our study demonstrates the value of multi-platform qualitative analysis in understanding complex digital service phenomena. The combination of longitudinal review data across multiple platforms enabled identification of temporal patterns and cross-platform dynamics that single-platform or snapshot studies might miss. This methodological approach offers a template for future research into complex digital service environments. Furthermore, our analytical approach of combining thematic analysis with theoretical model

development provides a roadmap for theory elaboration in digital transformation research. This approach enables researchers to maintain empirical grounding while developing sophisticated theoretical frameworks.

Managerial Implications: The DSC model offers several strategic insights for service providers navigating digital transformation. First, organizations must develop new capabilities for dynamic service calibration. This includes: Dynamic Stakes Assessment: Organizations need mechanisms for real-time evaluation of interaction stakes and emotional intensity. This requires both technological capabilities for pattern recognition and organizational capabilities for rapid response. Temporal Learning Systems: Providers must develop systems for tracking and learning from service evolution patterns. This includes both individual customer relationship evolution and broader market-level learning. Calibration Capabilities: Organizations need new capabilities for achieving and maintaining calibration resonance. This includes technical infrastructure for flexible service delivery and organizational capabilities for rapid recalibration. Second, the model suggests the need for a fundamental redesign of customer journey mapping. Rather than designing fixed journeys, organizations must create adaptive pathways that can flex based on stakes, temporal context, and emerging interaction patterns. Third, organizations need new metrics and measurement systems aligned with calibration effectiveness. Traditional metrics focusing solely on technical integration or customer satisfaction may miss critical aspects of calibration quality.

Policy Implications: Our findings have significant implications for policy makers and regulators in digital financial services. First, regulatory frameworks need updating to account for dynamic service calibration. Current regulations often assume relatively static service models, potentially constraining necessary calibration capabilities. Second, consumer protection policies should consider how different service models handle calibration challenges. This might include new requirements for stakes assessment capabilities or minimum standards for presence provision during high-stakes interactions. Third, industry standards may need revision to incorporate calibration capabilities. This could include new standards for measuring and reporting calibration effectiveness across different service contexts.

Future Research Directions: The DSC model opens several promising avenues for future research. Researchers should explore how the DSC model applies in other complex service contexts beyond insurance. This could reveal additional mechanisms or boundary conditions that are not evident in our study. Contexts combining routine and high-stakes interactions, such as healthcare or legal services, would be particularly interesting. Studies tracking the development of calibration capability over time could reveal how organizations learn to achieve and maintain calibration resonance. This could enhance our understanding of organisational learning in digital transformation contexts. Research investigating how emerging technologies like artificial intelligence affect calibration capabilities could unveil new possibilities for dynamic service delivery, including the potential for automated stakes assessment and real-time calibration adjustment. Studies examining how calibration requirements vary across cultural contexts could uncover important boundary conditions and necessary adaptations of the model for different markets. Research focused on developing and validating measures for key DSC model constructs would enable quantitative testing of model relationships and facilitate practical application. These research directions would further develop both theoretical understanding and practical application of dynamic service calibration in digital transformation contexts.

Conclusion

This study advances understanding of digital transformation in complex service environments by developing the Digital Service Calibration (DSC) model. Through analysis of customer reviews across multiple platforms, we reveal how successful digital transformation in insurance services requires dynamic calibration of channel integration and social presence based on interaction stakes, temporal context, and provider-customer interaction patterns. Our findings demonstrate that existing theoretical frameworks, while valuable, inadequately explain the dynamic nature of digital service delivery in complex environments. Channel integration theory's assumption of stable integration requirements and social presence theory's binary conceptualization of presence fail to capture the nuanced reality of modern insurance services. The DSC model addresses these limitations by introducing new theoretical mechanisms—stakes-based calibration, temporal evolution, and provider-customer alignment—that explain how organizations successfully navigate digital transformation challenges. The model's key insight is that digital transformation success depends not on achieving static technical excellence, but on developing dynamic calibration capabilities that enable continuous adjustment of service delivery patterns. This reconceptualization helps explain previously puzzling phenomena, such as why technically superior integration sometimes produces inferior service outcomes, and why customer satisfaction often varies independently of technical integration quality.

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EXPLORING THE USE AND PERCEIVED VALUE OF DIGITAL MARKETING BY SMALL TO MEDIUM ENTERPRISE (SME) POULTRY FARMERS IN GAUTENG PROVINCE.

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Abstract

The study explores the use and perceived value of digital marketing among Small and Medium Enterprise (SME) poultry farmers in Gauteng Province, South Africa. SMEs play an important role in the agricultural sector and the economy, yet many face challenges in adopting digital marketing, limiting market reach and sales performance. The objectives of this research were to identify the digital marketing tools used by SME poultry farmers, examine their perceived benefits, assess barriers to adoption and evaluate the impact of digital marketing on market access and sales performance. An interpretivist paradigm and qualitative research approach were adopted. Semi-structured interviews were done with 20 SME poultry farmers from Tshwane, Johannesburg, and Ekurhuleni. Thematic analysis was employed to identify patterns and themes from the collected data.

Main findings revealed that social media platforms, particularly Facebook and WhatsApp are the mostly used digital marketing tools by SME poultry farmers. This is attributed to the platforms being easy to use and affordable. These tools enhance customer acquisition, digital visibility and communication efficiency with participants valuing their ability to reach diverse audiences and foster engagement. However, limited use of websites and email marketing was noted, attributed to high costs and the informal nature of their target audience who are mostly informal resellers. Barriers such as inadequate digital skills and infrastructure were identified as significant challenges.

The study recommends that SME poultry farmers attend training programs on digital literacy so as to effectively use the digital marketing tools. Cost-effective solutions for website development and maintenance, improved infrastructure to support digital marketing adoption are also recommended. These interventions could enhance SME poultry farmers' market reach and contribution to the economy. The findings offer insights that are replicable across other SME sectors in South Africa.

Keywords: digital marketing, perceived value, poultry farmers, small to medium enterprises.

Introduction

Digital marketing has revolutionised the way organisations communicate with their target customers. Digital marketing plays a crucial role in all businesses including small to medium enterprises (SMEs). SMEs influence the growth of most economies around the world. SMEs are defined as businesses that have fewer than 250 employees (Horváth & Szabó, 2019:123). Chiromo and Nani (2019:3) define small enterprises as businesses with 11-50 employees, with the medium entities having 51-200 employees. SMEs are found in various economic divisions like mining, agriculture, electricity, construction, finance, and telecommunications among others (Small Enterprise Development Agency (SEDA), 2019). The agriculture sector is broad and made up of many subsectors including poultry farming. In its industry report, South African Poultry Association (SAPA), (2019:5) records that poultry remains the largest contributor to the agricultural sector in South Africa. More than 20% of South Africa's gross domestic product (GDP) and 43% of its animal product GDP are contributed by the country's largest agricultural sector, which is the chicken industry. It is in this context that a study of the use and perceived value of digital marketing was carried. Poultry farming as a big contributor to the agricultural sector in South Africa, digital marketing becomes key in ensuring that the products are sufficiently marketed thus bringing growth not only to the SME poultry farmers but to the industry at large as well as the economy.

To effectively communicate with customers, it is of great importance for SME poultry farmers to have an understanding of the use of digital marketing tools and how to yield benefits from their use. The internet, social media, smartphone apps and other digital communication tools have become important in the way businesses communicate with their target market. Digital marketing is now popularly being used as a form of marketing communication to access and disseminate information. In these modern times of ever advancing information technology, farming businesses have no choice but to use the digital media to promote their products (Borisova, Baranova & Bruzhukova, 2020). Hasan, Sambo, Muchlis and Yahya (2020) state that digital marketing is useful in the marketing of agricultural food products. This entails that SME poultry farmers can make use of digital platforms to communicate with their customers about the products and services they offer (Hasan et al., 2020). Digital marketing provides an ideal platform for poultry famers to communicate with target customers because it has a broader reach (Mambile & Machuve, 2019:7). The fact that some SME poultry farmers fail to achieve optimum sales can be attributed to lack of utilisation of digital marketing toos rather than to lack of demand for their products (Mambile & Machuve, 2019:5).

Problem investigated

Small and Medium sized businesses, particularly SME poultry farmers, face significant barriers in adopting and using digital marketing (Fanelli, 2021:9-12). This results in stagnant growth, impedes potential and subsequently failure. Although there is awareness of the digital marketing tools, there seems to be barriers that influence the use and perceived value of using the digital marketing tools among SME’s (Gregori & Temperini , 2015). Despite the transformative power of digital marketing , many SMEs have limited use and adoption of digital marketing tools which could prevent them from reaching their potential (Amad & Pandey, 2024:169). Consequently, there is a need for further research to explore the use of digital

marketing tools among SME poultry farmers in Gauteng. Understanding the use of digital marketing and the perceived value can provide insights on how best SME poultry farmers can use digital marketing effectively to improve growth and reduce failure rate.

Research objectives

The main objective of this research is to explore the use and perceived value of digital marketing for SME poultry farmers in Gauteng province.

The primary research questions are

1. What digital marketing tools are currently used by SME poultry farmers in Gauteng province?
2. What are the perceived benefits and value of these digital marketing tools?
3. What are the main challenges and barriers faced by SME poultry farmers in adopting and using digital marketing tools?
4. Does digital marketing impact the SME poultry farmers in reaching markets and sales performance?

Literature review

Theoretical perspectives

Digital marketing is defined as the act of advertising and selling goods and services through online platforms such as social media, search engines and emails (Deiss, 2018). Simply put, digital marketing is the use of digital tools, data and technology to achieve marketing goals (Chaffey, 2022:48). Websites, email marketing, social media, blogs, SEO, internet advertising and mobile marketing, are some of the basic digital marketing tools (Veleva & Tsvetanova, 2020). Mobile marketing, buzz marketing, online advertising, online video, interactive television advertising, websites and social media are some of the digital tools which SMEs can use to communicate with target audience (Jobber & Ellis-Chadwick, 2019). Digital marketing can also be enhanced in the poultry farming industry by using artificial intelligence (AI) to improve marketing communication (Hongbing et al., 2022). According Chinakidzwa and Phiri (2020:11), digital marketing leads to profitability, sales growth and increased market value.

The framework below illustrates the results of using digital marketing by SME businesses.

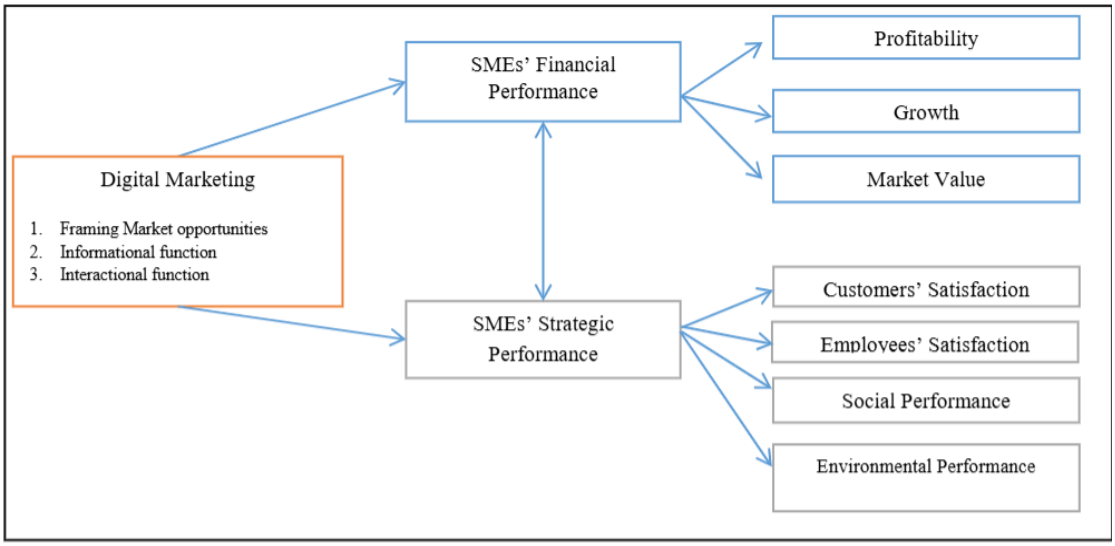


Figure 1.1 The impact of adopting digital marketing on SMEs' performances. (Deraz & Gebrekidan, 2019).

Figure 1.1 above shows the theoretical framework connecting the use of digital marketing and the benefits thereof to SMEs. The framework shows how the use of digital marketing results in profitability, growth and market value. On the other hand the framework shows customer satisfaction, employee satisfaction, social performance and environmental performance as results of the use of digital marketing. The framework has been modified to contextualise it to the use and perceived value of digital marketing by SME poultry farmers as illustrated below on figure 1.2

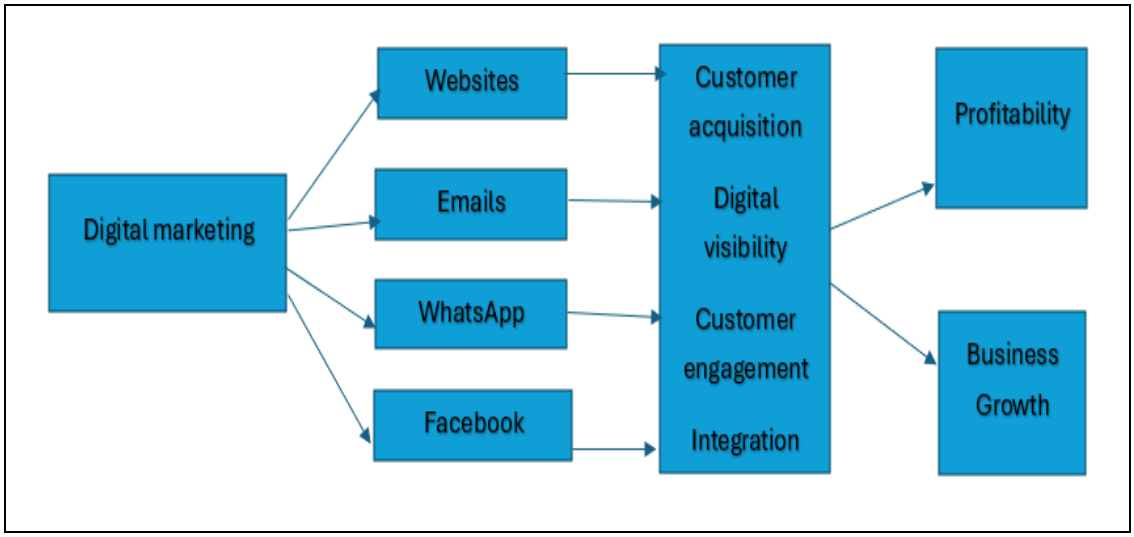


Figure 1.2 Digital marketing tools and the perceived benefits. (Authors own creation).

Figure 1.2 illustrates digital marketing tools that can be used by SME poultry farmers and the perceived benefits such as digital visibility and customer acquisition. It provides a view on how the benefits of using digital marketing contributes to key business outcomes that is profitability and business growth. Some of the digital marketing tools are discussed below.

Websites

A website is a collection of web pages that have relevant content, data and information made available through the internet (Kallier, 2017). A website has also been defined as a digital
version of a brand, product or service (Koekemoer, 2020). It can be used to promote and publicise a business and its brand. Furthermore, a website can be used to advertise products and services, informing consumers about new developments, provide customer support and interacting with customers (Gowpall, 2024:29). An SME poultry farmer may create and use a website as digital marketing tool to yield the benefits stated. However, for a website to be effective, users require a certain level of expertise. Therefore, SME poultry farmers may have to make use of website specialists to develop the website on which they can sell their products and communicate with customers (Borisova et al., 2020). A website requires regular maintenance which involves updating content to ensure that its relevant, accurate and appealing to visitors. Website maintenance also requires payment of fees to keep the website accessible online. The prices per month vary from R299 to R499 for an entry level website (New perspective design, 2024). For SME poultry farmers, these costs and effort required for maintaining a website may be perceived as burdensome especially if the target audience may prefer other channels of communication like social media.

Email marketing

The email has become a powerful marketing tool in many organisations' marketing communication strategy (Clow & Baack, 2016:260). There are two types of email marketing, that is, inbound and outbound email marketing. Outbound email marketing refers to sending emails to customers and prospects from a company, while inbound email marketing is the management of emails that come from customers as well as prospects (Chaffey & Ellis-Chadwick, 2016). The ability to deliver emails or content directly to consumers' mobile or desktop devices is one of email marketing's benefits. Another is that the email process yields important metrics that let marketers know who opened the email, how many times they read it, whether they clicked on any links, whether they shared it, and whether the email resulted in the necessary conversion (Hanlon, 2019). SME poultry farmers can use email marketing to communicate to target customers about availability of products, business hours and to solicit orders.

Social media

Businesses use social media platforms to share texts, images and audio and video files with consumers and other companies (Kotler & Keller, 2016:455). SME poultry farming businesses rely heavily on consumer interaction and social media has emerged as a crucial tool for connecting with and interacting with customers (Bosworth, Ardley & Gerlach, 2021). LinkedIn, Facebook, X (formerly Twitter), YouTube, TikTok and Instagram are social media platforms that allow businesses to have a public voice and have an online presence (Maheshwari, Shibhangu & Pal, 2021; Kotler & Keller, 2016:456). Social media can strengthen the connection between a business and its customers (Clyne, 2019). SME poultry farmers may not afford expensive digital marketing tools; hence, they can make use of inexpensive social media tools such as Facebook, Instagram and X to link with customers (Wahid, 2021). However, it is not just about being on social platforms like Facebook and X; it is about a business being present where its target customers hangout (Deiss, 2018). The basic purpose of social media marketing is to create a so-called communication funnel to help locate and attract users by moving people (users) from social media communities to company websites, blogs or e-commerce sites. Social media platforms allow businesses to promote as well as provide customer service resulting in consumer happiness and loyalty (Veleva & Tsvetanova, 2020). Below is a further discussion of some of the most commonly used social media marketing tools.

Facebook

Facebook is a social media marketing tool which offers a variety of ways to reach and attract new shoppers. It is ranked as the most used social network worldwide. Also, daily, traffic to the network is on the rise (Ghanem & Hamid, 2020:4). Facebook pages are created to assist businesses in engaging their audiences and promoting their goods and services. The page's members are referred to as "fans" who "like" the page. These followers will then receive status updates from the business page in their news feeds. New followers can be drawn through paid

Facebook ads, but they will also be attracted if other fans like the page or share content (Chaffey & Ellis-Chadwick, 2019:1112). SME poultry farmers can promote the sale of eggs and chickens on Facebook. Facebook is an excellent tool for connecting with many potential customers. One can upload pictures and videos of the chickens and eggs on Facebook. An SME poultry farmer can create a business Facebook page or join poultry farmers communities and groups where they interact with each other, learn about markets, suppliers and disease outbreaks (Falola, Mukaila & Kudabo, 2021:166-168). Barriers of using Facebook is the increasing scams and Facebook crimes leading to customers and SMEs not trusting the platform to conclude sales (South African Poultry Farmers and Suppliers Association [SAPFSA], n.d.). High data subscription charges, poor access to internet services, poor power supply, poor technical knowledge are some of the challenges in using Facebook (Falola, Mukaila & Kudabo, 2021:163-163).

X (formerly Twitter)

X is a “free” microblogging and social networking service on which users post and interact with messages known as "tweets". X is a popular social media marketing technique used by customers to express satisfaction and dissatisfaction with a company's products or services, as well as generating new visitors by promoting product offers, advice, ideas, and fresh material to a company's followers (Ghanem & Hamid, 2020:5). Businesses and their target audience interact on X thereby making it a platform of communicating marketing messages. Although X can be used to post updates about company goods and services on a regular basis, its true strength lies in its capacity to dissolve conventional barriers between the business and its clientele by giving it access to customer feedback and enabling it to anticipate and address customer concerns before they arise (Duncombe, 2017). The greatest method to get the word out about a poultry farm business is through social media sites like X. The only need for the farmer is to sign up on X and consistently tweet engaging stuff. People and potential customers will react to that. As a result, people will be involved in the company on a daily basis (Falola *et al*., 2021).

Instagram

One of the main tools in the social media sphere is Instagram. Instagram is a social media platform that allows users to share photos of their daily life with others and can serve as a source of electronic word of mouth (Gumpo *et al.*, 2020). Wahid (2021) suggests that businesses can make use of Instagram to advertise their goods and services. The visually oriented site now has over one billion active users. Many Instagram users of up to 200 million investigate at least one business account daily. According to the data collected in 2021, 80% of Instagram users decide to buy products or services after looking for information on the network (Wahid, 2021). Instagram has shown a significant growth in South Africa with over 6 million users in 2021 (Stats SA, 2022). This shows that if correctly applied, Instagram may be a powerful marketing communication tool for SME poultry businesses.

WhatsApp

WhatsApp is a communication platform designed for sending instant messages, but nowadays it is being used as a social networking platform (Dey & Parabhoi, 2019). WhatsApp allows users to make calls, send and receive texts, as well as media files, and it can be used as a marketing tool to promote a business and engage with customers (Ghanem & Hamid, 2020:4). WhatsApp has introduced ‘WhatsApp Business Application’, which can be used by small, medium and large-scale enterprises in all sectors of the industry (Sanitias & Dani, 2022). The business application allows enterprises to have constant communication with customers, prospects and connect with users, irrespective of where they reside (Ghanem & Hamid, 2020:4). To communicate market information to their audience, SME poultry farmers might start WhatsApp groups, communities that allow publishing of images of chickens or eggs among other things. All this can be done at a very low cost. WhatsApp business, communities, groups have proved to be an affordable communication platforms, which are ideal for use by SME poultry farmers (Chiridza, Yorodani, Sigauke & Katsaruware, 2017).

Methodology

The main aim of this research is to explore the use and perceived value of digital marketing by SME poultry farmers in Gauteng province. The question is how SME poultry farmers use digital marketing and the perceived value thereof. An interpretivist research paradigm was used to get an understanding on the way human beings try to make meaning of the world around them (Bryman & Bell, 2016:12-13). The interpretivist paradigm allows the researcher to understand SME poultry farmers viewpoints, beliefs and perceptions on the use of digital marketing (Saunders *et al*., 2019:148-149).

The qualitative research method was used in this research to gain a deeper understanding of SME poultry farmers' usage of digital marketing. The qualitative research approach has also been chosen because it allowed the researcher to understand SME poultry farmers' perceptions and attitudes on the use and perceived valued of digital marketing. Semi-structured one on one interviews were chosen as the most appropriate data collection method for exploring the use and perceived value of digital marketing by SME poultry farmers. Semi-structured interviews allowed the researcher to ask some standard questions to all participants such as the type of market and current digital communication tools. An interview guide assisted the interviewer in formulating pertinent questions related to the study's topic and goals. The guide acted as a trigger, prompting the researcher of necessary questions to ask and areas to probe. The interview guide was pretested to ensure the consistency of questions asked to the participants and to also enhance objectivity.

The population consisted of SME poultry farmers in Gauteng province who rear broiler and layer chickens. The population for this research included both formal and informal SME poultry farmers. SME poultry farmers are spread throughout Gauteng. Some of the areas were difficult to access hence convenience sampling was used to select the participants. A sample of 20 SME poultry farmers was used. Participants who are in and close to Tshwane, Johannesburg and Ekurhuleni metropolitans were interviewed. The interviews were recorded and transcribed. The data collected was analysed using thematic analysis as it is a systematic, flexible and accessible approach to analysing data. Thematic analysis' primary objective is to look for common themes or patterns in a data set (such as a series of interviews, observations, diaries or websites being analysed) (Saunders *et al*., 2019:652). Various themes were identified from the interviews and were analysed.

Results and findings (Themes)

Theme 1:Digital marketing tools

Digital marketing has been defined as “the application of digital media, data and technology integrated with traditional communications to achieve marketing objectives” (Chaffey & Ellis-Chadwick, 2019:59:59). This encompasses elements like the company's website, mobile applications and social media profiles, all seamlessly integrated with online communication strategies. The strategies include activities like search engine marketing, social media marketing, online advertising, email marketing, and collaborative partnerships with other websites (Chaffey & Ellis-Chadwick, 2019:60). Digital marketing encompasses a broad spectrum of strategies and tactics aimed at promoting products, services or brands through various online channels. Some participants indicated that they use digital platforms such as websites, social media and email marketing. An analysis of the digital marketing tools theme identified three distinct sub-themes and their respective categories as illustrated in Table 1.

Table 1:Digital marketing tools

Theme 1	**Subthemes**	**Categories**
Digital marketing tools	Social media	• Facebook • WhatsApp
	Websites	
	Email marketing	

Source: *(Authors’ own creation).*

Table 1 summarises the digital marketing tools used by the participants as indicated during the interviews. While digital tools are employed as marketing communication tools, some participants expressed limited familiarity with their usage.

Subtheme: social media

Facebook is one of the most popular social media platforms, offering a wide range of options for businesses (Falola, Mukaila & Kudabo, 2021:263) . Facebook emerged as one of the commonly digital platforms used by the participants. When asked about digital marketing, the majority of the participants mentioned that they use Facebook to communicate about their products.

Another digital tool, WhatsApp is also used by businesses. It is a messaging platform that can be utilised for marketing purposes, especially for direct communication with customers. It is widely used for customer support, sharing updates and conducting business chats. Participants stated that they used WhatsApp to communicate with customers. The results are consistent with the work of Almasi, Shausi, Athman and Mwaseba (2023) who sated that WhatsApp is widely and mainly use by small scale poultry farmers. This is in line with Falola, Mukaila and Kudabo’s study (2021:166-168) which stated WhatsApp as popularly used by SME poultry farmers. Another sub-theme which emerged was websites.

Subtheme: Websites

Websites are an essential component of digital marketing. A website is a collection of web pages that provide information about a business or an organisation on the internet (Bluehost.com, 2023). Websites provide business details, its products, or services. Shopping sites enable customers to browse and purchase products (Hanlon, 2019:61). A website also allows a business to engage with visitors. Regarding digital marketing, notably is the fact that the majority of the participants interviewed do not have websites. Participants explicitly stated that their businesses do not have websites. Instead, they seem to rely on alternative digital marketing channels like social media, particularly Facebook and WhatsApp, to connect with their audience.

For the majority of the participants, websites are not currently a part of the digital marketing communication tools employed. One participant expressed a desire to have a website but noted that this plan is based on available funds and the business' formalisation process.

The finding is in line with the work of Chinakidzwa and Phiri (2020:11) who recommended that SMEs in agro processing must develop digital marketing capabilities that enable them to move beyond intermediate market outcomes to attain the primary business objectives of profitability, sales growth and market share. A website is one digital marketing tool which can enable growth of the SME; hence some participants indicated that they have a website but the website is inactive. This inactivity might be owing to the costs associated with keeping a website active. The finding is in line with Mkansi (2022:1154-1155) who argues that SMEs remain behind in terms of use of digital marketing tools like websites owing to the setting up and maintenance costs. Many SMEs struggle to maintain a functioning website. Next is a discussion of email marketing in the context of digital marketing.

Subtheme: Email marketing

Email marketing is a powerful tool for reaching and engaging with customers as well as prospective customers. Email marketing was discussed as a direct marketing channel. When participants were asked about email marketing in the context of digital marketing, the results show that emails are not commonly used by the participants. A few participants stated that they use email marketing and these were emails for the corporate customers (B2B). The limited of use of emails for the B2B market could be owing to the fact that most of the B2B customers targeted by the SME poultry farmers do not use emails to communicate; hence it will be pointless to use emails. Emails are used for the formalised B2B customers like hotels and retail stores. Mkansi (2022:1161) asserts that limited consumer skills in terms of internet usage is an environmental barrier that hinders SMEs from using digital channels like email marketing.

Theme 2: Perceived value of digital marketing

This theme explores the various benefits that SME poultry farmers perceive from using digital marketing to promote their products or services. In this theme, several subthemes have been identified, each with specific categories as shown on the Table 2.

Table 2. Perceived value of digital marketing.

Theme 2	Subthemes	Categories
Perceived value of digital marketing	Getting new customers	• Facebook • WhatsApp
	Increase in digital visibility	• Facebook • WhatsApp • Website
	Ease of communication	• Facebook • WhatsApp
	Integration	• Facebook • WhatsApp • Website • Emails

Source: *(Authors' own creation).*

Digital marketing offers various benefits for both the sellers and the buyers, such as better targeting, improved loyalty, cost-effectiveness, fast turnaround, personalisation, integration and legitimacy. Digital marketing can also help the sellers to get new customers, increase their digital visibility, increase their sales, communicate easily with their customers, receive feedback from their customers, and develop new business models and strategies. Digital marketing can also create more convenience for the customers who can access more information and buy products or services from home. Digital marketing is especially suitable for start-ups, SMEs, as it requires less investment and has higher profitability (Veleva & Tsvetanova, 2020:5-6). The subthemes and categories that emerged from the interview data identified are discussed next.

Subtheme: Getting new customers

This subtheme revolves around the idea that digital marketing, particularly through platforms like Facebook and WhatsApp, is perceived as a valuable tool for acquiring new customers. These platforms allow businesses to reach a vast and diverse audience, making them effective channels for customer acquisition. When participants were asked about the benefits of using digital platforms such as Facebook and WhatsApp, their responses highlighted that the platforms attract new customers. Facebook and WhatsApp are social media tools that are instrumental in attracting new customers. The participants described instances where potential customers reached out after seeing their products or advertisements on these platforms. This finding indicates that digital marketing is effective in expanding the customer base for SME poultry farmers. Digital marketing can be used to enter new markets to get new customers who may not be aware of their products or services (Chaffey & Ellis-Chadwick, 2019:71). Furthermore, digital marketing can help SME poultry farmers to expand their market, increase their customer base and attract more leads.

Subtheme: Increase in digital visibility

This subtheme describes how SME poultry farmers use digital marketing to increase their online presence and exposure, and to enhance their brand awareness and recognition. Participants stated that they use digital marketing for their businesses to be visible online. SME poultry farmers can establish dedicated business profiles or fan pages on Facebook (Sajid, 2015). Facebook pages are designed to showcase the business, its products, and services. More importantly, using Facebook pages allows SME poultry farmers to have a professional online
presence that customers and potential clients can visit and engage with. Some participants also relied more on Facebook and WhatsApp to increase digital visibility. It has become vital for SME poultry farmers to effectively use digital tools to enhance business visibility. During the interviews, some participants stated that they have websites which have information about the business. When customers search on Google for poultry farms, they can be directed to that website. By having a website, the SME poultry farmer increases visibility on search engines like Google. This is important for potential customers to discover the business online. Digital marketing can help SME poultry farmers to be visible to more markets and the more digital tools are used the more visible the business becomes (Thaha, Maulina, Muftiadi & Alexandri, 2021:10).

Some of the SME poultry farmers indicated that they have websites, but they are not up and running all the time; hence the visibility of the business online is limited. Participants realise the importance of having a website in increasing the business' visibility but the cost of maintaining the website is a deterrent. The participants' view is in line with Mkansi (2022:1169) who stated that some SMEs have websites, but the cost incurred monthly to maintain is a barrier to using websites as a digital marketing tool. There are some participants who stated during the interviews that they intend to have a website in future as the business grows from informal to formal.

SME poultry farmers recognise the significance of having a business website. However, they also acknowledge that their current primary target audience, the informal market, may not extensively use technological tools such as websites. The quotes further reveal the farmers' aspirations to transition from primarily focusing on the informal market to engaging with larger commercial companies. The objective aligns with the observation made by Nkukwana (2019:869), which highlights the predominance of small-scale poultry producers in South Africa, catering mainly to the informal market. Although SME poultry farmers may possess a website, it might not effectively reach their primary target audience.

Subtheme: Ease of communication

Customer engagement is one of the primary goals of any marketing communication strategy (Fill & Turnbull, 2019:169). Digital marketing, particularly through social media platforms like Facebook and WhatsApp, is valued for its ability to facilitate easy and direct communication with customers (Olotewo, 2016:13). Communicating directly enhances customer engagement and fosters strong relationships. It is through this ease of communication that businesses obtain valuable feedback from customers. Platforms like Facebook and WhatsApp serve as channels through which customers can provide input and share their opinions, aiding agricultural businesses in making informed decisions (Chepkirui, 2021:57). Participants mentioned that they primarily use WhatsApp to spread the word about their poultry products. Spreading messages using WhatsApp is a form of word-of-mouth marketing in the digital terms (e-word-of-mouth). People can easily forward messages and information to their contacts, which can lead to a broader audience getting information about the business (Sengar, 2021:28). Participants highlighted the cost-effectiveness of using WhatsApp. It allows them to make calls, send messages and share images without incurring significant expenses. This affordability is particularly advantageous for the SME poultry farmers with limited marketing budgets. The ability to send pictures of their chickens and products through WhatsApp is a form of visual marketing. Visual content often has a strong impact on consumers, helping them better understand the products and potentially leading to increased interest and sales (Veleva & Tsvetanova, 2020:6). Participants mentioned that more often customers are interested in the size of the chicken; hence images help if they are not seeing the product live. The ease of sending messages and making calls through WhatsApp adds convenience for both the farmers and their customers. It simplifies the communication process, making it more user-friendly and accessible. The advantages stated contribute to the effectiveness of their digital marketing efforts in promoting their poultry products. Participants also stated that Facebook groups, WhatsApp groups do not only facilitate communication with customers, but they also connect with other poultry farmers in these channels.

The digital platforms serve as a means for poultry farmers to connect with their peers. SME poultry farmers can exchange information, experiences and insights about poultry farming practices. The knowledge-sharing aspect is beneficial for staying updated and informed about industry trends and best practices. The study revealed that digital platforms like Facebook and WhatsApp create opportunities for networking, learning, and mutual support among poultry farmers. The platforms facilitate the exchange of valuable information and help protect farmers from potential risks or scams in the industry (Chepkirui, 2021:52-53). In 2023, there was an outbreak in South Africa of Avian Influenza also known as Bird Flue. May poultry farmers lost their chickens (National Institute for Communicable diseases, NICD, 2023). Besides the information being publicised in the mainstream media, participants indicated that they received messages on WhatsApp and Facebook which indicates that digital platforms also assists in distributing the messages amongst SME poultry farmers.

Subtheme: Integration

Digitals tools such as websites, e-mails, Facebook and WhatsApp can be integrated (Ghanem & Hamid, 2020:4). Participants mentioned that they employ digital media tools because they collaborate with one another. Some participants indicated that they integrated various digital platforms to improve the effectiveness of the marketing communication strategy. It was highlighted that the digital platforms are synchronised, and there is a seamless connection between them. For instance, participants mentioned that the WhatsApp icon is present on Facebook. The integration ensures that customers can transition smoothly from one platform to another, enhancing the user experience. The participants explained how different platforms serve different purposes in the customer journey. Facebook is effective in generating leads and inquiries, while WhatsApp and email are instrumental in sealing deals. The synergy between platforms such as WhatsApp, Facebook and email is useful at various stages of the sales process. The next figure is a word cloud which presents a further analysis done on digital marketing.

The word cloud in Figure 1.3 shows the common words said by the participants when asked about the use and perceived value of digital marketing.



Figure 1: Word cloud: Digital marketing. (Authors' own construction)

Common words mentioned include Facebook, WhatsApp, website, social and customers. The platform which was mostly mentioned was Facebook. Most participants stated that the digital marketing tool that they use is Facebook. Facebook, one of the most widely used social media platforms globally, plays a pivotal role in digital marketing (Ausat, 2023). Social media marketing is a sub-branch of digital marketing that specifically leverages social networking platforms to engage with audiences and achieve marketing objectives (Ausat, 2023). Next is the summary of the chapter.

Implications of the research to SME poultry farmers

The implications of this study's findings are significant. SME poultry farmers in Gauteng Province might need comprehensive training programs focused on digital marketing to enhance their ability to effectively promote products and improve digital skills. This will ensure that they are equipped to make optimal use of the ever-evolving digital platforms. The mindset of SME poultry farmers must shift toward embracing continuous learning and adaptation to technological advancements. This will ensure that SME poultry farmers are not only able to adapt to the current digital marketing environment but also to be ready for future digital marketing advancement. This will strengthen their presence in the market and subsequently boost their businesses as well as contribution to the economy of Gauteng province. This will require interventions including attending digital marketing workshops and seminars, to understand the effective use of digital marketing platforms. Government support of SME poultry farmers should not only focus on funding but also address how SME poultry farmers can use digital platforms to communicate with their customers. The findings of this study have the potential to influence the broader SME sector, as many challenges faced by poultry farmers in adopting digital marketing tools are likely shared across other industries. By addressing these issues, the study contributes to the existing body of knowledge and provides a replicable model for other provinces in South Africa.

Recommendations

1. Provide training to SME poultry farmers on integrating different digital platforms for a more cohesive and effective marketing strategy. This will increase awareness among SME poultry farmers about the benefits of maintaining an active online presence through websites and social media platforms.
2. Explore and promote cost-effective solutions for maintaining websites to address the barrier of monthly expenses, enabling more SMEs to establish and maintain an online presence.
3. Invest in infrastructure development, such as reliable internet access and digital devices to support the adoption of digital marketing tools.
4. Develop digital market places to facilitate buying and selling of poultry products. The platforms can also be able to indicate availability of stock and geographical area where customers can purchase and any other information necessary.
5. Develop a policy and regulatory framework that supports the adoption and use of digital marketing tools by SME poultry farmers.

Conclusion, limitations and future study

The study revealed that digital marketing, particularly through social media platforms, is instrumental in acquiring new customers for SME poultry farmers. Digital marketing platforms enable the SME poultry farmers to reach a diverse audience and receive inquiries or orders through platforms like Facebook and WhatsApp enhancing the customer acquisition process. The findings clearly also indicated that the perceived value of digital marketing includes the ability to increase digital visibility and the ability to easily communicate and engage with customers. SME poultry farmers recognise the significance of having an online presence through platforms like Facebook, WhatsApp and websites. The study also revealed that communication through platforms like WhatsApp is a significant advantage for SME poultry farmers in cutting marketing communication costs associated with traditional media. Visual marketing through image sharing on WhatsApp adds convenience and affordability to the communication process. SME poultry farmers integrate various digital platforms in their marketing strategy to optimise customer engagement. The seamless connection between platforms ensures a smooth transition for customers, contributing to a more effective and comprehensive marketing approach. Websites and emails are not often used by SME poultry farmers because their target audience primarily consists of informal buyers who typically do not rely on websites when searching for chickens and eggs.

The limitations of this study are that the research was conducted only in Gauteng Province and the results may not be generalised to the other eight provinces in South Africa owing to differences. Convenience sampling was used in this study to ensure easy access to participants, however the representation may be compromised as the sample may not represent the entire population. Another limitation was that a sample of twenty participants were interviewed and future research could be done with a larger sample to get more themes. Future research could also be extended to include the other eight South African provinces in order to improve the findings' generalisability. A more thorough grasp of regional variances might be possible with a wider geographic focus. Furthermore, future research could use a quantitative methodology and a probability sampling like simple random sampling to be able to interact with a bigger and more representative sample. This will increase the statistical reliability and offer more robust insights that can guide policy formulation and decision-making in the poultry industry at large.

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GENERATING GROCERY RETAILING BRAND EQUITY FROM MARKETING OFFERINGS: MODERATING EFFECT OF BRAND LOYALTY

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Abstract

Businesses globally, including grocery retailers face competitive and sustainability challenges, yet a South African grocery retailer is performing well and expanding its footprints into other countries. High performing brands score high in customer-based brand equity (CBBE), which is added values/benefits that a brand endows products and services with. However, there are questions as to the varied determinants of CBBE, especially for grocery retailers. Studies have focused on explaining CBBE from brand factors., neglecting the marketing offerings. Thus, we employed the social exchange theory, Ahmed et al.'s (2024) and Anselmsson, Burt and Tunca's (2017) retailer brand equity model to examine how much a grocery retailer's marketing offerings (price, product quality, customer services, distribution and promotion) are influencing CBBE and the mediating role of brand loyalty. Quantitative data was collected from 480 South African consumers from various socio-economic backgrounds using online questionnaires to capture the grocery retailer's varied customers across South Africa. The data was analysed using Partial Least Square Structural Equation Modelling (PLS-SEM). The results revealed that CBBE was directly and positively influenced by customer services, distribution, price and brand loyalty. Promotion through awareness negatively influenced CBBE. Indirectly and through the mediating role of brand loyalty, CBBE was influenced by all the marketing offerings except customer service. This means that even when factors like product quality and promotion don't directly and positively influence CBBE, they can do so when brand loyalty is built. The developed conceptual model highly explained 61.6% and 69.2% brand loyalty and equity respectively. This demonstrates the important role of marketing offerings in generating CBBE.

Keywords: brand loyalty, brand equity, customer service, distribution, grocery retailers, product quality, price, promotion.

Introduction

[In the footsteps of global retailers' brands, such as Zara and Amazon increasingly gaining top ranking in global brands ratings (Interbrand, 2024), some grocery retailer brands are gaining top rankings. In South Africa for example and in 2024, Woolworths and Shoprite grocery retailers were amongst the 15 top South African brands in brand value (Bizcommunity, 2024). In terms of brand strength measured through the evaluation of the investments marketers put into building the brand, customers and workers' perceptions and satisfaction, stakeholder equity and corporate leadership and reputation, Woolworths was number 3 in brand strength in 2024 and number 1 in 2019 (BrandZTM, 2019; kyria

Keller (2020) and Viet and Anh (2021) assert that strong brands excel in brand preference, loyalty, and mostly customer-based brand equity (CBBE). CBBE is defined as “added value uniquely generated from having a strong brand and which emanates from consumers' differential and favourable responses to the marketing mix/offerings of the brand; increased utility/preferences that the brand name adds to the products and resultant financial value enjoyed because of the loved brand” (Viet and Anh, 2021, p. 74). CBBE can provide financial benefits, such as market share, sales revenue, profits; and product-market benefits such as brand preference, brand satisfaction, and repurchase intentions (Troiville et al., 2019). Despite these benefits and the fact that CBBE can emanate from favourable responses to the marketing offerings as Viet and Anh's (2021) definition suggest, studies on the impact of marketing mix offerings on CBBE are limited (Anselmsson, Burt & Tunca, 2017; Ahmed et al., 2024). Instead, there have high focus on testing the Aaker's (1991) and Keller's (1993) CBBE models to find brand-related drivers of CBBE. These models may not apply to the grocery retail industry sector that sells non-durable fast-moving consumer goods. Also questioning the applicability of the commonly used Aaker's (1991) and Keller's (1993) CBBE models, Anselmsson, Burt and Tunca (2017) and Ahmed et al. (2024) developed marketing mix offerings models to explain brand loyalty and brand equity respectively. The models suggest that the marketing mix offerings of price, distribution, promotion, products and services can all positively impact retailers' brand loyalty and equity. Considering the varied types of retailers, Anselmsson, Burt and Tunca's (2017) and Ahmed et al.'s (2024) models need to be tested in the context of grocery retailers. Thus, the objectives of this study are the following:

1) To examine how much marketing mix offerings of product quality, customer service, price, distribution and brand awareness from promotion impact a grocery retailer's (i.e., Woolworth) brand loyalty

2) To assess how much a grocery retailer's CBBE is impacted by marketing mix offerings of customer service, product quality, price, distribution and brand awareness from promotion

3) To test the mediating role of brand loyalty in the relationship between the marketing mix offerings of customer service, product quality, price, distribution and brand awareness from promotion and CBBE.

Literature review and hypotheses development

Considering the many financial and product-market benefits of CBBE (Troiville et al., 2019), studies have tried to examine the determinants of CBBE prominently using Aaker's (1991) and Keller's (1993) CBBE models. While Aaker's (1991) model suggests that CBBE is driven by brand perceived quality, awareness, image, loyalty, and proprietary brand assets, Keller's (1993) model posits that CBBE emanates from brand knowledge structure comprising brand awareness and image. Based on consumers' interactions and appreciation of these CBBE determinants, a differential/preferential value is created in their minds, which guides their brand attachment, commitment, retention, loyalty and resultant CBBE (Veloutsou, Christodoulides & de Charnatory, 2013; Coudounaris et al., 2024). For retailers, Anselmsson, Burt and Tunca (2017) report that CBBE further impacts future purchase behaviour, financial performance, retail market share, and even shareholder value. It was for these reasons that there are calls to study varied CBBE determinants and not only those provided by Aaker's (1991) and Keller's (1993) CBBE models. Marketing mix offerings are other determinants and retailers' important factors suggested by Anselmsson, Burt and Tunca's (2017) retailer brand equity and Ahmed et al.'s (2024) marketing mix and CBBE models. Thus, this section discusses a relevant theory and these two models pertinent in examining the impact of marketing mix offerings on brand loyalty and equity after which hypotheses are developed.

How much brand loyalty and equity may be generated depends on customers' appreciation of the marketing mix offerings as suggested by the social exchange theory. The theory posits that the degree to which a relationship initiator (e.g., brand owner) provides benefits to other parties (customers), the other parties will in response pay back in commensurate measures to the initiator (Khalid & Hadi, 2021). Thus, Anselmsson, Burt and Tunca's (2017) retailer brand equity model propose that a CBBE sources/determinants start with brand awareness generated from brand promotion. The awareness is built around retailers' marketing mix offerings in terms of product quality, pricing policy, physical store attributes and customer service. The marketing mix elements are proposed to be drivers of brand loyalty (Anselmsson et al., 2017). The current study adapts Anselmsson et al.'s (2017) model by adding distribution and using Ahmed et al.'s (2024) model's proposal that all of the marketing mix factors lead to CBBE. Thus, Ahmed et al.'s (2024) and Anselmsson et al.'s (2017) models guided the development of the hypotheses

Relationships between the marketing mix offerings, brand loyalty and brand equity
The marketing mix offerings such as price, product, promotion, place (distribution) and customer service studied here are "the blend of tactics that a business employs to reach and engage its target audience while advancing its objectives". They are used to satisfy consumers' needs, build relationships and resultant brand loyalty and equity (Ahmed et al., 2024, p. 4). Anselmsson et al. (2017) studied how much marketing the marketing mix elements of product quality, pricing, awareness created from promotion, customer service, and physical store distribution impact brand loyalty. Using retail brands, including grocery brands in Sweden, they found that brand loyalty was positively influenced by product quality, pricing policy, brand awareness, and the physical store.

Marketing Mix and Brand Loyalty

Price: We follow Herviana and Anik's (2018) definition of price as the sum of money or value exchanged by consumers to acquire, consumer or own products or services. Thus, price is a sacrifice that customers make to acquire products and services. Price has a significant role in influencing customer behaviour, including brand loyalty (Effany et al., 2018). As to how price impacts brand loyalty, there have been mixed results. For example, while Anselmsson et al. (2017) find that pricing policy positively influences brand loyalty, Effany et al.'s (2018) results show that price level negatively impacts brand loyalty. Gecti (2014) examined the seven related price components and observed that the pricing strategy positively impacts consumer behaviour, such as loyalty for high-end products, and conversely note a negative impact on brand loyalty for low-value items.

Distribution is all logistical activities performed to enable the delivery of products or services at the right price, place, and right time with grocery retailers being the last stage of the distribution interacting with the final users (Mondal, Das, Musunuru, & Dash, 2017). Distribution also involves availability of product assortment (Ahmed et al., 2024). Distribution is another marketing element that has been found to impact brand loyalty, especially as "consumers will be more satisfied when the products are available in a greater number of stores because they will be offered the product where and when they need it" (Effany et al., 2018, p. 196). The gravitational theory of retailing states that the greater the distance between the groceries retailers' brand and its customers, the smaller the level of interaction between the grocery retailer and its customers. The literature illustrates the importance of distance utility in customer buying behaviour. If customers are far from the grocery retailer stores' location, their number of visits to the grocery retailer decreases (Effany et al., 2018; Micu, Geru & Lixandroiu, 2017). Conversely, if there is an intensive distribution of a retailer's stores, there will be convenience, less time taken to go to the store, and easier access to the store products and services. This creates value to customers in terms of cost and time saving and builds the retailers' brand image and loyalty (Effany et al., 2018; Yoo & Donthu, 2002)

Customer service is the support that grocery retailers offer to customers during the pre-sale and post-sale stages of customer brand encounters and experiences (Hong-Youl & Ha, 2011). It is also interfacing activities undertaken between the customer and grocery retailers to facilitate the sale and use of the retailers' brand products and services (Barrett, 2018). Customer service is the intangible part of products, and the perceived product quality involves the functionality of the product and the quality of the services. Product and services quality also involves partnering and sourcing fresh and reliable raw materials and customization of services (Anselmsson et al., 2017; Ahmed et al, 2024). Although it has been found that the better the customer services, the better the customer loyalty to the brand (Lin, 2015), Anselmsson et al. (2017) found that customer services negatively impacted brand loyalty. Notwithstanding, if customer services in the forms of fast cash registers, home delivery, and after-sales assistance, aimed at adding value are provided, they can define the customers' touching points. These may result in customers' brand attachment and loyalty (Lin, 2015). Perceived product quality has been shown to impact brand loyalty in Sweden

(Anselmsson et al. (2017), Bangladesh (Ahmed et al., 2024) and Indonesia (Malelak, Setiawan, & Maulidah, 2021).

Promotion is informing, persuading and reminding consumers as to the availability, functionality and strength of the products and services in satisfying consumers' needs and wants. It can be in the form of direct marketing, exhibitions, sales promotions, advertising, campaigns and trade shows (Kotler & Keller, 2016). Anselmsson et al. (2017) found that awareness created by promotion positively impact brand loyalty. Duh and Pwaka (2023) also found that the awareness created by grocery retailers' promotion also positively impacted brand loyalty. According to Viet and Anh (2021), promotion impacts brand loyalty and equity through perceived quality and brand trust.

Marketing Mix and Brand Equity and the Mediating Role of Brand Loyalty

Generally, consumers patronize and become loyal to retailers, particularly grocery retailers mainly because of marketing mix offerings of price, product and service quality, distribution, and promotion (Anselmsson et al., 2017; Niazi et al., 2021; Viet and Anh, 2021). These offerings may either impact brand equity directly Ahmed et al., (2024) or through brand loyalty (Anselmsson et al., 2017) or as Duh and Pwaka (2023) found, through the mediating role of brand loyalty. Each of the marketing mix elements have unique ways and magnitude of impacting brand loyalty and resultant equity. For example, although high prices will generally impact purchase negatively, Shariq (2019) assesses that the high price may communicate high product quality and keep brand loyalty. Niazi et al. (2021) think that its distribution, product quality and promotion that drive brand loyalty and not price. Troiville et al. (2019), Shariq (2029) and Duh and Pwaka (2023) all suggest the mediating roles of brand loyalty between the marketing mix offerings and brand equity. Thus, the following are hypothesised:

H1a &b: Brand awareness from promotion of Woolworths brand will positively impact (a) brand loyalty and (b) brand equity

H2a &b: Woolworths' product distribution will positively influence (a) brand loyalty and (b) brand equity

H3a &b: The perceived product quality of Woolworths has a positive impact on (a) brand loyalty and (b) brand equity

H4 a &b: Woolworths' product price will positively influence (a) brand loyalty and (b) brand equity

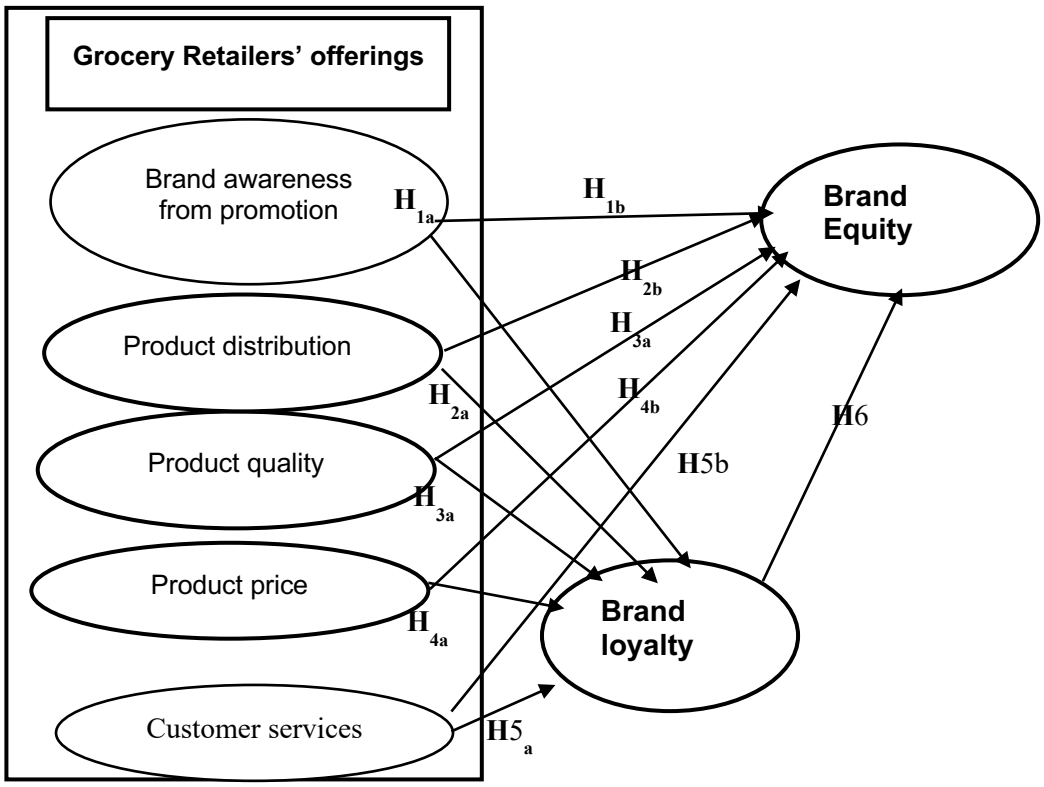
H5a &b: The customer services of Woolworths has a positive impact on (a) brand loyalty and (b) brand equity

H6: The brand loyalty to the Woolworths brand will positively influence brand equity

H7a, b, c, d and e: Brand loyalty has a significant mediating role in how much brand equity is impacted by (a) brand awareness from promotion, (b) brand distribution, (c) perceived product quality), (d) price and (e) customer services.

The hypotheses are presented in Figure 1

Figure 1: Study's Conceptual Model



Note: Hypotheses 6a-d are the mediating hypotheses.

Research Methods and Measures

This study employed a positivist research philosophy and a deductive design to test the hypotheses. The positivist philosophy ensures that theories and models are quantitatively tested (Creswell & Creswell, 2022). Through applying the descriptive design, cross-sectional data were collected from 480 a grocery retailer's (i.e., Woolworths) customers.

Sampling and sample size

The respondents consisted of both males and females, young adults (18-25) and adults (26-65+) who live within the Gauteng Province of South Africa. To capture Woolworths' customers across South Africa, online questionnaires were used distributed on the researchers' social media spaces and after obtaining ethics clearance with ethics number H20/04/17. Considering that a list of the grocery retailer's customers was not available for a random selection in a probability sampling method, non-probability convenience sampling technique was used and was supported by

snowballing to expand the questionnaire reach. Bryman (2023) noted that the convenience sampling enabled the collection of a relatively large sample of respondents who can be easily contacted or reached and who are willing to participate in the study.

To determine the sample size, the rule of thumb method was used. With the rule of thumb, an analysis of the variables under study is done, and each variable is supposed to have at least ten observations or respondents (Tabachnick & Fidell, 2019). In this research, the total number of studied constructs were six (6). Therefore, with each construct having 5-6 indicators, the estimated sample size was estimated to be 10 x 6 x 5 = 300. However, the guidelines from Kyriazos (2018) noted that in research circumstances where structural equation modelling (SEM) is used to analyse data, sample sizes of 300 is regarded as good, 500 is regarded as very good. Thus, a sample size of 480 retailer customers was effectively obtained.

Measures

Previously reliability and validity tested instruments/measures were used to measure this study's constructs. For example, scales for price and perceived quality were adapted Anselmsson et al.'s (2017) scale, price and distribution with Efanny et al.'s (2018) scale, promotion and perceived quality with Jaafar et al.'s (2012) scale. Brand loyalty was measure with Anselmsson et al.'s (2017) scales, while overall bran equity was measured with Buil et al.'s (2013) scale. The customer services construct was adapted with Rahi, Ghani and Ngah's (2020) scale. All the constructs used 5-point Likert-type scale with items rated on a 5-point Likert-type scale (1 = strongly disagree, 5 = strongly agree). Joshi, Kale, Chandel and Pal (2015) assert that five (5) points Likert scales achieve large scores in reliability when compared with 4 and 7-point Likert-type scale.

Data Analysis

Considering the multidimensional nature of the study, structural equation modelling (SEM) was deemed appropriate for the main data analysis method (Hair, Hult, Ringle & Sarstedt, 2022). The SEM analysis started with a measurement model, which determines constructs' reliability (Cronbach alpha and composite reliability), validity (convergent and discriminant validity) and model fit (Gudergan, Moisescu, Radomir, Ringle & Sarstedt, 2024). The second phase assessed the structural model which tested the hypotheses in the conceptual model. The PLS-SEM data analysis approach was selected to compute the estimated parameters of the model because it automatically calculates mediating effects and works well with smaller sample sizes (Hair et al., 2022).

Results

The descriptive statistics in terms of demographic information and constructs' means were first computed. The results are in Table 1.

Table 1: Demographic Analysis

Demographic Description		Frequency	Percent
Gender	Male	276	57.5
	Female	204	42.5
Total		480	100
Age Groups (in years)	18-25	36	7.5
	26-35	126	26.3
	36-45	169	35.2
	46-55	110	22.9
	56-65	30	6.3
	65 +	9	1.9
Total		480	100
Marital Status	Never Married	120	25
	Married	298	62.1
	Separated/Divorced	39	8.1
	Not married but living with partner	23	4.6
Total		480	100
Population Group	White	92	19.2
	Black	317	66
	Coloured	50	10.4
	Indian/Asian	19	4
	Others	2	0.4
Total		480	100

Household Financial Status	Not well-off at all	43	9
	Not so well-off	151	31.5
	Somewhat well-off	246	51.2
	Very well-off	40	8.3
Total		480	100

Table 1 shows that 57.5% were male and 42.5% were female. Majority (91%) of the sample are within the working age group of 26-65 years old in South Africa most of whom are married (62.1%). In addition to the majority at a working age group, 59.5% of the respondents agreed to be financially well-off. This does indicate that they can afford to shop at Woolworths that is perceived to be more expensive in their offerings. In terms of population group, all the racial groups were well represented.

Measurement Model

The PLS-SEM was performed using SMART PLS 4. The process of computing the measurement model (i.e. outer model) was done by selecting the PLS algorithm menu in the Smart PLS 4 workspace, and a path model with factor loadings, Cronbach alpha, composite reliability, Fornell-Larcker Criterion, AVE and HTMT. The results of constructs' reliability and convergent validity in terms of average variance extracted (AVE) are in Table 2. The discriminant validity results are in Table 3.

Table 2: Construct reliability and validity

Constructs	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Brand Awareness	0.872	0.904	0.906	0.658
Brand Equity	0.910	0.911	0.937	0.787
Brand Lolalty	0.940	0.945	0.953	0.772
Customer Services	0.879	0.881	0.912	0.673
Distribution	0.819	0.852	0.875	0.588
Perceived Price	0.831	0.891	0.884	0.619
Product Quality	0.835	0.863	0.880	0.594

As shown in Table 2, the that Cronbach alpha and composite reliability are above the recommended 0.7 signifying that the instrument was deemed reliable. For convergence validity, the AVE of all constructs are above the recommended 0.5 showing that the convergence validity passed for all constructs.

For discriminant validity testing, Henseler, Ringle and Sarstedt (2015) substantiate that the Heterotrait-monotrait ratio (HTMT) method has superior performance when compared to the Fornell-Larcker criterion and cross-loadings. Hair et al. (2022) suggest that the HTMT criterion should be below 0.85 or 0.90 to achieve discriminant validity.

Table 3: Heterotrait-monotrait ratio (HTMT) - Matrix

	BA	BEQ	BL	CS	DI	PP	PQ
BA							
BEQ	0.297						
BL	0.472	0.812					
CS	0.468	0.643	0.566				
DI	0.377	0.724	0.724	0.626			
PP	0.395	0.828	0.744	0.659	0.761		
PQ	0.620	0.597	0.650	0.701	0.517	0.602	

In terms of model fit, Hair et al. (2017) cautioned on applying model fit parameters on PLS-SEM analysis as their application contradicts the fundamental operation of SMART PLS 4. It is important, therefore, that the application of these parameters be treated with great care. However, some research evaluation insists on having a model fit test. Therefore, model fit tests were computed using SMMR. Henseler et al. (2014) suggest that SRMR values be less than 0.10 for conservative models or 0.08 for normal models. The computed SMMR values of our model was 0.073 for the saturated and estimated, thus the indicating that there was some model fit.

Structural model and hypotheses results

Using the results from the PLS SEM bootstrapping computation, path model estimates were computed that tested each hypothesis. In this research, complete bootstrapping with 5000 subsamples at 95% significance level was utilised. The other parameter that is shown in the path coefficient model is Rsquare. This was evaluated according to the guidelines given by Fuchs (2011) and Chin (2010), who state that results which are equal to or greater than 0.67 are regarded as excellent, results above 0.33 are generally good and those below 0.19 are regarded as weak. The results are in Figure 2 and Table 4

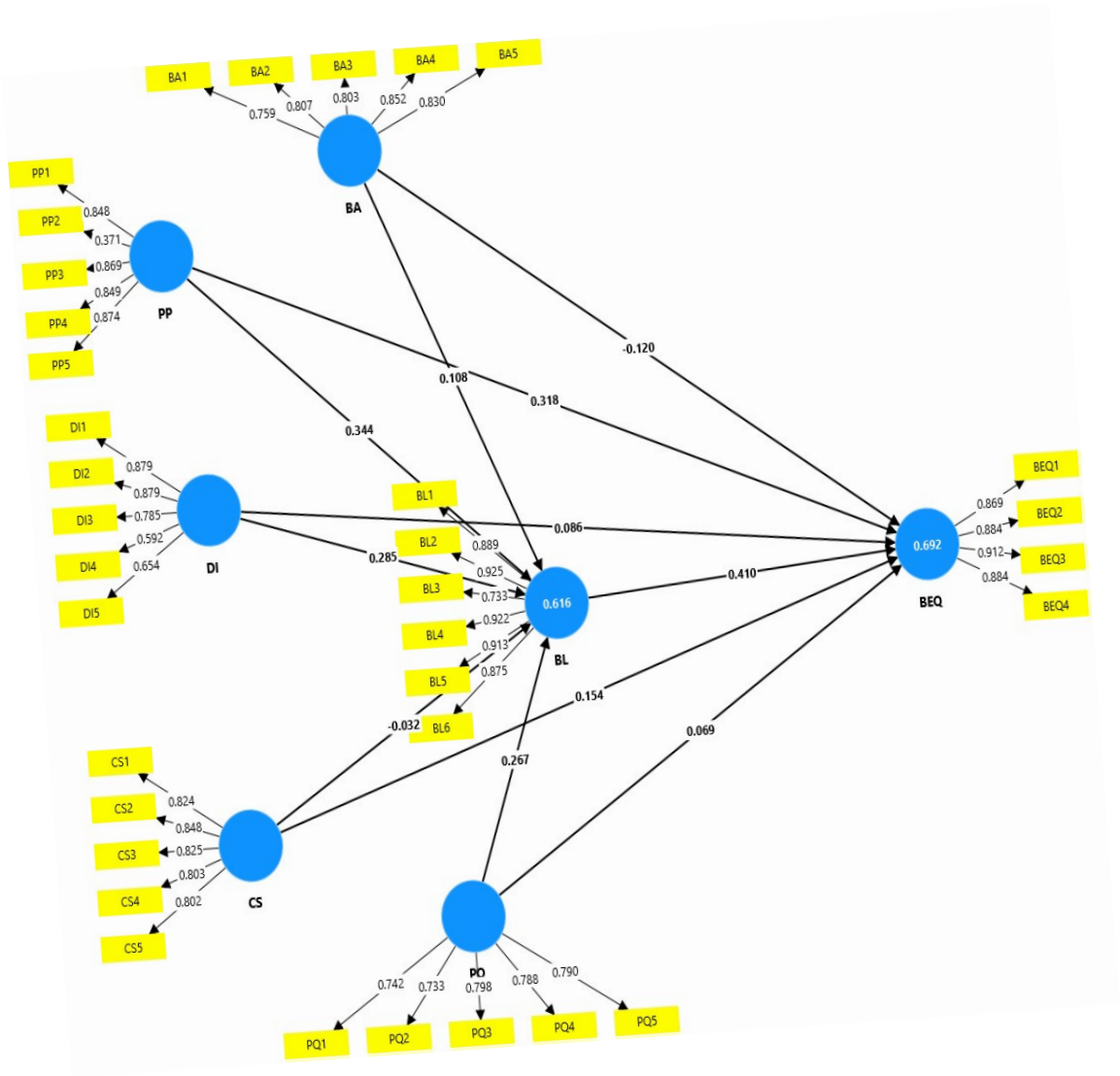


Figure 2: Structural model with paths coefficients and R-square

Table 5: Hypothesis Results

NO	Hypotheses	Original sample (O)	T statistics	P values	Decision
H1 a	Brand Awareness -> Brand Loyalty	0.108	2.486	0.013 **	Supported
H1 b	Brand Awareness -> brand Equity	0.120	3.220	0.001 ***	Supported
H2 a	Distribution -> Brand Loyalty	0.285	6.194	0.001 ***	Supported
H2 b	Distribution -> Grocery brand Equity	0.086	1.853	0.064 *	Supported

H3a	Perceived Quality -> Brand Loyalty	0.267	5.483	0.001 ***	Supported
H3b	Perceived Quality -> Grocery brand Equity	0.069	1.309	0.190 ns	Unsupported
H4a	Price -> Brand Loyalty	0.344	6.618	0.001 ***	Supported
H4b	Price -> Grocery brand Equity	0.318	6.471	0.001 ***	Supported
H5a	Customer Services -> Brand Loyalty	0.032	0.649	0.517 ns	Unsupported
H5b	Customer Services -> Grocery brand Equity	0.154	3.278	0.001 ***	Supported
H6	Brand Loyalty -> Grocery brand Equity	0.410	7.618	0.001 ***	Supported
H7a	BA -> BL -> BEQ	0.044	2.422	0.015	Supported
H7b	DI -> BL -> BEQ	0.117	4.725	0.001 ***	Supported
H7c	PQ -> BL -> BEQ	0.109	4.178	0.001 ***	Supported
H7d	PP -> BL -> BEQ	0.141	5.153	0.001 ***	Supported
H7e	CS -> BL -> BEQ	0.013	0.647	0.518 ***	Unsupported
Variance explained of brand loyalty		0.616 or 61.6%			
Variance explained of brand equity		0.691 or 69.2%			

Note(s): ***=significant at 99%; **=significant at 95%; *=significant at 90% confidence levels; ns=not significant.

Direct Effects

Hypotheses H1a-H5a proposed that grocery retailer promotion through brand awareness, distribution, perceived quality, price, and customer services will positively impact brand loyalty. Except customer services (H5a), all the other hypotheses were supported with promotion (β =0.108; $p<0.01$), distribution (β =0.285; $p<0.01$), perceived quality (β =0.267 $p<0.01$), and price (β =0.344; $p<0.01$).

Hypotheses H1b-H5b proposed that grocery retailer promotion through brand awareness, distribution, perceived quality, price, and customer services will positively impact brand equity. Except perceived quality that was not significant (H3b), all the other hypotheses were supported with promotion (β =0.120; $p<0.01$), distribution ((β =0.086; $p<0.09$), price (β =0.318; $p<0.01$) and customer services (β =0.154; $p<0.01$),

Hypotheses 6 proposed a positive relationship between brand loyalty and equity. According to Table 4, this hypothesis was supported with (β =0.410; $p<0.01$).

Hypothesis 7a-e posited that brand loyalty will play a mediating role in how much brand equity is impacted by promotion, distribution, perceived quality, price and customer services respectively. Table 4 shows that except for H7e related to customer services that was not supported, brand loyalty significantly had a mediating effect in the relationships between all the other marketing mix offerings (i.e., promotion, distribution, perceived quality and price) and brand equity. Thus, 7a promotion (β =0.044; $p<0.01$), 7b distribution (β =0.117; $p<0.01$), 7c perceived product quality ((β =0.109; $p<0.01$) and 7d price (β =0.141; $p<0.01$) were supported.

Our conceptual model explained 61.6% and 69.2% the variances Woolworths' grocery retailer's brand loyalty and brand equity respectively.

Discussion, theoretical and managerial implications

Discussion

This study examined how much Woolworths' marketing mix offerings of promotion through brand awareness creation, distribution, perceived product quality, price and customer services impact brand loyalty and equity. It also tested the mediating role of brand loyalty in these relationships. It was found that brand loyalty is significant influenced by promotion, distribution, perceived product quality, price but not services quality. Brand equity is significantly influenced by promotion, distribution, price, services quality, but not perceived product quality.

The positive relationship between brand awareness and loyalty found in this study is in support of Anselmsson et al.'s (2017) research conducted in the UK. Tran et al. (2020) found a positive and significant relationship between brand awareness in their study conducted in Vietnam and in the context of higher education, thus reinforcing the findings from this study. Brand awareness also impacted brand equity, Thus, supporting Ahmed et al.'s (2024) findings in Bangladesh

In addition to promotion that made a significant impact on brand loyalty, our results revealed that out of the five grocery retailer's marketing offerings studied, perceived price, perceived quality and distribution significantly impacted brand loyalty. Thus, greatly validates Anselmsson et al.'s (2017) model in Sweden. Customer service did not significantly influence brand loyalty. Even though surprising, Anselmsson et al. (2017) also found a problematic negative relationship between customer services and brand loyalty in their Swedish study in the grocery retailers' context. Our non-significant finding could be the self-service nature of grocery retailers, whereby customer services may not be needed for loyalty. We found a positive relationship between price, brand loyalty and equity. Consumers somewhat defy the demand law here maybe because Woolworths' known product quality maybe more valuable/appreciated than the price. Anselmsson et al. (2017) also found a positive relationship between price and brad loyalty.

Theoretical contribution

Shackman (2013) contends that business and marketing researchers should embrace and develop theories and models with high explanatory and predictive power. the model showed that the model explained 69.2% and 61.6 % variance in the retailer brand equity and brand loyalty respectively. The predictive relevance of the model on grocery brand equity and brand loyal was 0.502 and 0.586 respectively, thus showing high predictive power. Using Shackman (2013)'s quest for such important models, the research study adds value by adding marketing sources to the brand factors to explain brand loyalty and overall brand equity. The adding of marketing factors, such as price, distribution and customer service, broadens the study of how brand equity can be built, and consumer behaviour can be widely studied. The testing of the model in the context of a grocery retailer advances the study of retail marketing by exposing the pathway of gaining differential response and preference in an era of high competition.

It can be seen from these results that the market-brand equity model of retailer brand equity relatively improved the explanation of overall retailer brand equity. The majority explanatory power of brand equity falls at 20 to 50%. For example, White, Joseph-Mathews and Voorhees (2013) find that 23% of the variance in retailer brand equity was explained in their model; Gil-Saura et al. (2013) concluded that 33.8% of the variance in stores equity was explained in their model. In addition, Martinelli and De Canio (2017) perceive 48.6% of the variance explained brand equity. These few examples show that the current model improved the explanatory power of customer output components of brand equity (69.2%) and brand loyalty (61.6%) relative to previous research studies.

Managerial contributions

The study showed that retailer brand loyalty has a high direct impact on grocery brand equity. Since brand loyalty directly affects overall brand equity, this study practically contributes by revealing to grocery retailers the pathway to building brand loyalty with marketing factors. The exposure of the sources of brand loyalty, a strong driver of retailer brand equity, can cause a ripple impact on customer buying metrics. This will guide how practitioners can work around issues of fading customer loyalty in the face of challenges of the expansion of e-commerce that threatens the brick-and-mortar stores.

The results of this study provide retail managers insights into developing evidence-based marketing action plans instead of using their intuition to make awareness building and other marketing decisions that usually require high cash investment. Exposing the strongest predictors of brand loyalty and overall retailer brand equity can help management select and prioritise the essential areas of committing their resources. For example, the results found that brand loyalty has the strongest impact on overall retailer brand equity, perceived quality and customer services. These statistics show that resources can be prioritised towards various brand loyalty enhancing programs to impact retailer brand equity significantly.

Study limitations and areas of further research

The study was also commissioned in the Gauteng province of South Africa, which is the country's economic hub with more liberal and opinionated customers. It is therefore that the generalisation of the finding to other South African provinces should be done with caution. The model should be tested in other provinces, such as the Western Cape province that hosts more White and conservative South Africans.

Despite the theoretical, contextual and practical contributions of this study, there are some limitations. The study was conducted with Woolworths grocery customers only considering the retailer's high ranking in terms of brand value. However, Woolworths attracts medium to high-income customers, whose perceptions about the sources and outcomes of brand equity may differ from customers of the low-cost grocery retailers. Further research should test the applicability of the unified model with other grocery retailers, especially the low-cost retailer brands. The study was also commissioned in the Gauteng province of South Africa, which is the country's economic hub with more liberal and opinionated customers. The model should be tested in other provinces, such as the Western Cape province that hosts more White and conservative South Africans.

Even though care was taken to test the construct reliability and validity, cross-sectional studies may suffer from social desirability bias and common method variance (CMV) issues emanating from a single response style. While this study tried to eliminate the CMV bias through factor analysing the items and confirming that they did not load in a single factor with variance explained of up to 50% (Podsakoff et al., 2003), further research should replicate this study with a longitudinal or experimental design to eliminate the social desirability bias issue.

Conclusions

Marketing mix offerings are important to grocery retailers for consumer purchase decisions, need satisfaction, brand loyalty (Anselmsson et al., 2017) and customer-based brand equity (CBBE) (Ahmed et al., 2024). Thus, we integrated Anselmsson et al.'s (2017) and Ahmed et al.'s (2024) models to examine how much the marketing mix offerings impact brand equity through brand loyalty. The results revealed that CBBE was directly and positively influenced by customer services, distribution, price and brand loyalty and not perceived quality. Promotion through awareness negatively influenced CBBE. Indirectly and through the mediating role of brand loyalty, CBBE was influenced by all the marketing offerings except customer service. This means that even when factors like product quality and promotion don't directly and positively influence CBBE, they can do so when brand loyalty is built. The developed conceptual model highly explained 61.6% and 69.2% brand loyalty and equity respectively. This demonstrates the important role of marketing offerings in generating CBBE.

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INFLUENCING ONLINE PURCHASE BEHAVIOUR USING VIRTUAL REALITY DIMENSIONS: MODERATING ROLE OF BRAND ATTITUDE

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Abstract

Virtual reality technologies are central to the development of the emerging digital economy. This study examines the influence of virtual reality dimensions on online purchase behaviour in South Africa's furniture industry. The stimulus-organism-response model and the uses and gratifications theory provided the theoretical lens for this study. An online survey was used to collect quantitative data from 401 South African furniture shoppers. Partial Least Squares Structural Equation Modelling was used to test posited hypotheses. Perceived social presence was found to have a positive influence on spatial presence, while perceived intrusiveness was found to have a negative relationship with spatial presence. The influence of metal imagery on spatial presence was found to be insignificant. Brand attitude was found to moderate the relationship between spatial presence and online purchase behaviour. The results of this study provide valuable insights to furniture marketers who intend to create sustainable competitive advantage through the use of virtual reality.

Keywords: virtual reality dimensions; brand attitude; online purchase behaviour; South African furniture industry

1. Introduction and background

The South African furniture industry is a key sector which contributes significantly to employment creation and economic growth (Department of Trade, Industry and Competition, 2021). However, the sector grapples with various challenges including declining local demand, intensifying competition from low-cost imports and shifting consumer preferences driven by the development of alternative products (Deloitte, 2021; Research & Markets, 2021). Adding to these challenges is the increasing global dominance of digital retailing, where consumer expectations are being shaped by convenience, personalisation and immersive shopping experiences (Romano et al., 2020). This evolving landscape presents challenges and enormous growth opportunities for South African furniture retailers.

Virtual reality (VR) technologies offer a transformative opportunity to tackle challenges confronting the South African furniture industry. Globally, VR has revolutionised the retail industry by enabling consumers to engage with digital products representations in immersive, interactive environments, thus blending the advantages of online and physical shopping (Hilken et al., 2021; Cipresso et al., 2018). Applications of VR in retail—such as allowing customers to visualise furniture in their own spaces enhance convenience, boost customisation, and minimise purchase uncertainty (Alcañiz et al., 2019; Hassan et al., 2021). Global brands like IKEA and Sephora have successfully leveraged VR technologies to elevate customer engagement and satisfaction (Yang, 2021).

The South African furniture industry is the largest in the African continent and accounts for over 50 percent of the continents furniture consumption (Deloitte, 2019). The sector is characterised by a blend of domestic and international players, but it faces substantial competition from imports, particularly from China and Vietnam (Furniture Africa, 2020). While the industry has demonstrated resilience through growing e-commerce activity and expanding export markets, persistent obstacles such as high raw material costs, limited access to capital, and inadequate investment in technological innovation impede its progress (SAFI, 2020). Addressing these challenges is crucial, and the adoption of VR technologies could function as a catalyst for growth, allowing the sector to adapt to evolving consumer demands and bolster its competitiveness.

Despite its potential, VR adoption in the South African furniture industry remains limited, due to barriers such as high implementation costs, insufficient technical expertise, and a lack of supportive government policies (Shin et al., 2020; South African Furniture Initiative, 2020). Nonetheless, the Covid-19 pandemic highlighted the urgency for digital transformation. During lockdowns, physical store closures prompted an unprecedented surge in online sales for furniture retailers, underscoring the importance of digital innovation to sustain growth in a post-pandemic context (Research & Markets, 2021). VR technologies offer solutions to logistical challenges, reduce reliance on physical retail spaces, and enhance consumer engagement—equipping local businesses to compete more effectively in an increasingly digitalised market (Deloitte, 2021).

This study explores the factors influencing online purchase intention within South Africa's furniture industry, with a particular focus on the role of VR technologies. The research is grounded in two theoretical frameworks: The stimulus-organism-response (S-O-R) model (Mehrabian & Russell, 1974) and uses and gratifications theory (UGT)

(Katz et al., 1973). These frameworks are employed to investigate constructs such as mental imagery, spatial presence, perceived intrusiveness, and perceived social presence. The overarching objective of this study is to provide insights into the psychological and behavioural mechanisms driving VR adoption and its impact on consumer intentions. By examining these dynamics, the study aims to provide actionable recommendations for South African furniture retailers to improve customer satisfaction, foster brand loyalty, and achieve sustainable growth. Furthermore, it contributes to the broader conversation on digital transformation in emerging markets, shedding light on the distinctive opportunities and challenges confronting South African businesses. This study seeks to address the following specific objectives:

1) to examine the influence of virtual reality dimensions (mental imagery; perceived intrusiveness; perceived social presence) on spatial presence, and
2) to examine the influence of spatial presence on online purchase behaviour.
3) To examine whether brand attitude moderate the relationship between spatial presence and online purchase behaviour.

2. Literature review

2.1 Theoretical framework

Stimulus-Organism-Response (S-O-R) Framework

The S-O-R framework, proposed by Mehrabian and Russell (1974), provides a psychological model for understanding how environmental stimuli influence an individual’s internal states and subsequent behavioural responses. In this study, VR environments serve as the external stimuli, offering features like interactivity, vividness, and immersion. These stimuli affect the consumer's internal state-emotions and cognitive processes such as mental imagery and spatial presence-which then shape behavioural outcomes like online purchase intention.

In the retail environment context, the S-O-R framework has been extensively applied to understand how immersive environments can enhance customer satisfaction and engagement (Scholz & Duffy, 2018). For example, sensory-rich VR experiences have been shown to create positive emotional states, increasing the likelihood of consumer engagement and purchase (Kim & Ko, 2019). In the South African furniture industry, where consumers may face barriers such as limited access to physical stores and logistical constraints, VR environments offer an innovative way to simulate in-store experiences. The S-O-R model is particularly valuable for exploring how these stimuli—such as realistic product visualisation and customisation options—affect consumer decision-making in this unique market context (Hilken et al., 2017). By applying the S-O-R framework, this study investigates the role of VR stimuli in shaping consumer emotions and perceptions, including constructs like mental imagery (the ability to visualise products vividly) and spatial presence (the feeling of being physically present in the virtual environment). Understanding these processes can provide insights into how South African furniture retailers can leverage VR to drive consumer engagement, reduce purchase uncertainty, and enhance online shopping experiences (Scholz & Duffy, 2018; Kim & Ko, 2019).

Uses and gratifications theory (UGT)

The UGT, developed by Katz and Blumler (1974), highlights the active role of consumers in selecting and using media to fulfil specific needs. Unlike passive

models, UGT posits that consumers are purposeful, choosing media experiences that satisfy their functional (utilitarian) and emotional (hedonic) requirements. In the context of VR, this theory explains how constructs like social presence (the perception of human interaction in virtual spaces) and mental imagery (vivid product visualisation) fulfil these needs, influencing VR adoption and purchase behaviour (Yim, 2017).

UGT is particularly relevant to this study as it examines the motivations behind South African consumers' engagement with VR technologies in the furniture industry. For consumers, VR offers a solution to key challenges in online shopping, such as the inability to physically assess furniture. By fulfilling the utilitarian need for functional product evaluation and the hedonic need for immersive, enjoyable experiences, VR creates a compelling value proposition (Hilken et al., 2017; Yim, 2017). For instance, research shows that consumers value the ability to interact with 3D product models and visualise how furniture will fit into their spaces, enhancing their confidence in making purchase decisions (Hilken et al., 2017). In South Africa, where geographical and logistical challenges may restrict access to physical furniture stores, these features are particularly impactful (Shin et al., 2020). UGT allows this study to investigate how such gratifications influence VR adoption and shape purchase behaviour, offering actionable insights for retailers looking to enhance their customer experiences (Yim, 2017; Hilken et al., 2017).

Virtual reality dimensions and online purchase intention

Mental imagery involves creating vivid sensory experiences in the mind, enabling individuals to imagine how a product might look or function in real life (MacInnis & Price, 1987). Within Virtual Reality (VR) environments, mental imagery plays a critical role in enhancing the consumer experience by allowing users to visualise furniture in their personal spaces. This ability reduces the perceived uncertainty associated with online purchases and increases confidence in decision-making (Hilken et al., 2017). Strong mental imagery is associated with higher customer satisfaction and improved purchase intentions, as consumers can better anticipate how a product will meet their needs (Park & Yoo, 2020).

Perceived intrusiveness refers to the level of discomfort or annoyance consumers feel when VR environments disrupt their browsing or decision-making processes (Riedel et al., 2018). This construct is crucial in understanding potential barriers to VR adoption in South Africa, where consumers may already face challenges such as limited digital literacy or access to advanced technologies (Shin et al., 2020). Excessive intrusiveness, such as over-personalised ads or frequent interruptions, can lead to negative attitudes towards brands, reduced engagement, and a lower likelihood of purchase (Chen & Yen, 2014). For South African furniture retailers, balancing interactivity with user control is essential to avoid perceptions of intrusiveness while fostering positive consumer experiences.

Perceived social presence is the extent to which individuals feel that others are real and physically present in a virtual environment (Short et al., 1976). In VR, social presence can mimic face-to-face interactions, creating a sense of connection and fostering trust (Kim & Lennon, 2013). High levels of perceived social presence are linked to increased emotional engagement and a stronger likelihood of purchase, as consumers perceive the shopping experience as more interactive and personalised (Jung et al., 2020). In this study, perceived social presence is particularly relevant for

simulating customer service interactions or collaborative decision-making with peers in VR shopping environments.

Spatial presence is the subjective feeling of "being there" within a virtual environment (Witmer & Singer, 1998). It enhances consumer immersion by enabling users to interact with virtual furniture as if it were physically present, which reduces perceived risks and increases purchase intentions (Kim & Ko, 2019). Spatial presence is a key driver of engagement in VR, offering consumers the ability to visualise how furniture fits and functions within their homes, leading to greater satisfaction and reduced return rates (Hilken et al., 2017). This construct is vital for South African retailers seeking to replicate in-store experiences online.

Online purchase intention reflects the likelihood that a consumer will complete a purchase after interacting with a VR environment. It is a critical outcome variable influenced by constructs such as mental imagery, social presence, and spatial presence (Lee & Lee, 2015). Research shows that immersive and interactive VR experiences positively impact online purchase intention by building trust and reducing perceived risks (Hilken et al., 2017). In South Africa, understanding online purchase intention is crucial for designing VR strategies that meet consumer needs and drive sales growth.

2. 2 Hypotheses development

2.2.1 Mental imagery and spatial presence

Mental imagery plays a pivotal role in shaping spatial presence in Virtual Reality (VR) environments. Mental imagery refers to the ability of users to create vivid, sensory-rich experiences in their minds based on visual and auditory stimuli from VR (Hilken et al., 2017). Spatial presence, on the other hand, is the subjective perception of "being there" in a virtual environment (Witmer & Singer, 1998). Research indicates that mental imagery enhances spatial presence by enabling users to feel more immersed and connected to the virtual environment. For instance, a study by Riva et al. (2021) demonstrated that high-quality mental imagery facilitated by realistic VR simulations significantly increased users' spatial presence in educational and retail contexts. Similarly, Adaval, Saluja, and Jiang (2018) found that mental imagery amplifies user engagement, contributing to a heightened sense of spatial presence in AR and VR applications. The relationship between mental imagery and spatial presence is particularly relevant in the furniture industry. VR tools that allow users to visualise furniture in real-world settings enhance spatial presence, leading to a more immersive shopping experience (Cipresso et al., 2018). Therefore, mental imagery is expected to strongly influence spatial presence, as vivid representations of virtual furniture increase user immersion.

H_1: Mental imagery positively influences spatial presence in virtual reality environments

2.2.2 Perceived social presence and spatial presence

Perceived social presence, the extent to which users feel a sense of human interaction and connection in a virtual environment, has been shown to enhance spatial presence. Social presence fosters trust and emotional engagement, which amplifies the perception of being immersed in the VR environment (Kim & Lennon, 2013).

Research by So et al. (2021) highlights that VR environments with high social presence, such as those simulating real-life customer interactions, significantly enhance users' spatial presence. Similarly, Kumar and Nanda (2021) demonstrated that perceived social presence in virtual shopping environments creates a stronger sense of spatial presence by simulating face-to-face interactions. In the furniture industry, incorporating interactive elements such as virtual sales assistants or collaborative shopping experiences can enhance perceived social presence, leading to a greater sense of spatial presence. By making users feel more connected, social presence ensures deeper immersion in the VR environment.

H_2: Perceived social presence positively influences spatial presence in virtual reality environments

2.2.3 Perceived intrusiveness and spatial presence

Perceived intrusiveness, defined as the level of discomfort caused by unwanted or disruptive stimuli in VR, negatively impacts spatial presence (Riedel et al., 2018). High perceived intrusiveness can disrupt a user's sense of immersion, diminishing the quality of the VR experience. Studies have shown that intrusive elements, such as irrelevant advertisements or excessive system prompts, reduce users' ability to focus on the virtual environment, thereby lowering spatial presence (Deng et al., 2020). Yoo et al. (2021) found that perceived intrusiveness significantly decreases the effectiveness of immersive environments by interrupting the flow state necessary for spatial presence. In the context of the furniture industry, perceived intrusiveness could arise from poorly designed interfaces or irrelevant system feedback, which interrupts users' attempts to visualise furniture in their spaces (Gavilan et al., 2020). Minimising these disruptions is critical to maintaining high levels of spatial presence, as interruptions can lead to frustration and disengagement.

H_3: Perceived intrusiveness negatively influences spatial presence in virtual reality environments

2.2.4 Spatial presence, brand attitude and online purchase intention

A strong emotional connection between the brand and the customer, known as brand attachment, is vital in influencing brand attitude (Bahri-Ammari et al., 2016). Additionally, brand traits and characteristics can influence the customers' perception of the brand, shaping their attitude toward it (Bowden, 2009). Moreover, brand congruence is also essential in developing brand attitude, reflecting the brand's reliability and consistency (O'Cass & Weerawardena, 2010). Studies in various industries, such as the restaurant industry, have shown the importance of brand unity in influencing brand attitude (Bahri-Ammari et al., 2016; Aureliano-Silva et al., 2019), highlighting the relevance of this construct in understanding customers' attitudes toward brands. Brand attitude is essential in increasing brand awareness and generating a favourable impression (Zhang et al., 2018). Effective brand management requires providing customers with comprehensive information about the brand and creating key features that encourage their return (Zhang et al., 2018). The benefits of brand attitude in terms of brand loyalty among customers, including those in the restaurant industry (Lee et al., 2009; Hussein, 2018). These findings emphasise the importance of brand attitude in building a solid and loyal customer base, which can ultimately lead to increased revenue and long-term success for a business.

Spatial presence enhances online purchase intention by immersing users in a virtual environment that closely resembles a physical shopping experience. When users perceive the virtual environment as real and tangible, they are more likely to feel confident in their purchase decisions (Kim & Ko, 2019). Research by Wei et al. (2019) found that spatial presence in VR applications significantly increased users' behavioural intentions by creating a realistic and engaging shopping environment. Similarly, Hilken et al. (2017) showed that spatial presence reduces perceived risks and enhances user satisfaction, leading to higher purchase intention. In the context of VR for the furniture industry, spatial presence allows users to interact with virtual furniture, assess its suitability for their homes, and make informed purchase decisions. This immersive experience reduces hesitation and fosters a stronger intention to buy.

H_4: Spatial presence positively influences online purchase intention in virtual reality environments

H_5: Brand attitude moderates the relationship between spatial presence and online purchase intention in virtual reality environments

Consistent with the posited hypotheses, Figure 1 shows the conceptual framework.

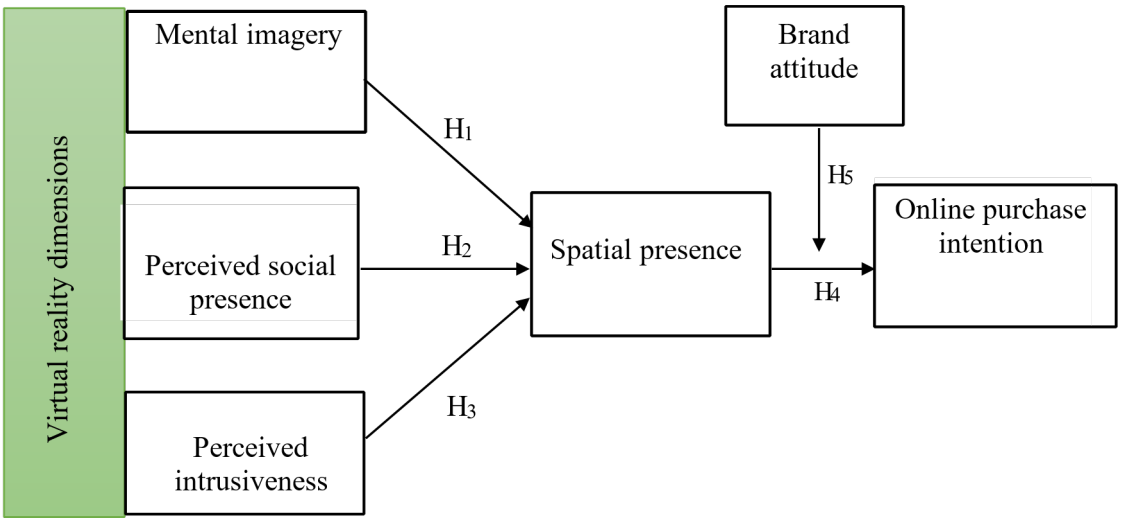


Figure 1: Conceptual model

3. Materials and methods

3.1 Sample and population

The target population for this study consists of individuals who engage in online shopping, specifically focusing on consumers purchasing furniture through virtual platforms. The target population includes South African residents across diverse demographics, such as age, gender, education, and income levels, as online shopping behaviour. This study targets individuals aged 18 to 55 years, as this age group represents the majority of online shoppers in South Africa, with younger consumers (18–35 years) being more tech-savvy and older consumers (36–55 years) increasingly adopting e-commerce platforms (Statista, 2023). Participants of all genders are included to ensure the sample reflects the diverse perspectives of the population.

Studies indicate that both males and females engage in online furniture shopping, although their preferences and motivations may differ (Clement, 2022). The inclusion of these age and gender groups allows for a comprehensive analysis of how VR technologies influence online purchase behaviour across various demographic segments. Due to the non-availability of a sample frame, a non-probability sampling technique, convenience sampling was used to select respondents. Convenience sampling allows the researcher to recruit participants based on accessibility and availability, which is practical and cost-effective for studies exploring specific relationships (Saunders et al., 2019).

3.2 Data collection and measurement scales

A reputable South African research company was contracted to collect data. Ethical Clearance H22/10/16 was granted by the University of the Witwatersrand's School of Business Sciences. A structured questionnaire was used to collect data. All variables were measured using validated scales that were adapted from previous similar studies. A five point Likert scale anchored by (1) strongly disagree and (5) strongly disagree was used. Table 1 provides the source of measurement scales that were used to measure study constructs.

Table 1 Source of measurement scales

Construct	Source(s)	Number of items
Spatial presence	Smink et al. (2020).	4
Perceived intrusiveness	Li et al. (2002).	5
Online purchase intention	Pena et al. (2020).	4
Mental imagery	Park and Yoo (2020).	4
Perceived social presence	Lu et al. (2016).	4

The questionnaire was pilot tested with 40 respondents to assess the appropriateness of the scale items. The results of the pilot study resulted in 8 items being dropped as follows: Perceived intrusiveness (PI4), mental imagery (MI1; MI3), perceived social presence (PSP1; PSP2) and brand attitude (BA1).

4. Data analysis

SPSS version 26.0 and Smart PLS 4 were used to analyse data. SPSS was used for descriptive statistics, assessment of data normality and common method bias assessment. SMART PLS 4 was used to validate the measurement and structural models as well as testing posited hypotheses.

4.1 Sample profile

A total of 500 questionnaires were administered and 401 were valid for analysis representing a response rate of 80.2 percent. The majority of respondents 59 percent (n

=238) were female, 36 percent (n =144) were male and the remaining 5 percent (n =19) did not indicate their gender. In terms of age, 42% (n =168) of the respondents ranged between 21-30 years, followed by 31-40 with 21% (n =84) and 41-50 with 18,3% (n =73). The remaining 18, 7% (n =76) did not indicate their age. Out of 401 respondents, 55.5% (n =228) were employed, 19.8% (n =81) indicated that they were students, followed by
17.3% (n =71).

In terms of education level, the results of the survey indicated that 49 respondents (12.0%) held a high school education, 45 (11.0%) held a diploma, 175 (42.7%) held a degree, 128 (31.2%) held a postgraduate degree, and 4 (1.0%) held other educational qualifications. The survey results showed that 25 respondents (6.1%) reported earning less than R1000 per month, 36 (8.8%) reported earning between R1000 and R5000 per month, 37 (9.0%) reported earning between R5000 and R10 000 per month, 196 (47.8%) reported earning more than R10 000 per month, and 107 (26.1%) preferred not to disclose their monthly earnings.

4.2 Data normality and common method variance

The Kolmogorov–Smirnov (K– S) and Shapiro–Wilk (S–W) tests were conducted to assess the distribution of data. The K–S and S–W results were statistically insignificant ($p > 0.05$), which is an indication that the data was normally distributed (Hair et al., 2019). The Harman's single-factor test was computed to check the possible effect of common method variance. The un-rotated exploratory factor analysis resulted in a total explained variance of 46.8 percent which is below the acceptable cut-off point of 50 percent (Podsakoff et al., 2012).

4.3 Measurement model

Cronbach's alpha and composite reliability values were computed to assess measurement scale reliability. As shown in Table 2, the measurement scales returned scores above the acceptable threshold of 0.7 signifying the reliability of measurement scales (Hair et al., 2019). Convergent validity was confirmed as all study variables returned average variance explained values above the approved threshold of 0.5 (Fornell & Larcker, 1981). The fitness of the CFA model was confirmed with the aid of goodness-of-fit indices: X2 /df = 2.630, CFI= 0.930, TLI = 0.910, RMSEA= 0.058 (Bagozzi & Yi, 2012). Reliability and validity indicators are shown in Table 2.

Table 2: Reliability and validity indicators

Constructs	Items	Factor Loadings	CA	CR	AVE
Perceived intrusiveness	PI1	0,862	0.837	0.889	0.668
	PI2	0.783			
	PI3	0.875			
	PI5	0.741			
Mental imagery	M12	0.959	0.910	0.957	0.917
	M14	0.956			
Perceived social presence	PSP1	0.934	0.835	0.923	0.858
	PSP3	0.918			
Spatial presence	SP1	0.901	0.813	0.914	0.842
	SP4	0.933			
Brand attitude	BA2	0.878	0.866	0.918	0.789
	BA3	0.925			
	BA4	0.861			
Online purchase intention	OPI1	0.942	0.913	0.950	0.820
	OPI2	0.880			
	OPI3	0.939			
	OPI4	0.860			
CA = Cronbach alpha; CR= Composite reliability; AVE = average variance extracted					

4.4 Discriminant validity

The Fornell-Larcker criterion was used to assess discriminant validity in a PLS-SEM model. As shown in Table 3, discriminant validity was confirmed as the square root of the AVE was more than the inter-correlations between study constructs (Fornell & Larcker, 1981).

Table 3 discriminant validity indicators

	MI	PI	PSP	SP	BA	OPI
MI	0.894					
PI	0.494**	0.835				
PSP	0.642**	0.505**	0.863			
SP	0.132*	0.124*	0.730**	0.906		
BA	0.677**	0.501**	0.715**	0.720**	0.875	
OPI	0.415**	0.140*	0.453**	0.171*	0,451 **	0.728
MI = Mental imagery; PI= Perceived intrusiveness; PSP= Perceived social presence; SP = Spatial presence; BA= Brand attitude; OPI= Online purchase intention. *. Correlation is significant at the 0.05 level (2-tailed).						

4.5 Structural model and hypotheses testing

The fitness of the structural model was assessed using goodness-of-fit indices. The structural model fitted well with the data as indicated by: X2 / df = 2.780, CFI= 0.913, TLI = 0.923, RMSEA =0.053 (Bagozzi &Yi, 2012). Multicollinearity was not an issue in this study. The tolerance values were all below 1 and the variance inflation factor was below 10 which shows that multicollinearity was not an issue in this study (Pallant,
2011). Table 4 shows hypotheses testing results.

Table 4 Hypotheses testing results

Path	Beta	T statistics	P-values	Decision	R-square value
Mental imagery -> spatial presence	0.109	1.475	0.140	Not supported	0.623
Perceived social presence -> spatial presence	0.409	4.960	0.001	Supported	
Perceived intrusiveness -> spatial presence	-0.313	4.122	0.001	Supported	
Spatial presence -> Online purchase intention	0.213	1.360	0.162	Rejected	0.151

4.6 Moderation analysis

The regression-based method (Hayes, 2018) was used to test whether brand attitude moderates the relationship between spatial presence and online purchase intention. Moderation was tested using the regression equation: $Y= i1 +\beta1X + \beta2M + \beta3XM + e1$ Where I = intercept; β (1, 2, 3) = regression coefficients; X = Independent variable (spatial presence); M = moderator (brand attitude); Y = Dependent variable (online purchase intention); e1 = standard error. Table 5 provides results of moderation analysis.

Table 5 Moderation analysis results

Constant	Coefficient effect	T	P	LLCI	ULCI	
	4.3260	120.8820	0.0001	3.1442	3.8330	
Brand attitude	0.1745	2.8364	0.00232	0.0301	0.1564	
Online purchase intention.	0.7820	12.684	0.0001	0.6832	0.768	
Moderating effect of brand attitude (interaction effect)	0.0068	0.5420	0.04612	0.0524	0.0030	Moderating effect

As shown in Table 4, the p-value was below 0.05 which is an indication that brand attitude moderates the relationship between spatial presence and online purchase intention.

5. Discussion of results

The first hypothesis which posited that mental imagery positively influences spatial presence in virtual reality environments was not supported. In fact, mental imagery was found to have an insignificant influence on spatial presence ($\beta = 0.109$; $p > 0.05$). This result implies that the marketing stimuli provided by South African furniture marketers on online shopping platforms is not strong enough for shoppers to perceive their existence in the spatial presence. This result is not consistent with that reported from previous studies (Bogicevic et al., 2019; Gavilan et al., 2020). For example, a study by Bogicevic et al. (2019) found that when consumers are exposed to weak mental images in virtual environments, it has the effect of reducing perception of behavioural control and weaken the development of online purchase intention.

The second hypothesis, which predicted that perceived social presence positively influences spatial presence in virtual reality environments was supported ($\beta = 0.409$; $p < 0.001$). This result gains support from previous studies (Chen & Cai, 2018; Zhou et al., 2020) where perceptions of social presence in virtual reality environments were found to be driven by hedonic motivation seeking behaviour. Commenting on this result, Zhou et al. (2020) suggest that marketers need to leverage on consumers' perception of social presence by re-directing them from hedonic oriented activities on virtual environments to more purchase behaviour oriented activities such as product search, evaluation, trial and purchase.

In support of the third hypothesis, perceived intrusiveness was found to have a negative influence on spatial presence in virtual reality environments ($\beta = -0.313$; $p < 0.001$). This result was also reported in previous studies (Deng et al., 2020; Zhao et al., 2021). In addition to discouraging consumers' engagement in virtual environments, Deng et al. (2020) found that perceived intrusiveness reduces intention to navigate through the online marketing messages and it also stimulate negative

attitudes towards products and services. To minimise perceptions of intrusiveness, a Zhao et al. (2021) recommended the use of low levels of personalisation when developing marketing messages for virtual environments.

The fourth hypothesis that predicted that spatial presence positively influences online purchase intention in virtual reality environments was not supported ($\beta = 0.213$; $p > 0.05$). This result suggests that consumers' presence in virtual reality environments does not always translate into the development of favourable online purchase intentions. Chatterjee and Kumar (2020) provide a possible explanation for this result. The authors argue that for high involving expressive products, the associated risk may discourage the formation of online purchase intentions. This may be the case in this study because furniture is a durable high involving and expressive product. To mitigate this challenge, Chatterjee and Kumar (2020) urge marketers to empower online shoppers to develop showrooming and web-rooming capabilities.

Finally, in support of the fifth hypothesis, brand attitude was found to moderate the relationship between spatial presence and online purchase intention in virtual reality environments. This result is consistent with that reported in previous studies (e.g., PeaGarca et al., 2020; Nguyen & Nguyen, 2021) wherein a favourable brand attitude was found to have a significant positive impact on consumers' desire to purchase products online. Overall, this result underscore the importance of prioritising the development a positive brand attitude order to boost online sales volumes.

6. Theoretical implications

This study produced intriguing results that shed more light on consumers' online purchase behaviour in virtual environments. Firstly, it was found that consumers' presence in virtual environments does not always translate into online purchase behaviour. Thus, this study contributed to literature by confirming the prevalence of the spatial presence-online purchase behaviour gap. Marketers are therefore challenged to continuously explore strategies to bridge this gap.

Secondly, this study affirms the importance of developing a positive brand attitude in virtual environments. While it is important to develop creative and interactive virtual environments, fostering a favourable brand attitude remains critical in order to enhance online purchase behaviour. Lastly, this study contributes to literature by proposing a model that has the potential to predict consumer purchase intention in virtual environments. Specifically, virtual reality dimensions were found to explain 62.3 percent variance in spatial presence.

7. Managerial implications

The results of this study offers four practical insights to South African furniture marketers. Firstly, the results underscore the need to create mental images that are more vivid in order to trigger mental stimulations that capacitate shoppers to interact in the virtual environment. To achieve this, furniture marketers may also need to utilise neuromarketing techniques such as functional magnetic resonance imaging which were found to be more effective in understanding the consumers' mental processes. Secondly, perceived social presence emerged as a major factor that entice consumers to engage in the virtual environment. This result suggests that consumers may be highly susceptible to social influence and the use of credible online influencers

with expertise in furniture products may prove to be useful in promoting online purchase behaviour. Digital nudging through the use of digital gifts may be used to stimulate consumer interest.

Thirdly, South African furniture marketers may need to implement attitude change strategies as a way of developing favourable consumer dispositions. Through the use of techniques such as perceptual mapping, dominant consumers' perceptions that can be used to develop attitude change strategies can be identified. Lastly, there is a need to address perceptions of intrusiveness as this have an adverse effect on consumers' browsing experience and this can nurture negative attitude towards promoted products. To mitigate this challenge, the use of ad formats and placements that are less intrusive, such as native advertising and contextual advertising is recommended (Huan et al., 2019). Also, the use of highly personalised ads is proposed as they are considered less intrusive than non-personalised ads (Liu et al., 2021).

8. Limitations and further research

This study relied on self-reported data which may be susceptible to bias. Future studies may address this limitation through the use of more objective methods such as experiments which provide an added advantage of testing cause and effect relationships. This study also focused on one product category, to enhance the generalisability of results, future studies may also consider the use of more product categories. Lastly, this study employed a mono-method in the form of a quantitative research method. To have a holistic perspective on how consumers interact and make purchase decisions in virtual environments, the use of mixed methods is recommended in future studies.

9. Conclusion

This study examines the influence of virtual reality dimensions on online purchase behaviour in South Africa's furniture industry. The stimulus-organism-response model and the uses and gratifications theory provided the theoretical lens for this study. The results underscore the need to create mental images that are more vivid in order to trigger mental stimulations that capacitate shoppers to interact in the virtual environment. Perceived social presence emerged as a major factor that entice consumers to engage in the virtual environment. Marketers may leverage o this result through the use of digital nudging to stimulate consumer interest. South African furniture marketers may also need to implement attitude change strategies as a way of developing favourable consumer dispositions to their products. Through the use of techniques such as perceptual mapping, dominant consumers' perceptions that can be used to develop attitude change strategies can be identified. There is also a need to address perceptions of intrusiveness as they have an adverse effect on consumers' browsing experience including the potential to nurture negative attitude towards promoted products. The use of ad formats and placements that are less intrusive such as native advertising and contextual advertising is recommended.

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LEVERAGING DIGITAL TECHNOLOGIES FOR ENHANCED COMPLAINT MANAGEMENT IN DELIVERY SERVICE SMES: INSIGHTS FROM AFRICAN CONSUMER BEHAVIOUR

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Abstract

Purpose - As digital transformation reshapes consumer expectations, small and medium-sized enterprises (SMEs) in Africa's delivery service sector must adapt to evolving complaint management practices. However, there seems to be limited research on how SMEs integrate digital tools to enhance real-time complaint resolution. Also, existing studies focus on large firms, overlooking SMEs' resource constraints in digital adoption. Finally, how digital complaint management strategies affect consumer long-term brand loyalty remains underexplored.

Methodology - Hence, a qualitative research approach was employed, utilizing semi-structured interviews with 15 owner-managers of delivery service SMEs in Ghana to explore how delivery service SMEs manage diverse customer complaints, focusing on the role of digital tools in enhancing service excellence, consumer trust, and brand loyalty. Thematic analysis, guided by the Miles and Huberman framework, was used to identify patterns in digital-driven complaint resolution strategies.

Findings - The study reveals that effective complaint management in delivery service SMEs follows a structured digital process: complaint identification through social media, chatbots, or mobile apps leads to automated or personalized engagement, informing resolution strategies. Also, digital integration enhances response efficiency and customer satisfaction. However, SMEs struggle with technological adoption barriers, limited financial resources, and evolving consumer expectations, making it difficult to fully leverage digital tools for real-time complaint resolution and long-term brand loyalty, as explored in this study.

Originality - This study contributes to the understanding of African consumer behaviour in the digital age, highlighting how digital inclusion influences service recovery and brand loyalty. By aligning findings with Attribution Theory, it provides a nuanced perspective on how SMEs can leverage technology to turn complaints into opportunities for service improvement and long-term customer retention. These insights offer practical guidance for SMEs aiming to enhance their digital complaint management strategies, ultimately strengthening Africa's evolving e-commerce and service ecosystems.

1.0 Introduction

Customer complaints are inevitable in the service industry, as service performance often fails to meet customer expectations (Kim & Baker, 2020). For small and medium-sized enterprises (SMEs), which form the backbone of global economies, managing customer complaints effectively is critical to sustaining competitiveness and building customer loyalty. However, SMEs face unique challenges in addressing the diverse behaviours and expectations of different types of complainers; passives, voicers, irates, and activists (Badghish & Shagagi, 2023; Nguyen, 2019). Each group requires tailored strategies, yet SMEs often lack the resources, frameworks, and expertise to handle complaints comprehensively.

The inability to address diverse complaints can have severe consequences. Passive complainers disengage without giving feedback, leaving businesses unaware of their shortcomings (Do et al., 2020). Irates and activists, on the other hand, can amplify dissatisfaction through negative word-of-mouth or public platforms, causing significant reputational damage (Narayanan & Singh, 2024). In the absence of effective strategies, these issues lead to customer attrition, reduced trust, and financial losses, posing an existential threat to SMEs competing against larger firms with more robust customer service systems (Knox & Van Oest, 2014).

Despite the critical role of complaint management in enhancing service excellence, research in this area predominantly focuses on large organizations (Aksoy & Yilmaz 2022; Clavel & Pomey, 2020). Little attention has been paid to how SMEs, with their resource constraints, can implement scalable and effective complaint management strategies. Furthermore, while theories like attribution theory highlight the psychological dimensions of customer complaints, practical insights into applying these frameworks in SME contexts remain limited (Mahato et al., 2024).

It is for this reason that this study aims to investigate how delivery service SMEs in Accra, Ghana, manage diverse customer complaints to enhance service excellence. Specifically, the study seeks to identify effective strategies for managing complaints, categorize types of complainants, and explore the impact of these practices on service quality. The findings aim to provide actionable recommendations for SMEs to tailor their complaint management processes and improve customer satisfaction. By bridging theory and practice, this research seeks to contribute to the broader understanding of service recovery while empowering SMEs to thrive in competitive markets through improved customer relationships.

2.0 Literature Review

2.1 Service Failure

Service failure, a critical aspect of service delivery, occurs when a service provider's performance falls below a customer's expectations, resulting in dissatisfaction (Sahaf & Fazili, 2024). As services are intangible and highly dependent on human interaction, failure is often inevitable, making its management a key determinant of organizational success (Lewis & McCann, 2004). For small and medium-sized enterprises (SMEs), understanding and addressing service failure is particularly critical, as their limited resources make recovery efforts challenging yet essential to maintaining customer loyalty (Nikolić et al., 2019).

Existing literature highlights the diverse causes of service failure, ranging from procedural inefficiencies to employee errors and unmet customer expectations (Nikolić et al., 2019; Sahaf & Fazili, 2024). Cho and Song (2012) identifies core service failures; such as billing errors, poor service quality, and unfulfilled promises, as primary drivers of customer

dissatisfaction and switching behaviour. These failures often undermine trust and tarnish an organization's reputation, particularly in the resource-constrained environment of SMEs (Cho & Song, 2012).

Customer perceptions of service failure vary widely, influenced by factors such as the severity of the issue and the degree of control the firm is perceived to have over the failure (Albrecht et al., 2017). Attribution theory suggests that customers are more forgiving of failures perceived as uncontrollable or one-off incidents. Conversely, repeated failures or those attributed to negligence are likely to evoke stronger dissatisfaction and negative word-of-mouth (Weiner, 1980).

2.2 Service Recovery

Service recovery refers to the actions taken by an organization to address service failures and restore customer satisfaction (Miller et al., 2000). Effective service recovery is critical as it not only mitigates the negative effects of service failures but also provides an opportunity to enhance customer trust and loyalty (Pizzutti dos Santos & Basso, 2012). For SMEs, which often operate in highly competitive markets with limited resources, service recovery becomes an indispensable tool for maintaining customer relationships and sustaining business growth (Nikolić et al., 2019).

The concept of the service recovery paradox posits that a customer's satisfaction level can exceed expectations if the recovery effort is exemplary (Krishna et al., 2011). However, Michel and Meuter (2008) argue that this paradox occurs under specific conditions, such as when failures are perceived as minor and recovery efforts are prompt, empathetic, and adequate. The cost and complexity of delivering such recovery, particularly for resource-constrained SMEs, remain significant challenges (Hübner et al., 2018).

Service recovery strategies often focus on fairness dimensions, outcome fairness, procedural fairness, and interactional fairness (Kumar & Kumar, 2016). Customers expect compensations that align with their inconvenience (outcome fairness), clear and efficient recovery processes (procedural fairness), and respectful communication (interactional fairness) (Kumar & Kumar, 2016). Hence, tailoring these strategies to different types of complainers, such as passives, voicers, irates, and activists, is vital for recovery success.

2.3 Service Recovery Strategies

Service recovery strategies are vital in addressing customer dissatisfaction and restoring confidence after service failures (DeWitt & Brady, 2003). These strategies involve specific actions aimed at rectifying the failure, minimizing its impact, and fostering loyalty. For SMEs, the design and execution of effective service recovery strategies are critical for maintaining competitive advantage and customer retention (Caballero-Morales, 2021).

Levesque and McDougall (2000) on service recovery strategies highlights two main approaches: fixing the customer and fixing the problem. Fixing the customer focuses on addressing the immediate dissatisfaction through prompt responses, compensation, and empathetic communication. For example, ensuring customers feel heard and valued by providing personalized solutions can significantly enhance satisfaction. Fixing the problem involves identifying and eliminating the root cause of the failure to prevent recurrence. This may include refining processes, training employees, or implementing technological solutions (Levesque & McDougall, 2000).

For instance, some effective recovery strategies include the use of service guarantees, which assure customers of resolution and provide a sense of security. However, in SMEs, such

extensive empowerment may not be feasible. Instead, practical methods, such as actively tracking and analysing complaints, prioritizing procedural fairness, and offering symbolic compensations, have proven effective (Kim, 2007).

2.4 Service Excellence

Service excellence refers to consistently exceeding customer expectations and delivering memorable experiences that foster trust and loyalty (Gouthier et al., 2012). For small and medium-sized enterprises (SMEs), achieving service excellence is essential for competitive differentiation in a marketplace dominated by larger firms with more resources (Sternad et al., 2019). Service excellence is not only a critical success factor but also a significant driver of customer retention and business growth (Clark & Baker, 2007).

Gouthier et al. (2012) emphasizes that service excellence is built on three pillars: service quality, employee empowerment, and customer-centric culture. Service quality frameworks, such as the SERVQUAL model, identify reliability, responsiveness, assurance, empathy, and tangibles as key dimensions influencing customer perceptions (Parasuraman et al., 1988). SMEs, however, often face challenges in consistently delivering these attributes due to resource limitations and operational constraints (Sternad et al., 2019).

According to Den Hartog and Verburg (2002), employee empowerment plays a vital role in fostering service excellence. Empowered employees are better equipped to make decisions, solve problems promptly, and personalize customer interactions, thereby creating positive service experiences (Den Hartog & Verburg, 2002). For example, companies like Zappos prioritize employee autonomy to enhance customer satisfaction. SMEs can adopt similar practices on a smaller scale by investing in training and creating flexible policies (Sternad et al., 2019). A customer-centric culture is the foundation of service excellence. Organizations that prioritize customer needs in their operations tend to deliver higher satisfaction levels. Despite its importance, many SMEs struggle to instill such a culture due to competing priorities or lack of expertise (Nurdiani & Alie, 2023).

2.5 Types of Complainers

Understanding the types of complainers is pivotal for businesses aiming to implement effective complaint management strategies. Research categorizes complainers into four primary groups: passives, voicers, irates, and activists (Singh, 1990). Each group exhibits unique behavioural tendencies and expectations, necessitating tailored approaches to service recovery. For SMEs, recognizing these distinctions can significantly enhance their ability to address diverse customer needs and foster satisfaction (Sharma et al., 2010).

Passives are the least likely to complain directly to the provider or spread negative word-of-mouth (WOM) (Oliver, 2014). Their dissatisfaction often remains unvoiced, making it challenging for businesses to identify and address issues. This silent disengagement can lead to reduced loyalty and eventual customer attrition (Singh, 1990). Proactively soliciting feedback through surveys and informal interactions is essential for reaching this group (Gyung Kim et al., 2010).

Voicers, in contrast, actively communicate their complaints to the service provider but refrain from spreading negative WOM (Oliver, 2014). They are often motivated by a belief in the constructive potential of their complaints and are considered the "best friends" of businesses. SMEs can leverage this behaviour by responding promptly and showing appreciation for their input, turning voicers into loyal advocates (Gyung Kim et al., 2010).

Irates are characterized by their propensity to share dissatisfaction through negative WOM and their lower likelihood of giving providers a second chance (Singh, 1990). Effective handling of irates requires prompt, empathetic recovery actions to rebuild trust and minimize reputational damage (Levesque & McDougall, 1996). Whiles activists are the most vocal, often complaining across multiple channels, including third-party platforms. They demand high responsiveness and accountability from businesses (Oliver, 2014). Ignoring activists can lead to public relations crises, particularly for resource-limited SMEs (Gyung Kim et al., 2010).

2.6 Attribution Theory

Attribution theory, developed by Heider (1958) and further refined by Weiner (1980), explains how individuals interpret and assign causes to events, particularly success and failure. This theory is a cornerstone in understanding customer reactions to service failures and the subsequent effectiveness of service recovery strategies. For SMEs, attribution theory offers valuable insights into tailoring complaint management practices based on customers' perceived reasons for service failure (Chakraborty & Bhat, 2018).

According to attribution theory, customers evaluate service failures based on three key dimensions: locus of control, stability, and controllability (Weiner, 1980). The locus of control determines whether the failure is attributed to internal factors (e.g., employee incompetence) or external factors (e.g., unforeseen circumstances). Stability refers to whether the issue is perceived as a recurring problem or a one-time incident, while controllability assesses whether the organization had the ability to prevent the failure (Manusov & Spitzberg, 2008).

Manusov and Spitzberg (2008) also suggest that customers are more forgiving of failures perceived as external, unstable, and uncontrollable. Conversely, failures seen as internal, stable, and controllable often lead to stronger dissatisfaction and reduced trust. SMEs can leverage these insights by shaping recovery strategies to influence customer perceptions positively (Chakraborty & Bhat, 2018). For instance, transparent communication about the cause of a failure, coupled with proactive recovery actions, can mitigate negative attributions.

3.0 Method

This study employs a qualitative research approach to explore strategies for managing diverse customer complaints to enhance service excellence in delivery service SMEs in the Greater Accra region, Ghana. The qualitative approach is ideal for capturing in-depth insights and understanding the subjective experiences of SME operators regarding complaint management (Creswel, 2013). For the purpose of this study, small and medium enterprises is operationalised based on number of workers and fixed assets as provided by the National Board for Small Scale Industries (NBSSI). Small enterprises engage 6 to 30 staff; have fixed assets (excluding land and building) not exceeding $100,000 and are formally registered at the Registrar General's department. Medium enterprises have between 30 and 100 workers with fixed assets (excluding land and building) not exceeding $1 million and formally registered at the Registrar General's department (Akpabli, 2019).

The research adopts a case study strategy, focusing on delivery service SMEs operating in the Greater Accra region. The Integrated Business Establishment Survey (IBES) report (GSS, 2016) indicates that the Greater Accra region is home to the largest number of business establishments in Ghana, particularly small and medium enterprises, hence the rationale for selecting Accra as the study area. These businesses represent the study population due to their direct interaction with diverse customer bases and their role in addressing complaints

effectively. The purposive sampling technique was employed, with inclusion criteria specifying SMEs that have been in operation for at least five years, ensuring the selection of experienced businesses capable of providing rich insights into their complaint management strategies (Malhotra & Birks, 2007).

Primary data was collected through semi-structured interviews guided by a well-constructed interview guide. This instrument ensured consistency in questioning while allowing flexibility to explore respondents' unique perspectives (Malhotra & Birks, 2007). The interviews focused on identifying the types of complaints encountered, strategies for addressing them, and their impact on service excellence. To ensure reliability, the interview guide was pre-tested with 5 owner-managers of SMEs delivery service firms operating in the Greater Accra region, after which the interview of 15 different owner-managers from the pre-test realised data saturation (Creswel, 2013). All interviews were recorded and transcribed verbatim. Validity was also ensured through member checking, allowing participants to review and confirm their responses for accuracy.

Thematic analysis, guided by the Miles and Huberman (1994) approach, was employed for data analysis. This involved coding responses, identifying patterns, and categorizing themes to uncover significant insights. The approach ensured a systematic and rigorous analysis process, enhancing the credibility of the findings.

4.0 Findings

Table 1: Profile of Respondents

Respondents	Position	Gender	Location	Age of firm	Number of Staff
R1	Owner-managers	Male	Madina	6	3
R2	Owner-managers	Male	Haatso	5	5
R3	Owner-managers	Female	Lapaz	8	7
R4	Owner-managers	Male	Tema	5	4
R5	Owner-managers	Female	Pantang	5	8
R6	Owner-managers	Female	East Legon	6	11
R7	Owner-managers	Female	Cantoment	5	5
R8	Owner-managers	Female	Adabraka	7	5
R9	Owner-managers	Female	Osu	6	9
R10	Owner-managers	Male	La	5	3
R11	Owner-managers	Female	Dzowulu	7	8
R12	Owner-managers	Male	Amrahia	8	6
R13	Owner-managers	Male	Pokuasi	9	6
R14	Owner-managers	Male	Weija	6	10
R15	Owner-managers	Male	Dawhenya	5	3

Table 1 above presents the profile of respondents for the study. These respondents comprised 15 owner-managers of delivery service SMEs operating in various locations within Accra, Ghana. The sample was diverse, reflecting key demographic and operational characteristics. Eight respondents were male, and seven were female, indicating a near-gender balance. This diversity ensures that the findings incorporate perspectives influenced by both male and female leadership styles.

The firms ranged in age from 5 to 9 years, with the majority being operational for at least 5 years, satisfying the study’s inclusion criteria. This criterion ensured that the businesses had

sufficient experience to provide valuable insights into managing diverse customer complaints. The firms' longevity also suggests stability and established practices, which enhances the robustness of the findings.

The number of staff employed by these SMEs ranged from 3 to 11, reflecting the resource constraints typical of small businesses. This diversity in staff size contributes to the validity of the findings, as it highlights how complaint management strategies may vary depending on workforce capacity. Furthermore, the geographical spread of respondents—from urban hubs like Madina, Haatso, and East Legon to suburban areas like Dawhenya and Amrahia—ensures representation across different customer demographics and market dynamics within Accra.

The diverse profile of respondents strengthens the robustness of the study by ensuring that findings are not biased toward a specific gender, location, or firm size. The variation in operational contexts and staff sizes adds depth to the data, capturing the complexities of complaint management across SMEs. The inclusion of experienced firms enhances the validity of the findings, as insights are drawn from businesses with proven operational stability. Finally, the study's reliability is supported by the use of purposive sampling, ensuring that all respondents met stringent inclusion criteria, making the data consistent and trustworthy for future applications.

4.1 Emerging Themes

In the quest of finding answers to the research objective, interviews were conducted with the permission of respondents, who consented to audio recordings and note-taking during the discussions. The recordings and notes were meticulously transcribed to ensure accuracy and to capture the nuanced perspectives of respondents.

The data were systematically sorted and categorized into codes relevant to the research questions. Using the Miles and Huberman qualitative data analysis technique, recurring ideas and statements were identified and grouped into codes. These codes were then organized into overarching themes based on their relevance to the study's objectives. This iterative process ensured that the themes directly addressed the complexities of managing customer complaints and enhancing service excellence in SMEs. After analysing the data, the following themes emerged:

1. Types of Complaints
2. Complaint Handling
3. Tailored Strategies for Different Types of Complainants
4. Challenges in Complaint Management
5. Impact of Complaint Management on Service Excellence
6. Learning and Continuous Improvement

On the types of customer complaints, delivery service SMEs reported various types of customer complaints, with delivery delays being the most common issue. R1 noted, "*Customers often complain about delays, particularly during rush hours and bad weather, making it difficult for us to maintain their trust and loyalty consistently*." These delays are largely attributed to traffic congestion in Accra and logistical challenges. Miscommunication was another recurring complaint. R10 explained, "*Complaints about wrong delivery times or unclear details to riders are common, and they often frustrate customers who expect better communication from us during their delivery process*." These issues highlight the need for improved communication strategies between the vendors and the delivery service firms to

manage customer expectations. Damage to packages, particularly fragile items, was also a frequent source of dissatisfaction. R8 stated, "*Some complaints focus on goods arriving damaged or in poor condition, especially fragile items, which negatively impacts the trust customers place in our delivery services.*" This indicates a gap in handling and transportation protocols. Lastly on the types of customer complaints, unclear charges emerged as a significant issue. R13 revealed, "*Several customers express dissatisfaction when they notice they have to pay for the delivery charges after delivery. They often feel misled by vendors that the price of the product they purchased include the delivery charges, which creates tension and demands for better transparency in billing*." This underscores the importance of clear and upfront pricing structures between the vendors and delivery service firms.

Considering the types of customer complaints presented above, effective complaint handling is critical for managing customer dissatisfaction. Respondents emphasized the importance of prompt responses. R3 shared, "*Whenever complaints arise, we aim to respond within 24 hours to reassure customers that their issues are a priority and to show our commitment to excellent service.*" This approach helps mitigate customer frustration and demonstrates accountability. Apologies and empathy were also central to managing complaints. R9 explained, "*We ensure our riders and staff apologize sincerely, particularly when delays or damaged items are involved, showing empathy to reduce the frustration felt by our valued customers*." This approach fosters trust and demonstrates customer-centric values. Compensation options, such as refunds and discounts, were frequently employed to resolve issues. R12 noted, "*To address customer dissatisfaction, we often provide refunds, discounts, or free deliveries to resolve issues and ensure they remain satisfied with our services despite the complaints.*" This helps retain customers and rebuild trust. Documentation practices were highlighted as essential for continuous improvement. R5 stated, "*We record every customer complaint in a log to track issues, analyze patterns, and improve training for staff, ensuring we learn and prevent recurring challenges in our operations*." This systematic approach facilitates long-term improvements.

Tailoring strategies to different types of complainants is key to effective complaint management. After analysing the data, it came to light that passives often require proactive engagement. R7 noted, "*Quiet customers rarely express dissatisfaction openly, so we proactively reach out through calls or surveys to understand their needs and improve our services based on their silent feedback*." It was also noted that irates demand immediate attention and resolution. R14 shared, "*Angry customers need immediate attention, so we prioritize resolving their complaints by offering refunds or replacements, ensuring they feel valued and reassured about our commitment to service*." Voicers actively share feedback, making them valuable for improvement. R2 explained, "*Voicers actively share feedback, and we appreciate their constructive criticism by listening, engaging them in discussions, and incorporating their suggestions into our improvement strategies to build trust*." Likewise, activists require transparency and accountability. R15 stated, "*Activists require transparent communication. We handle their complaints openly, engaging with them publicly when needed, and ensuring accountability to protect our reputation and foster confidence in our services.*"

From the data presented thus far, it was observed that SME delivery services in Accra face significant challenges in managing customer complaints effectively. Limited resources, such as insufficient staff and financial constraints, were a recurring issue. R4 explained, "*As a small business, our limited staff and financial resources make it difficult to handle high complaint volumes during peak seasons or periods of unexpected demand effectively*." This

limitation often leads to delayed resolutions and reduced customer satisfaction. Technology limitations further exacerbate complaint management challenges. R11 noted, "*The lack of advanced tracking systems in our operations results in delays and difficulties for customers, who expect updates and transparency throughout the delivery process*." This highlights the need for investment in technology to streamline operations and enhance communication. Traffic congestion in Accra was another major challenge impacting timely service delivery. R6 shared, "*Accra's heavy traffic significantly affects our ability to deliver on time and resolve complaints quickly, creating added stress for our staff and dissatisfaction among customers.*" Traffic delays directly contribute to service failures, increasing the volume of complaints. High customer expectations also pose difficulties. R9 stated, "*Customers often expect immediate fixes to their problems, which is hard to achieve with our limited resources. Meeting these high expectations remains a recurring challenge for our team.*" The combination of high expectations and operational constraints makes balancing service quality and complaint resolution particularly demanding for SMEs.

Nevertheless, it is paramount to manage customer complaints effectively, since it has a profound impact on service excellence for delivery service SMEs. Retaining customer loyalty emerged as a key benefit. R1 shared, "*Effectively resolving complaints ensures that customers stay loyal to our brand. They feel reassured and appreciated, even when service issues occur, strengthening their connection to our business*." Loyal customers contribute to sustained growth and positive brand reputation. Improved customer perceptions were another noted benefit. R8 explained, "*Handling complaints professionally and quickly improves our reputation. Customers see us as reliable and responsive, which enhances their overall perception of our brand.*" This underscores the role of effective complaint management in building trust and credibility. Reducing churn was also significant. R3 noted, "*Proper complaint handling minimizes customer attrition. Even after negative experiences, customers are more likely to stay if we manage their issues effectively and promptly.*" Retaining customers reduces the costs associated with acquiring new ones, ensuring stability. Lastly on managing complaints, the insights gained from complaints drive operational improvements. R12 stated, "*The insights gained from complaints allow us to refine our delivery systems and operations, ensuring better services for our customers and fewer recurring problems.*" This feedback loop fosters continuous improvement and innovation, reinforcing the importance of customer feedback in achieving service excellence.

From the analysis presented above, it further came to light that continuous learning and improvement are critical for long-term success in managing complaints. Staff training emerged as a foundational strategy. R14 stated, "*We use data from customer complaints to train our staff, helping them develop the skills needed to prevent and handle future issues more effectively, which enhances service delivery.*" Training ensures employees are equipped to handle diverse challenges. Integrating customer feedback into operational strategies was also emphasized. R10 explained, "*Customer feedback is analyzed thoroughly and incorporated into our operational strategies, allowing us to address weaknesses and continuously improve our delivery services.*" This practice enables SMEs to adapt to customer needs effectively. Investments in technology were highlighted as a key area for improvement. R13 shared, "*To address recurring complaints about delays and miscommunication, we have started investing in advanced tracking tools to streamline our operations and meet customer expectations*." These tools enhance transparency and efficiency. Preventive measures were another important focus. R6 noted, "*Analyzing past complaints helps us identify potential weak points in our operations, allowing us to implement measures that prevent similar issues from happening again in the future.*" This

proactive approach reduces the likelihood of repeated complaints and enhances customer satisfaction.

5.0 Discussion and Conceptual Framework

SMEs face unique challenges in complaint handling, stemming from limited resources, high customer expectations, and operational constraints. It is for this reason that this study aimed to investigate how delivery service SMEs in Accra, Ghana, manage diverse customer complaints to enhance service excellence. Specifically, the study sought to identify effective strategies for managing complaints, categorize types of complainants, and explore the impact of these practices on service quality. The findings highlighted six main themes, types of complaints, complaint handling, tailored strategies for different types of complainants, challenges in complaint management, impact of complaint management on service excellence, and learning and continuous improvement. These themes align with the literature on service recovery, customer service excellence, and Attribution Theory, offering valuable insights into SMEs' approaches to handling complaints.

5.1 Categorizing Complaint Types and Response

The study identifies delivery delays, miscommunication, damaged packages, and hidden charges as the primary customer complaints. These findings align with Gouthier et al. (2012), which emphasizes service reliability as a key determinant of customer satisfaction. Attribution Theory explains that customers often attribute service failures to controllable and stable factors, such as organizational inefficiencies or negligence (Sternad et al., 2019; Weiner, 1980). For example, respondents note that delivery delays result from traffic congestion and operational bottlenecks. While external factors like traffic may reduce perceived controllability, internal issues, such as poor planning, amplify dissatisfaction. This agrees with Manusov and Spitzberg (2008) assertion that controllable failures elicit stronger negative responses. Addressing these complaints demands improved operational efficiency and transparency, as highlighted by respondents' calls for better communication strategies and clear pricing policies. Critically, the emphasis on hidden charges underscores a gap in customer engagement. Customers feel misled, reflecting a breakdown in procedural fairness, a key dimension of service recovery (Caballero-Morales, 2021). While SMEs recognize the issue, a more proactive approach to transparency and trust-building is essential to preempt such complaints.

In remedying these complaints, prompt responses, apologies and empathy, compensation options, and documentation practices emerge as central to effective complaint handling. These practices align with Levesque and McDougall (2000), which highlights interactional, procedural, and outcome fairness as critical to successful service recovery. The practice of prompt responses aligns with Kim (2007) suggesting that timely resolutions enhance perceptions of interactional fairness and build trust. Attribution Theory supports this by highlighting that swift and empathetic responses can shift customer attributions from organizational negligence to genuine effort (Chakraborty & Bhat, 2018). However, the study reveals gaps in consistency and resource allocation. While some SMEs excel in documenting complaints for long-term improvement, others lack systematic processes, limiting their ability to learn from feedback. This inconsistency raises concerns about scalability and sustainability, especially as SMEs grow (Nikolić et al., 2019). The findings also highlight the psychological impact of apologies and compensation. Respondents note that small gestures, such as refunds or discounts, significantly restore goodwill. This supports the service

recovery paradox, where effective handling of minor failures can lead to higher post-recovery satisfaction than if no failure occurred (Krishna et al., 2011). However, reliance on compensation risks becoming costly, especially for resource-constrained SMEs, necessitating a balance between financial feasibility and customer satisfaction.

5.2 Strategies for Managing Different Types of Complaints and its Challenges

The study categorizes complainants into passives, irates, voicers, and activists, mirroring Singh's (1990) typology. Tailored strategies, such as proactive engagement for passives and transparency for activists, align with Oliver (2014) emphasizing customer segmentation in service recovery. Passives, who rarely voice dissatisfaction, challenge SMEs to adopt proactive feedback mechanisms. Respondents highlight the effectiveness of follow-up surveys, which align with the Attribution Theory principle of reducing ambiguity (Manusov & Spitzberg, 2008). By reaching out, SMEs can address latent dissatisfaction, fostering loyalty among silent customers. Managing irates requires immediate attention and resolution. Respondents prioritize refunds and personalized communication to mitigate anger. This aligns with Weiner's (1980) model, which suggests that customers are more forgiving when they perceive genuine effort to rectify controllable failures. For voicers, respondents emphasize constructive engagement and incorporating feedback into service improvement. This practice aligns with Gyung Kim et al. (2010) that identifies voicers as critical to organizational learning. However, the findings reveal limited scalability, as SMEs often rely on ad hoc responses rather than institutionalized feedback systems. Activists, the most vocal and public complainants, require heightened transparency and accountability. Respondents' strategies, such as public engagement and open communication, align with Sharma et al. (2010) emphasizing trust restoration. However, handling activists demands significant resources, posing challenges for smaller SMEs. A structured approach to social media and public relations could mitigate these challenges (Hübner et al., 2018).

Whiles SMEs may attempt to implement these strategies, it is worth noting that it may come with challenges such as limited resources, technology limitations, traffic congestion, and high customer expectations. These findings highlight systemic constraints that impede service recovery efforts (Caballero-Morales, 2021). Limited staff and finances exacerbate delays in complaint resolution. This finding aligns with Nurdiani and Alie (2023) emphasizing resource constraints as a key barrier to SME service excellence. While respondents acknowledge these challenges, few report leveraging collaborative networks or external funding to mitigate resource gaps, indicating a missed opportunity. Furthermore, technology limitations, such as the lack of tracking systems, further hinder SMEs' ability to provide timely updates. This gap contradicts customer expectations for transparency, as outlined in Clark and Baker (2007) on procedural fairness. Respondents' recognition of this issue underscores the need for affordable technological investments. Traffic congestion also represents an external factor beyond SMEs' control. Attribution Theory suggests that external attributions, such as traffic delays, reduce customer dissatisfaction compared to internal attributions (Chakraborty & Bhat, 2018). However, respondents note that customers' expectations for proactive communication remain unmet, reflecting a need for better contingency planning. High customer expectations intensify these challenges. Respondents' frustration with demanding customers highlights a tension between service ideals and operational realities. While Gouthier et al. (2012) acknowledges the difficulty of meeting rising expectations, the findings suggest that SMEs must focus on managing expectations through clear communication and realistic service guarantees.

5.3 Impact of Complaint Management on Service Excellence

Complaint management significantly enhances customer loyalty, perceptions, retention, and operational processes. These findings align with Sternad et al. (2019) assertion that effective recovery fosters trust and strengthens relationships. Retaining customer loyalty emerges as a primary benefit. Respondents emphasize that resolved complaints reassure customers, reducing churn. This aligns with Clark and Baker (2007) on the relational benefits of service recovery. Attribution Theory supports this, as successful recovery shifts customer attributions from systemic flaws to organizational competence. Reducing churn through complaint management reflects the financial value of customer retention (Manusov & Spitzberg, 2008). Respondents highlight the cost savings of retaining dissatisfied customers compared to acquiring new ones. Pizzutti dos Santos and Basso (2012) supports this, emphasizing that loyal customers are more forgiving and less price-sensitive. Improved customer perceptions further validate the importance of complaint management. Respondents note that professional handling enhances brand reputation. This finding aligns with the SERVQUAL model, which highlights responsiveness and assurance as key drivers of perceived quality (Sternad et al., 2019). However, inconsistent practices among SMEs risk undermining these benefits, emphasizing the need for standardization.

Operational improvements, driven by complaint insights, represent a critical outcome. Respondents' focus on using feedback to refine processes aligns with continuous improvement frameworks. However, the findings reveal limited institutionalization of learning mechanisms, suggesting room for more structured approaches to leveraging feedback (Kim, 2007). Nevertheless, it is important for SMEs to prioritise staff training, feedback integration, technology investments, and preventive measures as pillars of continuous improvement (Nurdiani & Alie, 2023). These findings align with Den Hartog and Verburg (2002) emphasizing the iterative nature of service excellence, as staff training emerges as foundational. Respondents emphasize using complaint data to upskill employees, aligning with Caballero-Morales (2021) on employee empowerment. However, the findings reveal disparities in training quality, reflecting resource constraints. Integrating feedback into operational strategies underscores the importance of customer insights. Respondents' practices align with Nikolić et al. (2019) advocating for feedback loops. However, limited scalability and documentation risk reduces long-term impact. Technology investments also address recurring issues, such as tracking and communication gaps. Respondents' efforts align with Kumar and Kumar (2016) on the role of technology in enhancing procedural fairness. However, high costs remain a barrier for many SMEs, highlighting the need for affordable solutions. Preventive measures, informed by past complaints, reflect proactive management. Respondents' focus on identifying weak points aligns with continuous improvement models. However, the findings reveal limited cross-organizational learning, suggesting opportunities for industry-wide collaboration.

5.4 A Conceptual Model for Managing Customer Complaints to Enhance Service Excellence for SMEs

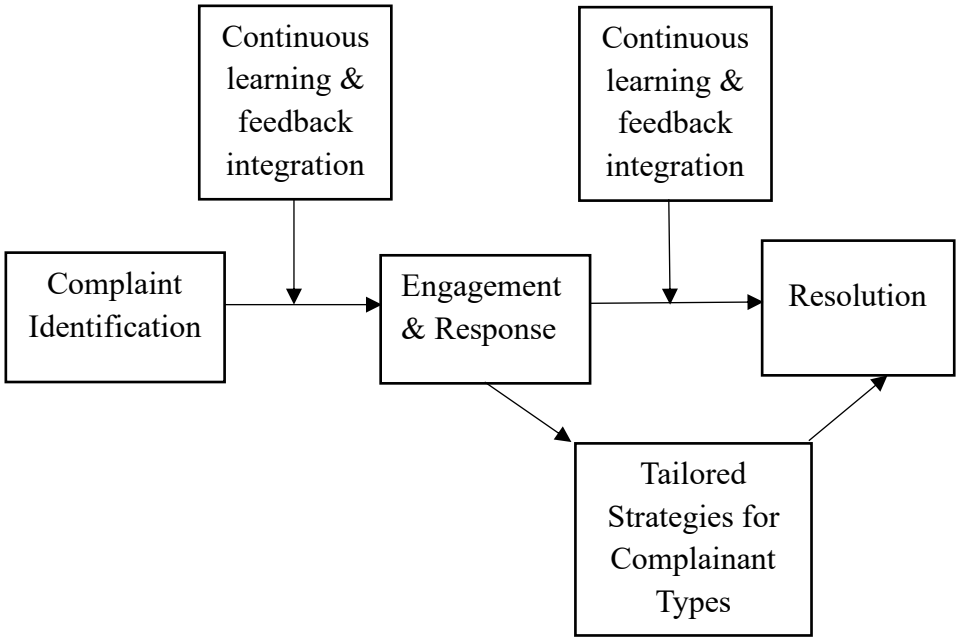


Figure 1: Conceptual Model for Managing Customer Complaints

Source: (Author, 2024)

After analysing the data, Figure 1 presents a conceptual model for managing customer complaints to enhance service excellence for SMEs. This model suggest that complaint identification will lead to engagement and response. SMEs begin by identifying complaints through customer feedback or operational monitoring. This stage sets the foundation for engaging customers and addressing their issues. Followed by engagement and response leading to resolution. Once a complaint is identified, engagement with the customer follows. Empathy, apologies, and compensation foster trust and pave the way for effective resolutions. However, tailored strategies for complainant type may influence resolution. Tailoring strategies based on customer behaviour (e.g., passives, irates, activists) enhances the effectiveness of engagement. Respondents emphasize that understanding customer psychology, as explained by Attribution Theory, ensures that responses meet specific needs and expectations. Furthermore, continuous learning and feedback integration may enhance or constrain the entire process. Effective integration of feedback improves complaint identification and resolution. The model's propositions are presented below:

P_1: Complaint identification leads to engagement and response.

P_2: Engagement and response leads to resolution.

P_3: Tailored strategies for complainant types may influence how engagement and response lead to resolution.

P_4: Continuous learning and feedback integration may enhance or constrain how complaint identification leads to engagement and response.

P_5: Continuous learning and feedback integration may enhance or constrain how engagement and response lead to resolution.

6.0 Conclusion and Implications

The findings of this study underscore the complexities and opportunities inherent in managing customer complaints within SME delivery services in Accra, Ghana. The research highlights that effective complaint management is a multifaceted process requiring careful attention to complaint identification, tailored engagement strategies, resolution mechanisms, and continuous improvement practices. This structured approach not only addresses immediate customer dissatisfaction but also strengthens the organization's capacity for service excellence and competitiveness.

One significant implication is the need for SMEs to institutionalize processes that ensure consistent and proactive complaint management. By adopting structured complaint identification systems, SMEs can engage dissatisfied customers more effectively, transforming negative experiences into opportunities for trust-building and loyalty. This aligns with Attribution Theory, which emphasizes the importance of shifting customer perceptions from organizational failure to genuine recovery efforts.

The research also highlights the critical role of tailored strategies for different complainant types. By understanding customer behaviours, such as the passivity of silent customers or the vocal tendencies of activists, SMEs can implement targeted interventions that address specific needs. This approach aligns with existing literature emphasizing customer segmentation as a key driver of service recovery success.

Continuous learning and feedback integration emerge as essential components of the complaint management process. SMEs that actively analyze feedback and incorporate insights into operational strategies are better positioned to adapt to evolving customer expectations. This iterative process fosters a culture of innovation and improvement, enhancing both service quality and organizational resilience.

However, the findings also reveal critical challenges, such as resource limitations, technological gaps, and rising customer expectations. Addressing these barriers requires a combination of internal strategies and external support, such as collaborative networks or funding initiatives. Policymakers and industry stakeholders can play a pivotal role in supporting SMEs through capacity-building programs and access to affordable technologies.

The originality of this study lies in its contribution to the Attribution Theory and the broader understanding of complaint management in resource-constrained environments. It offers actionable insights for SMEs, emphasizing the need for structured, customer-centric strategies that align with theoretical frameworks and practical realities. By addressing the identified gaps and leveraging the proposed process map, SMEs can enhance their service excellence and sustain long-term growth.

7.0 Limitations and Future Research Directions

While this study provides valuable insights, it is not without limitations. First, the research focuses exclusively on delivery service SMEs in Accra, Ghana, which may limit the generalizability of findings to other regions or industries. Future research could expand the geographical scope to include rural areas or other urban centers, providing a more comprehensive understanding of complaint management practices across diverse contexts.

Second, the reliance on qualitative methods, while rich in detail, may introduce subjectivity in data interpretation. Although the study employs rigorous coding and thematic analysis, incorporating quantitative approaches in future research could enhance the robustness of findings. For instance, surveys could be used to quantify the prevalence of specific complaints or the effectiveness of different recovery strategies. Furthermore, future research can also test the propositions of the conceptual model for managing customer complaints to enhance service excellence for SMEs quantitatively.

Third, the study focuses primarily on SME perspectives, potentially overlooking customer viewpoints. Understanding customer expectations and satisfaction levels would provide a more holistic perspective on complaint management. Future studies could adopt a dual-perspective approach, gathering data from both SMEs and their customers to identify potential gaps and align strategies with customer needs. Additionally, the study identifies resource constraints and technological limitations as significant challenges for SMEs. Future research could explore innovative solutions, such as affordable technology platforms or collaborative partnerships, to address these barriers. Investigating the role of government policies and industry associations in supporting SMEs' capacity for complaint management would also be valuable.

Finally, while this study highlights the importance of continuous learning and feedback integration, it does not delve deeply into the mechanisms for institutionalizing these practices. Future research could examine specific tools or frameworks that SMEs can adopt to create sustainable feedback loops and foster a culture of continuous improvement. In conclusion, this study lays the foundation for further exploration of complaint management practices in SMEs. By addressing the identified limitations and pursuing the suggested research directions, future studies can contribute to a deeper and more nuanced understanding of this critical aspect of service excellence.

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MULTI-CHANNEL STORYTELLING IN THE SOUTH AFRICAN WINE INDUSTRY

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Abstract

Maker-wine brands in South Africa are redefining marketing practices in the wine industry by prioritising storytelling across all their brand identity elements. These smaller, younger, entrepreneurial wine producers use storytelling and strategic narratives to build unique brand identities and connect with younger wine consumers seeking authentic and sustainable brand experiences. The research identified five key storytelling themes based on twelve face-to-face, semi-structured interviews with maker-wine owners and winemakers authentic storytelling is the foundation of maker-wine brands; the winemaker is central to the brand's identity; brand names, wine names, and labels share stories about the brand's heritage; the winemaker acts as the marketing custodian of the brand; and there is an emergence of a new, younger wine consumer. These themes are pivotal in highlighting how younger, adventurous wine consumers proactively engage with and support wine brands that guarantee sustainable viticulture and offer unique and authentic experiences with elements of fun. The findings highlight the role of digital platforms in enabling personal relationships between maker-wine producers and consumers, leading to the co-creation of brand stories and cultural brands that are transforming the wine industry. The study introduces an innovative multi-channel storytelling framework integrating digital tools such as e-commerce, social media, and direct consumer engagement. The storytelling framework offers maker-wine brands a platform to share brand stories proactively and target relevant consumers who seek adventurous, experiential and fun wine experiences. The storytelling framework is a practical guide for maker-wine brands to align their marketing strategies with sustainable farm and wine production practices.

Keywords: brand authenticity, brand culture, brand identity, brand personality, marketing communications, narrative theory, narrative transportation, storytelling.

Introduction

The South African wine industry

The wine industry in South Africa consists of still wine, fortified wine, sparkling wine, wine for brandy, distilling wine, and grape juice for non-alcoholic beverages (SAWIS, 2022). The still wine category is the most significant contributor to the industry, referencing metrics such as total production, producer income, domestic sales, and exports (SAWIS, 2022). The research conducted for this thesis will focus on the still-wine category.

Distinguishing between old- and new-world wine-producing countries is a useful point of departure that describes the history and current trends in the South African wine industry. Cholette et al. (2005) define the old-world wine industry as having a long, uninterrupted wine-supply and wine-consumption history, traditionally setting the way for quality and taste preferences. Old-world wines are associated with countries such as Germany, Italy, France, Spain, and Portugal. Old-world wines have a rich history and heritage and are made following traditional winemaking practices that are aligned with the origins of winemaking.

New-world wine countries include the United States, New Zealand, Argentina, and South Africa (Kavtaradze and Khatiashvili, 2023). New-world wines are characterised by experimental and non-traditional winemaking methods, allowing for the production of high-quality, affordable, and unique wines. Wickham et al. (2001) and Cholette et al. (2005) highlight that the old-world wine regions risk losing market share to new-world wine regions because of the latter's increased quality and more strategic branding strategies.

The South African wine consumer

Focussing on the South African wine consumer, it is clear that purchase behaviour and consumption vary significantly when considering different age cohorts. In one of the most comprehensive studies on South African wine consumption, Kruger and Viljoen (2022) utilise generational theory as the conceptual framework, relating how the same generations experience similar life events, leading to similar attitudes, beliefs, and consumption behaviour (Meriac et al., 2010). This is reflected in their research findings, which identify and categorise the following wine-drinking cohorts:

Table 1: South African wine-drinking cohorts (Kruger and Viljoen, 2022)

Generation	Date of birth	Motivation for wine consumption
Generation Z	1997–2012	Basic, budget and image-orientated
Generation Y (young)	1990–1996	Experimenting and enjoyment seeking
Generation Y (mature)	1981–1989	Aspirational and purpose orientated
Generation X	1965–1980	Ritual, avid and attention seeking
Baby Boomers	1946–1964	Conservative, value-searching and experienced consumers

Across all the generations, the following findings were identified by Kruger and Viljoen (2022):

- Generation Y tend to base their purchase decisions on eye-catching labels.

- Tasting notes and food pairing recommendations are essential across all generations.
- Trying wine and enjoying experiences with the particular wine, including reading about it in online content, social media, and reviews, are essential across all generations.
- Even though younger generations are more price sensitive and older generations less price sensitive, generations have similar spending behaviour in restaurants, purchasing more expensive wines.

In addition to generational wine consumption, it is also worth considering current South African wine trends as part of the research background. Elmarie Rabe, Chairperson of South African Wine Routes, highlights some emerging preferences and patterns of the South African wine consumer (Rabe, 2024). Three trends are particularly relevant and tie in with this research paper. The first trend is that Generation Y and Generation Z value sustainable, organic, and biodiversity practices. Therefore, it is imperative that any industry, including the wine industry, leverages these values as part of its marketing efforts. The second trend touches on affluent wine drinkers and their preference for high-quality wines. These consumers are more likely to recommend wines and wine farms where quality wines are available and the overall experience is good.

The third trend is the emergence of what Rabe calls “maker-wine brands”. These are new, smaller boutique wineries whose brands highlight the unique stories of the winemaker and their wines. Maker-wine producers source grapes from specific regions and farmers, with some planting vineyards on owned or hired agricultural land. They have limited production, grow new varieties that are more suited for climate change, and utilise artisanal methods to highlight the original terroir of the wine, with limited intervention.

In light of these trends, the overarching aim of this research is to explore the use of storytelling as a marketing practice across maker-wine brands in South Africa. The research will focus specifically on younger boutique wineries, called maker-wine brands, who have been operating and producing wines for less than twenty years. The study will engage with maker-wine brands by interviewing winemakers, who mostly also fulfil the role of business owners and marketers.

This research contributes to the respective academic fields of storytelling by approaching it from a narrative-transportation, brand-identity and cultural-branding perspective. Using seminal research by Kapferer (1992; 2004), Fournier (1998), Escalas (2004), Woodside et al. (2008), Lundqvist et al. (2013), Van Laer et al. (2014), Holt (2016), and Aimé (2023), among other authors, storytelling is explored from a multidimensional and holistic approach, allowing for the further development and understanding of storytelling as a marketing practice.

Focusing on the South African wine industry, specifically maker-wine brands, the research illustrates how storytelling is fundamental to these winemakers’ and their wineries’ existence and brand identity. The engagement with maker-wine brands revealed how their brand identity, in some instances even unintentionally, resonates with a new generation of adventurous wine consumers. Finally, the research offers a pragmatic storytelling framework developed from existing theory and primary data collected. The storytelling framework suggests an improved process to harness stories and storytelling across marketing channels catered to specific audiences and wine consumers.

Theoretical framework

The theoretical framework offers a comprehensive overview of key concepts associated with storytelling as a marketing practice. The concepts include how storytelling is defined and utilised in the field of marketing (Aaker and Fournier, 1995; Fournier, 1998; Woodside et al., 2008; Quadri-Felitti and Fiore, 2013; Rytkönen et al., 2021), how narrative transportation enhances storytelling efforts (Escalas, 2004; Van Laer et al., 2014), how the establishment of cultural brands can transform industries (Holt and Cameron, 2012; Holt, 2016), and the ability to use brand identity aspects to share storytelling strategically across consumer touchpoints (Kapferer 1992; 2004; 2012; Vallaster and De Chernatony, 2006).

Table 2: Theoretical Framework

Literature review concepts	Overview of concepts	Authors	Wine industry
Storytelling	People think in narratives and store information episodically, allowing the recall of information and pleasurable experiences. Emotionally driven stories and storytelling positively affect consumers' brand views and purchase behaviour.	Aaker and Fournier (1995); Fournier (1998); Escalas and Stern (2003); Patterson and Brown (2005); Woodside et al. (2008); Pulizzi (2012); Lundqvist (2013); Avery (2019); Woldarsky (2019); Smith Maguire et al. (2021); Santos et al. (2022); Aimé (2023)	Traditionally, storytelling has focused on informational and factual elements such as product information, variety, wine region, and awards. *How winemakers and wineries define and view storytelling is unclear in the literature.*
Narrative theory and transportation	Stories with powerful narratives and a strategic plot, setting, and identifiable characters decrease consumer decision-making analysis and increase positive affective responses to a brand. Targeting consumer segments who carry an element of familiarity or cultural knowledge with the product increases narrative transportation.	Escalas (2004); Escalas (2007); Van den Hende et al. (2007); Fountain and Dawson (2014); Chaudhury et al. (2014); Van Laer et al. (2014)	Wine is a hedonic, sensory product that lends itself to rich, emotional storytelling. Storytellers can use it to transport wine consumers to a place in time where the wine was made. *Limited research and information are available on how wineries use storytelling in their marketing efforts, specifically in South Africa.*

Cultural branding	When a brand purposefully or sometimes unintentionally leapfrogs traditional cultural consumption, it allows subcultures of consumers to redefine the brand's identity and champion it from a new perspective, leading to its adoption by wider society.	Holt and Cameron (2012); Holt (2016); Holt (2018)	The concept of cultural wine brands could not be identified in existing literature. *Maker-wine brands have emerged in South Africa, and research is warranted to explore how the stories behind their brands will disrupt the local wine industry.*
Brand identity	A brand seeks to differentiate itself through its physical features, personality, values, principles, and stakeholder relationships. Brand identity is also reflected in the type of consumer it attracts, the reasons for consumption, and the image it portrays when the product is consumed.	Kapferer (1992; 2004); Nandan (2005); Vallaster and De Chernatony (2006); Kapferer (2012)	Brand identity aspects carry the stories of rich heritage and tradition for wineries across the globe. *Research is warranted to establish how maker-wine brands without a rich historical heritage and tradition can share stories about their identities that resonate with a new generation of wine consumers.*

Methodology

Data was collected through a multi-method, cross-sectional, qualitative approach. Twelve semi-structured, face-to-face interviews were conducted with maker-wine brands, covering the Swartland, Stellenbosch, West Coast and Franschhoek wine regions of South Africa. The semi-structured interview approach assisted the researcher in exploring themes by asking predetermined questions that touch on certain themes (see Figure 1). However, the nature of the interviews allowed the researcher to ask additional questions as new themes arose during the discussion.

Non-probability, purposive sampling was used for the research. To establish how storytelling is used in the South African maker-wine industry, the most optimal approach was to select stakeholders in the industry. Because the maker-wine wineries are practically managed as "one-man shows", the inevitable study participants were the owners and winemakers themselves.

Table 3: Maker-wine brand interview sample

Maker-wine brand	Title or job function of the interviewee	Year the wine brand was founded	Interview date and time, 2024	Interview duration	Interview number
Van Wyk Family Wines	Owner and winemaker	2018	12 August 10h00	39 minutes	1
Fram Wines	Owner and winemaker	2013	12 August 14h00	56 minutes	2
Vino PH Wines	Co-owner and winemaker	2020	12 August 15h00	30 minutes	3
Swerwer Wines	Owner and winemaker	2012	13 August 09h00	85 minutes	4
Wightman & Sons	Owner and winemaker	2015	13 August 11h00	34 minutes	5
Atlas Swift Wines	Owner and winemaker	2019	14 August 09h00	43 minutes	6
Ahrens Family Wines	Owner and winemaker	2008	14 August 10h45	42 minutes	7
Bruwer Vintners	Owner and winemaker	2014	14 August 13h00	32 minutes	8
Thistle & Weed Wines	Owner and winemaker	2015	14 August 14h30	35 minutes	9
Lourens Family Wines	Owner and winemaker	2016	15 August 09h00	30 minutes	10
Sakkie Mouton Family Wines	Owner and winemaker	2019	15 August 16h00	30 minutes	11
Kleinood Farm	Winemaker	2008	19 August 10h00	37 minutes	12

Results and analysis

This chapter presents and analyses the collected primary data from participating maker-wine brands. To relate the research's theoretical underpinnings, a visual summary is provided, which showcases the storytelling concepts dealt with as part of the theoretical framework and how interview questions were derived from existing theories. But first, five main themes were derived from the interviews.

A) Authentic storytelling is the foundation upon which maker-wine brands are built.

Analysis of the data revealed how stories and storytelling shape the past, present, and future of maker-wine brands. All twelve participants (Interviewees Number 1 to 12 [Intv. 1–12]) acknowledged that sharing their own and their brands' stories is a purposeful, driven action in an attempt to let consumers know about their wines. The winemaker is also the owner and serves as the brand custodian. The story of the winemaker and the brand is one and cannot be separated from each other. Referring to Figure 1 and the research by Slater and Rouner (2002) and Van Laer et al. (2014), a story is most impactful on narrative transportation and emotional level when an identifiable character shapes or is shaped by the plot. The winemakers are the central characters in their stories, and six maker-wine brands (Intv. 2; 3; 4; 6; 10; 11) share stories about their humble beginnings and how they put their heart and soul into their wines. Greg Sherwood, a Master of Wine, shares that brand building, like wine, is an art that starts with dedicated, authentic storytelling initiated by the winery and shared consistently with target consumers (Sherwood, 2023).

B) Brand identity is shaped by the winemaker and their relationships with people and the terroir.

Aaker (2011) and Ward et al. (1999) stress the importance of organisations' knowing why they exist and what they stand for, thereby ensuring the brand identity is developed in alignment with these reasons. Both Aaker and Ward et al. share that a brand's distinctive identity allows the communication of differences and uniqueness to consumers. Nine maker-wine brands (Intv. 1; 4; 5; 6; 8; 9; 10; 11; 12) described in detail how mentors, friends, and family played a role in setting the direction of the brand's identity. Additionally, across all the maker-wine brands (Intv. 1–12), it was clear how the vineyard, the region, and the people working the vines underpin brand identity. Referring to Kapferer's (2012) brand identity aspects of brand personality and culture, eight maker-wine brands (Intv. No. 2; 3; 4; 6; 7; 9; 10; 11) could clearly articulate the brand's personality and culture they wished to portray to consumers. It was evident how the winemakers' personalities align with the brand's values, persona, and overall culture. Common brand personality traits are curiosity, openness, generosity, sociability, rebelliousness, and creativity. Brand culture was portrayed as innovative, collaborative, informative, and welcoming. It is important to note that even though most maker-wine brands could explain their brand identity and culture, the majority were not as confident in identifying the most optimal methods and communication channels to share these elements with target consumers.

C) Brand names, wine names and label designs communicate brand identity.

Stories are the origin, link, and binding factor that determine maker-wine brand names, wine identity, and label designs. Participants shared that their brand names (Intv. 1; 2; 3; 4; 5; 6; 7; 8; 9; 10; 11), extended to wine names (Intv. 5; 7; 8; 9; 10; 11; 12) and labels (Intv. 1; 3; 4; 5; 6; 7; 9; 10; 11; 12), are the most impactful way to represent their overall identity and stories. Maker-wine brands are purposeful and highly involved in sharing the stories behind their brand and wine names. Five winemakers chose a brand name representing their life story (Intv. 2; 3; 4; 6; 9), purposefully allowing consumers to hear their story when encountering the brand for the first time. Maker-wine brands also use their online platforms, social-media profiles, and wine labels as vehicles to share their brand stories and new vintage releases. Wine names are extraordinarily creative and break the norm of showcasing

the variety as a brand name (Intv. 1; 2; 3; 4; 5; 6; 7; 9; 10; 11; 12). A winemaker shared the following during one of the interviews about his brand and different wine names: “I have to define my brand. I made a label that looks like a horror movie poster. No one has ever done that. But it’s a very cool concept.”

D) *Marketing is centred around the winemaker’s story and the ability to share it with relevant audiences.*

Winemakers are the most critical part of the maker-wine brand industry. They have in-depth, first-hand knowledge of the wines and are the best people to describe and showcase the products to consumers (Behera, 2024). Without exception, the twelve winemakers illustrated a hands-on approach to marketing their brands and wines and sharing their stories (Intv. 1–12). The winemaker is the face of the brand and the carrier of its story. Brian Crew, a former maker-wine brand employee and now sommelier in the United States, shares that the more consumers know about wine and winemaking, the more they will migrate to new varieties and regions they were previously unaware of. It presents a perfect opportunity for winemakers, the experts who made the wines, to carry and share the wine-maker’s message (Behera, 2024). Whereas all twelve maker-wine brands can access past and current consumer contact details, only eight utilise the data for memberships, subscriptions, and presenting special offers (Intv. 2; 3; 4; 6; 7; 10; 11; 12). Despite the lack of a clear email, membership, and subscription strategy among the maker-wine brands, a recurring item was the close and personal relationships they have with their customers. Referring to the research by Kruger and Viljoen (2022), wine consumers seek closer and more personal experiences with winemakers and their brands. Stories, images, and updates are shared sporadically and on instinct, with a heightened sense of sensitivity to not bombarding their social-media followers with predetermined content that is not authentic to their brand. Focussing on storytelling through social-media channels, it was clear that all the interviewed maker-wine brands aligned their stories and content with their brand identity, preferring to keep it natural, organic, and authentic to their brand culture (Intv. 2; 3; 4; 6; 9; 10; 11).

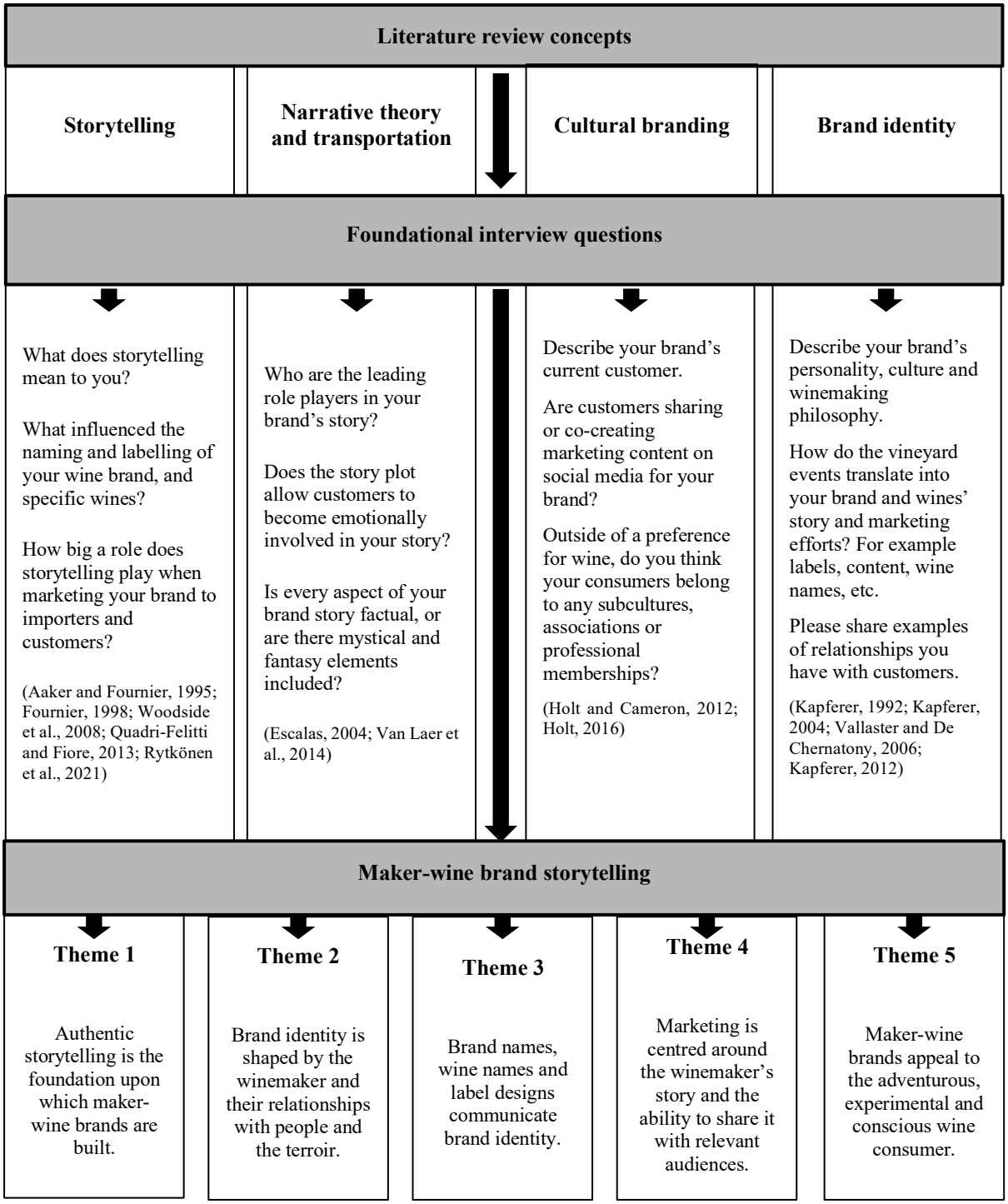
It is worth considering that smaller wineries such as maker-wine brands have limited marketing support to scale their storytelling efforts. Wilcox et al. (2008) explains that wineries do not have unlimited resources, and often smaller wineries need to choose between purchasing higher quality grapes or equipment to improve overall quality or spend more money to improve brand recognition. The research indicates that, in a highly competitive market, where more wine brands are entering the playing field, wineries need to strike a balance between quality and effective branding (Wilcox et al., 2008). During one of the interviews, a maker-wine brand shared the following: “We’re trying every day, and it feels like it’s getting easier, but it’s still hard to put our story out there and reach the right consumer. We can’t be everywhere, and we rely on word of mouth, but we know that’s not enough.”

E) *Maker-wine brands appeal to the adventurous, experimental, and conscious wine consumer.*

During one of the interviews, a maker-wine brand mentioned the following: “You need to be able to sell a bottle of wine to the right consumer.” Although none of the twelve maker-wine brands interviewed had a defined and systematic customer segregation strategy, all the maker-wine brands could clearly articulate their current consumer profile. It was evident across the board that a younger, curious, and

experience-seeking wine consumer is emerging. Without disregarding older consumers who have a higher disposal income for wines, maker-wine brands emphasised how younger generations engage with their brands and find pleasure in sharing their philosophy about winemaking and life in general. The maker-wine brand participants interviewed shared how consumers have been more willing to try new varieties of natural wines that have been farmed sustainably for the past two years (Intv. 1; 2; 3; 4; 8; 10; 11). Eight of the maker-wine brand participants shared how consumers are informed about their wines and demonstrate an understanding of their winemaking approach and philosophy. More importantly, winemakers shared how existing consumers will share experiences and images on social media without being asked to do so, promoting their wines and brands (Intv. 2; 3; 4; 6; 10; 11; 12). In Table 1 Kruger and Viljoen (2022) illustrated that wine-drinking age and reasons for consumption cohorts are diverse and complex. Calvo-Porral et al. (2020) share this view and emphasise the importance of having different wine varieties on offer and ensuring that communication strategies and advertising campaigns cater to various consumer segments, not only in terms of consumption motivation but also in terms of how it will make them feel emotionally.

Figure 1: Maker-wine brands – Main themes from primary data collection



Storytelling framework

Maker-wine brands require more dedicated storytelling strategies to build their brands effectively. An overdependence on winemaker-to-consumer storytelling and natural word of mouth by existing consumers or brand ambassadors restricts the impact stories behind maker-wine brands can have on brand growth and consumer experience (Lundqvist, 2013). It was evident across all the maker-wine brands that marketing channel identification, a clearly

defined storytelling content plan, and consumer segmentation strategies were less prominent or developed than winemakers would prefer. The following section proposes a multi-channel storytelling framework that suggests a possible avenue to formalise and improve the current storytelling efforts of maker-wine brands in South Africa.

In this research, the storytelling framework presented by Aimé (2023) was adapted to accommodate the theoretical framework in Table 2 and the primary-data findings summarised in Figure 1. The framework required further adjustment to make it relevant to the wine industry and, more specifically, to maker-wine brands in South Africa. Considering the limited resources at the disposal of maker-wine brands, the framework was further simplified to allow for a variety of approaches to share stories with consumers. Because a more formal and structured approach is required, the storytelling framework is divided into three steps, each broken down into a systematic flow. The storytelling framework starts with story creation across various brand identity aspects (Kapferer, 2012), followed by selecting a storytelling strategy and compiling a marketing communications plan suited to the maker-wine brand and its audience.

The first step of the storytelling framework suggests that maker-wine brands create story content that stretches across their brand, wines, terroir, and the people shaping the wines. Referring to the literature review and the research by Herskoviz and Crystal (2010), Pulizzi (2012), and Dessart (2018), storytelling is a form of content marketing that allows for marketing practices focussing on emotional narratives about the brand and its persona. At strategic and opportune times, stories about the maker-wine brand's values, culture, and winemaking philosophy can be shared, as illustrated in Figure 2's storytelling framework. Deliberately excluding the product in some of the story content and focusing on alternative brand identity aspects can further positively affect consumers' bond with the brand (Herskoviz and Crystal, 2010; Kapferer, 2012). A critical part of Step 1 is to ensure that story content is prepared across all brand identity aspects in advance and continuously rather than spontaneously.

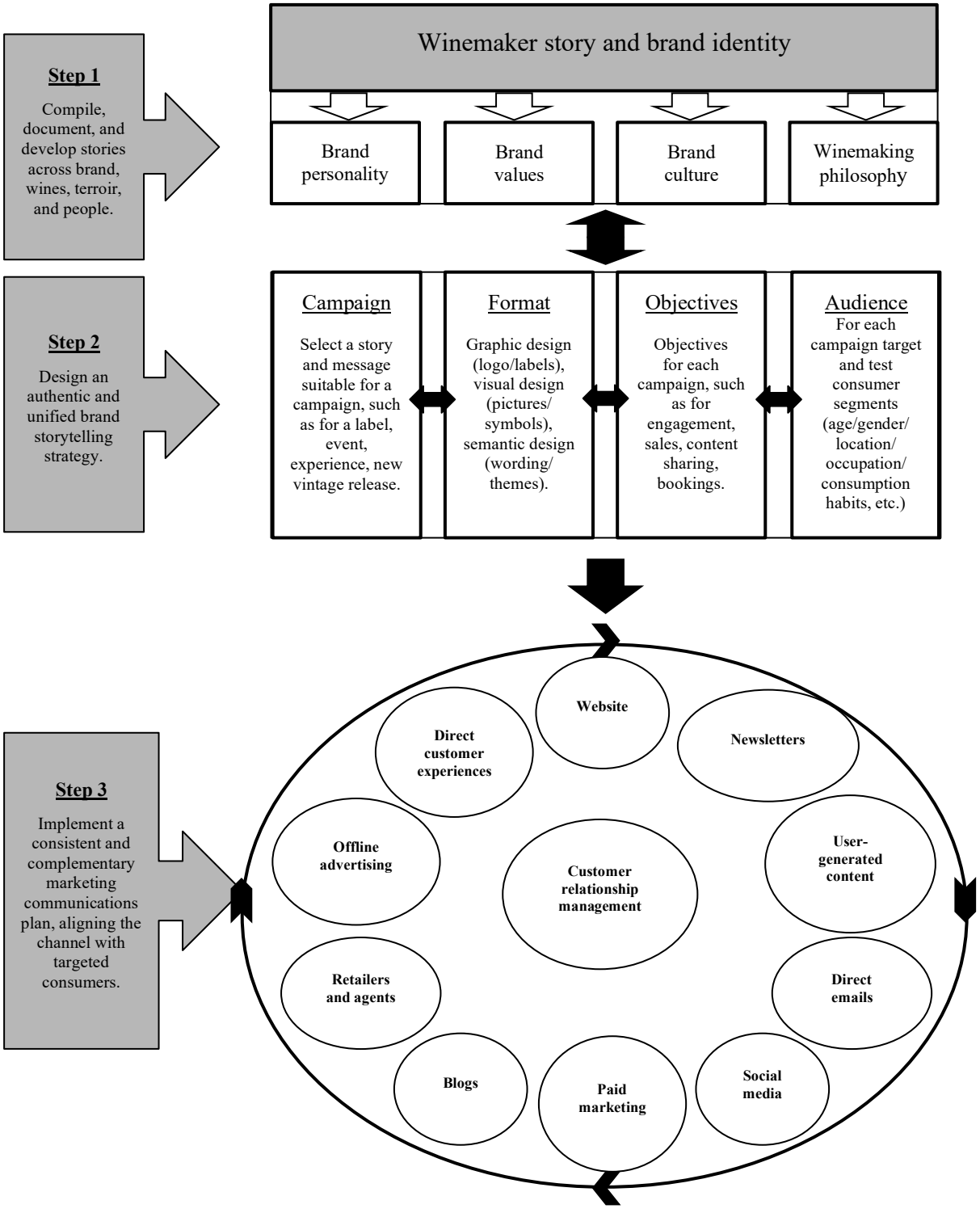
The transition between Step 1 and Step 2 is an iterative process. The story content creation process will always influence the storytelling strategy, and elements of the strategy will require adjustments to the stories. The storytelling strategy considers campaigns as the trigger event, reason, or motivation to share stories. Campaigns in the wine industry include new vintage releases, wine-label introductions, food-pairing and tasting events, and general periodic winery updates through the website, email, or social-media channels. The trigger event will mostly inform the type of story content selected, accompanied by formatting, stretching across digital design for logos or websites, visual design including images and symbols, and semantic design considering specific wording and theme selection. For the purposes of streamlining campaigns, it is worth noting that format and design elements do not have to be revised for each campaign but rather considered against the campaign's desired outcome and who the audience will be.

Kruger and Viljoen (2022) and Rabe (2024) share how South African wine consumers' motivation for consuming wine differs across generations (see Table 1). The storytelling framework suggests that maker-wine brands should consider different motivations and target generations through strategically chosen story formats and objectives. If maker-wine brands want to target Generation-Y consumers, it is worth considering that this generation consume wine to experiment and seek fun, enjoyable experiences. They also consider purchasing wines based on eye-catching labels. If Generation Z is the target audience, authentic, genuine content that promotes sustainability is preferred (Atkin and Thach, 2012; Mingione, 2017; Castellini and Samoggia, 2018; Tirocchi, 2024). Generation Z's consumption motivation is

basic, budget- and image-oriented. However, they are willing to pay just as much for wine as older generations in social settings and restaurants (Kruger and Viljoen, 2022; Rabe, 2024).

Suppose Generation Y and Generation Z are grouped together. Maker-wine brands can potentially succeed in targeting these audiences by offering tasting experiences in social settings. In these settings, maker-wine brands promote and share stories of a specific selection of their wines that offers the most natural and experimental winemaking methods, presented with non-traditional and fun wine labels. Rather than sharing a chronological story of the brand's origin, winemakers can select specific generation-inspired stories, carrying narratives of authenticity, transparency, and sustainable farming and winemaking practices.

Figure 2: Storytelling framework (Moolman, 2024)



As pointed out in the literature review on narratives in stories, Green (2004), Van Laer et al. (2014), Ardelet et al. (2015), and Zak (2015) illustrate the importance of audiences or story receivers' having some degree of cultural knowledge, familiarity, and personal experience with a story topic, ensuring their optimal absorption and transportation into the story. As the storytelling framework illustrates in Figure 2, if the campaign's objective is to increase consumer engagement with the brand on social media, coupled with a specific percentage increase in sales of selected wines. The narratives of stories are vital in achieving these objectives. Precision marketing and strategic selection of narratives for audiences increase the likelihood of a consumer selecting one wine brand over the other (Ardelet et al., 2015).

The final step of the storytelling framework is to ensure that the story content and strategy are implemented through a marketing communications plan that employs various channels and consumer touchpoints. The primary data, specifically in Figure 1, show how maker-wine brands attract consumers who actively seek information and knowledge about their wines and the wider wine industry. During one interview, a winemaker mentioned, "Our consumers ask a lot of questions. They want to hear the story behind the wine, and they want to learn more". Another maker-wine brand shared the following when asked about their consumers, "Consumers have consciously decided I want to be sustainable, and they want to know where the wine comes from and what its origin is".

Maker-wine brands must select communication channels that allow the sharing of relevant information to consumers curious and willing to learn more about wine. The storytelling framework suggests a continuous flow of multiple channels to share stories, ranging from direct digital and social-media marketing, offline advertising, retail and agent representation to personal winemaker-to-consumer-experience marketing. Across all channels, the direct winemaker-to-consumer relationship, as Table 2 illustrates, is still encouraged. However, as the operations of maker-wine brands grow, it is recommended that interactions be formalised through developing a customer-relationship programme that still fits the authentic and personal preferences of both winemakers and their consumers.

Finally, user-generated content is an area of the storytelling framework that can offer additional beneficial results for maker-wine brands. As indicated by literature already referenced in this paper and by Freeman (1984), Jones (1995), and Rusticus (2007), the value of stakeholder engagement and co-creation of authentic content should not be ignored. Maker-wine brands can leverage their personal relationships with consumers and invite their consumers to share and adjust existing content or even co-create new content. If the winemaker's story and the brand's desired identity are evident in the foundational content creation process (Step 1 of the storytelling framework), maker-wine brands should trust their consumers to enhance or redefine the stories and the brand's identity.

As Freeman (1984), Jones (1995), and Holt (2016; 2018) illustrate, the process of shaping brand identity through consumer and societally driven initiatives leads to the creation of brands embedded into consumer culture. If maker-wine brands can achieve the status of what Holt (2016; 2018) defines as a cultural brand, the future for these winemakers and their brands looks promising. By applying storytelling more strategically and sharing more of their authentic stories with relevant audiences, maker-wine brands are positioned to revolutionise the South African wine industry.

Conclusions

In this research, storytelling across maker-wine brands in South Africa was explored to establish how these smaller wine brands use storytelling as a marketing practice. Storytelling

was defined and studied from a narrative-theory approach, focussing on the broader, global wine industry. Covering the seminal research of authors Fournier (1995; 1998), Escalas (2004), Woodside et al. (2008), Quadri-Felitti and Fiore (2013), Van Laer et al. (2014), and Rytkönen et al. (2021), and others, the study contributes to existing literature by showing how storytelling practices are built on narratives that highlight the winemaker's background, the terroir, and the winemaker's relationships with people.
Leveraging the research by Kapferer (2014) and Holt (2016; 2018), the research explored storytelling and brand identity by following a dual approach that considered how stories can be both shaped and transferred through brand-identity aspects. It also suggests ways in which brands can harness consumers' self-image and self-concept from a generational standpoint to build a cultural brand and identity. By interviewing maker-wine brands, the research could identify how storytelling is utilised in their marketing practices and determine the consumer profile they attract.

A multi-channel storytelling framework based on theory and primary data was developed to offer a practical and formalised process for maker-wine brands to enhance their storytelling efforts. By following a more structured and multi-channel approach to their marketing efforts, maker-wine brands can identify and approach younger-generation wine consumers, targeting relevant communication channels and using content appealing to younger audiences. A multi-channel approach allows the utilisation of diverse communication methods, sharing content about the authentic nature of maker-wine brands and the sustainability of their wine-making methods, which are organically driven and aim to preserve the industry for future generations. These aspects of a brand appeal to younger generations.

The storytelling framework contributes to an improved storytelling departure point for South African maker-wine brands and the global wine industry, as well as to future brand research on storytelling. With the availability of more time and resources, future research could map and approach maker-wine brands across South Africa for data collection following a possibly mixed-method research approach, allowing for both quantitative and qualitative data collection. Future research should explore the effects of storytelling on wine consumers and how it influences the end-to-end purchase decision-making process.

Martinho (2021) points out that wine marketing is most impactful when it segments wine consumers according to age, gender, and consumption preferences. Presenting segmented wine consumers with stories about winemakers and wine farms could prove valuable in establishing the impact of stories on consumer preference and their purchase decision-making process. Woldarsky (2019) shares this view, calling on future research to explore how cultural differences among consumers impact the effect of storytelling in the wine industry. As the research by Smith Maguire et al. (2021) suggests, a final avenue for possible future research is to use the research findings, specifically Step 3 of the storytelling framework, to refine the marketing communications process to share stories more effectively through digital channels.

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THE DIGITALIZATION OF AFRICAN MUSICSCAPES: AFROBEATS AND AMAPIANO - AFRICA TO THE WORLD

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Abstract

The digital revolution has significantly transformed the music industry, with African genres like Afrobeats and Amapiano emerging as major beneficiaries. This paper explores the role of digitalization and digital inclusion in their rapid global rise, analysing their impact at macro, meso, and micro levels. It examines how digital streaming platforms, viral content, and artist independence have fuelled their success. The study highlights key platforms such as Spotify's Afro Hub and TikTok, as well as the growing presence of African-themed music festivals in Western Europe and North America. These platforms and events not only provide exposure for both emerging and established artists but also facilitate cross-cultural exchange and appreciation. Using streaming data, desk research, and market trends, this study assesses the cultural and economic significance of African music's expanding global footprint. Grounded in cultural globalization theory, the research explores factors such as diaspora influence, enhanced digital access, and shifts in the global music industry. It compares Afrobeats and Amapiano's international market penetration strategies to map a pathway for cultural renaissance. The qualitative research design incorporates narrative and discourse analysis, drawing from multiple data sources and the lived experiences of the authors. While this approach may have limitations, it provides foundational insights into this growing field within the creative industries. Despite increasing media recognition—from the Grammy Awards to the MOBO and MTV Awards—there remains limited academic research on the key drivers of this success, the challenges facing the industry, and the broader managerial and policy implications for marketing, production, and consumption both in Africa and globally.

Keywords: Afrobeats, Amapiano, digital inclusion, digitalization, glocalization, place branding, Africa, storytelling.

Introduction

The digital revolution has dramatically transformed the music industry, with African genres like Afrobeats and Amapiano emerging as prime beneficiaries of this shift (Long-Innes, 2022). This paper explores the role of digitalization and digital inclusion in the exponential growth of these genres, examining their impact on the macro, meso, and micro levels. The study investigates how digital streaming platforms, viral content, and artist independence have contributed to the global prominence of Afrobeats and Amapiano (Eaby-Lomas, 2024). This study focuses on strategic platforms such as Spotify's Afro Hub and TikTok, as well as the rise of African-themed music festivals in Europe and America, which have become significant cultural touchstones (Livermon, 2020). These platforms and events are significant because they have not only provided exposure for established and emerging African artists but also fostered cross-cultural exchanges and appreciation (Long-Innes, 2022). By analysing streaming data, desktop research, and market trends, this study aims to shed light on the cultural and economic impact of African music's rise in popularity. The paper draws on cultural globalization theory to examine factors such as diaspora influence, enhanced digital inclusion, and evolving dynamics of the global music industry (Steingo, 2016).

African genres like Afrobeats and Amapiano are gaining global prominence as prime beneficiaries of the shift toward digitalization of the arts (Long-Innes, 2022). These genres have experienced explosive growth, reaching global audiences through streaming platforms, social media, festivals and music awards in Europe and America, thus reshaping the music landscape (Eaby-Lomas, 2024). This paper explores how digitalization and digital inclusion have played a role in the exponential growth of these genres. Digitalization has taken place on the macro, meso, and micro levels, through digital streaming platforms, viral content, and artist independence (Livermon, 2020). Digital inclusion through strategic platforms like Spotify’s Afro Hub and TikTok, along with the rise of African-themed music festivals in Europe and America, are propelling Afrobeats and Amapiano to global prominence (Steingo, 2016). Launched to celebrate and promote African music, Spotify’s Afro Hub has become a pivotal platform for artists to reach global audiences, reflecting a broader trend of international recognition for African music genres such as Afrobeats and Amapiano (Long-Innes, 2022).

Festivals like Afro Nation in Portugal, Piano People in London, and the African Music Festival in Chicago have become significant cultural touchstones, attracting thousands of attendees, and showcasing the rich diversity of African music (Eaby-Lomas, 2024). These festivals not only provide a platform for established and emerging African artists but also foster cross-cultural exchanges and appreciation, reflecting the growing global influence of African music genres (Long-Innes, 2022). The role of digital platforms, particularly TikTok, in cultural production has been instrumental in the growth of Afrobeats and Amapiano (Livermon, 2020). These platforms have enabled artists to reach global audiences, bypassing traditional gatekeepers and reshaping the music industry landscape. African music, with its infectious rhythms, deep cultural roots, and unparalleled creativity, continues to captivate global audiences, with the fusion of Afrobeats and Amapiano representing a powerful force poised to redefine African music’s global influence (Steingo, 2016).

The rising popularity of African sounds can be attributed to various factors, such as the influence of the diaspora, enhanced digital inclusion and the evolving dynamics of the global music industry. Borrowing from cultural globalization theory, this paper examines these elements, providing an analysis of how African music is reshaping the global music landscape. By analysing streaming data, festival attendance, and market trends, this study

aims to shed light on the cultural and economic impact of African music's rise in popularity. The paper is structured into five sections. Following this introduction, it provides a brief context to Afrobeats, followed by a contextualization of Amapiano as the empirical setting. The second broad section makes a comparative analysis between the two genres and the strategies employed to penetrate international markets, with a view to crafting a pathway to cultural renaissance in the final, concluding section.

1. Literature Review

In recent years, the global music industry has undergone a significant transformation, driven by the rising popularity of African music (Madichie, 2021). This surge in global recognition of Afrobeats and Amapiano can be attributed to the strategic use of digital platforms and the growing emphasis on digital inclusion. Platforms like Spotify's Afro Hub and TikTok have played crucial roles in amplifying the reach of African artists, enabling them to connect with a diverse and widespread audiences. Digital distributors such as Spotify and especially TikToK helped ignite a burgeoning independent sector of artists. It was through this model that made its way into the mainstream market and dominated global charts (Charisma, 2021).

Collaborations between African and US based artists such as Drake, Beyonce, and Major Lazer amongst others led to the rise in acceptance of the two genres in mainstream billboard chart (Charisma, 2021). Additionally, the experiential nature of African-themed music festivals in Europe and America, such as Afro Nation in Portugal and the African Music Festival in Chicago, highlights the expanding demand for African sounds and the cross pollination of cultures derived from live events. These events celebrate the rich cultural heritage and diversity of African music, providing platforms for both established and emerging artists to showcase their talent (Wanjohi, 2024; Young, 2020).

This paper delves into the factors driving the global success of Afrobeats and Amapiano, examining the cultural and economic impacts of their rise in popularity. African music, particularly from the West Coast to the Southern borders of the African continent, thrives on storytelling and relatability, creating a bridge between African traditions and modern urban life. Afrobeats, with its broad sonic palette ranging from high-energy anthems to mellow ballads, has given the world a taste of West Africa's dynamic spirit. As the genre continues to expand its influence, its interactions with other styles, such as South Africa's Amapiano, are creating even more compelling narratives. By intertwining Afrobeats' universal appeal and Amapiano's innovative depth, African artists are crafting a winning formula that solidifies Africa's place on the global music stage. This paper seeks to provide exploratory insights into this trend using storytelling as its research approach. In the next section we explore the genesis of the two genres and how they grew into internationally recognised by mainstream music conglomerates and music lovers worldwide.

Afrobeats: Africa's Universal Sound

Afrobeats, with its origins in Nigeria and Ghana, has grown into a global phenomenon. Characterized by pulsating rhythms, catchy hooks, and themes that traverse love, social issues, and celebration, Afrobeats has become synonymous with joy and unity. Artists such as Burna Boy, Tiwa Savage, Wizkid, and Davido have transformed the genre into a cultural export, earning accolades and topping international charts. The genre's versatility allows it to blend seamlessly with pop, reggae, hip-hop, and electronic music, making it accessible to diverse audiences across continents. Afrobeats thrives on storytelling and relatability, creating a bridge between African traditions and modern urban life. Its broad sonic palette, from high-energy anthems to mellow ballads, has given the world a taste of Africa's dynamic

spirit. Yet, as the genre continues to expand its influence, its interactions with other styles, such as South Africa's Amapiano, are creating even more compelling narratives.

Amapiano: The Soulful Groove of Innovation
Amapiano, originating in South Africa, has rapidly gained traction as one of Africa's most innovative musical genres. Distinguished by its log drum, mid-tempo beat ranging from 110-115BPM, jazzy piano riffs, and heavy use of syncopated percussion, Amapiano offers a sonic experience that feels simultaneously grounding and otherworldly. Emerging from South Africa's townships, the genre embodies creativity, resilience, and the ability to turn everyday experiences into danceable art. Pioneers like MRF Soul, Calvin Fallo, MDU aka TRP, Kabza De Small, Tyla, Durban Gogo, DJ Maphorisa, and Focalistic have propelled Amapiano into the global limelight. The genre's emphasis on communal dance and hypnotic grooves appeals to audiences looking for more immersive musical journeys. While Amapiano is firmly rooted in South African culture, its adaptability has made it a natural collaborator with Afrobeats, resulting in boundary-pushing soundscapes.

Originating from South Africa's townships, Amapiano has transcended its local roots to achieving global prominence. Artists like Kabza De Small, Uncle Waffles, and DBN Gogo have played a pivotal role in elevating the genre from underground movements to the international spotlight, including the GRAMMY stage. This distinctive sound, blending deep house, jazz, lounge, and South African musical influences, now resonates across Tokyo nightclubs, European music festivals, New York venues, and even Hollywood films. Characterized by hypnotic grooves, piano melodies, deep basslines, and rhythmic percussion, Amapiano operates at a relaxed tempo of 110-120 bpm. Born in Gauteng Province's townships, particularly Pretoria and Johannesburg, during the mid-2010s, it has since evolved into a global phenomenon, fuelled by grassroots innovation and digital platforms. On TikTok, the #Amapiano hashtag has surpassed 10 billion views, underscoring its widespread appeal. Streaming platforms have also significantly boosted its growth; Spotify recorded 100 million streams in 2020, which surged to 855 million by mid-2024—a remarkable 153% increase in international exposure over the past decade.

One standout example is Tyla's Amapiano-inspired Afropop hit 'Water', which topped the Billboard US Afrobeats Songs and Hip-Hop/R&B charts, becoming the first African song to enter the Billboard Hot 100 since 1968. The viral "Water" dance challenge on TikTok, created by Tyla's choreographer Litchi, further propelled the track's popularity. Reflecting on the genre's rise, Kabza De Small, often dubbed the "King of Amapiano," opines that "Amapiano is considered a raw, rough sound. According to him, and highlighting the role of digital, "seeing people worldwide engaging with it through dance and TikTok challenges is exhilarating." Indeed, as Amapiano continues its global ascent, its blend of authenticity and adaptability cements its place as a transformative force in global music culture.

Beyond commercial success, the fusion of Afrobeats and Amapiano serves as a cultural renaissance for Africa. It celebrates the continent's ability to innovate while honouring its traditions. This union fosters a sense of pride among Africans and the diaspora, creating music that resonates with both local and global audiences. Furthermore, this fusion acts as a bridge for cross-continental collaboration, bringing African artists closer to their counterparts in the Caribbean, South America, and beyond.[i] The global interest in Afrocentric music, fuelled by this fusion, creates opportunities for African culture to permeate other spheres, such as fashion, dance, and cinema.

2. Research Methodology

This essay employs a qualitative research methodology, focusing on the intersection of storytelling, cultural entrepreneurship, and creative expression within organizational and societal contexts. Drawing from scholarly works such as Daykin's (2004) exploration of arts-based inquiry and Koch's (1998) discussion of storytelling as a research tool, this approach emphasizes the interpretive and narrative dimensions of cultural phenomena. Key methodological frameworks include arts-based inquiry (Daykin, 2004), which integrates music and creativity as analytical lenses, and narrative inquiry (Koch, 1998; Vivek & Nanthagopan, 2023), which positions storytelling to uncover organizational dynamics and cultural values. The analysis also incorporates theoretical insights from Florida (2003) on the creative class and DiMaggio (1982) on cultural entrepreneurship to contextualize emerging creative scenes and their organizational bases. To address the methodological challenges of researching dynamic and contemporary cultural phenomena, as highlighted by Taylor (2023), the study combines traditional qualitative techniques with emerging methods like digital storytelling (Zort et al., 2023). This integration allows for a nuanced examination of how cultural values are shared and preserved in digital and physical spaces. By synthesizing these methodological approaches, the essay critically examines the role of digitalization, glocalization and the three-act structure of storytelling in understanding the constructs that advanced the global reach of the two genres, i.e., Afrobeats and Amapiano.

3. Analysis: How digital technologies are empowering the business of music

Micro Level Analysis

Like a three story that has a three-act structure we have identified a micro, meso and macro level of analysis in the constructs that have influenced entrepreneurship and innovation among Afrobeats and Amapiano artists. In the first act of our storytelling analysis, a prominent feature that has arisen is the way in which entrepreneurial innovation and digitalization strategies have been leveraged by artists. These artists have been able to harness their craft through digitalization. An example of this is seen in the democratization of production and distribution within the Amapiano sector. Individual artist empowerment has been enabled through independent music production. A raw Amapiano beat is typically created by a DJ within a studio, crafted without any gatekeepers hindering their production due to the advancements in the music industry. The production of music has become cheaper, allowing individuals to gain greater independent economic agency in how they produce, distribute, and promote their music without relying on traditional record labels. This shift has been facilitated by the rise in smartphone ownership, which enabled Amapiano artists to distribute their music as raw file formats online, including through WhatsApp chats. This became a quick way of accessing customers or the intended market. Artists would often produce two variations of the same song and ask for feedback on which version resonated more with listeners. This process is like an artist sharing their rehearsal process with their intended audience. Musicians started sharing works in progress with their intended consumers, which helped them gain independence through market testing while also creating an appetite for their music. This approach generated excitement and anticipation among fans, akin to a dopamine response associated with sampling new songs.

Localized Learning and External Economies

The second aspect that has played an important role in the digitalization of Afrobeats and Amapiano is localized learning within external economies. Both genres have benefited from internal cluster dynamics facilitated by digital platforms. The emergence of Spotify, YouTube, and TikTok has allowed individuals to showcase their work in progress while sharing resources in a digitally connected environment. This was particularly evident during lockdowns when artists facilitated collaborations with international musicians by sharing files and allowing others to layer vocals onto tracks. Twitter was widely used as a platform for artists to create beats, share them, and invite vocalists to add their contributions. The lockdown period enabled cross-pollination and collaboration across countries, as everyone had to engage on digital platforms and local performances became global as DJs and artist curated live stream events delivered to the world through digital platforms.

Global Linkages and Decentralized International Connectivity

The third micro-level influence is global linkages and decentralized international connectivity. Digital platforms have allowed artists not only to collaborate with each other but also to connect with global audiences. Unlike before, when music was primarily distributed through radio—where registration was necessary—music is now readily available on platforms like Spotify. Artists can enable algorithms to create personalized playlists for them, making digital marketing and promotion significantly easier. There is now a collaborative nature in which music is created based on consumer preferences, especially through viral TikTok challenges that bypass traditional methods of music consumption. The WhatsApp, Instagram, and TikTok cultures have enabled a mixtape approach to creating music while allowing for easy access by target audiences. What we see here is that while innovation is primarily entrepreneurial in nature, artists have removed traditional gatekeepers from the equation. Lower production costs eliminate individuals who might otherwise approve or reject certain products while drawing artists closer to end users. There is also a clear leveraging of available digital tools that enable them to produce and distribute music with greater ease. Furthermore, developments in smartphones and access to social media platforms mean that consumers are easily accessible and can consume music with minimal resistance through digital platforms. The first act shows how digitalization and access have played an important role in minimizing the gap between production and distribution while fostering collaboration with end users through an iterative approach. This innovation in music production, combined with advancements in digital economy technologies, has allowed artists to advance both genres significantly. Africa is no longer viewed as a "dark and disconnected continent" or merely a recipient of Western cultural products; rather, it has emerged as a significant contributor to global music trends, dominating charts previously reserved for Western artists.

Meso level Analysis

The meso level that we're using as a unit of analysis, or rather the second act of the narrative regarding the emergence of Amapiano and Afrobeats, through the innovation that comes with digitalization, is the alignment of organizational priorities around supporting the emergent ecosystem of these two genres. Digital platforms and streaming services have realized that while they can no longer gatekeep the distribution of music, they can be enablers and facilitators of global reach. They have played a crucial role in promoting these genres and advocating for their accessibility within mainstream music (Lobb, 2023). The strategic use of these platforms by artists and organizations has been an essential aspect of the growth of both genres.

Digital Platforms as Enablers

Streaming platforms have played a crucial role in ensuring ease of access and collation of music while supporting festivals through sponsorship, collaboration, and endorsement. This support has made the experiential component of these emerging genres possible (Music Business Worldwide, 2023). Spotify has been at the forefront of promoting Amapiano by creating the Africa Hub as well as "A Decade of Amapiano," which tells the narrative of the genre (Notion Online, 2023). Sports drinks such as Red Bull have also facilitated the fusion of these genres with classical music. Red Bull has an ongoing program where they combine classical music and an orchestra with an Amapiano DJ, featuring artists like Sun El, Kabza De Small, and Musa Keys (Rolling Stone Africa, 2023). This not only shows appreciation for Amapiano as a burgeoning genre but also links it to an established genre like classical music. The creation of this sub-genre within Amapiano enhances its global appeal while transcending traditional genre boundaries.

Streaming Growth and Cultural Shifts

The Digital Transformation of African Music: Afrobeats and Amapiano's Global Rise. The digital revolution has fundamentally transformed African music genres, particularly Afrobeats and Amapiano, through unprecedented global reach and technological innovation. Both genres exemplify how digitalization has democratized music production, distribution, and promotion, enabling artists to bypass traditional gatekeepers and connect directly with global audiences (Steingo & Sykes, 2019). The impact of this digital transformation is evident in remarkable streaming statistics. Afrobeats has experienced exceptional growth, with Spotify reporting a 550% increase in streams since 2017, attracting diverse audiences across Brazil, India, and the US (Madichie, 2022). Similarly, Amapiano has seen an astounding 5,668% growth in streams between 2018 and 2023, accumulating 1.4 billion streams on Spotify alone (Music Business Worldwide, 2023). The success of these genres stems from multiple digital innovations. Through disintermediation, artists have gained independence from traditional record labels, while digital platforms have facilitated global reach and cross-cultural collaboration. Vevo reported a 56% year-on-year increase in viewership of Afrobeats and Amapiano videos globally in 2023, with nearly 4 billion global views for Amapiano's catalogue alone (Music Business Worldwide, 2023).

Digital literacy and smartphone adoption in Africa and emerging economies have played crucial roles in this transformation. The affordability and accessibility of platforms like YouTube, which offers free access with advertisements, and Spotify's premium services have democratized music consumption and discovery (Sheydance Studios, 2023). These platforms have enabled artists to reach global audiences while maintaining control over their creative output. The transformation extends beyond streaming platforms to include social media engagement, particularly through platforms like TikTok, where viral content has helped these genres transcend geographical and cultural boundaries (Eaby-Lomas, 2024). This digital ecosystem has fostered a new paradigm where local festivals and international collaborations flourish, enabling artists and independent producers to grow their enterprises while maintaining their cultural authenticity.

What was once distinctly local music from West and Southern Africa has evolved into global phenomena, accessible at the click of a button. This shift reflects changing cultural norms and how digital platforms influence the reception and adaptation of music in different contexts (Nama, 2023). The success of both Afrobeats and Amapiano demonstrates the power of digital transformation in reshaping the global music landscape, creating opportunities for artists while preserving their cultural identity. In addition to the growth of the genres there

have been developments which have led to a globalization of the music due to the ability of artists to fuse authentic Afrobeats and Amapiano to genres to those found in the global north.

The macro level analysis

The macro level of analysis focuses on two key aspects: cultural globalization and changes in industry structures.

Cultural Globalization and Genre Fusion

Cultural globalization theory helps explain how Amapiano and Afrobeats have spread globally through digital platforms. The global flow of cultural products created by African artists has been primarily enabled through digitalization, allowing them to reach international audiences (Nama, 2023). International collaborations with major artists have played a crucial role in this expansion. For instance, collaborations between African artists like Davido and global stars such as Beyoncé and Chris Brown have leveraged social capital to facilitate the global spread and cultural flow of these genres (Lobb, 2023). These collaborations have led to cross-genre fusion, creating new and innovative sounds. For example, Burna Boy's sampling of Toni Braxton's "He Wasn't Man Enough for Me" demonstrates the fusion of Afrobeats with R&B (Rolling Stone Africa, 2023). Similarly, artists like Tyla, who calls her style "Pop Piano," have blended R&B with Amapiano, showcasing the genre's versatility (Highsnobiety, 2023). The cultural globalization of music production has fostered an authentic desire from both the Global North and South to appreciate and understand the essence of Amapiano and Afrobeats. This mutual appreciation has resulted in collaborations that honour the core of these African genres while incorporating elements from other musical traditions, creating truly global fusion sounds.

Industry Structure Changes and Digital Transformation

Digitalization has fundamentally altered the music industry, enabling new localities to emerge against traditional geographical hierarchies. The appreciation of the economic potential represented by African artists has expedited the process of cultural development, allowing them to play on a global stage (Music Business Worldwide, 2023). The rise of digital platforms has shifted power dynamics within the industry, allowing for more diverse musical expressions to gain visibility. On a macro level, there has been a widespread adoption of a digital mindset by artists, promoters, and creators of genres and musical experiences in both the Global North and South. This shift has led to the understanding that collaboration and fusion of genres are now the norm rather than the exception. For instance, artists like Ed Sheeran have incorporated elements of Afro fusion and Amapiano into their work, demonstrating the global adoption of these genres (Lobb, 2023).

Glocalization: The Fusion of Global and Local

The collaboration between artists from the Global North and South has become mutually beneficial, increasing social capital, expanding audiences, and diversifying musical repertoires. This approach has led to a "glocal" phenomenon, where the authenticity of the genres is maintained while their global reach and penetration are promoted (Appadurai, 1996). Artists from the Global North now recognize the importance of collaborating with African artists for both authenticity and political correctness. These collaborations have propelled African artists' brands and reach, as established Global North artists bring new audiences to the mix. Simultaneously, Global North artists gain access to markets in the Global South, creating a symbiotic relationship that benefits both parties (Nama, 2023). The

opportunities for artists are no longer limited to local or global spheres but have expanded to a glocal approach. This approach values and promotes both the authenticity of the genres and their global reach and penetration. As a result, Afrobeats and Amapiano have become powerful cultural exports, reshaping the global music landscape and challenging traditional power dynamics in the industry (Steingo & Sykes, 2019). In conclusion, the macro-level influences on Afrobeats and Amapiano, driven by cultural globalization and changes in industry structures, have created a new paradigm in the global music scene. These genres have not only thrived but have also reshaped international music tastes, demonstrating the power of digital platforms and cross-cultural collaborations in the modern music industry.

The digital revolution has transformed African music genres, particularly Afrobeats and Amapiano, through unprecedented global reach and technological innovation. Afrobeats has experienced remarkable growth, with Spotify reporting a 550% increase in streams since 2017, attracting diverse audiences across Brazil, India, and the US (Madichie, 2022). This success stems from strategic social media engagement, widespread streaming platform adoption, and data-driven marketing approaches. The digitalization of the music industry has fundamentally altered how artists produce, distribute, and promote their music. Through disintermediation, artists have gained independence from traditional record labels, while digital platforms have facilitated global reach and cross-cultural collaboration (Steingo & Sykes, 2019). Amapiano exemplifies this digital transformation, experiencing a remarkable 5,668% growth in streams between 2018 and 2023, accumulating 1.4 billion streams on Spotify alone (Music Business Worldwide, 2023). The success of both genres demonstrates how digital platforms have democratized music distribution, enabling artists to bypass traditional gatekeepers and connect directly with global audiences. Through viral content, particularly on platforms like TikTok, these genres have transcended geographical and cultural boundaries, reshaping the global music landscape (Eaby-Lomas, 2024).

4. Conclusions and Implications

Despite increasing media recognition—from the Grammy Awards to the MOBO and MTV Awards—there remains limited academic research on the key drivers of this success, the challenges facing the industry, and the broader managerial and policy implications for marketing, production, and consumption both in Africa and globally. We discuss these in two parts – first, under a theme *Together Apart Afrobeats and Amapiano*, and second, against the backdrop of *Digital Transformation and the Future of African Music.*

Together Apart Afrobeats and Amapiano.

The synergy between Afrobeats and Amapiano is a testament to Africa's musical diversity and interconnectedness. These genres complement each other: Afrobeats' upbeat energy and global reach combine effortlessly with Amapiano's sophisticated grooves and introspective depth. This fusion creates tracks that are rhythmically engaging, emotionally resonant, and culturally rich. Collaborations such as Davido's Champion Sound with Focalistic and Burna Boy's Sungba Remix with Asake highlight how these genres can coalesce to create hits that resonate on dance floors and playlists worldwide. These tracks exemplify how artists can leverage the strengths of each genre to appeal to both African and global audiences. This blending also highlights Africa's unity in diversity, demonstrating how the continent's music can transcend regional boundaries to create a collective identity. Such collaborations are not just about sound but about storytelling—bringing together narratives of joy, struggle, and celebration from different corners of Africa – and amplified via digital platforms like TikTok, YouTube and Spotify. By creating music that is distinctly African yet universally appealing, these genres challenge the dominance of Western musical paradigms, highlighting Africa as a

creative powerhouse. Additionally, this convergence paves the way for African artists to dominate global streaming platforms, festivals, and awards.

In this exploratory study, we argue that digital tools and/ or platforms such as TikTok and YouTube have been instrumental in promoting Africa's diverse cultures and internationalisation of African music genres, and thus exploring how these digital technologies and innovative practices are driving this entrepreneurial growth on the continent merits interrogation. Indeed, the success of platforms like Spotify's Afro Hub and the rise of African-themed music festivals in Europe and America underscore the growing demand for African sounds. By combining forces, Afrobeats and Amapiano artists can further capitalize on this momentum, ensuring sustained visibility and influence. The impact of digitalization on Amapiano has been transformative, catapulting the genre from its South African roots to global recognition in a remarkably short time. Digital platforms, social media, and streaming services have played crucial roles in this journey, democratizing music discovery and allowing Amapiano artists to reach global audiences directly. The genre's ability to adapt to and thrive in the digital ecosystem demonstrates the power of technology in shaping modern music trends. As Amapiano continues to evolve and expand its influence, it serves as a prime example of how digitalization can elevate a local genre to international stardom. The genre's success story underscores the importance of digital strategies in the modern music industry and highlights the potential for other emerging genres to follow a similar path to global recognition.

Digital Transformation and the Future of African Music

The impact of digitalization on African music genres, particularly Amapiano and Afrobeats, has been transformative, fundamentally reshaping the music industry landscape. The digital platform economy is projected to contribute significantly to South Africa's economy, with estimates suggesting an addition of R91.4 billion by 2035, expanding from 0.02% of GDP in 2022 to 1.38% (Accenture, 2023). This economic growth creates substantial opportunities for artists and related businesses within the ecosystem. Through the lens of Cultural Industry Systems Theory, we can observe how digitalization has revolutionized music intermediation in the South African music industry, creating new pathways for artist development and market penetration. The application of Cluster Theory helps us understand the dynamics of scene growth, including localized learning and external economies, which have been crucial in the genres' development (Florida et al., 2010). Artists now benefit from diverse revenue streams through various digital channels, including streaming, social media partnerships, and online performances. This diversification reduces reliance on traditional revenue models and empowers artists with greater control over their careers (Madichie, 2022). Digital platforms, social media, and streaming services have democratized music discovery, allowing artists to reach global audiences directly while maintaining their artistic authenticity. While the ease of digital distribution has increased competition, requiring artists to continually innovate, the future of African music appears promising. The success of Amapiano and Afrobeats demonstrates how digitalization can elevate local genres to international prominence, creating a blueprint for other emerging genres. As these genres continue to evolve and expand their influence, they not only reshape the global music landscape but also challenge traditional industry power dynamics (Steingo & Sykes, 2019). The transformation of African music through digitalization represents more than just technological advancement; it symbolizes a cultural renaissance that celebrates innovation while honouring traditions. As we look to the future, the continued growth in international collaborations, music tours, and cultural exchanges suggests that African music's global influence will only continue to strengthen, powered by digital innovation and cultural authenticity.

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THE INFLUENCE OF STAKEHOLDERS ON HOTEL PERFORMANCE: THE MEDIATING ROLE OF NESTED ECO-INNOVATION IN AN EMERGING MARKET.

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Abstract

This study explores the influence of stakeholders on hotel performance, emphasising the mediating role of nested eco-innovation processes and eco-innovation products in an emerging market context. Using a quantitative research design, data were collected from 225 hotel managers in 3- to 5-star hotels across Ghana's Greater Accra and Central regions. Structural Equation Modeling (SEM) with SMART-PLS was employed to analyse the relationships between stakeholder influence, eco-innovation practices, and hotel performance. The findings indicate that stakeholders play a crucial role in driving eco-innovation adoption, which, in turn, enhances hotel performance. Both eco-innovation processes and products significantly mediate this relationship, underscoring their importance in sustainable hotel management. The study contributes to the growing discourse on stakeholder theory and eco-innovation, offering valuable insights for hotel managers and policymakers aiming to improve sustainability and performance in emerging markets.

Keywords: Stakeholders, Eco-Innovation, Hotel Performance, Emerging Market, SMART-PLS, Ghana, Sustainability

1.1. Introduction

In response to the growing concerns over climate change and environmental degradation, countries worldwide have embraced eco-innovation policies to improve competitiveness (Ilic et al., 2022; Jo et al., 2015). However, there is a limited understanding of how eco-innovation influences hotels' performance (Wang et al., 2020; Aboelmaged, 2018). Eco-innovation is defined as "a set of economic processes, on which firms develop and commercialize innovations, in products, processes, organizational forms and marketing matter, that are new, or significantly improved, and are intended to create a competitive advantage, with a reduction of environmental risks, resource depletion and pollution, and emissions of any environmental damaging substances" (Rennings, 2000, p.135). According to Chen et al. (2006), eco-innovation can be divided into eco-innovation processes and products. Eco-innovation processes can take the form of new projects, products, systems or activities by firms, individuals or governments (Raut et al., 2022). Eco-innovation products refer to goods or services with processes, systems, or management approaches that significantly reduce environmental burdens compared to existing or alternative products (Raut & Yadav, 2022). Thus, the concept and ideas of "nested eco-innovation" have gained the attention of researchers and practitioners alike. Nesting means that the system in concern is part of a larger and more complex system. A nested eco-innovation process is defined as a system-wide networking and interactive organisation of eco-innovation processes to enhance system-wide improvement in environmental performance (Chan, 2021).

The importance of eco-innovation for economic development is widely recognised. Commercial enterprises, stakeholders and public authorities in most industrialised countries pursue eco-innovation to sustain development, competitive advantage and high quality of life (Santos et al., 2019). However, stakeholders' engagement with eco-innovation that enhances performance is still ambiguous and elusive due to its comprehensiveness and evolving nature (Wang et al., 2020; Aboelmaged, 2018). Adomako et al. (2023) also pointed out a lack of research on eco-innovation on the African continent, particularly in Ghana. With Ghana's economic development, the tourism and hospitality industry has gained increasing societal importance in Ghana (Amoako et al., 2019). In response to the growing concerns over environmental issues, the Ministry of Tourism, Arts and Culture of the Republic of Ghana has sought to implement policies and programs to promote sustainability in the hospitality industry (Adomako et a., 2023). Nevertheless, Ghanaian eco-innovative hotels are facing increasing market pressures to understand the business benefits of eco-innovation. Given the emerging eco-innovation in the hospitality industry, it is worthwhile to understand and share eco-innovation experiences. To bridge these research gaps, this study examines the mediating role of nested eco-innovation between stakeholder pressure and hotels' performance. It also investigates the direct relationship between eco-innovation and hotels' performance in the hospitality industry. Furthermore, past eco-innovation studies focused on manufacturing and engineering technology companies. To bridge the gap in the literature on eco-innovation, this study aims to provide an understanding of eco-innovation by addressing the following specific objectives: 1) to examine the effect of stakeholder pressure on the hotel's performance. 2) examine the influence of stakeholder pressure on eco-innovation practices. 3) To investigate the impact of eco-innovation

practices on hotel performance, thereby contributing to understanding the performance implications of eco-innovation. 4) To investigate the mechanism of stakeholder pressure on a hotel's performance through the mediating role of nested eco-innovation. Following nested eco-innovations, the proposed research model will answer the following research questions. 1) What effect does stakeholder pressure have on the hotel's performance? 2) What is the influence of stakeholders on eco-innovation practices? 3) How do eco-innovation practices impact hotel performance, thereby contributing to understanding the performance implications of eco-innovation? 4) What mechanism of stakeholder pressure on a hotel's performance through the mediating role of nested eco-innovation process and eco-innovation product?

1.2. Significance of Study

The contribution of this research is threefold. It sheds light on how various eco-innovation forms are interconnected. It is noted that producers find it hard to implement product eco-innovation without accompanying process innovation; process eco-innovation also indirectly enhances downstream product eco-innovation. The study enriches eco-innovation research in the hotel sector and provides insights into the driving forces behind various eco-innovation forms. The novelty added to this study relates to the country where this research is undertaken. The paper will help to inject and promote new critical thinking, understanding, knowledge, and policy directives among critical stakeholders such as hotel staff, owners, and their executives/managers.

The study consists of five sections. Section 1 presents the study's introduction, problem, objectives, and significance. Section 2 discusses the literature on existing studies on stakeholders, eco-innovation, eco-innovation, and hotels' performance, as well as the study's theoretical underpinnings and conceptual framework. Section 3 describes the methodology and the research design. Section 4 analyses the quantitative data analysis, demographic information, normal distribution test, measurement model, structural model, and research hypotheses test. Section 5 deals with the results and discusses the findings from the study. Section 6 concludes with a summary of findings, implications for theory and practice, recommendations for future research, limitations, and ethical issues.

2. Literature Review

Stakeholders have a significant impact on the performance of hotels. Stakeholders play a crucial role in an organisation, whether internal or external, and their interactions can be positive or negative (Abdel-Maksoud et al., 2016; Mensah, 2014). Stakeholders are critical in the hospitality sector, as it relies on these stakeholders to conduct its business (Mensah, 2014). Compliance with stakeholders in the hospitality industry tends to be compelled by legislation and is detrimental to hotel performance. According to Elshaer et al. (2023), pressure from stakeholders was found to enhance green managerial behaviour in Indian hotels, and this improved the hotel's performance in terms of employee retention and satisfaction.

Recent studies have examined the significance of stakeholder pressure and eco-innovation as well as stakeholder pressure and hotel performance (Sharma et al., 2020; Weng et al., 2015). However, the concept of nested eco-innovation practices on the

hotel's performance in the emerging market has been absent in the literature. The paper focuses on the relationship between stakeholder pressure and hotel performance through the interaction of nested eco-innovation strategies to fill this gap in the research. Scholars have often studied a subset of these variables in isolation, such as stakeholder pressure or eco-innovation processes, without paying attention to a network of relations constituted by interconnected nested processes and products (Xavier et al., 2020). Consequently, the present study's explorative approach will apply theories related to these interactions in the context of star hotels in Ghana.

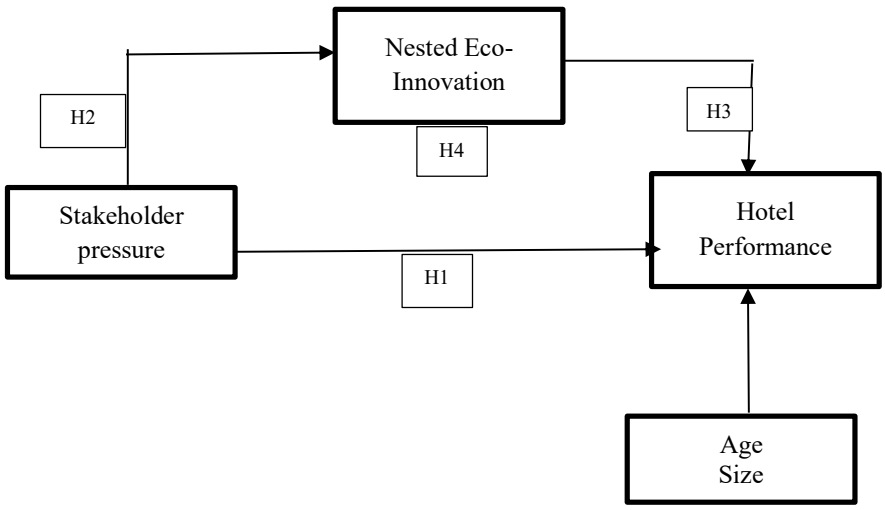
2.1 Theoretical Underpinnings

According to the stakeholder theory (ST), managers should consider all the company's stakeholders when making choices for the company. These stakeholders include financial backers, employees, customers, communities, government agencies, suppliers, competitors, the media, and the environment (Chan, 2021; Weng et al., 2015). For instance, getting stakeholders' opinions on pollution avoidance and other sustainable behaviours is crucial because products and services constantly evolve in response to customer needs and global business regulations. Therefore, the study adopts the stakeholder theory as a theoretical lens to understand nested eco-innovation's mediating role in hotel performance.

2.2 Conceptual Framework

The conceptual framework provides a diagrammatical representation of the mediating effects of nested eco-innovation techniques on stakeholder pressure, the independent variable, hotel performance, and the dependent variable. Hotels must innovate to achieve competitive advantages and minimise their adverse impacts on the natural environment (Fraj et al., 2015). Eco-innovation has been put forward as a solution to these dual problems. Although the literature on the positive consequences of eco-innovations on firm performance is abundant, the concept remains underdeveloped, and, as a result, limited supportive evidence is available on the contextual model from the empirical literature, particularly in the hotel industry (Kuo & Smith, 2018). Therefore, the paper conceptualises a model to test. Figure 1 represents the conceptual framework diagram.

Figure 1



2.2.1. Stakeholder Pressure and Hotel Performance

The hospitality industry, which plays a key role in the economy, is a major contributor to environmental footprints and greenhouse gas emissions as one of the largest sectors of services in terms of energy consumption (Lai, 2015). The hotel industry is a wide field of opportunities and is the focus of this study. To effectively address environmental challenges and enhance competitiveness, hotels must be proactive in their eco-innovation, such as adopting environmental management and pollution prevention measures as part of their operations and stakeholder interactions. However, the current knowledge of eco-innovation is still nascent and incomplete.

Stakeholder pressure from external and internal environments is a direct focus of hospitality. Guests, employees, suppliers, competitors, and regulators are major actors in hotels. Daily effects of these environmental circumstances promote quick responses from the hotel industry via chain reactions, such as hotel groupings and partnerships. Thus, stakeholders are defined as anyone who can affect or is affected by hotel operations. When controlling competitiveness, effectiveness, and efficiency, the stakeholder approach considers the significant efforts, thoughts, and interests of hotel morality, legality, and obligations toward stakeholders.

Stakeholders can supply customers with desired products and simultaneously perform activities that cannot be effectively carried out individually. Satisfying demands and expectations fosters good relationships. All stakeholders pursue their rewards while minimising risk and insecurity by controlling the tasks as effectively as possible. Controls may occur in the agreement on guarantees, bonds, fines, interests, reputation, and prices. Thus, although stakeholders operate with a sense of common interest, they struggle with conflicts and strive for subsequent negotiations to discuss dissatisfaction (Bundy et al., 2018). This conflict situation pressures hotel performance, which refers to how hotels fall short or surpass their obligations toward stakeholders. This study hypothesises a relationship between stakeholder pressure and hotel performance. Hence:

H1: There is a positive relationship between stakeholder pressure and the hotel’s performance.

2.2.2 Stakeholder Pressure and Eco-Innovation

Several studies have demonstrated that hotels are utilising eco-innovations because of stakeholder pressure (Sharma et al., 2020; Wang et al., 2020; Aboelmaged, 2018). Stakeholders are critical motivators for businesses and the defence of the natural environment against the detrimental effects of the firms' operations, according to Freeman (1999). Pressure from stakeholders can change the firm's activities (et al., 2023) and strategic approach to management decisions. An ever-increasing number of stakeholders have started to show social responsibility to protect our planet. Many categories of stakeholders influenced the practices of eco-innovation in the hotel industry. One category consists of the hosts and customers. Customers have cited concern about environmental practices as the main reason an enterprise's reputation will be enhanced (Weng et al., 2015). Customers’ demands become increasingly more challenging as they desire to protect the earth and to stay in green businesses (Jayaraman et al., 2023).

Meanwhile, staff also have an impact, as they hope for an ecologically friendly space (wang et al., 2020; Weng et al., 15). In the opinion of Chan (2021), the most proactive companies work with internal stakeholders like employees and external stakeholders like consumers, suppliers, regulators, and communities to reach their common objective. The study thus proposes that stakeholder pressure influences the eco-innovation practices of the hotels and hypotheses that:

$H2_a$: Stakeholders influence hotel managers to use eco-innovation process.
$H2_b$: Stakeholders influence hotel managers to use eco-innovation products.

2.2.3 Eco-Innovation Practices and Hotel Performance

Given the environmental impact of the hotel industry, eco-innovation has become increasingly popular in this sector in recent years. The most common types of eco-innovations adopted in the hotel industry primarily relate to hotel operations, including energy-efficient lighting, heating, air conditioning, and energy-efficient hotel equipment (Wang et al., 2020; Xie et al., 2019). In addition, waste reduction, such as waste recycling, composting, and water-saving practices, has also been widely introduced in the hotel industry. Eco-innovation generally focuses on reducing the impact of a company's products, services, and activities on the environment, but economic objectives are also considered (Gürlek & Koseoglu, 2021; Weng et al., 2015).

Eco-innovation is a way for companies to address environmental challenges while seeking ways to improve their competitiveness and operational efficiency (Kemp & Arundel, 1998). Scholars have indicated that when eco-innovation-related practices are developed, they can receive positive market feedback through market share increases or price premium effects (Gürlek & Koseoglu, 2021; Sharma et al., 2020). Again, studies of eco-innovation practice have revealed a range of trends, some of which relate to growing environmental awareness among the broader public, customer expectations surrounding environmental responsibility, market entry pressures, and subsequent growth in eco-specific market niches (Wang et al., 2020; Xie et al., 2019).

Another school of thought suggests that the primary barriers preventing the implementation of eco-innovation programs are the direct costs of the waste management program, staff shortages, and lack of expertise, and that, other than recycling programs, members do not see a priority (Hojnik & Ruzzier, 2016). However, this study suggests that hotels adopting eco-innovation practices play an important role in the sustainability agenda in the hotel business and proposes that:

$H3_a$: Eco-innovation processes influence hotel performance
$H3_b$: Eco-innovation products influence hotel performance

2.2.4. The Nested Eco-Innovation Mediates Stakeholder Pressure and Hotel Performance

Eco-innovation processes and products are crucial strategic responses that help firms improve their environmental performance (Gürlek & Koseoglu, 2021). However,

empirical studies that focus on a comprehensive formulation of eco-innovation processes and products, as well as their relationships with eco-innovation performance in the hospitality industry (i.e. star-rated hotels), are scant, especially in emerging economies context (Gürlek & Koseoglu, 2021; Xie et al., 2019). This study fills in the research gaps by testing the mediating effects of nested eco-innovation processes and products in the eco-innovation performance of star hotels (Bani-Melhem et al., 2022). It is revealed that regulatory pressure predicts the star hotels' eco-innovation process intention and further indirectly influences eco-innovation products, which in turn enhances hotels' performance (Wang et al., 2020). From the above discussion, this study hypothesises that nested eco-innovation processes and products mediate the performance of star hotels. Hence,

H4: Nested eco-innovation mediates the relationship between stakeholder pressure and hotel performance.

3. Research Methodology

3.1 Research Design

The present study adopts a quantitative approach to investigate the application of nested eco-innovation. Quantitative research aids in measuring hypotheses (Sturmberg & Marcum, 2024). A cross-sectional and explanatory design was used in this study. This approach is congruent with the call for nation-specific studies on eco-innovation for tourism development. The choice of eco-innovation in the hospitality industry aligns with the global, regional, and national calls and efforts to achieve sustainability (Ilic et al., 2022; Singal et al., 2015). The research model with proposed relationships was developed based on an extensive review of the relevant literature. Eco-innovation in the hotel industry is essential for reducing environmental impact while maintaining high-quality service standards. Through energy efficiency, water conservation, waste reduction, and sustainable guest experiences, hotels can contribute to a greener future while enhancing their brand value and operational efficiency (Wang et al., 2020). Data on the model constructs were collected in a survey targeting managers in Ghanaian star-rated hotels. The model was controlled using hotel size and age.

3.2 Research Sample

Using a census sample technique, the study's population comprises hotel managers working in three to five-star establishments in Ghana's Central Region and Greater Accra. The selected hotels with ratings between three and five stars accurately capture the variety and traits of the industry's 3-to-5-star population. Hotel managers who possessed hotels with government-awarded star ratings for at least three years were sent the questionnaire for the quantitative study (GTA, 2021). This ensured that the respondents' knowledge was derived from training, the availability of eco-innovation items, and the actual use of eco-innovation procedures. Two hundred eighty questionnaires were therefore distributed to hotel managers. After data screening, 225 was obtained and used for the data analysis. That is an astounding 87% of managers responded to the survey. In order to preserve the integrity of the dataset utilised for the study, responses with low data quality were excluded, resulting in a population decrease of 225.

3.3 Research Instrument

The questionnaire was given to managers who were legitimately involved in making decisions. A Likert scale with five possible responses—from strongly disagree (1) to strongly agree (5)—was used in the poll to gauge respondents' attitudes. Cronbach Alpha was used to assess the surveys' validity and guarantee consistency. Permission for the study was obtained after informing the hotel administration. The objectives of the study and the participants' rights were communicated to the hotel managers. The authorities were assured of the anonymity and privacy of the collected data. This study's operationalised measuring variables were modified from earlier studies. Four stakeholder indicators were modified from previous research (Chan, 2021; Wang et al., 2021). Eco-innovation practices which include five questions from eco-innovation processes and five questions on eco-innovation products were posed (Chan, 2021; Wang, 2021). Hotel performance was modified to include five non-financial outcome metrics and four financial outcome indicators.

3.4 Research Procedure

A questionnaire was used to collect primary data for this investigation. Data analysis is done using Structural Equation modelling (SEM) SMART-PLS. SEM is a powerful tool for examining how linkages like eco-innovation, stakeholder pressure, and hotel performance interact.

4. Results and Findings

This paper explores the mediating role of a nested eco-innovation process and eco-innovation product in the performance of 3-to-5 star-rated hotels in Ghana. Using data from 225 respondents and employing structural equation modelling (SEM) with Smart-PLS, findings reveal that eco-innovation processes and products significantly mediate the relationship between stakeholder pressures and the performance of star-rated hotels. The findings of the study are discussed below:

4.1. Descriptive Statistics

Managers of the 3-to-5-star hotels made up the survey's participants. The managers are qualified to deliver adequate and accurate information on their stakeholders, eco-innovation practices, and the performance of the different hotels. Table 1.1 below demonstrates that 40% of the respondents were general managers, operations managers comprised 25.3%, marketing managers comprised 31.1%, hygiene managers were 3%, and 1.3% did not state their positions in the hotels. Furthermore, 44% of the respondents had been in their posts for one to five years. 37% of respondents had held the position for six to ten years. 12% of the managers were in the same position for eleven to fifteen years, and 7.1% had been in their role for more than sixteen to twenty years.

Table 1. Descriptive Statistics for Hotel Managers

Details		Frequency (n=225)	Per cent (100%)
Positions	General Manager	89	40.0
	Operations Manager	57	25.3
	Marketing Manager	70	31.1
	Hygne Manager	6	3.0
	Others	3	1.3
Number of Years in that Position	1-5	99	44.0
	6-10	83	37.0
	11-15	27	12.0
	16-20	16	7.1

4.1.2 Hotel Characteristics

The study considered the number of employees and the hotel's years in operation as demographic variables. The hotel's age and size are the hotel's characteristics. The profile of the hotel characteristics is illustrated in Table 7.2 below.

Table 2 Hotel Characteristics

Details		Frequency (n=202)	Per cent (100%)
Hotel's years of operations	1-5	32	15.8
	6-10	83	41.1
	11-15	54	26.7
	16-20	23	11.4
	More than 20	10	5.0
Hotel's Employee size	Less than 50	18	8.9
	51 – 100	97	48.0
	101- 150	65	32.2
	More than 150	22	10.9
Hotel's Rating	1 Star	114	56.4
	2 Star	70	34.7
	3 Star	10	5.0
	4 Star	4	2.0
	5 Star	4	2.0

According to Table 7.2 most hotels (41.1%) have been open for six to ten years. The hotel's lifespan provides information on its length of operation. Thus, the period might also suggest how long a hotel operates. However, most of the hotels in this study were still in their prime (6 to 10 years). According to Narteh et al. (2013), hotels in Ghana are developing, so there are more low-rated hotels than high-rated ones. In addition, building hotels in Ghana comes at a considerable cost (Narteh et al., 2013). The results indicate that most hotels (48%) employed between 51 and 100 people. The number of employees revealed information about a hotel's size. Most hotels have more than 51 employees. This observation demonstrates that the hotels utilised for this study were medium sized to large hotels. Furthermore, the amenities or features of a given hotel describe its rating. 56.4% of the hotels in this research had a one-star rating. Ghana has more low-rated hotels than high-rated hotels, as evidenced by the vast percentage of respondents who work for low-rated (1- and 2-star) hotels.

4.2 Measurement Modelling Evaluation

The validity and reliability of the dataset are evaluated using Factor Loadings (FL), Cronbach Alpha (CA), Composite Reliability (CR), and Average Variance Extracted (AVE). According to Hair et al. (2021), the validity and convergence of the assessment items are demonstrated by values that are higher than the thresholds of (.50), (.70), (.70), and (.50). According to Marklinder et al. (2022), a factor loading greater than .50 was kept, as shown in Table 3. Both values in Table 3, CA and CR show that the measuring items are valid and reliable, as they surpass the recommended threshold of .70 (Sarstedt et al., 2019). According to Hair (2021), the consistency of the questions is shown when the AVE values are higher than the recommended cutoff of .50. Because the measurement item values in Table 3 are more significant than .50, AVE findings show that AVE is accurate.

Table 3. Measurement Model

Constructs	Code	FL	CA (α)	CR	AVE
Stakeholder Pressure	SP		0.84	0.89	0.74
Indicators					
Competitors	SP1	0.87			
Customers	SP2	0.85			
Employees	SP3	0.69			
Government	SP4	0.93			
Suppliers	SP5	0.70			
Eco- Innovation Process	PRC		0.85	0.91	0.77
Indicators					
Opportunity Identification	PRC2	0.77			

Continuous Improvement	PRC3	0.93			
Market Deployment	PRC4	0.92			
Eco-innovation Products	PROD		0.91	0.93	0.71
Indicators					
Sustainable Materials & Design	PROD1	0.85			
Energy Efficiency & Renewable Energy	PROD2	0.83			
Pollution Reduction & Emission Control	PROD3	0.84			
Sustainable Agriculture & Food Innovation	PROD4	0.85			
Smart & Green Transportation	PROD5	0.85			
Hotel Performance	HP				
Indicators			0.89	0.91	0.54
Sales Growth	HP1	0.68			
Cash Flow Analysis	HP2	0.73			
Market share	HP3	0.76			
Revenue	HP4	0.82			
Customer Satisfaction	HP5	0.61			
Employee Engagement	HP6	0.80			
Operational Efficiency	HP7	0.71			
Brand Reputation	HP8	0.70			
Innovation	HP9	0.78			

4.2.1 Multicollinearity

According to Hair et al. (2021), common method bias is proposed to be markers of the occurrence of a variance inflation factor (VIF). When the VIFs derived from a thorough collinearity test are equal to or lower than 3.3, a model is considered free of common method bias. The VIF values from the study are lower than 3.3, ranging from (1.03 to 3.07). As a result, the study does not suffer from common method bias. The results of the VIF in Table 4 below.

Table 4 Variance Inflation Factor (VIF)

Outer Valus	VIF
SP1	0.77
SP2	0.85
SP3	0.69

SP4	0.93
SP5	0.70
PRC2	2.60
PRC3	2.11
PRC4	2.24
PROD1	1.03
PROD2	2.07
PROD3	1.84
PROD4	0.85
PROD5	0.85
HP1	0.68
HP2	0.73
HP3	0.76
HP4	0.82
HP5	0.65
HP6	0.80
HP7	0.72
HP8	0.70
HP9	0.73

4.2.3 Discriminant Validity

The findings indicate that the association between a construct and other components is less than its square root of AVE, indicating excellent discriminant validity (see bold values). Results are shown in Table 5.

Table 5 Discriminant Validity

	SP	PRC	PROD	HP
SP	**0.83**			
PRC	0.79	**0.79**		
PROD	0.76	0.77	**0.77**	
HP	0.77	0.76	0.69	**0.77**

4.2.3 Model Fit Analysis

The significance path coefficients, the blindfolding-based cross-validated redundancy measure (Q2), and the coefficient of determination (R2) were measured. The coefficient of determination is denoted by R^2. It shows the percentage of a dependent (endogenous) variable's variance that can be accounted for by the model's independent (exogenous) variables. Thus, the R square (R2) value determines the variance and explains the model's explanatory power. As a rule, Hair et al. (2021) indicated that R2 values of (0.75), (0.50), and (0.25) are substantial, moderate, and weak respectively. From the analysis R2 of 0.50 indicates that 50 per cent of the variance in stakeholder pressure is explained by the hotel’s performance. The R2 of 0.62 means that 62 per cent of the variance in the predictors made up of the influence of stakeholder pressure and has a substantial

explanatory effect on eco-innovation process. R2 of 0.56 means that 56 per cent of the variance in the predictors made up of the influence of stakeholder's pressure has a substantial explanatory effect on eco-innovation product.

The Effect size (f^2) evaluates the impact of an independent variable (exogenous construct) on the dependent variable (endogenous construct) in terms of its contribution to the explained variance (R^2) in the model (Hair et al., 2021). According to Cohen's (1988) general rule, effect sizes should be small (0.02), medium (0.15), and large (0.35). Thus, $f^2 \geq 0.02$: Small effect, $f^2 \geq 0.15$: Medium effect, $f^2 \geq 0.35$: Large effect. The results show that there is a small effect size stakeholder pressure (0.09), when removed from the model predicting eco-innovation processes and product. This result indicates that the effect of the exclusion of these predictors of Eco-Innovation Practices dimensions do not lead to a significant impact on the exogenous constructs. An important finding relating to the (0.01) for both eco-innovation process and eco- innovation product) is the relevance of the dimensions of eco-innovation practices on hotel performance.

The predictive relevance (Q^2) is a measure of the predictive accuracy of the model. This was investigated using the blindfold method Hair et al. (2021). The rule states that Q2 values must be greater than zero for an endogenous construct, indicating the predictive accuracy of the structural model. The Q2 values higher than (0), (0.25) and (0.50) signify small, medium, and large predictive relevance of the PLS path model (Hair et al., 2021). From the results, all the Q2 values are greater than zero. Hotel performance (0.27) and Eco-innovation practices (0.32). Therefore, all the endogenous predictors have scores higher than zero which signifies that they are relevant in contributing to the predictive accuracy of the path model used.

4.3 Structural Modelling Evaluation

4.3.1 Direct structural hypothesis testing results

Table 6 and Figure 2 present the hypothesis testing results of the direct effects, and Figure 2 shows the measurement model results.

H1: There is a positive relationship between stakeholder pressure and the hotel's performance.

The outcome demonstrates that SP did not positively and significantly impacts HP in Ghanaian H1 ($\beta = 0.075$, $t = 0.937$, $p = 0.349$), hypothesis 1 was not supported.

H2: Stakeholders influence hotel managers to use eco-innovation practices.

The result shows that SP positively and significantly influences ECO-PRC and PROD

H2a: Eco-innovation process ($\beta = 0.766$, $t = 29.169$, $p = 0.000$). Hence, the hypothesis 2 (H2a) was supported.
H2b: Eco-innovation product ($\beta = 0.718$, $t = 20.037$, $p = 0.000$). Hence, the hypothesis 2 (H2b) was supported.

H3: Eco-innovation processes and products influence hotel performance

The outcome displays that ECO-PRC positively and significantly influences the HP in Ghana.
H3a: (β = 0.421, t = 4.786, p = 0.000). Hence, the hypothesis 3 (H3a) was supported.
The outcome displays that ECO-PROD did not positively and significantly influence the HP in Ghana.
H3b: (β = 0.075, t = 0.896, p = 0.370). Hence, the hypothesis 3 (H3b) was not supported.

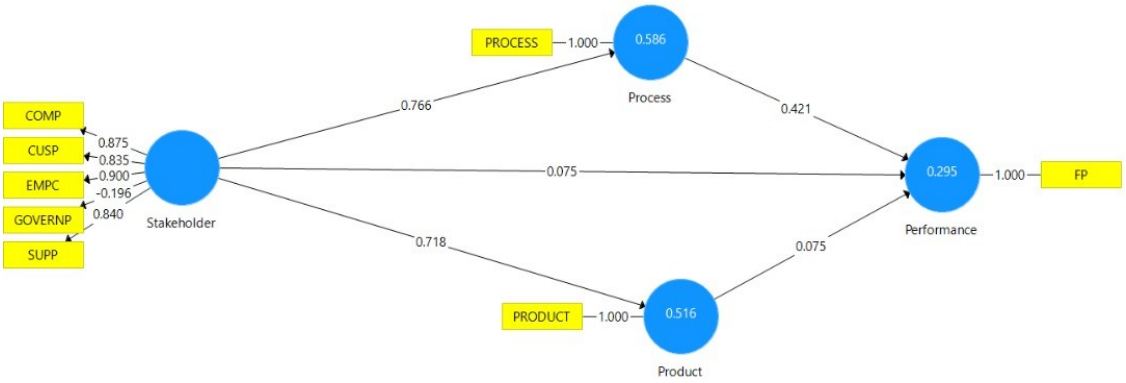
Table 6. Structural Model: Direct Hypothesis Testing

Hypotheses	Structural paths relationship	β	*t*	*p*	Decision
H1	SP -> HP	0.075	0.937	0.349	Not Supported
H2	SP -> ECO-PRC	0.766	29.169	0.000	Supported
	SP -> ECO-PROD	0.718	20.037	0.000	Supported
H3	ECO-PRC -> HP	0.421	4.786	0.000	Supported
	ECO-PROD -> HP	0.075	0.896	0.370	Not Supported

Key: Stakeholder pressure-SP; Eco-innovation process-ECO-PRC; Eco-innovation product- ECO-PROD; Hotel performance-HP

The measurement model presented in Figure 2 evaluates the reliability and validity of the constructs Stakeholder Pressure (SP), Eco-Innovation (PRC & PROD), and Hotel Performance (HP). High factor loadings (typically above .70) suggest that the indicators are good measures of their respective constructs. The path coefficients indicate the strengths/weaknesses and direction of the relationships between the constructs. Where SP and HP did not show a positive direct effect, SP and PRC&PROD showed a positive direct effect. ECO-PRC to HP showed a positive effect but ECO-PROD to HP did not display a positive effect.

Figure 2. Measurement Model Diagram



4.3.2 Mediating structural hypothesis testing results- (Nested Eco-innovation)

According to Hellström (2007), The term "nested eco-innovation" describes a hierarchical, interconnected structure in which bigger systems (like eco-innovation processes) contain smaller components (like individual eco-innovation products). The result is a multi-layered strategy in which many levels of innovation collaborate to achieve a shared sustainability objective. Nestled eco-innovation so guarantees that distinct systems, processes, and products function to produce long-term business and environmental advantages (Wang et al., 2024).

H4: Nested eco-innovation mediates the relationship between stakeholder pressure and hotel performance

According to Hellström (2007), The term "nested eco-innovation" describes a hierarchical, interconnected structure in which bigger systems (like eco-innovation processes) contain smaller components (like individual eco-innovation products). The result is a multi-layered strategy in which many levels of innovation collaborate to achieve a shared sustainability objective. Nestled eco-innovation so guarantees that distinct systems, processes, and products function to produce long-term business and environmental advantages (Wang et al., 2024). The results of the analysis indicate that when eco-innovation products were embedded in the relationship between stakeholders, eco-innovation process and hotel performance, there was no positive and significant impact. However, when the eco-innovation process was embedded in the relationship between stakeholders and hotel performance, there was a significant positive and significant effect. Mediation analysis determines whether nested eco-innovation mediates the relationship between stakeholders and hotel performance. With significant indirect effects among Stakeholder -> Process -> Performance, a partial mediation effect was achieved. However, significant indirect effects among Stakeholder -> Product -> Performance full mediation effect was accomplished.

Table 7. Structural Model: Mediating Hypothesis Testing

Hypotheses	**Variables**	**Structural relationship**	**β**	***t***	***p***	**Hypothesis results**
H4	Nested ECO-PRC&PROD	SP -> PROD -> HP SP -> PRC ->HP	0.054 0.322	0.886 4.587	0.376 0.000	Not Supported Supported

However, there is a partial mediation effect for the link when eco-innovation practices are not nested in stakeholders and hotel performance.

Table 8.

Structural Relationship	**β**	***t***	***P***	**Hypothesis Results**
Stakeholder -> Process -> Performance	0.355	6.011	0.000	Supported

Stakeholder -> Product -> Performance	0.199	3.807	0.000	Supported

5. Discussion

The findings of this study provide valuable implications for the design and implementation of nested eco-innovation practices in 3-to-5 star-rated hotels. Eco-innovation processes should be nested across multiple disciplines or areas of the hotel chain, and managers should encourage cross-departmental nesting in the eco-innovation process to improve eco-innovation product development. Hotel companies should emphasise green technological innovation and green product innovation initiatives to address the nest patterns of eco-innovation processes across disciplines. A solid proposal for a green hotel eco-innovation framework is provided, which can help hotel companies design eco-innovation strategies and systems nested across departments in different hotel locations. The implication of this study is that academic researchers can focus on the generalisation of the eco-innovation framework in designing eco-innovation strategies and systems nested across disciplines. Further attention should be given to the generalizability of findings from Ghana hotels and other developing economies. The study sheds light on the need for further focus on eco-innovation and emphasises the developmental objectives of eco-innovation in facilitating sustainable industry development in developing markets. This research is one of the few attempts to design and develop a framework for eco-innovation strategies nested across multiple stakeholders and hotel performance in developing nations.

Through the use of Smart-PLS 3, which employs a partial least squares structural equation modelling (PLS-SEM) path approach, data from 226 star-rated hotels in Ghana was analysed to determine the mediating role of eco-innovation process and eco-innovation product in the performance of the hotels. The study highlighted the concept of the eco-innovation process, eco-innovation product, and hotel performance in Ghana. First, it was found that the eco-innovation process significantly affects the eco-innovation product in star-rated hotels in Ghana. This corroborates prior frameworks on the eco-innovation process and eco-innovation product. Second, it was found that the eco-innovation product significantly affects the performance of star-rated hotels in Ghana. This is consistent with the previous view that hotels cannot boast of good performance without providing eco-innovation products, among which eco-innovation services stand out as critical elements. Last, it was observed that both the eco-innovation process and eco-innovation product significantly mediate the relationship between the performance of star-rated hotels in Ghana. The study contributes to the literature on eco-innovation processes and products in developing countries. Additionally, it provides implications for the orbital point of management in hotel performance through sustainable strategies.

6. Implications

6.1 Practical Implications for Policy Makers

The study has practical implications for aiding policy formulation to promote sustainability in the hospitality industry. Policy programs should focus on improving public accommodation by promoting energy-efficient facilities, preventing the

deterioration of terrestrial and aquatic ecosystems, and ensuring the availability of a clean atmosphere to improve air quality and reduce greenhouse gas emissions. Macro budgets should be assigned to train and educate hospitality personnel. The Ministry of Tourism should perform feasibility studies to ensure that green hotel properties are best suited for specific locations and harmonise with local culture while playing a complementary role to existing properties.

6.2. Managerial Recommendations

The findings of the study assist managers of star-rated hotels in Ghana in reinforcing the focus on eco-innovation strategies. It is highly recommended that hotel managers construct a long-term roadmap for eco-innovation by fostering eco-innovation practices. It is highly suggested that hotel managers ensure that the hotel executives are actively engaged in eco-innovation-related tasks so that the whole hotel staff is aware of the benefits of eco-innovation. The hotel associations should organise kits and workshops related to eco-innovation for the hotels. The management of the hotel could institute an award for the “Best Eco-Innovation staff” so that other employees can embrace eco-innovation. Eco-innovation strategies should be integrated into the hotel companies' overall strategies, and hotels should set clear eco-innovation objectives. Eco-innovation programs should be introduced in star-rated hotels, as there is a strong indication that the presence of awareness programs on the eco-innovation process in star-rated hotels will bring a huge participation in the eco-innovation process.

7. Conclusion and Recommendations

Due to emerging economic challenges, sustainable development in the tourism sector is of increasing interest to many stakeholders. Star-rated hotels in developing markets typically pay attention to eco-innovation practices through eco-innovation processes and products to achieve the hotel’s green performance. However, the role of eco-innovation processes and products in the performance of star-rated hotels remains unexplored. Accordingly, this study investigates the mediating role of nested eco-innovation processes and products in enhancing the performance of star-rated hotels. Based on a survey of 225 star-rated hotels in the Greater Accra and Central region of Ghana, structural equation models are estimated using Smart-PLS. The results show that eco-innovation processes and products positively and significantly influence the performance of star-rated hotels. Both play a complementary mediating role in strengthening the relationship between tourism development and the performance of star-rated hotels. The findings also highlight the critical role of eco-innovation practices in achieving sustainable growth in the tourism sector. Some future directions are suggested in light of the study's limitations.

8. Limitations and Future Research Directions

The current study's empirical examination of the mediating roles of nested eco-innovation processes and products across the performance of 3-to-5-star-rated hotels provides an important and valuable contribution to the existing body of knowledge. To promote and weather-harden the utility of this research output in the conduct of subsequent studies, some need for caution in interpreting the results of this inquiry is noted. Design-related

restrictions encumbered this study process. The sample was limited to 3-to-5-star hotels in Greater Accra and Central Regions of Ghana that meet the criterion of star-rated hotels; further studies could be conducted in other regions to promote the hospitality industry in Ghana-

Data collection in the present study was carried out only in the West African country of Ghana. This could represent a limitation in the view of the internationalisation (transferability) of the empirical results obtained. Great caution should, therefore, be noted when assessing the transferred validity and value of the results of this study to contexts differing in geographical or cultural aspects. This study investigates the mediating role of nested eco-innovation processes and eco-innovation products in enhancing the performance of star-rated hotels. It highlights the importance of green commitment to achieving environmental and economic performance. However, some limitations must be acknowledged. First, this study focuses only on 3-5-star-rated hotels because they typically take the lead in adopting and developing eco-innovation practices in the hotel industry. A similar study should compare environmental, organisational, and economic performance among chain, star-rated, and other hotels.

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Track 7 - Healthcare Management

Track 8 - Energy Management

NATURAL RESOURCE ENDOWMENT, FOOD SECURITY AND AFRICA's ECONOMIC TRANSFORMATION: THE CRUCIAL RELEVANCE OF ENERGY TRANSITION

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Abstract

This paper studies the impact of natural resource endowment and food security on Africa's economic transformation by analysing 19 African countries between 2010 and 2022 using the Augmented Mean Group (AMG) approach. This paper found that natural resource endowment and food security combined with energy transition can significantly increase economic transformation in African countries. The study shows the importance of energy transition in bolstering the impact of food security in resource-rich nations to achieve economic transformation. Finally, the study recommends significant policies to aid African countries in attaining higher sectors of economic transformation.

Keywords: Natural Resources; Food Security; Energy Transition; Economic Transformation.

JEL Codes: O13; Q18; P36; Q42; N57.

Introduction

Natural resources, encompassing minerals and fossil fuels, have historically played a decisive role in shaping economic structures and development trajectories (Auty, 1993). Data from the World Bank (2023) highlights that numerous African countries possess substantial natural resource reserves, with mineral-rich nations like South Africa and Nigeria prominently featured. However, the Resource Curse theory introduces a paradox wherein countries heavily reliant on resource revenues might grapple with diversification hurdles, as emphasized by Auty (1997). This dynamic connection between natural resource abundance, economic transformation, and potential constraints lays the groundwork for a comprehensive exploration of these variables within the context of African nations.

The intertwining of food security, a vital indicator of societal well-being, with economic transformation and natural resource endowment is a complex narrative deserving careful analysis. As underscored by the Food and Agriculture Organization (FAO, 2021), Sub-Saharan Africa struggles with food insecurity, affecting approximately 239 million individuals. This statistic underscores the urgency of establishing robust food production systems, especially in regions where agriculture is pivotal for livelihoods and employment. The reliance on natural resources, whether as income sources or factors influencing agricultural productivity, introduces intricate dynamics that influence a nation's ability to achieve food security objectives. In Africa, where agriculture often constitutes a substantial portion of the economy, achieving food security is paramount. However, challenges such as land degradation, climate change, inadequate infrastructure, and limited access to modern agricultural technologies hinder efforts to ensure a consistent and adequate food supply (Premanandh, 2011). The interplay between natural resource management and food security is complex, as unsustainable resource exploitation can contribute to environmental degradation and compromise agricultural productivity, exacerbating food insecurity (Misselhorn et al., 2012; Gomiero, 2016).

Against the backdrop of the global imperative for sustainable development and reduced environmental impact, the transition to renewable energy sources takes the central stage. The Intergovernmental Panel on Climate Change (IPCC) emphasises the urgency of swift renewable energy adoption to mitigate greenhouse gas emissions. In this context, African nations have a unique opportunity to leapfrog into renewable energy, sidestepping some challenges faced by industrialised economies. Examples abound, such as Kenya and South Africa, investing in solar and wind energy (Ansari et al., 2013). However, the path to energy transition is complex, requiring meticulous policy frameworks and robust infrastructure. Studies have shown that energy transition, involving a shift from fossil fuels to renewable sources, can lead to reduced greenhouse gas emissions, improved energy security, and potential economic benefits (Owusu and Asumadu-Sarkodie, 2016). African countries, endowed with abundant renewable energy resources, stand to benefit from adopting clean energy technologies. Increasing investments in solar, wind, hydro, and geothermal energy can not only contribute to mitigating climate change but also foster economic growth by creating jobs and enhancing energy access (Yüksel, 2010; Creutzig et al., 2014). Nonetheless, challenges related to infrastructure, financing, and policy implementation must be navigated to realize the full potential of energy transition in Africa.

As global discussions underscore the importance of natural resource availability, food security, and the transition to sustainable energy in driving economic progress, the necessity for this study becomes increasingly evident. Previous research has fallen short of establishing a comprehensive link between the effects of natural resource availability and food security concerning economic advancement. Moreover, the innovative exploration of how the transition

to sustainable energy can moderate both these factors within Africa's economic landscape expands the boundaries of knowledge. This has significant implications for numerous developing nations in Africa that are striving to find a delicate equilibrium between ensuring access to food and the wealth of natural resources and driving economic change, with the transition to sustainable energy emerging as a pivotal solution to counteract the adverse impacts of resource-related challenges. However, this challenge is complex, given that the dynamics of natural resource endowment and food security are critical to Africa's economic sustainability. Hence, the present study holds considerable value in illuminating this intricate relationship and its consequences for Africa's economic trajectory. Consequently, the specific objectives are as follows: (i) To investigate the influence of natural resources on Africa's economic transformation. (ii) To determine the impact of food security on economic transformation. (iii) To analyse the effect of natural resources on economic transformation via the moderating channel of energy transition. (iv) To assess the impact of food security on economic transformation through the channel of energy transition.

2. Literature Review

The role of natural resources in shaping economic outcomes has been a topic of extensive research. Qiang and Jian (2020) examined the effect of natural resource endowment on China’s economic growth from 2005 to 2018. The paper revealed that China is likewise affected at the provincial level and showed that its market resource allocation system which is of low-quality eventually resulted in the resource curse effect. The paper recommended that institutional quality should be raised, since the higher the institutional quality, the lower the reliance on natural resources and as such, the lower the resource curse. This opposes the findings of Ajide (2022) that studied the connection between natural resources endowment and economic complexity. The study revealed that in more thirty-two African countries, the natural endowment of those countries caused the natural resource course unconditionally. The study revealed that the effect applied across board especially in relation to economic transformation. These findings are opposed by a study done by Upreti (2015) which examined factors that resulted in economic transformation and found that natural resources endowment had a positive relationship to it in the long run. This proves that natural resource endowment plays a part in economic transformation.

Food security has emerged as a critical concern, particularly in the developing world, where a significant portion of the population relies on subsistence agriculture. The literature highlights the multidimensional nature of food security, encompassing availability, accessibility, utilization, and stability. Osundahunsi et al. (2016) looked at the impact of food security and food safety on Nigeria’s economic transformation. The research uncovered that food security is positively related to economic transformation. However, it found that several factors, such as conflicts, natural calamities, unemployment, insufficient technological utilization, and elevated post-harvest losses, contribute to the issue of food insecurity. The paper recommended that proper measures be taken such as food fortification and increased use of biotechnology to ensure better food security. Jayne et al. (2018) examined the connection between food security and economic growth. The study revealed that in Asia, a rice-based economy, Asian economies have refused to make rice, which is the most stable source of food in the region, to be readily available to customers, famers and consumers. The results show that this creates artificial scarcity in the region and slows down economic growth. The study recommended that energy transition combined with the government allowing the invisible hand of the market would ensure stability of its price along with its availability.

Gielen et al. (2019) examined the impact of energy transition on economic transformation. The study showed that an accelerated energy transition to 2050 would supply two-thirds of the world's demand for energy. The study revealed that an accelerated energy transition would result in scalable technologies, ubiquitous resources and ultimately, economic transformation. The paper advised enabling policy and regulatory frameworks to facilitate the necessary six-fold increase in renewable growth, primarily in wind and solar PV technologies, alongside a substantial emphasis on energy efficiency measures. This contradicts with Khan et al. (2021) that studied the impact of energy consumption and energy transition on economic transformation in International Energy Agency (IEA) countries. The study found that although the variables are related in the long run, only energy transition affects economic transformation negatively and significantly in the long run. As such, the paper recommended carbon taxation and costs to be settled by policymakers of the IEA countries.

In short, comprehending the complexities of economic transformation involves considering many different factors. Previous research mainly concentrated on indicators such as financial restructuring, social diversification, income inequality and economic growth (Fainstein and Fainstein, 1985; Zhou, 2000; Fantini, 2013), but they often overlooked natural resource endowment and food security. This study goes beyond examining the impact of these two (2) variables but also investigates the moderating effect of energy transition on Africa's economic transformation. By including interaction terms that show how natural resources and food security interact, we can better understand their combined influence on economic transformation. This research adds to the existing knowledge on economic sustainability models and provides a useful example for developing countries.

3. Methodology

The study leans on the Resource Curse theory to develop its framework. This theory, also known as the "Paradox of Plenty, is a widely studied phenomenon in the context of natural resource-rich countries such as the ones in Africa. This theory posits that nations endowed with abundant natural resources, such as oil, gas, and minerals, may experience slower economic growth and face numerous challenges in achieving sustainable development. Auty (1993) coined the term "resource curse" in his investigation of the underperforming economies of resource-rich developing countries.

The Resource Curse theory provides valuable insights into the potential pitfalls of overreliance on natural resources for a country's economic transformation. Nations heavily reliant on resource exports may prioritize the extraction and export of these resources, often at the expense of developing other sectors of the economy. This singular focus on resource-driven revenue can lead to limited diversification and hinder efforts to achieve food security through a well-rounded and resilient agricultural sector. Moreover, the export-oriented nature of resource-dependent economies can expose them to external shocks, such as fluctuations in commodity prices, which can disrupt food security and overall economic stability. When a nation's economic fortunes are heavily tied to resource revenues, it may face challenges in ensuring a stable and consistent food supply, especially in times of global economic volatility.

We specify our empirical model following studies by Tabash et al. (2022) and Mesagan et al. (2023) to conduct the empirical work. Model (1) entails analysing natural resource endowment and food security and is presented thus:

$$ECI_{it} = \alpha_0 + \alpha_1 NA_{it} + \alpha_2 FS_{it} + \alpha_3 FDI_{it} + \alpha_4 TO_{it} + \alpha_5 GFCF_{it} + \mu_{it} \quad (1)$$

Where GDPC (Gross domestic product per capita) captures economic growth and NRR (Natural resource endowment) proxies the natural resource wealth. The other moderating regressors include trade openness (TO), foreign direct investment (FDI), gross fixed capital formation (GFCF), and corruption control (COR).

The second model is then extended to accommodate energy transition, and is presented thus:

$$ECI_{it} = \alpha_0 + \alpha_1 NA_{it} + \alpha_2 FS_{it} + \alpha_3 ET_{it} + \alpha_4 FDI_{it} + \alpha_5 TO_{it} + \alpha_6 GFCF_{it} + \mu_{it} \quad (3)$$

ET is energy transition. All other variables in the model are consistent with the earlier explanations. Finally, we account for the moderating influence of energy transition on economic transformation in Africa by incorporating it as a moderator variable in equation (4):

$$ECI_{it} = \alpha_0 + \alpha_1 ET_{it} + \alpha_2 NAET_{it} + \alpha_3 FSET_{it} + \alpha_4 FDI_{it} + \alpha_5 TO_{it} + \alpha_6 GFCF_{it} + \mu_{it} \quad (4)$$

Where NAET is the interaction of natural resource endowment and energy transition (Resource-Energy Nexus) and FSET is the interaction of food security and energy transition (Energy-Food Nexus).

Table 1: Data Identification

Variable	Identification	Description	Source
ECI	Economic Transformation	Represented by Economic Complexity Index	WDI, 2022
NA	Natural resource endowment	Revenues generated from the exploitation of abundant natural resources within a country	WDI, 2022
FS	Food security	Availability, access, and utilization of nutritious food within a given population	WDI, 2022
ET	Energy transition	Captured by a ratio of Renewable and Non-renewable energy	Derived
NAET	Resource-Energy Nexus	Captured by the multiplication of natural resource endowment and energy transition	Derived
FSET	Energy-Food Nexus	Captured by the multiplication of food security and energy transition	Derived
FDI	Financial Development	Represented by credit to the private sector % of GDP	WDI, 2022
TO	Trade Openness	A country's degree of integration into international trade markets	WDI, 2022
GFCF	Gross Fixed Capital Formation	Total investment in physical assets within an economy	WDI, 2022

Source: Author's Compilation

This study employs the AMG method for analyzing specific country and panel data. The AMG method was chosen because of its capacity to yield consistent and efficient panel result estimates. Moreover, this analytical technique is robust, overcoming the constraints of cross-section (N) and time (T) encountered in the Generalized Method of Moments (GMM), making it a dynamic choice. The decision to use this approach is based on its ability to provide dynamic results and overcome the limitations of GMM (Pedroni, 1999; Mesagan et al., 2019). The study covers the period from 2010 to 2021, and data were obtained from the World Bank's World Development Indicators (WDI) (2022), as presented in Table 1.

4. Results and Discussion

4.1 Results

Table 2: Descriptive Statistics

Variable	Mean	Std. dev.	Min	Max
ECI	-0.804049	2.5635626	-2.505675	9.509432
NA	9.632694	8.216097	0.2961282	39.02268
FS	49.49564	6.604839	33.7	66.4
FDI	1916584612	3568747292	784000000	42000000000
TO	72.5423	23.65339	16.3531	124.204
GFCF	1092139533	17394688043	0	140000000000
ET	438.3114	610.3044	0.0600506	3324.493
NAET	6141.715	13659.92	0.8962704	90170.11
FSET	19270.86	24991.2	3.296778	113045.6

Source: Researcher's Computation

Table 2 shows the average levels of economic transformation, natural resource endowment, food security, energy transition, financial development, trade openness, gross fixed capital formation, natural energy transition and food energy transition are 1.45 metric tons per capita, 11.61 million people, 2198.96 United States Dollars (US$), 469.7, 927.98 million US$ rate, 63.94, 10.93 billion US$ and 592.56 million US$ and 356080.1 US$ respectively.

Table 3: Correlation Matrix

	ECI	***NARENT***	***FSEC***	***FDI***	***TO***	***GFCF***	***ET***	***NAET***	***FSET***
ECI	1								
NA	-0.5354	1							
FS	0.5834	-0.4396	1						
FDI	0.1767	-0.1803	0.2912	1					
TO	0.1551	0.1825	0.0529	-0.1214	1				
GFCF	-0.1294	0.061	0.2964	0.3271	-0.4387	1			
ET	-0.3185	0.3844	-0.6037	-0.0179	-0.0416	-0.2019	1		
NAET	-0.2976	0.5341	-0.4893	-0.0226	0.0937	-0.1803	0.8969	1	
FSET	-0.322	0.3638	-0.5987	-0.0185	-0.0549	-0.2063	0.9927	0.86	1

Source: Researchers' Computation

Table 3 reveals presence of weak correlations between economic transformation, natural resource endowment, food security, energy transition, financial development, trade openness, gross fixed capital formation, natural energy transition and food energy transition. Therefore, it is justified to combine these indicators into a single equation to enhance the analysis, considering their low collinearity. However, it is worth noting that all other variables demonstrate a reasonably significant relationship.

Table 4: Cross-sectional Dependence Test

Test	***Model I***	***Model II***	***Model III***
	Statistic	***Statistic***	***Statistic***
Breusch-Pagan LM	295.275***	3167.301***	295.335***
Pesaran CD	3.023***	14.735***	2.850***
Frees' CD	0.825***	5.913***	0.814***
Friedman CD	23.653***	135.631***	23.473***

***** indicates a significance level of 1%**

According to Table 4, the Breusch-Pagan, Pesaran, Frees and Friedman's statistics are significant at the 1% critical level, indicating the presence of cross-sectional dependence (CD) among the African countries. This confirms a strong CD among these countries, which means that the first-generation unit root test is inappropriate for determining the panel regressors' stationarity. Therefore, we introduce the second-generation unit root test, which employs Pesaran's CIPS test, and present the results in Table 5.

Table 5: CIPS Unit Root

	HO: Non-stationary				
Variables	***CIPS at Level (0)***	***CIPS At First Difference (1)***	***5%***	***1%***	***Status***
ECI	-2.412***	-5.071***	-1.87	-1.79	I(0)
NA	-1.609	-3.484***	-1.87	-1.9	I(1)
FS	-1.665	-3.767***	-1.87	-1.9	I(1)
FDI	-1.723	-3.992***	-1.87	-1.9	I(1)
TO	-1.708*	-2.521***	-1.87	-1.9	I(1)
GFCF	-1.006	-2.478***	-1.87	-1.9	I(1)
ET	-3.290***	-3.745***	-1.87	-1.9	I(0)
NAET	-1.629	-3.389***	-1.87	-1.9	I(1)
FSET	-2.576***	-3.610***	-1.87	-1.9	I(0)

Note: 1%, 5%, and 10% level of significance with *, **, and * respectively.**

We utilized the CIPS unit root test developed by Pesaran (2007) to determine the stationarity of various variables, considering the presence of cross-sectional dependence as indicated in Table 4. The results from Table 5 demonstrate that only economic transformation, energy

transition and food energy transition is stationary at level. On the other hand, natural resource endowment, food security, financial development, trade openness, gross fixed capital formation and natural energy transition become stationary after being differenced once. Consequently, we reject the null hypothesis and affirm that all the series under consideration exhibit stationarity.

Panel Regression Results

We present the study's empirical findings in Table 6. Table 6 show the AMG and CCEMG estimates for Model I, II and III. The Augmented Mean Group (AMG) results were done due to cross-sectional dependence. Moreso, to check for the robustness of our estimates in Table 6, we apply the Common Correlated Effects Mean Group (CCEMG) and present the findings in Table 7.

Table 6: Estimates of the Augmented Mean Group (AMG)

Independent Var.	**Dependent Var. ΔECI**		
	Model I	***Model II***	***Model III***
AMG			
NA	-0.0201	-0.0268	-
	(0.0131)	(0.0151)	
FS	-0.0043**	0.0018***	-
	(0.0020)	(0.0008)	
ET	-	0. 0012***	0.6930***
		(0.0006)	(0.2563)
NAET	-	-	0.0019
			(0.0012)
FSET	-	-	0.0140**
			(0.0070)
FDI	0.0341	0.02848	0.0907
	(0.0310)	(0.0238)	(0.0645)
TO	-0.0026	-0.0026**	-0.0042**
	(0.0019)	(0.0012)	(0.0020)
GFCF	-0.0651	-0.0851	-0.2314**
	(0.0621)	(0.0558)	(0.1199)
Constant	-4.0492***	-3.5505**	-3.0812**
	(1.5436)	(1.4867)	(1.4004)

*****, **, and * represent 1%, 5%, and 10% levels of significance. Author's compilation.**

Table 6 above shows that natural resource endowment and food security have a negative impact on economic transformation in both models I and II. However, natural resource endowment had an insignificant impact in model I and II, unlike food security which had a significant impact on economic transformation in both models. Natural resource endowment and food security reduced economic transformation by 2.01% and 0.4% respectively. It was revealed that energy transition had a positive and significant impact on economic transformation by increasing it by 0.1% and 69.3%. The moderation terms in Model III had a positive impact on

economic transformation. This suggest that interacting energy transition with natural resource endowment and food security could potentially increase economic transformation.

Table 7: Common Correlated Effects Mean Group (CCEMG)

Robustness Check using the Common Correlated Effects Mean Group estimates (CCEMG)

Independent Var.	**Dependent Var. ΔECI**		
	Model I	***Model II***	***Model III***
CCEMG			
NA	-0.0255	-0.0988	-
	(0.0211)	(0.0778)	
FS	-0.0187***	0.0298***	-
	(0.0059)	(0.0095)	
ET	-	0. 0080**	0.0272***
		(0.0034)	(0.0019)
NAET	-	-	0.0039
			(0.0034)
FSET	-	-	0.0055**
			(0.0025)
FDI	0.1428	-0.0533	-0.0612
	(0.1378)	(0.0391)	(0.0581)
TO	-0.0294	0.0134	-0.0042**
	(0.0183)	(0.0128)	(0.0015)
GFCF	0.5800	0.2081	0.0043*
	(0.4992)	(0.1531)	(0.0024)
Trend	-0.0511	0.0640	-0.0755
	(0.0492)	(0.0449)	(0.0409)
AV_ECI	0.3522	0.7434	0.5681
	(0.2874)	(0.6286)	(0.3941)
AV_NA	0.0168	0.0194	-
	(0.0138)	(0.0458)	
AV_FS	0.2183	0.0280	-
	(0.1215)	(0.0229)	
AV_ET	-	-0.0018	-0.0056**
		(0.0013)	(0.0020)
AV_NAET	-	-	0.0016**
			(0.0007)
AV_FSET	-	-	0.0024***
			(0.0007)
AV_FDI	0.6434	0.1143	0.0007
	(0.4465)	(0.1095)	(0.0007)
AV_TO	0.0726	0.0148	0.0094
	(0.0568)	(0.0101)	(0.0078)
AV_GFCF	0.1329	0.2411**	0.0124
	(0.0574)	(0.1397)	(0.0103)
Constant	20.4568	-14.0966***	12.3413
	(17.8412)	(6.9014)	(11.2239)

*****, **, and * represent 1%, 5%, and 10% levels of significance. Author's compilation.**

The robustness check is done using CCEMG estimates. The robustness of the estimates for the main regressors is supported by the consistent findings of the CCEMG analysis in Table 7, which align with the results of the AMG analysis in Table 6.

4.2 Discussion of Results

The results light on the impact of natural resource endowment and food security on economic transformation in Africa, with a focus on the moderating influence of energy transition. First, since natural resource endowment is found to have an insignificant impact on economic transformation in both models I and II, this suggests that the presence of natural resources alone may not be sufficient to drive substantial economic transformation in Africa. This result is consistent with previous literature that emphasizes the importance of natural resource management and value addition to translate natural resource endowment into economic growth (Jones et al., 2019). It is likely that factors such as political stability, institutional quality, and investment in human capital play significant roles in determining how natural resources contribute to economic development.

In contrast, food security emerges as a more influential factor impacting economic transformation, as it is found to have a significant negative effect in both models. This underscores the critical role of food security in promoting economic growth and stability in African countries. Ensuring adequate food supply, improving agricultural productivity, and implementing effective food distribution mechanisms are essential for reducing vulnerability to shocks and stimulating economic development (Gibbon and Ponte, 2019). The findings highlight the need for policymakers to prioritize investments and policies that address food security challenges to foster sustained economic transformation.

Moreover, the positive and significant impact of energy transition on economic transformation in both models I and II signifies its potential as a driver of economic growth and transformation in Africa. The results indicate that adopting cleaner and more sustainable energy sources can lead to notable economic benefits. This aligns with the global trend towards renewable energy adoption, which has been associated with job creation, reduced environmental degradation, and enhanced energy security (Ren, 2022). The encouraging findings on energy transition underscore the importance of investing in renewable energy infrastructure and technologies across the continent to accelerate economic transformation. The incorporation of moderation terms in Model III also reveals that interacting energy transition with natural resource endowment and food security could potentially boost economic transformation. This suggests that combining efforts to promote energy transition with strategies to effectively manage natural resources and address food security challenges may lead to synergistic effects, resulting in greater economic development.

In conclusion, the results from the AMG table provide valuable insights into the relationship between natural resource endowment, food security, energy transition, and economic transformation in Africa. The findings highlight the significance of food security and energy transition in shaping economic development outcomes on the continent. While natural resource endowment alone does not show a substantial impact, its interaction with energy transition and food security presents an opportunity for fostering greater economic transformation. These results offer valuable guidance for policymakers and stakeholders seeking to design effective strategies to promote sustainable economic growth and development in Africa. Future research

could further explore the underlying mechanisms driving these relationships and examine potential regional variations to inform more targeted and context-specific policy interventions.

5. Conclusion

This study assesses how the availability of natural resources and food security impact the process of economic transformation in African nations. Through robust AMG and CCEMG analysis methods, the research investigates an extensive dataset covering the years 2010 to 2022. What sets this study apart is its holistic approach in examining the combined influence of natural resource availability, food security, and the moderating role of energy transition on economic transformation, all within a unified framework. The results reveal that the interplay among natural resource availability, food security, and energy transition has significant potential in advancing economic transformation. Given these findings, it is strongly recommended that African countries continue proactive efforts to enhance economic transformation. This can be achieved through resource diversification, increased investment in agriculture, and improved infrastructure to support economic activities in these sectors.

5.1 **Theoretical and Empirical Contributions**

The findings of the study have enriched our understanding of how the availability of natural resources and ensuring food security influence economic transformation. Additionally, the study underscores the significance of integrating energy transition to ensure enduring economic transformation. As a result, the research contributes significantly to the discourse on Africa's economic transformation, offering actionable policy recommendations. One vital proposal underscores the urgency of diversifying skills development across the continent. This involves a comprehensive approach: aligning educational curricula with the evolving needs of emerging industries, introducing vocational training programs, and partnering with industries for apprenticeships. This strategy would empower the workforce with skills directly applicable to the job market, thus fostering a dynamic and adaptable labour force crucial for sustainable economic expansion. Furthermore, the study advocates for the establishment of a robust innovation ecosystem. This entails creating specialized research and technology hubs in key industries, providing financial incentives for research initiatives, and fostering collaboration between academia and industry. Supportive infrastructure, such as research grants and technology parks, should be developed to facilitate the practical application of research findings. By nurturing a culture of innovation, this approach aims to drive technological advancements, stimulate entrepreneurship, and ultimately propel growth across various sectors.

5.2 **Practical contributions**

The results of this study have significantly enhanced our comprehension of the complex interplay between natural resource availability and food security. This highlights the utmost importance of incorporating energy transition strategies into the pursuit of economic transformation. Consequently, a critical policy suggestion emerges, urging African countries to remain aware of the economic transformation challenges arising from inefficient natural resource management and food production. This is particularly relevant due to the continued use of traditional agricultural methods in many African nations. These outdated techniques limit efficiency and restrict economic progress. Thus, African leaders should prioritise the establishment of comprehensive agricultural extension initiatives. These programs should offer farmers training, resources, and access to modern farming technologies like tractors and

harvesters. When merged with targeted financial incentives, the approach can promote the adoption of modern techniques such as agroforestry, vertical farming, and hydroponics. Thereby improving food security and economic transformation.

Additionally, understanding the crucial role that energy transition plays in lessening the negative impacts of natural resource availability and food insecurity on economic progress, it becomes essential for African leaders to take proactive steps in allocating finances and fostering the growth of renewable energy initiatives. The aim is to mitigate potential adverse effects on the economy. This demands a significant commitment to strengthening the necessary infrastructure to facilitate the shift towards renewable energy sources. Moreover, a fundamental stride forward involves giving prominence to sustainability and seamlessly integrating eco-friendly energy solutions into the management of natural resources and agricultural products. By incorporating technologies like GPS, sensors, and data analysis to optimize resource utilization, African nations can effectively minimize waste by concentrating on advanced production methods, promoting energy-efficient technologies, and establishing partnerships for knowledge and technology transfer to drive efficiencies and enhance economic transformation.

5.3 **Limitations of the study and future research directions**

While our findings are significant, it's important to acknowledge certain limitations. Our research focuses on 19 African countries that have data on natural resource endowment, food security and energy transition. The limited data used for the analysis might not present a complete depiction of the outcomes in Africa. Nonetheless, as more data becomes accessible for a broader range of countries, upcoming research could adopt a more relative approach, using time-series analyses to examine specific nations individually.

Moreover, the conflict in Ukraine has raised tensions for countries with valuable resources like oil and gas. Russia and other involved nations are seeking alternatives to manage their resources due to the sanctions imposed on them. This could create economic ripples in different countries, possibly pushing them to switch from using resources like oil and gas to renewable energy sources. Therefore, it would be a good idea for future studies to consider these factors when they're looking at how economies are changing. Despite these limitations, the findings of our study give a strong starting point for looking at how having natural resources, ensuring food security, and transforming economies are connected.

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Track 9 - Operations, Supply Chain and Project Management

AN ASSESSMENT OF CUSTOMER SATISFACTION WITH SERVICES IN THE AIR CARGO SUPPLY CHAIN INDUSTRY IN NIGERIA

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Abstract

Customer satisfaction with services is crucial to offering efficient air cargo supply chain management. However, the frequent interruption of expected seamless delivery of cargo by air often results in poor customer satisfaction with service delivery. This study assesses customer satisfaction with air cargo services at Murtala Muhammed International Airport (MMIA), Lagos, Nigeria, with a focus on customer perception and expectation. The data for the study were collected using a well-designed questionnaire administered to stakeholders at the Murtala Muhammed International Airport, Lagos. A simple random sampling technique was employed to collect data and produced 223 valid responses out of 385 copies of the distributed questionnaire. The data were analysed using structural equation modelling - partial least squares (SEM-PLS). The study found that customers' expectations significantly influence their perception of services and vice versa. The finding implies that customer perception and expectation are major ingredients for customer satisfaction in the air cargo supply chain industry.

Keywords: Air Cargo; Supply Chain, Customer Expectation; Customer Perception; Customer Satisfaction

1. Introduction

Air cargo has evolved from a secondary consideration for combination carriers in global logistics to a pivotal component in supply chain resilience, a transformation accelerated by recent global disruptions such as the COVID-19 pandemic and the surge in e-commerce (Adenigbo, 2021; Bernal et al., 2012; Merkert, 2022; 2024). Traditionally overshadowed by passenger transport, air cargo has now emerged as a critical enabler for rapid, cross-border transactions and supply chain efficiency (Adenigbo, 2021; Bernal et al., 2012; Dresner & Zou, 2020; Merkert, 2022; 2024). This evolution is evident in the remarkable growth figures reported by the International Air Transport Association (IATA, 2025), which noted significant increases in cargo tonne kilometres (CTK) and yields globally with a strong performance in regions such as Asia-Pacific, Europe, North America, and the Middle East (IATA, 2025). To buttress, a reported growth of 13.4% CTK (which measures demand) by the airline industry at the beginning of 2024 and 11.3% growth compared to 2023 is noticeable. This growth was even more pronounced in international operations, which saw a 12.2% rise in average yields in 2024, marking its 17th consecutive month of growth as of December 2024 (IATA, 2025).

In contrast, the African air cargo market presents a more nuanced scenario. Although the continent has recorded an 8.5% annual demand growth, short-term challenges such as a marginal decline in December 2024 signal underlying issues related to infrastructure, regulatory frameworks, and economic fluctuations (Adenigbo, 2021; Akinyemi, 2023; IATA, 2025). Within this context, Nigeria stands out as a critical player in West African air logistics. Leveraging its strategic geographic position and robust economy, Nigeria is central to regional air cargo activities, with its market characterised by a diverse mix of cargo types and key trade partners spanning Europe, the Middle East, and beyond (Adenigbo et al., 2023; Akinyemi, 2023).

The dynamic nature of the air cargo market consists of two major players, the carriers (airplane owners/ service providers) and the freight forwarders who are the major direct customers (Almofeez et al., 2024; Bunahri & Jayapura, 2023; Maharani & Wahyuni, 2021; Sales & Scholte, 2023) is further driven by the increasing demands for swift and reliable services propelled by the rise of e-commerce. Air cargo operators are thus compelled to adopt innovative business models and invest in digitisation, automation, and fleet renewal to maintain competitive service levels (Ayantoyinbo, 2018; Merkert, 2024). Investment in digitisation, automation, and fleet renewal is transforming the industry, making operations more efficient and responsive to market demands (Merkert, 2024), undeniably assuring that the air cargo industry will continue to play an evergreen role as a business enabler in international transaction, with its competitive advantage of speedy transaction across international boundaries (Adenigbo, 2023; Ayantoyinbo, 2018; Bunahri & Jayapura, 2023; Dresner & Zou, 2020; Merkert, 2024). Central to this evolution is the emphasis on service quality, often evaluated through dimensions such as tangibility, reliability, responsiveness, assurance, and empathy, which directly influences customer satisfaction, loyalty, and ultimately, company profitability (Maharani & Wahyuni, 2021; Namukasa, 2013; Suki, 2014).

Despite its critical importance, the nexus between air cargo service quality and customer satisfaction in Nigeria has received limited scholarly attention. Addressing this gap, the current study seeks to quantitatively assess customer satisfaction in Nigeria's air cargo supply chain using structural equation modelling (SEM). This advanced statistical technique is well-suited for disentangling the complex relationships between observed and latent variables, allowing for a nuanced evaluation of how service quality dimensions impact customer perceptions and loyalty (Chen, 2008; Farooq et al., 2018; Jenatabadi & Ismail, 2014). The problem that this study addresses is the satisfaction of customers with air cargo supply chain services in Nigeria. The problem arises due to the perception and expectations of customers of services in the air cargo supply chain industry.

The paper is structured such that after this section, section 2 deals with the review of literature, section focuses on the description of data and methods, section 4 provides the results and description, and section 5 concludes the paper with the last section dedicated to conclusion and policy recommendations.

2. Literature Review

This section provides an empirical review of the literature on customer satisfaction in the air cargo logistics industry, the relationship between customer perception, expectation, and service delivery, service quality and operational efficiency for customer satisfaction, the influence of operational and infrastructure factors on air cargo service performance, and integration of the supply business models in the air cargo industry.

2.1. Customer satisfaction in the air cargo logistics industry

Understanding customer satisfaction in the air cargo logistics industry is essential for enhancing service quality, fostering customer loyalty, and maintaining a competitive advantage. While several studies have examined air transport passenger satisfaction across different regions, they serve as a background on how to ascertain customer satisfaction with air cargo logistics (Ganiyu, 2017; Raț et al., 2022; Vuthisopon & Srinuan, 2017).

The work by Ganiyu (2016) in Nigeria’s airline logistics industry provides an early indication of the positive link between perceived service quality and customer satisfaction. This study revealed that higher levels of perceived quality not only enhance customer happiness but also foster loyalty among users. The implications are significant, notably if air transport service providers can deliver high-quality services characterised by reliability, responsiveness, and professionalism, they are more likely to secure long-term patronage from their customers. Similarly, Vuthisopon and Srinuan (2017) evaluated the relationship between electronic service quality, customer satisfaction, and customer loyalty. Their findings reveal that customer satisfaction significantly impacts customer loyalty, which in turn affects repurchase intention. Additionally, electronic service quality is found to have a positive effect on customer satisfaction.

Expanding on this notion, Farooq et al. (2018) utilised a PLS-SEM model to investigate the impact of various service quality dimensions. Their findings pinpointed reliability and assurance as the strongest influencers of customer satisfaction. In practical terms, reliability in air cargo logistics translates into punctual deliveries and consistent performance, while assurance encompasses elements such as safety, security, and the overall dependability of the service provider. Additionally, responsiveness emerged as a vital contributor to customer satisfaction. These studies collectively underscore the centrality of service quality; as such, when air cargo services meet or exceed customer expectations in these critical areas, satisfaction and loyalty follow.

To capture the complexity of these interrelationships, researchers have increasingly turned to integrative methodologies. Leong et al. (2015) is an exemplary study that combined SEM with Artificial Neural Networks (ANN) to capture both the direct and non-linear relationships among service quality dimensions, customer satisfaction, and loyalty. The dual-analytical approach enabled the researchers to observe that customer satisfaction serves as a mediator between service quality and loyalty. In other words, when air cargo service providers enhance specific dimensions of quality, such as improving responsiveness or reinforcing reliability, customer satisfaction increases, which then translates into stronger customer loyalty.

Moreover, Chen (2008) extended this line of inquiry by exploring how customer expectations shape their perceived performance of air cargo services. Using SEM, Chen established that while customer expectations significantly influence their evaluation of service performance, these expectations do not have a direct impact on perceived value or satisfaction. Instead, perceived value, which reflects customers' assessments of whether the service is worth the cost, plays a critical mediating role. This finding suggests that meeting customer expectations is necessary but not sufficient; air cargo service providers must also deliver tangible value to ensure customer satisfaction and promote repeat business. Further, both perceived value and satisfaction play essential roles in shaping passengers' future behavioural intentions, such as their willingness to use the airline again or recommend it to others. Interestingly, they found that perceived value has a stronger effect on behavioural intentions than satisfaction, indicating that passengers are more likely to return and advocate for an airline if they believe they are getting good value for their money, even if their overall satisfaction is moderate.

2.2. The Nexus Between Customer Perception, Expectation, and Service Delivery

Customer satisfaction is fundamentally rooted in the relationship between expectations and perceptions. Mehta (2000) and Johnston and Clerk (2005) argue that satisfaction is achieved when service performance meets or exceeds customer expectations. This dynamic is particularly critical in the air cargo logistics industry, where customers, ranging from freight forwarders to large-scale enterprises, have precise expectations regarding timeliness, security, and operational efficiency. Pakdil and Aydın (2007) specifically measured the gap between expectations and perceptions across different SERVQUAL dimensions. Their research underscored that responsiveness, characterised by staff willingness, promptness, and readiness to attend to customer needs, is the most critical determinant of satisfaction. Moreover, they found that customers' educational levels influence their expectations and

perceptions of service quality, suggesting that demographic factors may also play a role in shaping satisfaction outcomes. Chen (2008) extended the discussion by investigating the relationships between service quality, perceived value, and behavioural intentions using SEM. His findings indicate that while customer expectations positively influence the perceived performance of air cargo services, they do not directly impact perceived value or satisfaction. Instead, perceived value emerges as a key mediator, significantly influencing satisfaction and, ultimately, future behavioural intentions such as reuse or recommendation. This underscores the importance of not only meeting customer expectations but also delivering tangible value that customers recognise and appreciate. Customers who perceive high value in their air cargo services are more likely to be satisfied, even if their initial expectations are moderate. This perceived value is critical for fostering repeat business and customer advocacy.

Customer perception is a multi-faceted construct that plays a critical role in determining overall satisfaction. Hamid et al. (2021) investigated customer perceptions of service quality among Singapore-based airlines and identified key factors such as security, timeliness, and cleanliness as major influencers. Their study reveals that customer satisfaction is not solely dependent on tangible service attributes but is also shaped by the overall perception of the service quality provided. Similarly, Hussain et al. (2014) reported that dimensions of service quality, particularly reliability and responsiveness, along with a positive brand image, significantly enhance customer satisfaction and promote loyalty among UAE airline customers (Namukasa, 2013).

A critical insight from the literature is the mediating role of customer satisfaction between service quality and subsequent behavioural intentions. Almofeez et al. (2024) examined the satisfaction levels among freight forwarders and their impact on airport competitiveness. Their findings indicate that when customers, especially business customers like freight forwarders, are satisfied with service quality across dimensions such as infrastructure, operational performance, and cost efficiency, they are more likely to exhibit loyalty. This, in turn, enhances the competitive performance of the airport or service provider, as satisfied customers contribute to a positive brand image and competitive market position.

The mediating effect of customer satisfaction is further supported by Chen (2008), who demonstrated that satisfaction serves as a critical link between perceived value and future behavioural intentions. When customers are satisfied, they are more likely to reuse services and recommend them to others, reinforcing the importance of investing in quality improvements that align with customer expectations.

2.3. Service Quality and Operational Efficiency for Customer Satisfaction

While high service quality is essential, its translation into customer satisfaction can be compromised by operational inefficiencies. In many emerging markets such as Nigeria, the air cargo logistics industry faces a host of operational challenges that dilute the perceived quality of service. Ayantoyinbo (2018) and Adenigbo (2021) have documented several inhibitors in Nigeria’s air cargo operations. These include high fuel prices, cumbersome customs procedures that prolong waiting times, cut-throat costs of ground handling services,

and systemic issues such as corruption. Each of these factors not only hampers operational efficiency but also creates a gap between what customers expect and what they receive. The SERVQUAL model has been a popular tool for evaluating these discrepancies. For instance, the study by Ayantoyinbo and Gbadegesin (2021) used SERVQUAL to assess the quality of Nigeria's air cargo delivery system and uncovered significant gaps between customer expectations and perceptions. Key areas where service becomes unsatisfactory include delays in cargo delivery, a lack of effective tracking systems, and inadequate customer service responsiveness. Such findings are critical because they illustrate that even if the fundamental service quality is high, operational inefficiencies can erode customer satisfaction and loyalty.

2.4. Influence of operational and infrastructure factors on air cargo service performance

The literature on air cargo customer satisfaction, though scanty, reveals a complex and multifaceted landscape where regional, operational, and infrastructural factors intertwine to shape industry performance and customer perceptions. Research by Hong and Jun (2006) illustrates that while overall service quality priorities between air cargo providers and customers may appear similar, a deeper examination exposes significant differences in specific service criteria. For instance, factors such as the handling of special freight, the convenience of land transportation, and the flexibility of contract conditions vary notably between providers and customers, with even greater divergences emerging when comparing Korean providers to their international counterparts. This suggests that service quality perceptions are deeply influenced by regional contexts and that tailored strategies are necessary to address these distinct priorities.

In emerging markets, the challenges are even more pronounced. Studies focusing on regions like Karachi and Nigeria highlight significant operational and infrastructural hurdles that hinder service quality. Hashar and Alwi (2024) point to Karachi's struggles with limited infrastructure, regulatory and security challenges, a shortage of skilled personnel, and fierce market competition, all of which contribute to suboptimal service quality and customer satisfaction. In Nigeria, research by Ayantoyinbo (2018) and Adenigbo (2021) identifies issues such as fluctuating fuel prices, inefficiencies in customs processes, high costs associated with ground handling, and systemic corruption as key inhibitors of air cargo logistics. These factors not only impede operational efficiency but also significantly affect the overall customer experience, creating a pronounced gap between expectations and actual service delivery. Specifically, the study by Ayantoyinbo and Gbadegesin (2021) further elucidates these operational challenges using the SERVQUAL model. Their analysis of Nigeria's air cargo delivery system revealed significant disparities between expected and perceived service quality. Key areas of dissatisfaction included delays in cargo delivery, inadequate tracking systems, and poor customer service responsiveness. Such findings emphasise the urgent need for infrastructural and operational reforms to enhance the quality of air cargo services and, by extension, improve customer satisfaction. The unique socio-economic infrastructural challenges in Nigeria necessitate the adoption of tailored strategies to enhance customer satisfaction. For instance, infrastructural investments, regulatory

reforms, and the adoption of modern technologies are essential to address the inefficiencies identified in prior studies.

Furthermore, the impact of service quality on customer satisfaction and loyalty is strongly emphasised by Maharani and Wahyuni (2021). They used PT Garuda Indonesia (Persero) Tbk as a case study. Their findings demonstrate that improvements in service quality, particularly through enhanced cargo security and the implementation of real-time monitoring platforms, directly boost customer satisfaction and indirectly reinforce customer loyalty. Complementing this view, Merkert (2024) emphasises the necessity of a digitally integrated supply chain to ensure seamless service delivery, further highlighting the role of technology in modernising air cargo operations.

The research collectively indicates that while the air cargo industry faces universal challenges related to operational efficiency and service quality, regional variations play a critical role in shaping these dynamics. In more mature or differently regulated markets, such as those in Korea versus international benchmarks, service priorities differ markedly, calling for region-specific strategies. In emerging markets like Karachi and Nigeria, infrastructural and regulatory deficiencies, compounded by operational challenges, significantly hinder service delivery. Conversely, investments in improving service quality through enhanced security measures, digital supply chain integration, and responsive operational processes have a demonstrable impact on customer satisfaction and loyalty.

2.5. Integration of the supply chain business models in the air cargo industry

Beyond technology and regional customisation, integrative business models are emerging as critical tools for enhancing customer satisfaction in the air cargo logistics industry. These models advocate for closer collaboration among various stakeholders, including airlines, freight forwarders, and regulatory authorities. Almofeez et al. (2024) examined the factors influencing freight forwarder satisfaction and found that improved infrastructure, streamlined operations, and competitive cost structures collectively enhance customer loyalty, since satisfied freight forwarders not only contribute to a positive brand image for airports and service providers but also bolster overall market competitiveness. Additionally, Maharani and Wahyuni (2021) provide empirical evidence in support of this approach. Their study on PT Garuda Indonesia (Persero) Tbk illustrates those investments in service quality, such as improvements in cargo security and the implementation of real-time monitoring platforms, lead to higher levels of customer satisfaction and loyalty. These findings suggest that when air cargo service providers adopt integrative business models that focus on enhancing both operational performance and digital integration, they create a virtuous cycle of customer satisfaction, increased loyalty, and improved competitive positioning.

In essence, integrative business models represent a holistic approach that goes beyond the isolated improvement of individual service quality dimensions. By coordinating efforts across various operational and technological fronts, air cargo service providers can more effectively meet customer expectations by bridging the gap between perceived and actual service quality.

This contributes to the existing literature on customer service and satisfaction by focusing on the air cargo supply chain industry. It employs perception and expectation to assess the satisfaction of customers with air cargo services at the Murtala Muhammed International Airport (MMIA), Lagos, Nigeria. The study utilises structural equation modelling to analyse data collected by a questionnaire survey.

3. Data and method

The study employed a survey research design to collect data for quantitative analysis. The data for the study were collected with a well-designed questionnaire. The questionnaire was administered to various respondents who were airline staff, cargo agents, cargo handling companies staff, customs officers, and staff of the Federal Airport Authority of Nigeria (FAAN) in the cargo department. The survey was conducted at the Murtala Muhammed International Airport (MMIA), Lagos, Nigeria. MMIA is a major airport hub not only in Nigeria but across the West African region. The airport handles the passenger and cargo traffic in Nigeria. Major aviation activities in Nigeria are also concentrated at MMIA.

The administration of the questionnaire was conducted using a simple random sampling technique. The administration of the questionnaire was conducted face-to-face with the respondents. A total of 385 copies of the questionnaire were produced following the application of the study sample size with an infinite population. The study assumed an infinite population because the exact numbers of the different categories of the respondents were not known. The random sampling technique was employed to give an equal chance to the respondents to be surveyed. The survey successfully recorded 223 responses for data analysis, which accounted for approximately a 60 per cent return rate.

The data collected were analysed using structural equation modelling with partial least squares (SEM-PLS). Compared with other techniques, SEM-PLS is a robust analytical technique with the capacity to handle small sample sizes, non-normal data distributions, predictive modelling, and complex models involving unobserved and measurement variables. SEM has been employed in many air cargo studies, such as (Adenigbo et al., 2023; Chen, 2008; Farooq et al., 2018; Leong et al., 2015; Ringle et al., 2011; Singh & Sharma, 2014; Suki, 2014; Vuthisopon & Srinuan, 2017). Jenatabadi and Ismail (2014) stated that SEMs can analyse complex relationships between both exogenous and endogenous variables. Other alternative methods, such as factor analysis, were not employed for the study because the number of variables has been limited to three, which is already a few. Additionally, SEMs can incorporate unobserved (latent) variables, which are represented as linear combinations of observed (measured) factors. In other words, SEM is a statistical technique that helps analyse complex cause-and-effect relationships while accounting for both directly measurable (observed) and indirect (latent) factors. As such, concepts such as customer satisfaction or intelligence cannot be directly measured but are inferred from multiple measurable indicators (observed variables). SEM allows researchers to model these latent variables by mathematically combining observed data.

The study adopted the Partial Least Squares (PLS-SEM) approach using Smart PLS 3.3. The model consists of an inner model (structural model) that establishes relationships between latent variables and an outer model (measurement model) that defines how observed indicators load onto latent variables.

Structural (Inner) Model Equations

The relationships among the latent constructs are given by equations 1 and 2.

$$P = \lambda_1 \mathrm{E} + \zeta_{\mathrm{P}} \quad (1)$$

$$S = \lambda_2 \mathrm{E} + \lambda_3 \mathrm{P} + \zeta_S \quad (2)$$

The measurement model equations (outer model) are given by equations 3, 4, and 5.

$$\mathrm{E}_n = \beta_n \mathrm{E} + \varepsilon_{\mathrm{E}n} \quad (3)$$

$$\mathrm{P}_n = \beta_n \mathrm{P} + \varepsilon_{\mathrm{P}n} \quad (4)$$

$$\mathrm{S}_1 = \beta_n S + \varepsilon_{\mathrm{S}1} \quad (5)$$

Where:

E, P, and S are the latent variables: Expectation, Perception, and Satisfaction

$\lambda_1, \lambda_2, \lambda_3$ are the path coefficients for the structural model

n=1, 2, 3, 4

β are the outer loadings for the measurement model.

ζ_{P} is the error term for the model

ε is the measurement error

The study adopted perception and expectation to assess customer satisfaction with services in the air cargo supply chain system. The table below shows the content of the questionnaire that provides the respondents with options to rank each statement in order of agreement from 1 – Not Agreed to 5 – Strongly Agreed. The questionnaire was designed on a 5-point Likert scale.

Table 1: Indices of variables to measure customer satisfaction with air cargo services

Code	Statement
Perception1	Customers gladly refer others to the company's services.
Perception2	Customers' perception of services is good.
Perception3	Customers express their satisfaction with the services in the organisation.
Perception4	Customers express their willingness to remain loyal to your organisation.
Expectation1	The needs of customers and employees are met.
Expectation2	The qualities of service expected are optimally met.
Expectation3	Customers patronise organisational services as expected.
Expectation4	Service delivery is as expected.

4. Results and Discussion

The PLS-SEM confirms that the factors significantly affect the customer satisfaction of the employees in the air cargo logistics industry. The factors that serve as the latent variables (i.e., inner model) for confirmation are expectation (e), perception (p), and satisfaction (s). The structure model built for this study, as presented in Figure 1, shows the regression values of the relationships that exist among the variables. It is indicative that all the observed variables are highly correlated with each latent factor. It implies that the variables significantly determine the validity of the latent variables as the factors determining the customer satisfaction with services in the air cargo supply chain industry in Nigeria. The estimation of the model is done in two parts, including the outer model and the inner model. The unobserved variables are named as latent variables in PLS-SEM.

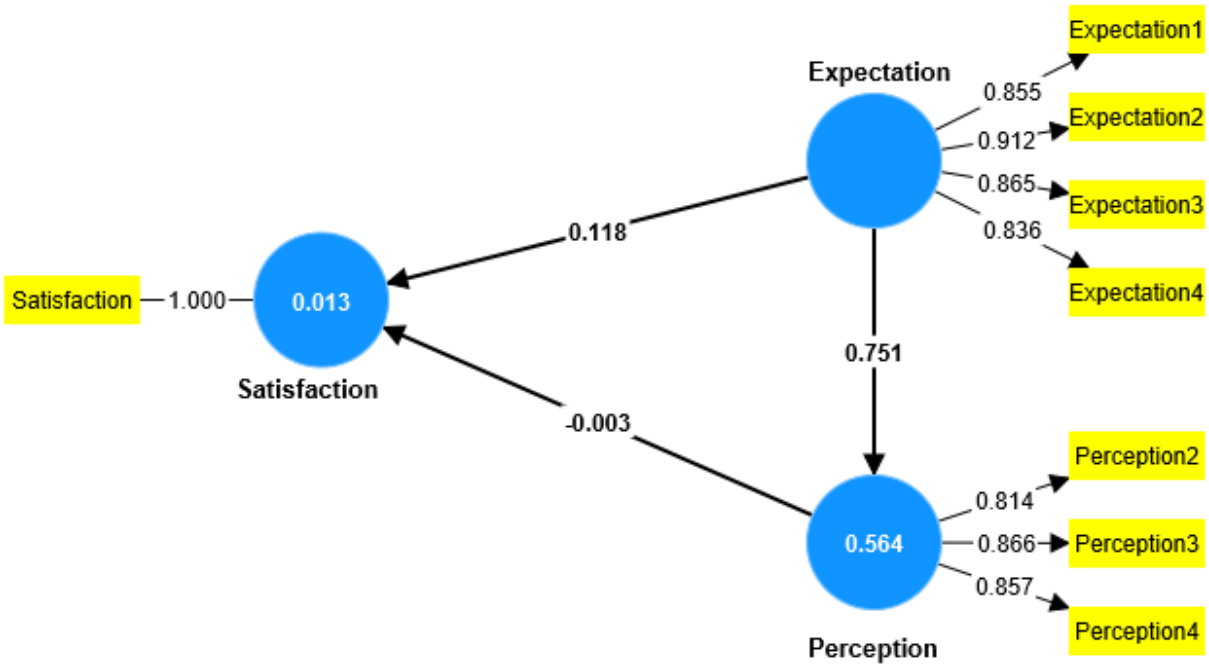


Figure 1: Structure of customer satisfaction with services in the air cargo supply chain industry

The information in Table 2 indicates the indices and their outer loadings regarding the validity of the variables to measure customer satisfaction with services in the air cargo supply chain industry in Nigeria. The result shows that all the statements significantly measure customer satisfaction regarding their expectation and perceptions with outer loading that is greater than 0.800. The result implies that the variables are suitable for reliable output and interpretations.

Table 2: Outer loadings of variables for SEM

List	Statement	Outer loadings
Expectation1 <- Expectation	The needs of customers and employees are met	0.855
Expectation2 <- Expectation	The quality of service expected is optimally met	0.912
Expectation3 <- Expectation	Customers patronise organisational services as expected	0.865
Expectation4 <- Expectation	Services are delivered as expected	0.836
Perception2 <- Perception	Customer perception of the service is good	0.814
Perception3 <- Perception	Customers express their satisfaction with the service in the organisation	0.866
Perception4 <- Perception	Customer expresses their willingness to remain loyal to the organisation	0.857
Satisfaction <- Satisfaction	I am very satisfied with air cargo services	1.000

The finding shows that the expectation and perception of customers influence their satisfaction with air cargo supply chain services. The result in Table 3 indicates that expectation and perception relate significantly at p = 0.000 to measure customer satisfaction with services in Nigeria's air cargo supply chain industry. The other finding from Table 3 is that perception and expectation do not individually influence customer satisfaction in the air cargo supply chain industry. This is indicative of the result that shows statistically insignificant p-values greater than 0.05 for the individual relations of perception and expectation with satisfaction.

Table 3: Relationship between expectation, perception and satisfaction

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P Values
Expectation -> Perception	0.751	0.754	0.038	19.937	0.000
Expectation -> Satisfaction	0.118	0.118	0.081	1.469	0.142
Perception -> Satisfaction	-0.003	-0.004	0.090	0.036	0.971

4.1. Measurement Model

Tests of reliability and validity validated the structure's measurement model to determine the model's consistency and accuracy. Table 4 presents a test of the model's reliability of the structure using Cronbach's Alpha, Composite Reliability, and AVE – Average Variance Extracted to determine if the model is valid. The Cronbach's Alpha for

both expectation and perception is above 0.800, indicating that the model is valid and reliable for the analysis. The composite reliability (rho_a and rho_c) values of the model are greater than the 0.700 threshold, which indicates that the model is reliable. The AVE values for each variable are greater than 0.500, which indicates that the variance of the model is consistent. The AVE test implies that the latent variables converge for significant model measurement. The model explains over 50% of the variance in customer expectation and perception towards their satisfaction with services in the air cargo supply chain industry, with no discriminant problem.

Table 4: Test of model reliability

Latent construct	Cronbach's Alpha	Composite Reliability (rho_a)	Composite Reliability (rho_c)	AVE	Discriminant validity problem?
Expectation	0.890	0.895	0.924	0.753	NO
Perception	0.802	0.803	0.883	0.716	NO

AVE - average variance extracted.

The study adopted the Fornell-Larcker, the Heterotrait-Monotrait Method (HTMT), cross-loading and VIF (Variance Inflation Factor) to determine the discriminant validity of the model (See Table 5). The results in Table 5 indicate that the model has discriminant validity. The Fornell-Larcker Criterion diagonal values are greater than the value underneath, which implies that the model is valid. The HTMT value of 0.884 implies that the ratio values are less than 0.800, which shows the validity of the model. The cross-loading shows that the observed and latent variables are loaded adequately. The VIF measures the level of collinearity between the variables and shows that there is no multicollinearity in the model, with all the values greater than 1 and less than 5.

Table 5: Test of Discriminant Validity

Fornell-Larcker Criterion				
	Expectation	Perception	Satisfaction	
Expectation	0.714			
Perception	0.362	0.683		
Satisfaction	0.224	0.042	0.833	
Heterotrait-Monotrait Ratio (HTMT)				
	Expectation	Perception	Satisfaction	
Expectation				
Perception	0.884			
Satisfaction	0.126	0.093		
Cross Loading				**Collinearity**
	Expectation	**Perception**	**Satisfaction**	**VIF**
Expectation1	0.855	0.589	0.150	2.406
Expectation2	0.912	0.702	0.075	3.211
Expectation3	0.865	0.691	0.063	2.282
Expectation4	0.836	0.616	0.124	2.088
Perception2	0.638	0.814	0.127	1.510
Perception3	0.664	0.866	0.076	1.913
Perception4	0.599	0.857	0.009	1.958
Satisfaction	0.116	0.086	1.000	1.000

The result in Table 6 presents the model fit of the variables for the analysis. It shows how the model's implied covariance matrix ties with the sample covariance of the model. The SRMR value of 0.064 is less than 0.08, which is the threshold for determining the fitness of the model. Also, the NFI value of 0.877 is close to 1.00 determines the significance of the chi-square value and confirms adequate fitness of the model covariance to the sample covariance matrix.

Table 6: Model Fit of the Variables

	Estimated model
SRMR	0.064
d_ULS	0.148
d_G	0.089
Chi-square	116.024
NFI	0.877

4.2. Analysis of the SEM inner model

The inner model of the structure is the equation that establishes the relationships between the latent factors, which are the unobserved variables. The structure analysis involves the test of hypotheses formulated via the relationships within the model. The path coefficient of the model, which is the direct relationship between the latent factors, indicates the hypotheses tested with the model.

Table 6 shows that one (1) of the three hypotheses was significant, implying the rejection of the null hypothesis. The result shows that Expectation→Perception ($\beta = 0.751$, $t = 19.937$, $p = 0.000$) is statistically significant, with the implication that customer expectation affects their perception about services in the air cargo supply chain industry. The remaining two hypotheses, Expectation→Satisfaction (B = 0.118, T = 1.469, P = 0.142); Perception→Satisfaction (B = -0.003, T = 0.036, P = 0.971) are statistically insignificant (See Table 4.26). It implies that the null hypothesis is accepted. The results imply that expectation positively affects the perception of the customer of services in the air cargo supply chain industry in Nigeria.

Table 6: Path coefficient of the model

Hypothesis	Path Coefficients	T Statistics (|O/STDEV|)	P Values	Decision
EXP->PER H1: Expectations of the customer affect the perception of the customer	0.751	19.937	**0.000**	**Reject the Null hypothesis.**
EXP ->SAT H2: Expectation of the customers affects the satisfaction of the customers	0.118	1.469	0.142	Accept the null hypothesis.
PER -> SAT H3: Perception of the customer affects the satisfaction of the customers	-0.003	0.036	0.971	Accept the null hypothesis.

The findings show that expectation does not singly affect the satisfaction of the customers in the air cargo supply chain industry. Likewise, perception does not singly influence customer satisfaction. It implies that it takes a combination of what a customer expects and perceives that significantly influences their satisfaction with services in the Nigerian air cargo supply chain industry.

The findings from this research support several conclusions from the literature, with a focus on the level of customer satisfaction in the air cargo supply chain industry. For example, according to Sulieman (2013), satisfied customers broadcast to others about their experiences. According to Mehta (2000), the customer satisfaction model reiterates the customer's essence in comparing their judgment of the products and the performance of services with their expectations. When customer perception is greater than the expectation, the result of the services rendered is customer satisfaction. In the same vein, when customer expectation is greater than their perception, the result of the services provided is dissatisfaction, and when the perception is equal to expectation, the result is the satisfaction that emanates from the assessment of a service based on a comparison of their perception of their service delivery with their prior expectation.

5. Conclusion and Policy Recommendations

This study focused on customer satisfaction with services in Nigeria's air cargo supply chain industry. The study employed the indices of expectation and perception to assess customer satisfaction with services in the air cargo supply chain industry. The data for the study were collected with a questionnaire administered to respondents at MMIA and subjected to PLS-SEM. The study found that a combination of customer expectations and perceptions significantly influences their satisfaction with services in the air cargo supply chain industry. The finding implies that customer expectations and perceptions are important in determining customer satisfaction with services in the air cargo supply chain industry. The finding provides an indicative recommendation that stakeholders in the air cargo supply chain industry need to initiate strategies to improve the perception and expectations of customers to increase their loyalty and patronage. The strategies should focus on meeting customers' needs and promoting referrals from customers. It is recommended that stakeholders in the air cargo industry provide a platform to improve customer expectations and the quality of service

delivery. The implication of the finding is relevant to assessing air cargo customer experience in the global air cargo market.

This study is limited to customer satisfaction assessment using the indices of expectation and perception in Nigeria's air cargo supply chain industry. The findings indicate a need for a comparative study to enable generalisation of the findings beyond Nigeria, as variables such as pricing, competition and regulatory policies were not included in the model. Further studies can examine the factors that influence customer perception and expectations of services in the air cargo supply chain industry.

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ASSESSMENT OF THE IMPACT OF SUPPLY CHAIN RISKS ON THE SUSTAINABILITY OF SMALLHOLDER FRESH PROCUCE FARMERS IN LIMPOPO PROVINCE

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Abstract

Despite their crucial role in food security, inclusive economic growth, rural development, and job creation, smallholder farmers face a multitude of interrelated risks that hinder their participation in formal and high-value markets, thereby threatening their sustainability. This study aimed to investigate the impact of supply chain risks on the sustainability of smallholder fresh produce farmers in Limpopo Province. Utilising a thematic analysis approach, qualitative data were collected from purposively sampled smallholder vegetable farmers in the Capricorn and Vhembe Districts. The findings of this study revealed pervasive risks at various stages of the agricultural supply chain. At the input supply stage, high costs and unavailability of key inputs disrupt production coordination. During the production stage, pests and extreme weather conditions significantly reduce productivity and market participation. Post-harvest, inadequate investment in market infrastructure and adherence to food safety standards impede access to high-value markets. These challenges prevent smallholders from fulfilling their potential in driving inclusive growth, job creation, food security, and rural development. The study also highlighted that farmers predominantly rely on the government input subsidies, crop rotation, pesticide application, weather forecasting, and shared services as risk management strategies. Enhanced support and targeted interventions are essential to bolster smallholder resilience and sustainability.

Keywords: Keywords: Smallholder farmer, Supply Chain Risks, Agricultural Value Chain

Introduction

Agriculture remains a cornerstone of South Africa's economy, with its potential for growth and transformation being widely acknowledged (National Treasury, 2019). In line with the National Development Plan (NDP, 2012), smallholder agriculture has been designated a critical driver for rural development and the enhancement of livelihoods in South Africa's rural areas. Historically, smallholder farmers have been instrumental in the South African agricultural sector, and their role continues to be vital in both economic participation and transformation. As of 2016, approximately 2.3 million households were engaged in agriculture in South Africa, with 16% of these farmers located in Limpopo Province (StatsSA, 2016).

Over time, the role of smallholder farmers has evolved, now encompassing broader economic dimensions (Fan & Rue, 2020). Despite their essential contributions to food security, economic growth, rural development, and job creation, these farmers face persistent challenges that undermine their productivity and overall contributions.

Traditional literature has primarily focused on the impediments to their livelihood strategies, yet emerging risks related to climate, health, pricing, and finance are increasingly impacting them (Fan & Rue, 2020). The occurrence of these risks exacerbates smallholder poverty, as it leads to a heightened risk aversion and a tendency towards subsistence-oriented activities (Dercon et al., 2008). These interrelated risks threaten their livelihoods, food security, and nutrition (Fan & Rue, 2020).

In Limpopo Province, smallholder farmers are predominantly rural-based and face numerous supply chain risks (SCRs) that hinder their effective participation in formal and high-value markets, particularly in vegetable crop production. The nature of these risks spans various categories of the supply chain, underscoring the need for a cross-disciplinary approach to understanding their impact. This study aims to assess how supply chain risks affect the sustainability of smallholder fresh produce farmers in Limpopo Province, focusing on the specific challenges encountered and the extent of their impact. Johnson Mary (2025) referred to risk assessment in supply chains as the systematic process of identifying, analysing, and evaluating potential threats that could disrupt operations, increase costs, or impact business continuity. The research questions addressed in this study are: What are the main supply chain risks faced by smallholder fresh produce farmers? To what extent do these risks affect their sustainability?

Literature Review

The agricultural supply chain is subject to various risks and uncertainties that can disrupt the flow of goods, impact productivity, and affect farmers' livelihoods. Agricultural business is perceived to be typically risky, due to uncertainty to forecast the outcomes of farmers' operations and production decisions due to the physical and economic complexity of agricultural systems (Getu (2025) According to Komarek et al (2020), risks in the agricultural sector include unfavourable outcomes, such as reduced yields and incomes. as well as severe events like financial bankruptcy, food insecurity and health problems (Nevertheless, the potential for higher returns often serves as an incentive for taking on these risks. Smallholders are subject to diverse

challenges that threaten their agricultural productivity and their livelihood (Touch et al, 2024).

Smallholders are increasingly vulnerable to various emerging risks and challenges related to climate, health, pricing, and finance (Fan & Rue, 2020) Yang and Liu (2018) explained the vulnerability of the fresh agricultural food supply chain. They pointed out that an imbalanced supply and demand, transport capacity bottlenecks, seasonal cycles, and other factors contribute to the fragility of the fresh agricultural products supply chain led platforms. This fragility hinders the smooth functioning of the supply chain, leading to potential disruption risks

OECD (2024) observed that South Africa agricultural supply chain has become highly industrialized and characterized by super commercialization, which limits the scope of small-scale participation in farming. Mazhar et al, 2022) recognised that in developing countries, supply chain processes are inherently complex, where most small farmers face numerous dependencies for information, credit and marketing. Further, small farmers face several inbound and outbound network constraints, restraining their access and linkages with modern supply chains (

To contextualise agricultural supply chain concept Sharma et al., 2020) defined it as "the set of activities involved in the farm-to-fork process, including farming primary production, processing/production, testing, packaging, storage, transportation, distribution, and marketing. Achieving agricultural supply chain goals requires well-structured designs, networks, processes, and infrastructure. Therefore, the supply chain acts as a network that connects individuals or businesses through upstream and downstream activities, allowing for the competent stream of goods, information, and funds from manufacturers to end customers (Zhang et al. 2021, Mahuwi et al., 2023).

Smallholders confront a complex array of interconnected risks and challenges that jeopardize their livelihoods, food security, and nutritional well-being (Fan & Rue, 2020). FPMI (2025) report , confirmed array of risks that limit the participation of small-scale farmers in formal, high income value chains at two levels. At the production level, farmers face risks from the procurement of inputs through to the post-harvest stage of the food supply chains. At the retail and consumption level, risks are tied to meeting the quality and quantity standards (which include packaging, grading, and labelling), and traceability and transport requirements. Because of these risks materialising, small-scale farmers tend to resort to distributing their products in informal, low-income markets. Consequently, this implies that these farmers are less likely to effectively participate in the fresh produce market facilities, and thus, market access may be limited. This confirmed earlier observation made by Louw et al (2016)

To provides a contextual foundation for assessing the impact of Supply Chain Risks (SCRs) on the sustainability of smallholder farmers in Limpopo, Table 1 below outlines the key categories of major risks within the agricultural chain, as derived from the literature.

Table 1. Categories of risks facing agricultural supply chain risks

Type of Risk	Source Risk	References
Weather and Natural disaster risks	(1) Periodic deficit and/or excess rainfall, (2) hailstorms, (3) flooding, (4) extreme drought, (5) strong wind (6) cold weather	Louw et al (2016), Komarek et al (2020), Nyamah et al (2017), Shi & Wang (2022), Zhao et al (2020), Sharma et al (2020), Mokhaukhau et al (2020)
Biological and Environmental	1)Risk from Pests and diseases, (2) Contamination related to poor sanitation and illnesses, (3) Contamination affecting food safety, (5) Contamination and degradation of production and processing processes (6) Pandemics such as Covid 19 that disrupt global supply chain.	Louw et al (2016), Nyamah et al (2017), Komarek et al (2020) , Zhao et al (2020), Sharma et al (2020), Mokhaukhau et al (2020), Tripathi et al (2021)
Demand and Supply side risks (Market risks)	(1) Unanticipated or very volatile customer demand, (2) Insufficient or distorted information from your customers about orders or demand quantities, (4) Changes in food safety requirements (5) international prices of inputs and/or outputs, (6) Poor logistic services and shortage supply in the market	Nyamah et al (2017), Louw el al (2016), Sharma et al (2020) , Ray (2021), Zhao et al (2020)
Logistical and infrastructural risks	(1) poor infrastructure and services; (2) volatility in fuel price; (3) unreliable transport; (4) changes in transportation; (5) lack of infrastructure and service units; (6) poor performance of logistics service providers; (7) lack of effective system integration; (8) labour disputes	Louw el al (2016), Nyamah et al (2017), Zhao et al (2020),
Management and operational risks	(1) poor management decisions on asset allocation; (2) use of expired seeds; (3) poor quality control; (4) poor decision-making in use of inputs; (5) farm and firm equipment breakdowns; (6) inability to adapt to changes in cash and labour flows (7) forecast and planning errors	Louw el al (2016), (2020) Nyamah et al (2017),Zhao et al (2020),

In the context of smallholder farmers in South Africa, Louw et al. (2016) identified SCR at various transaction points within the supply chain and showed that value chain risks affect the quantity and quality of agricultural products within a given supply chain. Ultimately, this impacts their ability to participate and compete in formal high-value markets. Mokhaukhau et al. (2020) found that small-scale vegetable farmers face major risks, such as pests and adverse weather conditions leading to crop failure and limited market participation.

The impact of SCRs on the sustainability of smallholder farmers encompasses economic, social, and environmental dimensions. Their sustainability is crucial for addressing global food security, diminishing poverty, and promoting responsible agricultural practices.

The severity of risks often overwhelms smallholder farmers, who may have limited capacity and willingness to manage these risks effectively (Louw et al., 2016). Research has shown that farmers use various strategies to cope with risk, such as seeking cheaper inputs, applying reduced quantities, and employing risk management techniques like pesticides and crop rotation (Kumar et al., 2020; Mokhaukhau, 2020).

Research Methodology

The study utilised primary data collected from smallholder vegetable farmers in the Capricorn and Vhembe districts of Limpopo Province, South Africa. These districts, despite their distinct agro-climatic zones, share microclimatic advantages conducive to vegetable production. The research focused on these areas due to their high concentration of smallholder farmers and their unique agricultural potential. Data collection involved face-to-face interviews with farmers using an open-ended questionnaire, which gathered information on demographics, types of supply chain risks faced, vegetables produced, market access determinants, and risk management strategies. Additionally, structured interviews were conducted with key supply chain stakeholders, including market agents, supermarkets, processors, and government representatives.

A purposive sampling technique was employed to select participants who were particularly relevant to the study, aiming to provide in-depth insights into the supply chain risks faced by smallholder farmers. The sample size, initially set at 30, was adjusted to 20 based on continuous assessment of information saturation, ensuring that no new insights were emerging. Thematic analysis was used to analyse the qualitative data from interviews, identifying and interpreting patterns and themes to address the research questions effectively. This approach allowed for a detailed examination of the challenges and risk management strategies of smallholder farmers in the study areas. The thematic analysis undertaken in this study followed six sequential steps, as illustrated in Figure 1 below.

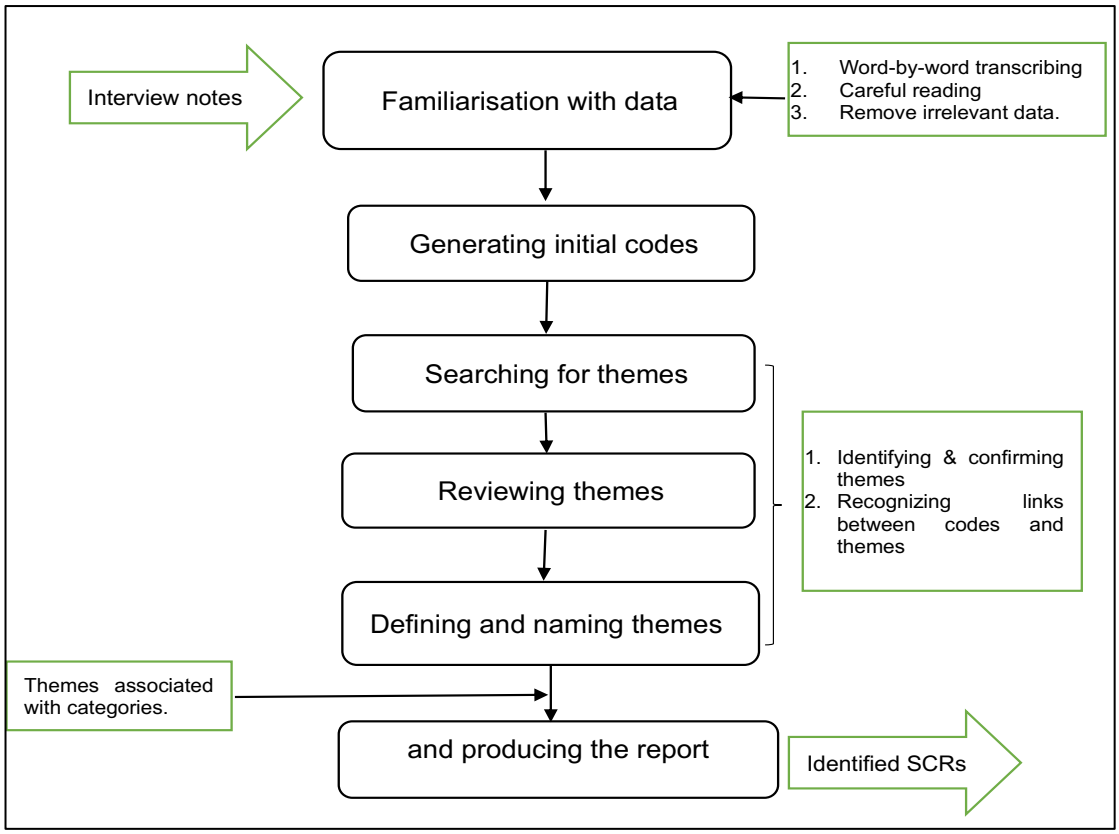


Figure 1: Data Thematic Analysis Process.

All coded data were validated thoroughly and guided by the literature and research questions. The next step was searching for themes by evaluating the relationships between codes, between themes, and between main themes and sub-themes. This was followed by checking whether the emerging themes inform the main themes which link with the research question and objectives. After reviewing the emerging themes, an ongoing analysis was performed to ensure that there were clear definitions and names for each theme.

Discussions

Table 2 below provides the demographic characteristics of the farmers from the study area.

Table 2: Farmer's Demographic Characteristics

	Number	Percentage (%)
Gender		
Male	13	65%
Female	7	35%
Education		
Primary	0	0%
Secondary	9	45%
Tertiary	11	55%
Age		
18-30yrs	2	10%
31-40yrs	7	35%
41-50yrs	5	25%
51-60yrs	3	15%
Above 60yrs	3	15%
Land Tenure		
Private land	0	0%
Communal	0	0%
PTO	20	100%

The sample predominantly comprises male farmers (65%), indicating a gender disparity in farming roles within the study areas. The education levels of the farmers are notably high, with 55% having tertiary education and 45% having secondary education, but none possessing only primary education. This suggests that the farmers are relatively well-educated, which may influence their adoption of advanced agricultural practices and engagement with new technologies. The age distribution shows a majority of farmers are between 31-40 years old (35%), indicating a relatively youthful and potentially dynamic farming community, although there is a notable presence of both younger (10% aged 18-30) and older farmers (30% aged 51 years and above). This age distribution may impact the farmers' adaptability to new practices and risk management strategies.

The land tenure situation is particularly striking, as all farmers report having land under a Permit to Occupy (PTO), with no private or communal land ownership reported. This land tenure arrangement could significantly influence the farmers' investment capacity and long-term planning. PTO land tenure often limits farmers' access to credit and investment in infrastructure due to perceived instability in land

rights. Consequently, this may impact their ability to adopt risk management strategies and invest in sustainability measures.

Emerging categories and themes

Deductive analysis was conducted with predetermined codes informed by previous studies and the literature review. The thematic analysis identified several key themes and categories that underscore the multifaceted nature of these risks. Table 3 below presents the emerging themes and they have been categorised as follows.

Table 3: Emerging categories and themes

Themes	Emerging categories of themes	Literature
Theme one Fresh Produce Supply chain risks	Operational & Management risks Climate and Weather risk Biological and Environmental risks Institutional risks Market and economic risks Logistical and Infrastructure	Louw et al (2016), Komarek et al (2020), Nyamah et al (2017), Shi & Wang (2022), Zhao et al (2020), Sharma et al (2020, Mokhaukhau et al. (2021)
Theme two Supply Chain Risks Impact on Sustainability of Smallholder farmers	Financial / income loss Livelihood loss Enterprise change / Closure Sustainable farming	(Ramukhwatho et al (2021) , (Nyamah, 2017), Terlau et al (2019.) Komarek et al (2020) , Zhao et al (2020), Sharma et al (2020)

Theme One: Fresh Produce Supply Chain Risks

This theme encompasses a broad spectrum of risk categories, including operational and management risks, climate and weather risks, biological and environmental risks, institutional risks, market and economic risks, and logistical and infrastructure risks (Jaffee, 2010; Louw et al., 2016; Komarek et al., 2020; Nyamah et al., 2017; Shi & Wang, 2022; Zhao et al., 2020; Sharma et al., 2020; Mokhaukhau et al., 2021). Each category highlights specific challenges smallholder farmers face. Operational and management risks, such as inadequate farming practices and poor decision-making, can disrupt production. Climate and weather risks, including extreme weather events, directly impact crop yields and quality. Biological and environmental risks, such as pests and diseases, further threaten agricultural productivity. Institutional risks, such as policy inadequacies, and market and economic risks, including price volatility and market fluctuations, exacerbate the uncertainty. Lastly, logistical and infrastructure risks involve inefficiencies in transportation and market access, which hinder the distribution and sale of produce.

Theme Two: Supply Chain Risks Impact on Smallholder Farmers' Sustainability

The categories under this theme include financial/income loss, livelihood loss, enterprise change/closure, and sustainable farming (FAO-SDG, 2015; Jaffee, 2010; Ramukhwatho et al., 2021; Nyamah, 2017; Terlau et al., 2019; Komarek et al., 2020; Zhao et al., 2020; Sharma et al., 2020). These impacts are profound; financial losses undermine the economic stability of farmers, while livelihood losses threaten their overall well-being and capacity to continue farming. Enterprise change or closure reflects the severe consequences that supply chain risks can have on farm operations, potentially leading to the cessation of farming activities. Sustainable farming practices are jeopardised as farmers struggle to maintain productive and economically viable operations amidst these challenges.

Key supply chain risks faced by smallholder fresh produce farmers

Based on the information provided by smallholder fresh produce farmers in two study areas, supply chain risks (SCRs) were identified across two main spectra: 1. Supply-side risks primarily experienced by farmers, and 2. Demand-side risks encountered by end markets. These SCRs were found at three key stages of the supply chain: input supply, production, and post-harvest and marketing. Figure 2 below illustrates the various points where SCRs were identified through interviews with both farmers and buyers.

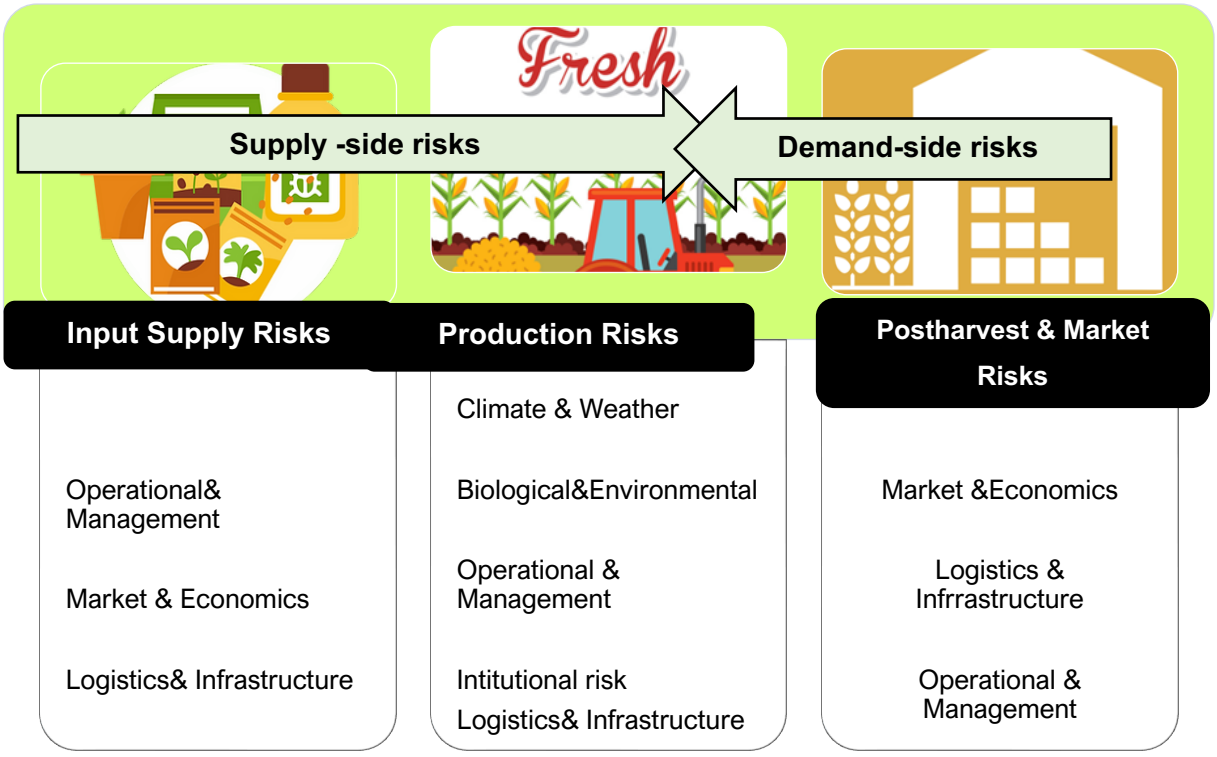


Figure 2: Agricultural Supply Chain stages.

Source: The Author

Input Supply Risks

Farmers in the study identified input supply risks as a significant disruptor in their agricultural practices, affecting productivity, quality, and market access. The high cost and limited availability of essential inputs, such as seeds, agrochemicals, and fertilizers, were cited as major concerns. These inputs are crucial for maintaining and enhancing crop yields, and their scarcity or expense can lead to decreased productivity and lower quality produce (Jaffee, 2010; Louw et al., 2016). This problem is compounded by issues with mechanization access, which affects production timing. Proper mechanisation is vital for timely planting, cultivating, and harvesting, and its inadequacy can further diminish the efficiency and effectiveness of farming operations. Limited access to modern machinery can delay production cycles and lead to suboptimal harvests, ultimately affecting the quantity and quality of produce available for market (Komarek et al., 2020; Nyamah et al., 2017).

The impact of these input supply risks is substantial, as they influence not only the immediate productivity of farmers but also their longer-term market access and financial stability. High input costs can erode profit margins, making it difficult for smallholder farmers to remain competitive in the market (Jaffee, 2010; Zhao et al., 2020). Additionally, if farmers are unable to acquire necessary inputs or access mechanisation, their ability to produce high-quality and timely crops is compromised, reducing their market opportunities and income potential. This situation underscores the need for better input supply systems and support mechanisms to ensure smallholders can access affordable and timely resources essential for maintaining agricultural productivity and market competitiveness (Shi & Wang, 2022; Sharma et al., 2020).

Production Risks

Production risks, particularly related to severe weather conditions, were reported as critical challenges for farmers. Extreme weather events such as hail, excessive rain, and heat were identified as major threats to crop production. The study noted visible damage from hail, which underscores the direct impact of such adverse weather on agricultural outputs (Jaffee, 2010; Louw et al., 2016). Severe weather conditions can lead to reduced crop yields and compromised quality, making crops less marketable and increasing financial losses for farmers. This is particularly concerning for high-value crops like potatoes and tomatoes, which are more susceptible to weather-related damage and pests (Komarek et al., 2020; Nyamah et al., 2017).

In addition to weather-related risks, pests and diseases were highlighted as significant threats to crop health and productivity. These biological risks can decimate high-value crops and pose severe challenges to maintaining consistent and profitable production (Sharma et al., 2020; Zhao et al., 2020). The impact of these risks extends beyond immediate crop losses; they affect farmers' ability to participate in the market and sustain their livelihoods. Addressing production risks requires comprehensive strategies, including improved weather forecasting, pest management practices, and resilient crop varieties, to enhance farmers' ability to cope with and mitigate the effects of these risks (Fan & Rue, 2020; Komarek et al., 2020).

Post-Harvest and Marketing Risks

Post-harvest and marketing risks identified in the study reflect significant barriers to smallholder farmers' market access and profitability. Low market prices at open spot markets were cited as a critical issue, affecting farmers' income and financial stability (Jaffee, 2010; FAO-SDG, 2015). These low prices often result from oversupply or market inefficiencies, which can erode profit margins and discourage farmers from engaging in market transactions. Additionally, the lack of adequate market infrastructure, such as pack houses, leads to produce waste and quality issues. Without proper facilities for sorting, packing, and storing produce, farmers are unable to maintain the quality of their products, further limiting their market access and reducing their competitiveness in higher-end markets (Nyamah, 2017; Sharma et al., 2020).

Without proper facilities for sorting, packing, and storing produce, farmers are unable to maintain the quality of their products, further limiting their market access and reducing their competitiveness in higher-end markets. These findings align with Stathers and Mvumi, (2020) observation, that, despite smallholder farmers' crucial role, the efforts of smallholder vegetable farmers are often hampered by significant post-harvest losses. These losses occur at various stages along the value chain, including harvesting, handling, storage, transportation, and marketing. Moreover, the perishable nature of vegetables makes them particularly susceptible to deterioration due to factors such as improper handling, inadequate storage facilities, and lack of access to appropriate cooling technologies (Makule et al., 2022)

Market standards certification also emerged as an institutional barrier for smallholders seeking to access high-end retail markets. Certification requirements can be stringent and costly, making it difficult for smallholders to meet the necessary standards and gain entry into lucrative markets (FAO, 2022). This barrier exacerbates the challenges faced by smallholder farmers, as they struggle to comply with market demands and access profitable market segments. Addressing these post-harvest and marketing risks requires investment in market infrastructure, support for meeting certification standards, and strategies to improve market price stability to enhance smallholder farmers' market participation and income generation (Ayaz et al., 2011; van Stade, 2019).

Impact of SCRs on the Sustainability of Smallholder Farmers

Smallholder farmers are increasingly recognized as pivotal players in rural development, food security, and economic contribution, with roles extending across economic, institutional, and social dimensions (FAO-SDG, 2015; Jaffee, 2010). The impact of supply chain risks (SCRs) on these farmers is significant, affecting their income, operational capacity, and sustainability. SCRs such as high input costs, severe weather conditions, and inadequate infrastructure can lead to substantial income loss, which directly influences the farmers' ability to sustain their agricultural enterprises. This economic strain reduces their capacity to hire rural labour, invest in sustainable farming practices, and maintain productive operations (Komarek et al., 2020; Zhao et al., 2020). Such income instability undermines the farmers' role as economic contributors and diminishes their effectiveness in promoting rural development and job creation, ultimately impacting their broader sustainability objectives (Louw et al., 2016; Sharma et al., 2020).

In addition to economic implications, poor post-harvest infrastructure exacerbates sustainability issues by leading to significant food waste and spoilage. This not only affects the quality and availability of food but also contributes to environmental concerns such as increased emissions from decomposing produce (Nyamah et al., 2017; Shi & Wang, 2022). Smallholder farmers, who play a critical role in food security and social support in rural areas, are significantly impacted when SCRs hinder their ability to manage and market their produce effectively. The inefficiencies and losses caused by inadequate infrastructure further compromise the sustainability of their operations and their capacity to support local food systems and social cohesion (Jari & Fraser, 2012; van Stade, 2019).

Addressing these challenges is essential to maintaining the role of smallholders in achieving Sustainable Development Goals (SDGs) such as Goal 2 (Zero Hunger), Goal 12 (Responsible Consumption and Production), Goal 13 (Climate Action), and Goal 7 (Affordable and Clean Energy) (FAO-SDG, 2015; Terlau et al., 2019). SCRs that disrupt these roles compromise the farmers' ability to contribute to rural livelihoods, job creation, and social cohesion, highlighting the need for comprehensive strategies to mitigate these risks and support the sustainability of smallholder farming systems.

Conclusions

This study highlights the pervasive nature of risks in the agricultural supply chain, demonstrating that smallholder fresh produce farmers face concurrent risks across key stages, including input supply, production, and post-harvest management. These farmers grapple with significant barriers to accessing high-value formal markets, such as limited credit, regulatory constraints, information asymmetry, and insufficient market infrastructure. The study also reveals the fragile resilience of smallholders, who struggle to implement effective risk management strategies due to resource constraints, which threatens their role in the industry and their overall sustainability. In line with Rue and Fan (2020), it is crucial to enhance the resilience of smallholder farmers through improved access to risk management tools and strategies. To achieve this, a collaborative and coordinated effort among government agencies, producer organisations, and private sector partners is essential. This approach should focus on building adaptive capacity by addressing barriers to market access, improving infrastructure, and providing targeted support to mitigate and adapt to various risks, ultimately strengthening the sustainability and resilience of smallholder farming systems.

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DIGITAL INTERVENTION FRAMEWORK FOR ENHANCED STAKEHOLDER ENGAGEMENT IN EMERGING ECONOMY SERVICE DELIVERY PUBLIC PRIVATE PARTNERSHIP (PPP) PROJECTS

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Abstract

Digital Intervention Frameworks (DIF) have become essential for improving the design, implementation and evaluation of services delivered through formal and informal digital approaches. This paper critically examined the use of digital frameworks for addressing stakeholder engagements within regulated municipal service delivery projects. A two-tier qualitative approach was adopted by conducting a detailed diagnosis of digital intervention models and guidelines of the South African municipal planning and budgeting processes, with the municipal Public-Private Partnerships (PPP) project cycle process. Overlapping stakeholder engagements across the three processes were juxtaposed with the various stages and phases from the three processes; a theoretical lens was used for scrutinising digital intervention tools alongside stakeholder engagement barriers, gaps and challenges; while stakeholder segments and the level of engagement required per consultation process were mapped against associated risks. The findings indicated that stakeholder engagement occurs across all stages and phases of the regulated three municipal processes; and the barriers, gaps, and challenges that prevent the use of digital interventions can be circumvented by applying more than one digital intervention method per overlapping engagement process. The findings discouraged the use of digital intervention as an alternative to conventional consultation methods, but promoted the use of multiple digital methods to enhance stakeholder engagement and participation. These findings informed the development of a DIF for improving stakeholder engagements to enable successful delivery of municipal PPP projects in emerging economies. It is recommended that government and policy makers use these findings for guiding current service delivery PPP projects with overlapping stakeholder engagements that depend on fiscal budget approvals; and to prioritize the lower and/or lesser risk levels outlined on the DFI per stakeholder segment.

Keywords: digital intervention, framework, integrated development plan, municipality, public private partnership, risk, service delivery, stakeholder engagement.

Introduction

Technology and the digital environment have evolved significantly in the last decade (Ciarli et al., 2021), compelling government and the private sector to adapt to digital technological innovation and interventions or face opposition and litigation for miscommunication, lack of inclusive engagement, delays or termination of projects (Galea, 2020; Dokubo, 2024).

Digital intervention during stakeholder engagement processes involves the use of technology, digital tools and platforms that are either a formal or informal means of communication to enable access to information and decision-making (Shava & Vyas-Doorgapersad, 2023). This usually takes place through online portals, social media, virtual meetings, webinars, data visualisation tools, surveys and polls. Such interventions serve as an additional means of engagement and does not replace the conventional approaches of in-person workshops attendance; radio or television broadcasting; print media or other communication formats for stakeholder engagement and consultations (Tan et al., 2022).

Conventionally, municipalities are mandated to provide service delivery to their communities and to augment budget and resource shortfalls by engaging in Public Private Partnerships (PPPs), an effective financial model for risk sharing between government and the private sector (Mamokhere, Mabeba & Kgobe, 2022). However, municipal fiscal budget allocations, planning processes and implementation of service delivery PPP projects are highly regulated processes that involve extensive stakeholder engagement (National Treasury; 2024; ETU, 2024; DWS, 2024). These processes tend to be costly, and new age technological interventions seem to be cost effective and a viable option (Shava & Vyas-Doorgapersad, 2023).

Problem statement

Different stakeholder segments are consulted at specific points within the regulated municipal processes (ETU, 2024; DWS, 2024; Albareda, 2024) and there is limited empirical research that outlines the use of digital interventions on the overlapping processes.

Published research highlights that inadequate stakeholder engagement often result in violent service delivery protests, political interference and ineffective municipal planning and budgeting (Banda et al., 2020; Matyana & Mthethwa, 2022).

Beyond these concerns, there is a lack of information on stakeholder engagement using digital interventions for PPP projects that must be aligned to municipal planning and budgeting processes. Published literature on the use of digital interventions exists, but it does not address stakeholder engagement, digital interventions and PPP projects collectively.

Research objectives

The main objective of this study was to develop a Digital Intervention Framework (DIF) for enhanced stakeholder engagement in emerging economy service delivery PPP projects. The inaugural objective was to review the South African municipal planning, municipal budgeting and PPP regulated processes. The second objective was to identify the overlaps and alignment between the three stakeholder engagement processes and the implications of using digital interventions. The third objective involved identifying the barriers, gaps and challenges that affect the use of digital interventions across the three engagement processes. The final objective was to present the DIF highlighting the targeted stakeholder segments, risk levels, type of digital interventions and level of stakeholder engagement required.

Research methodology

This paper adopted a two-tier qualitative approach by conducting a detailed diagnosis of digital intervention models; the South African regulated guidelines for municipal planning, municipal budgeting and the PPP process cycle and juxtaposed the overlapping stakeholder engagement with special focus on the stages and phases of those processes. The South African context was used as a case study, and the three processes were selected mainly due to their interconnectedness when requesting approvals for fiscal budget and the inclusion into the Integrated Development Plan (IDP) which is a regulated instrument for municipal planning in South Africa.

The main sources of information were the Parliamentary Monitoring Group (2022) report, National Treasury (2024) documents and guidelines on municipal budgeting, ETU (2024) and DWS (2024) guidelines on municipal planning.

Qualitative analytical techniques applied included content analysis to obtain an in-depth understanding of stakeholder engagement across the three municipal processes; framework analysis to unpack the barriers, gaps and challenges affecting stakeholder engagement when using digital intervention methods; and comparative analysis to critically examine the alignment and overlap between the three stakeholder engagement processes at the interfacing intervention points, while risk assessment served to distinguish the risk associated aspects that can affect the use of digital interventions when engaging stakeholders during consultation processes (Kyngäs, 2020; Shi et al, 2020; Maier et al, 2020; Batra, 2021).

The adoption of the three South African regulated municipal process guidelines as the main data sets and the incorporation of the Batra (2021) analytical framework for unpacking the barriers, gaps and challenges facilitated a multifaceted comprehension of the complicated and overlapping stakeholder engagement processes. The qualitative approach linked with empirical research on digital interventions provided a richer understanding and context in contrast to the assessment of a subjective quantitative opinion piece from officials and PPP partners involved in municipal stakeholder engagements processes, especially since this is an emerging new field within the PPP space.

Analysis of findings

Stakeholder engagement across the three regulated processes

The stakeholder engagement processes in South Africa are complex and highly regulated (Albareda, 2024). Such engagements sometimes take longer to be completed when there are objections or when there is a requirement for a broader consultation process to confirm buy-in (Dlamini & Mutereko, 2021).

Table 1 presents a summarised display of the three processes, outlining the regulated stages/phases, allocated timeframes for implementation and the months those processes should be completed.

Table 1 Summary of the 3 municipal processes with timeframes

Stage	Planning process (IDP)	Stage	Budgeting process	Phase	PPP process
1	Preparation (1 month- Sep)	1	Planning (2 month- Aug)	1	Inception (timeframes not specified)
2	Analysis (3 months- Dec)	2	Strategizing (4 months- Oct)	2	Feasibility (60 days comment period)
3	Strategies (3 months- Jan)	3	Preparing (11 months- Jun)	3	Procurement (60 days comment period)
4	Projects (3 months- Feb)	4	Tabling (4 month- Mar)	4	PPP contract management (timeframes not specified)
5	Integration (6 weeks- Apr)	5	Approving (4 months- Jun)		
6	Approval (6 weeks- Apr)	6	Finalising (3 months- Jun)		
7	Implementation (12 months- Jul)				

The municipal planning process (IDP) best practice framework has seven stages as detailed in Table 1, with the municipal budgeting process with six stages while the PPP process has four phases (Mamokhere, Mabeba & Kgobe, 2022; DWS, 2024).

Municipal planning process

Publications highlighted that the municipal planning process also known as the Integrated Development Plan (IDP) provides an overall framework and strategy for development, co-ordination and management of municipal finances and activities within local government. This Plan is funded through fiscal budget regulated within set timeframes (Parliamentary Monitoring Group, 2022). IDP's have a 5 year lifespan; are reviewed and updated annually and take 6 to 9 months for development. After every local government election, the new Municipal Council decides whether they adopt the existing IDP, expand on it, or develop an entirely new plan. Municipalities adjust their IDPs according to the changing needs and priorities of their communities. IDPs are a legislative requirement and have a legal status that supersedes all other plans at local government. They are enforced and overseen by Mayors, Executive Committees, and Municipal Managers. Internal and external consultations cut across all the seven stages for 9 months prior to the draft report being tabled at Council for approval by April of that year (ETU, 2024).

Municipal budgeting process

The municipal financial year runs from 01 July of each year to 30 June the following year, and annual budgets are prepared and approved by Council before the new financial year begins. IDP activities and projects are included in the 3-year municipal Financial Plan and IDPs 5- year Financial Plan (ETU, 2024). Approved municipal budgets are submitted as a recommendation to National Treasury for approval and integration into the national and provincial fiscal allocation. All municipal priority projects must be approved through the IDP process; and projects excluded on the IDP do not receive funding from the budget allocation by national and provincial government (Parliamentary Monitoring Group, 2022). Internal and external consultations occur within each of the 6 stages and the draft budget must be submitted by March for approval by June to be implemented by 01 July of that year.

Municipal PPP project cycle

Municipal PPP projects are subjected to the same principles of consultation in order to receive the necessary funding allocations and inclusion into the IDP. Funding for such projects is ring fenced from the fiscus and private sector. Approvals are issued by Council after National Treasury has provided their Treasury Views and Recommendations (TVR). Municipal PPP projects differ extensively from one municipality to the other, and are rarely replicated. There is no published research that outlines how long each PPP project takes from project design to financial closure since each municipality is unique with their by-laws and policies, while each PPP itself is unique with their implementation framework, partnership agreements and project objectives. PPP contracts range from 3-years to 30 years (ETU, 2024; National Treasury, 2024).

Comparing the three processes

An examination of the three processes indicated that stakeholder engagement was taking place at each and every stage or phase of these processes, and these engagements were either internal processes where municipal officials engaged with each other across different sector departments; or external processes where municipal officials engaged with officials at national and provincial level, or other state organs, or with primary stakeholders (communities and associated stakeholder groups). The engagement modus operandi differed for each stakeholder segment based on the level of literacy, mandate, decision making, power play and interest. Furthermore, such engagements required extensive and rigorous consultations; and buy-in for the plans to receive the necessary Council and national government approvals. In a nutshell, there are guidelines, timelines and structures for developing the regulated municipal plans, budgets and PPP projects with set rules for stakeholder engagement processes that need to be fulfilled.

Interfacing of the three regulated municipal processes and digital interventions

Empirical research highlighted that there was a growing interest and movement on digital interventions within the health sector (Moshe et al., 2021; Verweel et al., 2023); service delivery in municipalities (Shava & Vyas-Doorgapersad, 2023; Duygan, Fischer & Ingold, 2023; Bressane, Loureiro & Almendra, 2024) and for training and education purposes (Nogueira et al., 2022; Timotheou et al., 2023).

Smart City municipalities such as the City of Johannesburg, Sao Paulo and many others have embraced digital transformation models to enhance their customer experience and automated their customer engagement processes (Shava & Vyas-Doorgapersad, 2023; Bressane, Loureiro & Almendra, 2024). They offer services such as e-learning opportunities through their libraries

(Nyoka, 2022) and provide access and real-time feedback on health services (Fischer et al., 2019).

However, there are with limited publications on the use of digital interventions for engaging stakeholders during the development of municipal plans, budgets and PPP projects. This study is among the first to put forward a solution for addressing overlapping stakeholder engagement processes across municipal service delivery projects with a focus on PPP projects that also compete for an allocation from the fiscal budget.

In order to assess the stakeholder engagement intersection points across the three processes, this study overlayed the processes and examined the timeframes of engagement. The results are presented in Annexures - Figure 1 with a step wise process for the overlay.

Annexure – (Figure 1)

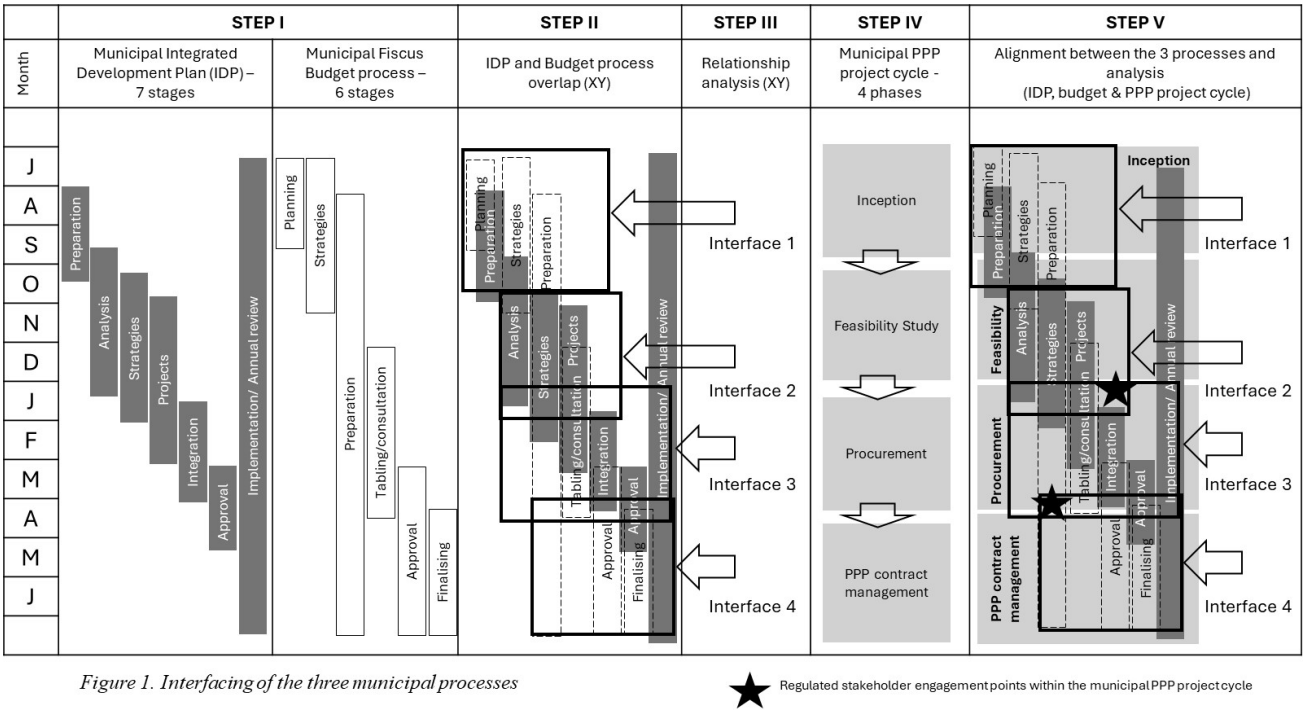


Figure 1. Interfacing of the three municipal processes

★ Regulated stakeholder engagement points within the municipal PPP project cycle

The findings indicated the following -

Interface 1-
The IDP and Budget process stages overlapped on Planning, Preparation and Strategies stages. This is when stakeholders have to review progress on provincially and nationally funded projects; to unpack whether there was funding and special requirements for the new year for projects and to set target dates for tabling the budget plan and IDP processes for Council. The interface of the IDP and budget stages also overlapped with the Inception phase from the PPP process where the public, National Treasury and COGTA can be notified of an impending project and application process for a PPP project.

This interface is very important as it sets the scene and implementation plan for the three processes for the financial year. Integrating or tabling issues at the same stakeholder engagement meetings for the three processes would reduce the costs of running three parallel meetings to the same stakeholders.

The estimated stakeholders engagement period is between July and mid October. Scheduled meetings include internal inter-departmental municipal meetings; external meetings with provincial, national and other parastatal organisations; Mayoral committees, Ward committees, IDP technical committees, and other community groups. Key areas of discussion include (but not limited to)- tariffs, indigent policy, credit controls, free basic services, previous year performance and economic trends. Digital interventions would play a significant role for sharing of resources, databases, calendar dates and coordinated, centralised and comprehensive documentation.

Interface 2-
IDP and Budget process stages overlapped on Analysis, Strategies, Preparation, Projects, and Tabling stages with the Feasibility study phase from the PPP process. The period of stakeholders engagement is between mid October and January and scheduled meetings include internal and external stakeholders with emphasis on analysing previous years' performance, revisions and confirmations of priority strategies, identification of projects and budgets; and then tabling these at Council to inform them of progress, outcomes and to solicit comments.

The use of digital interventions would ensure that all stakeholders have access to the relevant information; can input comments or relay concerns and objections in real-time, and for the relevant officials to integrate and consolidate the comments and solutions in one central area to maintain information integrity and quality in a secure portal. Virtual meetings and real-time feedback would be benefit to all.

Interface 3-
IDP and Budget process stages overlapped on Analysis, Strategies, Projects, Tabling, Integration and Approval stages with the Procurement phase from the PPP process. This interface carries the heaviest weight for PPPs as the Procurement phase can occur between January and April, and it can take longer to get the necessary buy-in and approvals from all stakeholders. However, this interface could be used as a launch pad for informing stakeholders of the progress on the PPP project, and to solicit the necessary feedback to inform, resolve, appraise and to confirm buy-in and support as required.

The overlap for the IDP and Budget processes is initiated between mid September and April of the next year. These stages involve extensive internal and external engagements, with revisions and confirmations of the priority strategies, projects and the proposed budgets. Integration of

issues and projects, and compiling a draft IDP and Budget Plan are a major milestone for any municipality, hence Council and internal municipal engagements become critical for securing the necessary alignments and budgets.

The use of digital interventions during Interface 3 is important as majority of concerns and confirmations would be presented in the draft reports and budget plan. These documents need to be presented in a clear and simplified manner such that both literate and illiterate stakeholders can understand the contents and be able to provide their input and support. The documents should be easily accessed and comments captured digitally and in real time wherever possible. Notifications, updates using social media, e-newsletters and virtual consultations are important during this period.

Interface 4-
IDP and Budget processes overlapped on Preparation, Integration, Tabling, Approval and Finalising stages with the PPP Contract management phase from the PPP process. This interface takes place between April and June before the new municipal financial year starts on 01 July. At this point, the majority of issues should have been resolved and alternative solutions presented for approvals and publication of final documents on municipal websites, placement within municipal libraries and offices.

Stakeholder engagement during this interface involves internal and external engagements for confirmation of resolutions tabled at Council meetings with support from national/provincial government and relevant state organs. The use of digital interventions during this interface is the most critical as approvals are required by 01 July. A combination of digital intervention methods will be useful, dependant on the stakeholder segment and engagement level required.

The implementation (annual review) and preparation stages on the IDP and budget are on-going process throughout the year. It would therefore be amiss not to highlight that digital technology can assists with the distribution and reporting on both stages. The PPP process on the other hand has two regulated stakeholder engagement points that occur during Feasibility study phase and Procurement phase where 60 days are allocated for public comment - of which 30 days are allocated for public, Treasury and COGTA to comment and a further 30 days are provisioned for submission of project documents for review to Council (60 days in total for commenting).

Past studies have not unpacked the above four mentioned interfaces in detail and this current analysis is a unique contribution to the PPP fraternity and those involved in municipal knowledge management, especially municipal stakeholder engagement for the three regulated municipal processes.

Barriers, gaps and challenges from the three processes when using digital interventions

Batra (2021) defined 'barriers' as obstacles that prevent or obstruct the functioning in whole or in part of a system or process; 'gaps' were defined as differences between what has been happening and what should be happening; and 'challenges' were defined as situations that require effort to be overcome successfully'.

For this study, issues that could cause 'barriers' (issues that hinder or block engagements), 'gaps' (issues that are interrupters, or can pause engagements) and 'challenges' (issues that test, defies or oppose engagements) were grouped separately and examined in relation to stakeholder engagement using digital interventions. Table 2 outlines the four interface points differentiated into the barriers, gaps and challenges.

Table 2- Barriers, gaps and challenges that can emerge when using digital interventions during stakeholder engagement

Overlap	Barriers	Gaps	Challenges
Interface 1	Resistance to use / adopt technology Inadequate digital infrastructure - Digital divide challenges	Lack of a comprehensive stakeholder database Blurred communication on service delivery objectives, plans and budgets	Lack of access to information to develop project proposals & programs Lack of budgets to establish digital platforms to engage stakeholders
Interface 2	Lack of technology (software & programmes for data analytics) Network issues Low technology literacy	Lack of baseline data to inform business case development Lack of digital tools to communicate or share evidence-based research, budget & projections	Loadshedding/stollen cables that disrupt electricity, thus disrupt scheduled meetings Lack of systems for sharing information in real time
Interface 3	Consultation timeframes overlap into end of year/ holiday season and results in limited participation/ engagement	Lack of centralized systems to share docs & update inputs Lack of coherent feedback loop between process managers and the intended stakeholders	Budget cuts & no access to latest technology to consolidate data and inputs Rigorous consultation requires up to date and functional digital systems
Interface 4	Lack of efficient systems for monitoring and reporting across stakeholders Technical complexity	Inadequate systems to consult and report progress and updates (communication) Limited technical experience/ expertise to update data	Data privacy concerns Concerns about cyber security risks Complex implementation processes – M&E, reporting and benchmarking

Note: list of barriers, gaps and challenges presented is not exhaustive

Research findings on Table 2 indicated the following-

Interface 1-
The municipal landscape is typically divided into digitally literate and illiterate stakeholders, and sometimes has inadequate digital infrastructure, hence the resistance to use or adopt technology for/during stakeholder engagements. "Barrier" in this instance can only be overcome if adequate budgets exist to establish the necessary platforms, while bankable project proposals can be

developed if baseline information is available and accessible ('challenges'). In summary, if access to technology, network and data is provided, the digital platforms can be a very useful mechanism for stakeholder engagement across municipal processes.

Interface 2-
This interface involves data analytics, development of business cases and technology literacy. The lack of software for analytics, lack of data and networks to access the information; and tools to communicate or share evidence based research will be the 'barriers and gaps' that need priority attention since this interface is the backbone for motivating for buy-in, budget allocations and support. Such 'barriers and gaps' may affect the level of participation and contribute to delays in approvals. More so when challenges linked to loadshedding and stollen electrical cables can affect distribution of information, resulting in a disruption for scheduled meetings, deadlines and receipt of information by stakeholders. Interface 2 has the greatest potential to derail one or all the three municipal processes if information distribution, exchange and feedback amongst stakeholders is compromised.

Interface 3-
This interface period overlaps into end of year holiday season where limited participation and feedback occurs. Unfortunately, the three municipal processes are regulated and engagement timeframes cannot be changed. However, officials leading the stakeholder processes may need to be innovative and through the use of digital intervention methods, make information available through a centralised system with automated and real-time feedback where applicable. Lack of a coherent feedback loop between process managers and the intended stakeholders has potential to derail the processes when tabled at Council meetings. Budget cuts and lack of access to the latest technology for consolidating feedback while maintaining information integrity can cause the engagement processes to be extended.

Interface 3 is pivotal for securing the necessary approvals and as such, the digital intervention methods used during this period need to be rigorous, up to date, functional and auditable.

Interface 4-
The three municipal processes have intense stakeholder engagement during implementation of IDP, budget and PPP projects and they require comprehensive monitoring and reporting systems. Inadequate systems with inexperienced officials and partners would flag data credibility issues, resulting in lack of trust and further delays in approvals. Concerns on data privacy and cyber security are a concern and have the potential to derail project approvals.

Concluding summary from Table 2
Overall, the use of digital interventions plays a significant role as the sharing of resources, databases, calendar dates and documentation can be coordinated and comprehensive for all involved stakeholders. However, the 'barriers', 'gaps' and 'challenges' identified can persist and affect stakeholder engagements, breeding more incoherent and unstable relations between the public and private sector. Data concerns, security risk, monitoring, evaluation and reporting are priority concerns that continuously get raised when digital interventions are mentioned, hence the need for a risk mitigation plan on such risks for regulated municipal processes.

Majority of the 'barriers', 'gaps' and 'challenges' identified are consistent with those mentioned by emerging economy researchers such as Hudson et al., (2020) for stakeholder engagement in the design, evaluation, and implementation of complex interventions for evidence based products;

and Machiri & Pade-Khene (2022) for appropriating digital citizen engagement in resource constrained local government service delivery in South Africa.

Municipalities from developed countries seem to have advanced significantly compared to emerging economies. Examples include Swiss municipalities (Bektas, Muller & Haller, 2024) involved in the use of digital interventions and implementing data-centric procedures in municipal strategy development processes; and the development of urban projects using digital tools for engaging stakeholders by municipality (city) in Finland (Toukola & Ahola, 2022).

Understanding and unpacking the 'barriers', 'gaps' and 'challenges' per interface was a useful exercise; and it is also required for DIF that are developed for emerging economy service delivery related stakeholder engagement process. The interlinkages with risk rating per digital intervention is important for guiding level of engagement required.

Development of the Digital Intervention Framework (DIF)

Key components of the DIF

A Digital Intervention Framework (DIF) can be in a form of an online platform for real-time feedback, interactive surveys, targeted communication channels, data visualization tools, and document portals, all intended to enable open engagements and access to information; to gather diverse views and track progress across projects or issues with a special focus on transparency, accessibility, inclusivity, and meaningful stakeholder engagement (Shava & Vyas-Doorgapersad, 2023; Duygan, Fischer & Ingold, 2023; Bressane, Loureiro & Almendra, 2024).

For this paper, a DIF with four key components was developed, comprising of (1) digital innervation tools, (2) level of stakeholder engagement, (3) stakeholder segments and (4) risk level. The following priori digital intervention tools (component 1) were noted -

- Web-based survey software for interactive surveys for collecting data and polls.
- Virtual meetings and forums for hosting meetings, share information, collaboration, and working together remotely.
- Communication channels for information sharing, discussion forums, feedback collection, and exchanging information or interacting in real time.
- Social media to reach a wider audience, promote awareness and encourage dialogue.
- Digital media tools are on demand mass media shared digitally and through the internet.
- Open data portals for increasing access to information and to promote transparency.

The International Association for Public Participation (IAP2, 2025) identified five levels of stakeholder engagement (component 2) as presented below -

- Inform - to provide access to information so that stakeholders can understand the problems, identify alternative opportunities and solutions to make informed decisions.
- Consult - to provide information and obtain feedback after stakeholders have processed and analysed the information to guide with establishing alternatives and solutions.
- Involve - to actively get stakeholders to participate throughout the process to ensure concerns and views are understood and considered.
- Collaborate- to work in partnership with stakeholders to identify and develop solutions.
- Empower- to provide stakeholders with the capacity and authority to make decisions for resolving identified problems and concerns.

Stakeholder segmentation is very important for any stakeholder engagement process. Using priori, the following stakeholder segments (component 3) were identified -

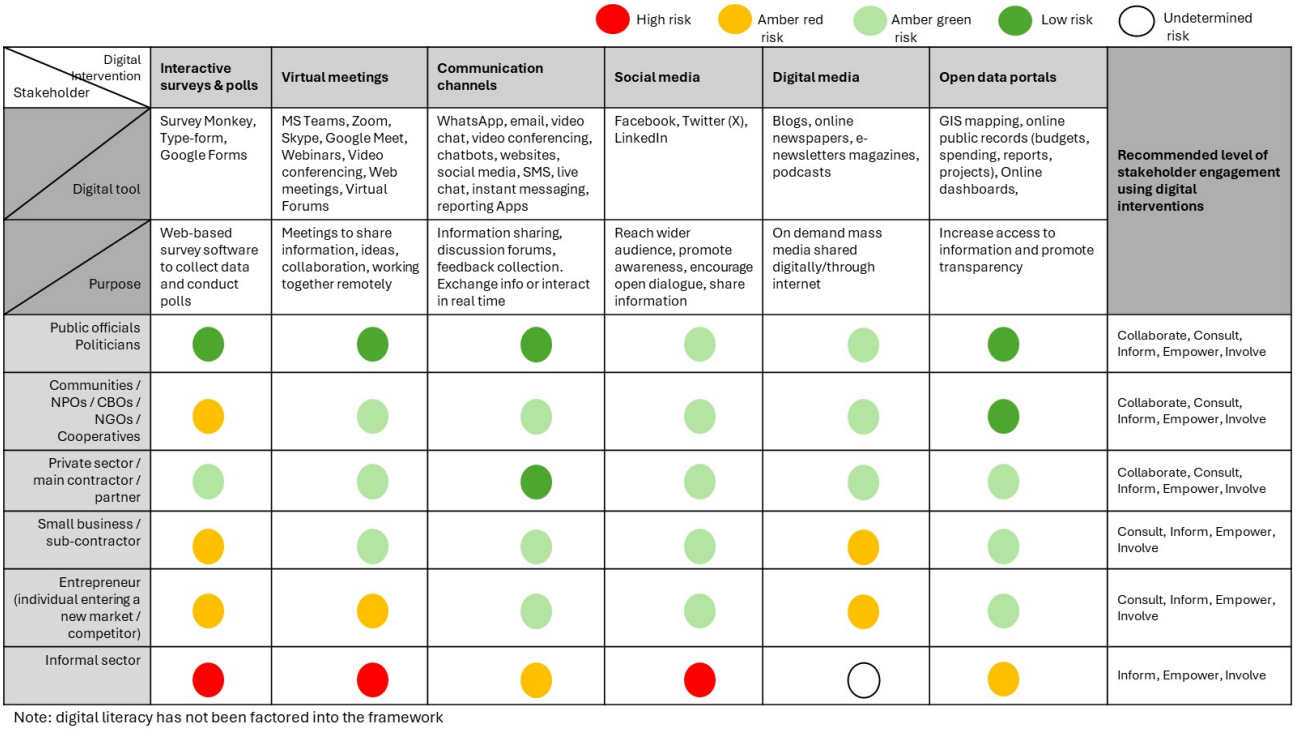
- Public officials and politicians - play a significant role in developing and facilitating the municipal planning, budgeting and PPP processes, and for hosting the engagement and consultation processes.
- Communities / NPOs / CBOs / NGOs / Cooperatives - are the core stakeholders whose input and concerns require prioritisation and redress.
- Private sector / main contractor / partner - are the stakeholders to the PPP projects, they fund and bring skills, capacity and capability to the PPP.
- Small business / sub-contractor - are stakeholders that are brought into the partnership to supplement the available skills set and expertise, or to offer products to the PPPs. These could be competitors as well, offering alternative skills and products.
- Entrepreneur (individual entering a new market / competitor) - are the new smaller participants that serve as competitors or innovators bringing new services and products to the market.
- Informal sector includes informal businesses, stakeholders or communities that reside in the informal settlements or represent organised stakeholders groups that are not registered or affiliated to any political party, institution or organisation.

The South African Masterplan development toolkit from the Department of Trade, Industry and Competition (the dtic, 2025) risk rating was adapted for benchmarking the risk of using digital intervention tools (component 4) as follows-

- Undetermined - risk level cannot be assigned/classified/predicted. Best not to engage using this intervention format.
- Low - risk level is insignificant/can be managed. Continue engaging using this format.
- Amber green - risk level is moderate/can be managed. Intervention needs slight deviation or moderate amendments. Imperfect if intervention format is used on its own.
- Amber red - risk level is moderate/cannot be managed. Intervention needs significant deviation or amendments. Intervention format may not be effective on its own.
- High - level of risk is high and will not yield desired outcomes. Best not to engage using this format as it will be ineffective.

These four components were instrumental in developing the DIF.

Annexures – (Figure 2)



Digital Intervention / Stakeholder	**Interactive surveys & polls**	**Virtual meetings**	**Communication channels**	**Social media**	**Digital media**	**Open data portals**	**Recommended level of stakeholder engagement using digital interventions**
Digital tool	Survey Monkey, Type-form, Google Forms	MS Teams, Zoom, Skype, Google Meet, Webinars, Video conferencing, Web meetings, Virtual Forums	WhatsApp, email, video chat, video conferencing, chatbots, websites, social media, SMS, live chat, instant messaging, reporting Apps	Facebook, Twitter (X), LinkedIn	Blogs, online newspapers, e-newsletters magazines, podcasts	GIS mapping, online public records (budgets, spending, reports, projects), Online dashboards,	
Purpose	Web-based survey software to collect data and conduct polls	Meetings to share information, ideas, collaboration, working together remotely	Information sharing, discussion forums, feedback collection. Exchange info or interact in real time	Reach wider audience, promote awareness, encourage open dialogue, share information	On demand mass media shared digitally/through internet	Increase access to information and promote transparency	
Public officials Politicians							Collaborate, Consult, Inform, Empower, Involve
Communities / NPOs / CBOs / NGOs / Cooperatives							Collaborate, Consult, Inform, Empower, Involve
Private sector / main contractor / partner							Collaborate, Consult, Inform, Empower, Involve
Small business / sub-contractor							Consult, Inform, Empower, Involve
Entrepreneur (individual entering a new market / competitor)							Consult, Inform, Empower, Involve
Informal sector							Inform, Empower, Involve

Note: digital literacy has not been factored into the framework

Figure 2 Digital Intervention Framework for stakeholder engagement in emerging economy service delivery PPP projects

The Digital Intervention Framework

The proposed Digital Intervention Framework (DIF) presented in Annexures- Figure 2, outlines digital intervention tools and their purpose, the various stakeholder segments that need to be consulted and the recommended level of engagement. The most critical aspect of the DIF was the risk levels associated with using digital intervention when consulting stakeholders.

For instance, risk levels for using digital interventions when engaging with public officials, politicians, communities and the private sector were broadly identified as Low risk and Amber green risk. Low risk was indicative that the risk levels were either insignificant and can be managed, therefore engagement can continue using the identified digital intervention. Amber green risk on the other hand was indicative that the risk level was moderate and can be managed with moderate amendments since the intervention was imperfect if used on its own.

Risk levels for engaging with small business and entrepreneurs were Amber green for most of the interventions except when using interactive surveys and polls as well as digital media such as online newspapers, e-newsletters, blogs and podcasts (Amber red risk). The Amber red risk signifies moderate risk levels that cannot be managed and needs significant deviation or amendments since they may not be effective when used on their own.

Small businesses and entrepreneurs engage with surveys and digital media only if it will profile them or help them deliver their services to targeted customers (Gleason & Murschetz, 2019; Bachmann et al, 2024). Home-based small businesses especially in rural and peri-urban areas rarely make use of e-commerce (Reuschke & Mason, 2022; Reuschke, Mason & Syrett, 2022b) or respond to online surveys or read the e-newsletters due to limited connectivity and data challenges; their limited digital skills; security risk to their data and data privacy concerns.

Engaging the informal sector using digital intervention is a high risk. The Akinyemi (2022) report mentioned that the digital divide, especially for those who lack connectivity and digital skills; the reduction in social protection afforded to informal traders and small businesses on digital platforms; and users of fully digital solutions may be wary of digital interventions due to lack of trust in financial service companies and government, and the risk that their data will be misused.

This partly explains the High risk and Amber red risk levels identified for engaging the informal sector using digital interventions. The same principle applies for informal stakeholders or communities that reside in the informal settlements or representatives of organised stakeholder groups that are not registered or affiliated to any political party, institution or organisation.

Understanding these digital interventions in alignment with the level of stakeholder engagement can ensure a comprehensive and standardised DIF for implementation. The risk rating levels outlined against the digital intervention tools on Appendix- Figure 2 serve as an example for how researchers can customise, benchmark and allocate risk according to their stakeholder segments and the associated risk levels for future DIFs.

Conclusions

An examination of the South African stakeholder engagement processes for municipal planning, budgeting, and PPP projects; and the use of digital interventions was useful for informing the development of a Digital Intervention Framework (DIF). Such a framework can benefit any

municipal entity mandated to develop an annual municipal plan, budget plan and PPP projects in support of service delivery to communities within constrained resources.

Salient issues identified indicated that stakeholder engagement occurs across all stages and phases of the regulated three municipal processes; and the 'barriers', 'gaps' and 'challenges' that prevent the use of digital interventions can be circumvented by applying more than one digital intervention method per overlapping engagement process.

It was further noted that the use of digital intervention as an alternative to conventional consultation methods was discouraged, while the use of multiple digital methods to enhance stakeholder engagement and participation was supported, dependant on the associated risk level.

The proposed DIF is not yet tested since it is part of an ongoing research. The next phase involves testing and validation of the framework for applicability and appropriateness when conducting stakeholder engagement while trying to secure resources from partners through regulated consultation processes. A validated DIF can contribute towards addressing similar challenges in other regulated municipal processes that overlap; that engage the same stakeholders with limited resources; and that need to share resources. It is therefore recommended that future research test the alignment of the identified digital interventions on the framework across the three processes; the proposed remedial solutions and develop criteria for selection of lesser risk levels across the stages and phases of the three municipal processes.

Future research must take cognisance that stakeholder engagement during municipal planning (i.e. development of IDPs), municipal budget planning to secure fiscal allocations from national and provincial government; and selection and implementation of municipal PPP projects is very complex, not linear, while overlapping and aligning the three consultation processes will reduce costs. This will also require a rigorous undertaking with a comprehensive framework that involves innovation and the use of carefully designed and selected digital intervention tools, with a well defined risk matrix.

It is recommended that government and policy makers use these findings for guiding current service delivery PPP projects whose overlapping stakeholder engagements depend on fiscal budget approvals and the regulated processes. Policy makers should also prioritize the lower and/or lesser risk levels on the DFI per stakeholder segment to improve the chances of successful project delivery for PPP projects.

Successful development of such regulated plans while using the DIF is dependant on buy-in and support earned through rigorous stakeholder engagement processes.

And lastly, adoption or development of a DIF is dependant on an entities readiness for using digital technology; availability of financial instruments and resources to invest in the technology and infrastructure; executive and/or political commitment and support; and consumer/stakeholder interest and appetite to use the technology. These dependencies will need to be secured in advance, and the best way would be to set milestones and allocate key outputs since initial costs for digital interventions can be high when setting up but will be cost and time efficient down the line.

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EXAMINING PROJECT COMPETENCE: CHALLENGES AND SOLUTIONS FOR ICT PROJECT SUCCESS IN SOUTH AFRICA

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Abstract

This study examined the challenges of project management competence and solutions for ICT projects in South Africa. The study used a mixed methods approach for data collection. The study reveals that project management does increase the success rates of ICT projects. The findings highlight the significance of various challenges, including personality, accountability to perform, delivery pressure, multi-skilling, skills shortage, over-commitment (sales), and lack of mentorship. It also emphasizes the solutions, including governance, incentives, shadowing approach, community outreach, leaders' availability, industry forums, personal control, and PMO support. The implications of these findings emphasize the need for effective knowledge, skills, and experience. The research contributes valuable empirical evidence on issues and solutions to project management competence for ICT projects in South Africa. The findings can serve as the basis for improving the success rates of ICT projects in similar contexts. Ultimately, addressing these challenges can lead to solutions to ICT project delivery and practices in the country and suggest future research directions for success.

Keywords: Project management, Information and communication technology, project approaches, project manager competence, project success.

Introduction

Technology increasingly enables business operations, and Information and communication technology projects enhance efficiency and maintain competitive advantage. This has led some organizations to employ managers based on their technical expertise without appropriate knowledge to manage projects. Organizations need capabilities for achieving positive outcomes. Despite the critical role of ICT projects, failure rates remain very high. Common challenges include budget overruns, missed deadlines, scope creep, and poor stakeholder satisfaction.

Technology plays a crucial role in our modern lives in today's changing environment (Mbebe & Jowah, 2024). ICT supports sectors and organizations, incorporating telecommunications and IT services and products. Project managers must navigate various technologies, environments, and challenges. Organizations must tackle challenges to successfully implement projects for business transformation, as factors like inexperienced managers and insufficient skills can lead to ICT project failures.

Project managers in the ICT sector are expected to balance technical complexities, dynamic market demands, and stakeholder expectations. Yet, many lack the essential skills, methodologies, and leadership capabilities to steer projects toward success. Common competence challenges include ineffective planning, weak risk management, poor communication, and inadequate stakeholder engagement. ICT projects will continue to suffer inefficiencies and costly failures without addressing these gaps.

This study focuses on competence issues that hinder ICT project success, identifying the core inadequacies and pitfalls that lead to project failure. Furthermore, it investigates solutions from industry best practices and project management frameworks that enhance ICT project outcomes. By bridging the gap between competence and execution, this research aims to provide recommendations for improving project management effectiveness and driving higher success rates in the ICT industry.

The study is informed by two primary sources: an overview of critical issues related to ICT PM competence from the literature (Sections 2 to 5) and a mixed methods study conducted in three organizations. It investigates whether their competence—defined by knowledge, skills, and experience—is critical for successfully implementing ICT projects.

The findings emphasize that project management increases the success rates of ICT projects and highlights personality, commitment, performance (accountability and delivery efficiency), multi-skilling, skills shortage, and mentorship challenges. It suggests solution strategies through governance, incentives, outreach programs, and control over one's career.

This paper outlines the research question in the next section, followed by a literature review on project management competence for ICT PMs. Then, it describes the methodology used in the study and concludes with a discussion of results, conclusions, and recommendations.

Research question

Below is the research question of the research study:

What should be done to address issues of ICT project managers' project management competencies?

The above research question provides context into two further research questions that investigate holistic improvement, which are beyond the scope of this article.

Project management competence of ICT PMs: theory and practice

Competence plays an essential role in the delivery of projects. Definitions of competence within project management vary, but Boyatzis's classical definition outlines it as a set of characteristics—knowledge, skills, abilities, and attitudes—necessary for high performance. This concept has helped create a strong framework tailored for project management (Ahmadi Eftekhari et al., 2022). Leading associations like the Project Management Institute (PMI), International Project Management Association (IPMA), and others have set important standards for effective project managers. Additionally, South Africa and New Zealand have developed their own rigorous standards. Many studies have used these frameworks to define the essential competencies for project management success.

Similarly, based on Spencer and Spencer (1993), this study defines competence as inherent qualities essential for effective or superior performance for ICT PMs achieving successful project outcomes. Rwelamila and Ssegawa (2014) identified four key contributors to competence, illustrated in Figure 1: knowledge acquisition, skills development, experience, and continual professional development (CPD) based on feedback. These factors develop over time within a supportive environment, highlighting the crucial link between competence and knowledge acquisition.

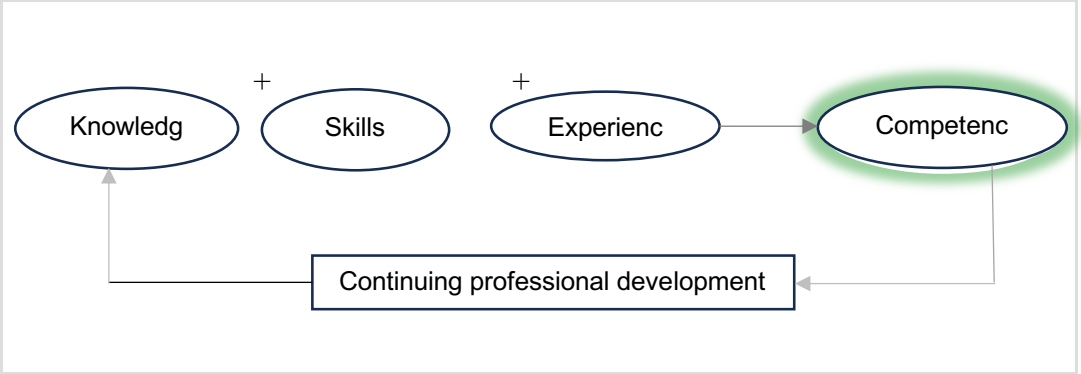


Fig. 1. Factors leading to the achievement of competence (Rwelamila & Ssegawa, 2014, p. 213)

Knowledge is essential for developing skills in project management (PMI, 2021). Skilled ICT project managers (PMs) follow processes to ensure efficiency, but face challenges when traditional methods do not fit all projects (Morris, Peter, 2013).

ICTs enhance business functions but come with risks such as coordination issues and inaccurate estimates (Dube & Chimoga, 2022). Proficiency is vital for success. Recent studies link these competencies to improved efficiency and project outcomes (Moradi et al., 2020).

This research focuses on the skills, knowledge, and abilities required for effective ICT project management. The study aims to identify the obstacles that hinder the successful delivery of ICT projects and solutions to resolve them.

Issues and challenges

Project managers face challenges when delivering projects. Some challenges stem from hiring managers with inadequate knowledge (Bishop, 2023), can be related to ineffective practices (Liana et al., 2023). Gaps underscore the need for key knowledge and competent project managers for successful outcomes (Pereira et al., 2022).

Complexity is a key challenge for ICT projects. This has become an obstacle to successfully completing projects (Ahmadi Eftekhari et al., 2022). Skills and leadership styles vary by project type, requiring managers to adapt approaches for effective change management (Patanakul & Milosevic, 2008). In ICT projects, multiple PMs contribute unique skills such as organizational experience and team management. Emotional competency and communication positively correlate with the success of medium and high levels of complexity, and insensitivity contributes to the success of projects with a high level of complexity (Klein & Müller, 2022).

Barriers include unrealistic expectations, poor project management, lack of skills, scope expansion (or uncertainty), and lack of integration, emphasizing the significance of having strong project management capabilities (Irfan et al., 2019). Liana et al (2023) point to poor planning, insufficient budgets, unqualified staff, ineffective communication, and a lack of management commitment, requiring expanded skills.

Project success factors

Project success has extensively been researched in the literature. However, studies on project manager competencies and their impacts on project success have been limited (Ochoa Pacheco et al., 2023). Project success has been a subject of debate, involving the success criteria, factors, and assessment.

Projects are considered successful when they meet specific success factors and criteria. These factors increase the likelihood of success, while criteria measure it. As projects have become more complex, criteria have expanded to include not just efficiency measures like time, cost, and quality, but also client and team satisfaction, stakeholder satisfaction, environmental impacts, and return on investment (Ochoa Pacheco et al., 2023). Success now encompasses a broader view, including project performance, which evaluates how effectively management practices meet goals and stakeholder expectations during and after project execution.

The success factors for projects are diverse. Cooke-Davis, Pinto, and Slevin identified key factors at various stages (Iriarte & Bayona, 2020) such as project-related elements, team dynamics, and external influences (Maqbool et al., 2017). For IT projects, vital factors include top management support, user involvement, effective communication, and technical expertise, with an emphasis on developing soft skills (Iriarte & Bayona, 2020). According to Yohannes and Mauritsius (2022), critical factors for IT project success are organizational communication, project team capability, methodologies, and effective leadership and documentation.

Project success factors

Effective delivery of ICT projects requires strong management and the right skills. Due to their complexity, project managers (PMs) should enhance their leadership and communication abilities while matching projects to their expertise (Kuliš, 2020). Skilled PMs and robust frameworks are essential for success and risk reduction (Sundqvist, 2019). Additionally, evaluating technical experts' project management skills and enhancing interpersonal abilities can improve team dynamics and stakeholder management (Castro et al., 2022). Addressing these competencies is vital for successful project outcomes.

Research methodology

This study uses an exploratory sequential mixed methods approach, including semi-structured interviews and survey questionnaires. The strategy was to complement the strengths of both instruments, use interviews to explore the context and gain deeper insights, and then determine

whether the questionnaire results could be generalized to assess challenges and solutions to project management competence objectively. It was expected that triangulation of the data would validate the information obtained.

First, semi-structured interviews and qualitative data analysis were conducted to explore the phenomenon in a limited context. A questionnaire was then completed to obtain other people's opinions and check whether the interview results could be confirmed.

The interview study

The interview study addresses the first phase of the research, which informs the second questionnaire phase.

The interview section includes interviews, population and sample details, and an analysis of the first phase of the mixed-methods design. The interview findings are used to update the instrument for the quantitative research phase.

Conducting interviews
Phase 1 involved seven semi-structured interviews with two ICT service providers in South Africa, focusing on project management competence challenges and solutions for implementing ICT projects.

Due to the researcher’s experience and feasibility, the study targeted ICT companies involved in commercial bank projects, knowledgeable and with existing infrastructure and high project management maturity. The case studies examined individuals' lived experiences regarding the phenomenon, offering insights into their perceptions (Creswell & Creswell, 2023) thereby clarifying the challenges and solutions encountered by ICT PMs. The truth of an event is subjective and can be understood only through embodied perception (Morse, 2016).

Population and sample
Participants were selected through purposeful sampling (Creswell & Creswell, 2023). The sample included senior PMs—three from Organization A and four from Organization B. Most interviews were conducted individually, with one session including two respondents. The two ICT organizations had five and twenty-five PMs, respectively. Senior PMs were chosen for their expertise using a snowball sampling method, with senior management granting access and time for the interviews. Each interview lasted forty minutes to one hour, primarily onsite, with one conducted via video conference. Follow-up communication was done via phone.

The interview protocol for the research questions included four main requests for the interviewees: (1) Describe what should be done to address issues of ICT PM competencies, (2) What issues can you relate to ICT PM competence (3) Share your thoughts on possible solutions, and (4) Share your views on the project environment both internal and external. Each interview began with the researcher’s background and the study’s objectives, clarifying key terms like project types, methodologies, and performance.

Analysing interview responses
The interview data was analyzed through open coding, axial coding, selective coding, and content analysis to identify key themes and categories essential for developing theoretical concepts using inductive reasoning (Creswell & Creswell, 2023). Initially, content analysis removed less relevant passages, followed by open coding to segment and code the text, focusing on data aligned with the research questions. Similar fragments were then grouped into categories via axial coding and summarized into main themes through selective coding.

This iterative process identified seven competence-related themes. The fifth theme relevant to this study is project management competence challenges and solutions. This process involved data summarization and clustering to interpret findings and draw conclusions.

The findings from the qualitative phase were used to update the questionnaire in phase 2 (quantitative). The themes, categories, and sub-categories informed two sections of the questionnaire: 1 - Demographics, indicated role level designations; 4 – Project manager competence.

Issues and solutions

Table 2 outlines the challenges and solutions of ICT PMS competence. The main competency was mentioned by 43% of respondents, while the less common ones included various skill sets, project processes, customer requirements, and development strategies.

Table 1 summarizes this study's four themes (from seven of a broader study), reflecting aspects of process and methodology. Each theme provides essential insights, organizing data into compared and contrasted categories, with subcategories formed and described (Creswell & Creswell, 2023). The table highlights competence issues and solutions, along with their subcategories. The researcher identified these competencies through interviews to answer specific research questions. It includes skill, knowledge, experience and competence related to combined hardware, network, and software development.

The issues and solutions identified by participants are reorganized into the central focus of the research questions, namely knowledge, skills, and experience in Table 2.

Table 2 presents interview responses regarding challenges and solutions of a PM implementing ICT projects.

Table 1: Theme, categories, and subcategories affecting issues and solutions of ICT PM competence

Theme	Category	Subcategory
Competencies, skills challenges and solutions: the ability to work across functions	1.Competence issues and challenges	(i) Skills shortages, multi skilling and interpersonal challenges
		(ii) Internal and external pressure on deliveries
		(iii) Rogue workers
		(iv) lack of mentorship and support
	2.Possible competence solutions	(i) Broader understanding of process by some role-player
		(ii) Training institutions and industry working together shadowing approach
		(iii) Community outreach service

Table 2: Interview responses to challenges/issues and solutions to ICT PM competence

PM competence challenges/solutions	Some interview responses
Challenges/issues	"Skill shortages, this is demand in the market. Multi-skilling is a challenging area for any PM." (interviewee 5)
	"The person's emotional intelligence, how that person can interact with that individual based on the different." (interviewee 7)
	"We never gave stakeholders requirements [attention]. The soft skills is understanding the context." (interviewee 6)
	"There is pressure around delivery, on budget and within time, and according to our quality [external]. Internally, there is accountability for you to perform." (interviewee 5)
	"Experience, …being able to navigate a client environment and managing your scope within a complex environment, managing multiple stakeholders ." (interviewee 6)
	"project manager is expected to have some basic knowledge on how to run a project." (interviewee 4)
	"The cowboy that does not really follow the process, that then create these ad hoc challenges that we need to work on." (interviewee 7)
	"They sell the project, the product, how they commit to unrealistic timelines, so all of that is the general sales challenges that we face on a day-to-day basis." (interviewee 5)
	"Build skill with experience. You cannot just manage one area." (interviewee 2)
Possible competence solutions	"The salesperson needs to understand the governing process. Incentives are more on a revenue sales perspective,..driven by sales. There is no incentives really from the delivery perspective." (interviewee 7)
	"Bring them on an extremely low rate; in this organization, we looking at right down the bottom of the." (interviewee 3)
	"Why are they [training institutions] not going to the community saying we going to be qualifying so many people, where do they fit into your organizations." (interviewee 3)
	"We created an industry forum. We got the players…did the workshops, …drew up a standards document, then got the SABS to approve it." (interviewee 3)

	"If you are working in this environment, these are the expectations is still the kind of support." (interviewee 4)
	"how you can fast track it. She became the leader of 19 people."

The questionnaire study

The questionnaire followed the completion of the interview study, which provided insight into the competence of project management and a refinement of the questionnaire.

Data collection method

Data were collected from three organizations: two private ICT companies (Organization A and Organization B) and one project management association (Organization C). Participants completed a web-based questionnaire comprising 82 questions across six sections hosted on a Lime Survey database. Each PM received a link via email (or through the association's website) to access the survey. Participants provided consent before starting and were assured of confidentiality. To boost response rates, senior PMs were contacted by phone to encourage their participation.

The first and fourth sections of the questionnaire comprised Sections 1 – Demographic data, and 4 - PM competencies. The competencies resulted from a questionnaire created based on literature updated with interview analysis results. Crawford (2006) categorized knowledge and skills as essential competencies that PMs bring to the job, including personal characteristics for effective performance, emphasizing a combination of skills for project success. The PMI's (2021) performance systems view highlights how customer requirements and methodology influence project management competence in ICT projects.

Thus, Section 4 required PMs to assess challenges and solutions—including skills, knowledge, and experience—to determine their challenges and whether solutions were effective. Respondents used a 4-point Likert scale (1="strongly disagree," 4="strongly agree") to provide insights about their issues and solutions using open-ended question inputs.

Addressing skills and competence challenges in ICT projects is crucial using various strategies (Savelsbergh et al., 2016).

Population and sample

Research requires a sample representative of the population, with a size that considers statistical significance and expected response rate (Remenyi et al., 1998). However, this research used a non-probabilistic sampling technique, the snowball technique. Therefore, there was no possibility of predetermining the sample size (Morris, Peter W. G., 1997). The intention was to involve ICT PMs in all three organizations, and snowballing appears to be the appropriate technique to achieve this goal.

An initial contact list is required to use the snowball technique. The researcher asked the senior managers of two ICT organizations to distribute the questionnaire to their PMs. The third organization (a Professional association) promoted the questionnaire to its members via its website and invited them to consider participating. Of the professional association's 90 potential PMs, around 32% supported this survey, which was published directly on its website.

Completed questionnaires were received from 42 practitioners across three organizations. The primary roles of the respondents were: project coordinator (2.4%), junior PM (2.4%), associate PM (credited) (11.9%), PM level 1 (consulting) (4.8%), PM level 2 (senior) (7.1%), senior PM (program manager or thought leader) (61.9%), and other roles (9.6%).

The organization with the highest participation was the professional association (Organization C) at 69%, Organization B at 26%, and Organization A at 5%. Most respondents (81%) were aged 36 to 65, 59.5% male and 35.7% female. Nearly two-thirds (69%) were in senior management, indicating they are experienced and qualified. A majority (67%) had at least a certificate in project management, while 19.2% held a diploma and 4.8% had a degree.

Method of analysis

During data analysis, data was obtained from a sample of ICT PMs and measured using a 4-point scale. A one-sample t-test was chosen for most analyses to compare the sample mean against a hypothesized mean. The chi-square test was utilized because the data was nominal (categorical). The one hypothesis was tested using the X2-test test for goodness of fit for the hypothesis's two sub-hypotheses (issues and solutions) and the one-sample t-test for the mean difference for the hypothesis (competence project success) (Blumberg et al., 2014).

For this study, hypothesized value used for the two sub-hypotheses was 12.667 (one-third of the population), 9.750 (one-quarter of the population) for the hypothesis, and hypothesized value (population mean) used for the main hypothesis was 2.5 (Shafer & Zhang, 2020) (is between "slightly agree" and "slightly disagree" on a 4-point scale ($\mu<2.5$ disagree; $\mu>2.5$ agree), with the idea that we are interested in knowing issues can be resolved with possible solutions, enabling for work performance, as perceived by significantly less than two and a half in the population. The averages were calculated by summing up the proportions of respondents who provided an answer either "strongly agree" or "slightly agree" to each question of the four categories of the combined variable of Section 4 of the research questionnaire.

Synthesis and analysis of results

The analysis and synthesis of results occurred after completing the interview and questionnaire studies, which provided insights into project management's competence.

Demographic profile of respondents
The demographic profile of the respondents reveals that a significant majority were male (59.5%), which aligns with South Africa's employment history. Most respondents held senior management roles (69%), with a majority being older (81%) and aged between 36-65 years, suggesting respondents are experienced PMs. Additionally, most respondents (69%) had formal project management training, highlighting the importance of moving away from ad hoc project management, often called "accidental PMs." This emphasizes the necessity for training and support to enhance effectiveness.

Competence issues and solutions
This section tests the study's hypothesis, which helps analyze respondents' project management competence challenges/issues and solutions.

Testing of hypothesis
The hypothesis in this research study states that:

"Project management does not increase success rates of ICT projects."

The hypothesis was tested by testing two sub-hypotheses using the X2-test for the good (Shafer & Zhang, 2020). In the one sample X2-test, it is appropriate to state the hypothesized value (expected value) against which the hypothesis is tested. For this study, for the first sub-hypothesis, the expected value that was used was 12.667 (the sum of the proportions of respondents who answered (strongly agree, slightly agree, and strongly disagree, divided by four [three] categories on the 4-point Likert scale), with the idea that we are interested in knowing whether competence issues occur with equal probabilities by significantly more than 12.667 of the population. The observed averages were calculated by summing up the proportions of respondents who indicated either "strongly agree" or "slightly agree" as an answer to question 62 of the competence category.

Two sub-hypotheses tested the significance of competence issues and competence solutions. To establish whether the respondent's competence issues were perceived not to be sufficient specifically to occur (experience personality, internal accountability pressure, external delivery pressure (budget, time, quality), skills shortage on market, over-commitment by sales personnel, lack of mentorship) by significantly more than 12.776 in the population, the following hypotheses (sub-hypotheses) were formulated:

H0: The percentage of respondents who chose either "strongly agree" or "slightly agree" as an answer is less than or equal to 12.776 (or 8.500) against

HA: More than 12.776 (or 8.500) chose "strongly agree" or "slightly agree" as an answer.

For the question (question 61) of the competence issues, a significance test was made to establish whether the issues were perceived to be arising by significantly more than 12.776 in the population.

For the second sub-hypothesis, the expected value that was used was 8.500 (sum of proportions of respondents who answered (strongly agree, slightly agree, slightly agree, and strongly disagree, divided by four categories answered on the 4-point Likert scale), with the idea that we are interested in knowing whether the solutions occur with equal probabilities in the hypothesized population. The observed averages were calculated by summing up the proportions of respondents who indicated either "strongly agree" or "slightly agree" as an answer to question 63 of the competence category of the research questionnaire.

To establish whether the respondent's perceptions of the candidate's solutions were equally distributed (at 8.500 expected value) in the current population, the hypothesis was formulated at an expected value of 8.500 as indicated in the hypotheses (sub-hypothesis) above.

Testing of significance for competence issues and solutions

Table 3 presents the results of X2-test of question 62 in the competence issues category (see Appendix 3 - Questionnaire), indicating that for competence challenges/issues, significantly (p-value = 0.000 (i.e., $p < 0.002$) $< \alpha = 0.05$) more than 12.667 of respondents felt they acknowledge the challenges/issues stated above. Based on the above, the null hypothesis is rejected for competence challenges (p= 81% - competence issues were perceived by participants).

Table 3. Competence issues and solutions

Competence	P	X2	CV (P0.5)	df	N	P value	Significance
Challenges and issues	.789	37.00	5.99	2	38	-.002	Significant
Solutions	.949	33.92	7.815	3	39	-.001	Significant

Notes. X2 (df, N) =value, p=p value. Significant: X2 > CV ($p < \alpha$).

Testing of significance for competence solutions

Table 3 presents the results of X2-test of question 63 in the competence solutions category (see Appendix 3 - Questionnaire), shows that for competence solutions, significantly (p-value = 0.000 (i.e., $p < 0.001$) $< \alpha = 0.05$) more than 8.500 of respondents felt that solutions were workable resolving the above-stated challenges. Therefore, based on the above, the null hypothesis is rejected for the solutions of competence (where p>= 33.3 %, the competence solutions resolved problems as highly used by participants) that the probabilities occur equally (there is sufficient evidence at 5% level of significance to reject the null hypothesis).

In summary, the above tests of significance for the two sub-hypotheses of competence challenges and solutions reveal the following:

More than one-third (33.3% or 12.667) of the respondents felt that they experienced the above challenges (selected “strongly agree” or “slightly agree” an answer) for the qualification of skills in the qualification category (question 62).

More than one-third (33.1% or 8.500) of the respondents felt that solutions were appropriate (selected “strongly agree” or “slightly agree” as an answer) for the solutions of competence category (question 63).

Since more than one-third (33.3% or 12.667) of the respondents were found to have been affected by the challenges or issues (above), and more than one-third (33.1% or 8.500) were found to agree with the solutions of competence, therefore, the first sub-hypothesis in this study is rejected. This implies that these challenges and issues exist during project delivery. The conclusion, therefore, is that PMs in the ICT sector experience challenges during project delivery.

The tests of significance carried out on the responses given by the respondents to the questions that concern solutions in the competence category (see Appendix 3 – Questionnaire) and subsequent discussions provide an answer to the research question in the study, which seeks to establish the state of the success rate of project management in the South African ICT Sector. The answer is that, in the category of competence issues, PMs (33.3% or 12.667 or more) experience the challenges, and 33.1% (or 8.500) or more confirm that the solutions are effective.

Respondents’ solutions are considered possible for several reasons. The study found that 71.4% of respondents proposed solutions that addressed the specific issues (above), raised by most (81%) respondents, through the relevant solutions (also indicated above). The issues were addressed through experiential learning.

Competence enhancing project success

The sub-hypothesis was tested using one sample t-test for difference in mean (Shafer & Zhang, 2020). In the one-sample test, it is appropriate to state the hypothetical mean (population value) against which the hypothesis is tested. For this study, the hypothesized mean (proportion) that was used was 2.5 (Shafer & Zhang, 2020), (between "slightly agree" and "slightly disagree" on a 4-point scale ($\mu < 2.5$ agree; $\mu >$ disagree), with the idea that we are interested in knowing whether competence enhances project success, as perceived by significantly less than two and a half in the population. The averages were calculated by summing up the proportions of respondents who provided an answer either "strongly agree" or "slightly agree" to the four questions of the category of Section 3 of the research questionnaire. To establish whether the competence of competencies was used (or supported) by the organization of the participants, as perceived by significantly less than two and a half in the population, the hypotheses were formulated as below.

H0: The percentage of respondents who chose either "strongly agree" or "slightly agree" as an answer is more than or equal to 2.5; against

HA: Less than 2.5 of the respondents chose either "strongly agree" or "slightly agree" as an answer.

For the category of competencies, a test of significance was made to determine whether the category of competence (knowledge, skills, experience, and competence) was perceived to improve delivery success significantly less than two and a half in the population. The results are presented in Table 4.

Testing of significance for competence enhancing project delivery

Table 4 presents the results of the t-test of questions in the competence category (see Appendix 3 – Questionnaire: questions – 64, 65, 66, 67) and indicates that for project success (competence), the mean difference is negative (i.e. mean level was lower than hypothesized mean (1.4375-2.5= -1.06250), significantly (95%CI(1.2728, 1.6022)) less than two and half (2.5) of the respondents felt they were appropriately skilled and competent (knowledge, skills, and experienced). Based on the above discussion, at a 95% significance level, the sample mean is significantly lower than the hypothesized value. Thus, we reject the null hypothesis that competence does not increase project success and accept the alternative hypothesis that it does.

Table 4. Test of significance for competence project success

Perceived relevance of competence	t	Mean dif	Lower	Upper	Significance
Competence project success	-13.094	-1.06250	-1.2272	-.8978	Significant

Notes. 95% Confidence Interval (lower, upper)

The above test of significance for the categories of competence (knowledge, skills, and experience, and competence) reveals the following:

Less than two and a half (2.5) of the respondents felt they had appropriate competence ("strongly agreed" or "slightly agreed" as an answer) for the combined variable (knowledge, skills, experience, competence) of the competence category.

Since fewer than 2.5 respondents displayed appropriate competence in the category, the study rejects the third sub-hypothesis, which claims that the "project management competence does not

enhance project success". Thus, having this competence success is essential for being an ICT PM.

Since fewer than 2.5 respondents displayed adequate competence (knowledge, skills, experience, and competence) in the relevant category, the study rejects the hypothesis, which claims that "project management competence does not enhance project success" for ICT projects. Thus, having this appropriate competence is essential for ICT projects.

In conclusion, while ICT PMs generally possess the necessary skills and experience, many ICT projects still fail. It is essential to evaluate their competence challenges to ensure they have comprehensive solutions for successful project management. Each project has unique challenges, requiring tailored solutions and diverse skills, highlighting the need for improvement.

The tests of significance carried out on the responses given by the respondents to the questions that concern the categories of competence challenges and solutions and enhancing project success (see Section 3 Questionnaire) and subsequent discussions provide an answer to the research question in this study, which seeks to establish competence project management success of ICT PMs in South Africa. The results show that in the category competence of competencies PMs (less than 2.5) have capabilities in the category of competencies.

Finally, project management competence improves the success of ICT projects. We identify challenges and use tools like skills matrices to find gaps in ICT project management skills for improvement.

Implications of results achieving project success of ICT projects

The analysis and synthesis of results occurred after completing the interview and questionnaire studies, which provided insights into project management's competence.

This section reports on the implications of the results (Section) in practice for achieving project management success of ICT projects. The results of the investigated competence (challenges and solutions, and enhancing project success of ICT projects. The following are considered based on the results to improve project success:

The competence challenges must be resolved to find workable solutions within the work environment.

The results show that challenges or issues were identified and solutions appropriate, and project delivery can be enhanced using project management.

The study found that 71.4% of respondents proposed solutions that addressed specific issues of personality, delivery pressures (internal and external), skill shortage, or need for multi-skilling mentorship) raised by most (81%). Most (87.1%) were hired for their relevant skills, knowledge, experience, and personal attributes, while 88.1% performed well due to these competencies. The problems were resolved, including experiential learning (48% skills and experience issues), and growth opportunities. Project managers needed to work across functions to tackle skill shortages and workload issues.

For question (question 61) of the competence issues, a significance test was made to establish whether the issues (experience personality, internal accountability for performance, external delivery pressure (budget, time, quality), skills shortage on market, over-commitment by sales personnel, lack of mentorship) were perceived to be arising by significantly more than 12.776 in the population.

For the second sub-hypothesis, the expected value that was used was 8.500 (sum of proportions of respondents who answered (strongly agree, slightly agree, slightly agree, and strongly disagree), divided by four categories answered on the 4-point Likert scale), with the idea that we are interested in knowing whether solutions (mentioned above) occur with equal probabilities in the hypothesized population. The observed averages were calculated by summing up the proportions of respondents who indicated either “strongly agree” or “slightly agree” as an answer to question 63 of the competence category of the research questionnaire.

The study found that 71% of respondents proposed that resolved specific internal and external problems. The Project managers faced accountability for performance (internal) and external pressure regarding delivery according to time, budget, and quality. This requires project managers (PMs) to commit to excelling in their roles. Success depends on their willingness to learn and take charge of their careers, as well as on improving project management skills and experience in ICT projects.

Most respondents (87.1%) were hired for relevant skills, knowledge, experience, and personal attributes. Since PMs work or focus on specific areas of specialization, they need to expand their skills to enable them to carry out various activities in other aspects of the project.

The PMs were to multi-skill to work across functional areas. Technology projects have different applications, and with the direct requirements from customers, PMs have to improve continuously (e.g. with 4IR technologies). This requires acquiring knowledge, skills, and experience, fostering competence through CPD (Figure 1) (Rwelamila & Ssegawa, 2014).] The foundational knowledge should also be balanced, including planning techniques, behavioral aspects, controlling techniques, organizational issues, business fundamentals, marketing/customer issues, and creating a conducive environment for successful projects (Rwelamila & Ssegawa, 2014).]

Skills Issues: 48% of respondents reported skills-related problems. These often stem from needing to perform tasks outside one's specialization and include factors like a lack of multi-skilling and personality conflicts. To address these challenges, interventions such as mentoring, shadowing, experiential learning, and growth opportunities were implemented. Addressing skill gaps requires a practical, multifaceted approach involving consultations with industry leaders, community engagement by training institutions, and establishing effective shadowing programs.y.

Governance processes: understanding governance processes streamlines sales incentives and aligns them with capabilities, ensuring customers receive valuable products that meet their needs.

Strategies: A structured approach to developing project management competencies aligned with project complexity can improve on-the-job learning through coaching, mentoring, and experiential learning. Specialists should possess specific skills and attributes for success, especially in ICT projects. Cross-skilling ICT PMs enable working across functions, gaining client knowledge, and improving familiarity with the organization’s systems and culture. Thus, experience is essential for learning and development (Yap & Shavarebi, 2022).

The next section discusses the conclusions on the issues and solutions of project management competence and provides recommendations.

Conclusions

This study examined the challenges of PM competence and solutions to enhance project management success. The absence of project management proficiency among those tasked with overseeing ICT projects poses a significant obstacle to the successful execution of projects, leading to failure to meet project objectives and stakeholder satisfaction. Reliance on people with deep technical knowledge but insufficient project management skills and experience cannot be addressed without redress. Based on the available literature, this is one of the few studies examining the PM's project management competence for project success in the ICT domain, focusing on ICT projects and considering the PM's proficiency in agile and traditional approaches. The results show that project management increases the success of ICT projects. Although in the literature, specific issues and solutions are indicated, the situation is dynamic and contextual. Therefore, the issues and solutions of competence are relevant to the South African environment. This can be reviewed as the holistic situation changes. Customers bring different requirements for different business applications, and individuals must be up to the job to meet those requirements regarding their skills and competencies. The results indicate that resolving problems can increase the chances of success. The analysis of the ICT PM's competence indicates that their knowledge, skills, and experience are crucial for the success of ICT projects, particularly in effectively blending agile and traditional approaches. Key competencies issues include (personality, internal accountability to perform, external delivery pressures (according to meeting budget, time, and quality), multi-skilling, skills shortage on the market, overcommitment by sales personnel, and lack of mentorship), and essential solutions broader understanding of governing processes by role players, balancing sales incentives and project realities, shadowing approach (industry and training institutions working together), community outreach or service by training institutions, availability of tertiary education leaders, industry forums with various role players and personal control over one's career. The study found that strong project management and delivery skills are essential for successful project outcomes, with experience enhancing a manager's flexibility and adaptability in delivery.

Most ICT projects utilize a traditional approach (hardware projects), while software projects often adopt agile methodologies. Hybrid projects combine both methods. The choice of methodology depends on project requirements, integration, and the desired outcomes for customers and stakeholders.

The competence issues of ICT PMs in South Africa must be addressed, and the need to emphasize solutions that work is important. This study focuses on South Africa, but similar challenges likely exist in SADC and Africa due to comparable project delivery experiences. Skills development can be improved through professional development, on-the-job training, and experiential learning.

Finally, the authors suggest that further research could enhance the investigation by including more African countries and exploring the link between project success and PM competence in South Africa's ICT sector.

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EXPLORING THE IMPEDIMENTS TO THE ADOPTION OF DIGITALIZATION IN CONSTRUCTION SUBCONTRACTING

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Abstract

The majority of construction works are executed through subcontracting. This makes a study on digitalization, that could enhance subcontracting performance, instrumental. However, the adoption of digitalization is faced with different challenges. This study aimed to study the major impediments of digitalization in construction subcontracting. A systematic literature review (SLR) was conducted to examine the available scholarly literature from Scopus and Web of Science databases. From the databases, 21 studies were selected for further detailed review. A thematic content analysis was conducted using ATLAS.ti25 to explore different themes from the screened studies. Accordingly, 10 major impediments to the adoption of digitalization in construction subcontracting were identified. This includes low trust and poor collaboration, complexity and fragmentation of construction projects, limited digital literacy and awareness, high initial investment cost, and absence of industry standards and regulatory frameworks. The findings provide actionable insights for contractors, subcontractors, project owners, and other construction project stakeholders to embrace digitalization and enhance subcontracting performance in construction projects.

Keywords: Adoption, Construction, Impediments, Digitalization, Subcontracting Performance

Introduction

The construction industry accounts for more than 8% of the GDP in developing countries (World Economic Forum, 2016). The industry is characterized by complexity and time-constrained projects. This high complexity, uniqueness of activities, and the required technologies urged construction firms to consider outsourcing strategies (Fridkin & Kordova, 2022). Subcontracting is a well-established practice in the construction industry (Choudhry et al., 2012).

Subcontracting is subletting to a subcontractor the obligations of the main contractor stipulated in a separate main contract with the project owner (RICS, 2021). Recently, the majority of construction works have been executed mainly through subcontracting(Schaufelberger & Holm,2017). Subcontractors play a pivotal role in the successful delivery of construction projects by providing specialized expertise and executing a significant portion of the work. However, managing subcontractors and ensuring seamless coordination across various stakeholders remain challenging due to the fragmented nature of the construction industry (Gunduz et al., 2013). Effective project management is crucial to address issues such as schedule delays, cost overruns, and quality assurance.

In this context, digitalization has emerged as a vital tool to enhance the efficiency and effectiveness of project management processes. It paves the road to real-time communication, resource planning, document control, and progress tracking, thereby supporting informed decision-making and reducing operational inefficiencies (Alaghbari et al., 2007). Despite the potential benefits, digitalization by subcontractors and contractors has been relatively limited, especially in developing countries, where resource constraints and limited technological capacity pose significant barriers.

Understanding the major impediments to digitalization in construction subcontracting is critical to addressing the challenges and fostering greater integration of digital tools in the industry. By identifying and analyzing these barriers, construction firms and subcontractors can better align their practices to leverage the advantages of digitalization, enhance project outcomes, and contribute to the overall growth of the construction industry. This study aims to explore the major impediments hindering the adoption of digitalization in construction subcontracting.

Literature Review

The way contractors, subcontractors, and other project stakeholders work together, manage resources and carry out projects could be transformed through digitalization. Digitalization reduces inefficiencies and promotes transparency by offering a centralised platform for scheduling, communication, and documentation. Real-time updates and efficient workflows allow subcontractors to guarantee on-time delivery and adherence to project specifications. For instance, cloud-based Digitalization technologies provide remote access to project data, which helps contractors and subcontractors remain informed about developments and modifications (Mohammed & Anumba, 2020).

Reliable and accurate information is crucial for decision-making in construction projects. The emergence of Building Information Modelling (BIM) has revolutionized the infrastructure construction industry by introducing real-time and collaborative information management tools to be used throughout the lifecycle of projects. The importance of BIM in this industry has been emphasized in different studies.

Recently construction projects often involve multiple subcontractors, making coordination critical to avoid delays and disputes. Digitalization enables contractors to effectively monitor subcontractor performance, manage contracts, and handle risk proactively (Zhou et al., 2018). However, challenges such as cost, resistance to change, and inadequate digital literacy among subcontractors remain barriers to widespread adoption. For instance, the subcontractors in a project may lack the training required for digitalization, which can hinder their ability to leverage their full potential (Zhou et al., 2018).

Despite these challenges, digitalization offers significant benefits for subcontracting, such as improved collaboration, automated reporting, and performance monitoring. By leveraging data-driven insights generated through digitalization, subcontractors can optimize their processes and demonstrate value to contractors, enhancing their competitiveness (Ahmed et al., 2021). As digitalization advances, future trends like cloud computing, data analytics, and the integration of emerging technologies are expected to further enhance the performance of construction subcontracting. For example, artificial intelligence could offer predictive insights to improve decision-making and risk management (Ahmed et al., 2021).

Construction subcontracting can benefit from digital technologies that improve project management, communication, and efficiency. Building Information Modelling (BIM) helps contractors and subcontractors integrate their work with the larger construction plan by facilitating collaborative planning and visualization of project design (Manzoor et al, 2021; Torrecilla-Garcia et al., 2022). Progress tracking, resource allocation, and scheduling could all be made easier by project management information systems (PMIS)(Choi & Ha, 2022). Drones provide real-time site monitoring, aiding in inspections and safety assessments. Mobile applications enhance on-site communication and data sharing, while cloud computing ensures centralized storage and accessibility of project documents (Osunsanmi et al., 2020).

Artificial Intelligence (AI) and Machine Learning optimize risk assessment, resource planning, and predictive analytics (Musarat et al., 2024; Regona et al., 2022). Internet of Things (IoT) devices, such as smart sensors, monitor equipment usage, material conditions, and site environments, ensuring operational efficiency and creating smart construction sites (Oke et al., 2022; Osunsanmi et al., 2020). These and other digital technologies collectively contribute to the seamless execution of construction subcontracting tasks while minimizing errors and delays.

Theoretical Underpinnings

The Technology-Organization-Environment (TOE) framework provides a comprehensive lens for understanding the factors that influence the adoption of technological innovations. By addressing the interplay between technological capabilities, organizational characteristics, and external environmental conditions, the framework captures the multidimensional challenges and opportunities involved in technology adoption. It examines how factors such as perceived complexity, resource availability, and external pressures shape decision-making processes. The versatility of the TOE framework allows it to be applied across industries to analyze barriers and enablers of technology adoption (Baker, 2012).

Complementing the TOE framework, the Unified Theory of Acceptance and Use of Technology (UTAUT) explores the behavioral and contextual dynamics influencing technology acceptance. It emphasizes the role of individual perceptions of effort, performance, and facilitating conditions, alongside social influence, in shaping attitudes and intentions toward adopting technology. UTAUT also highlights the importance of organizational support and stakeholder

influence in addressing resistance to change and fostering a positive environment for technology use (Momani, 2020).

By integrating the macro-level organizational insights of the TOE framework with the micro-level behavioral perspectives of UTAUT, a comprehensive understanding of the factors affecting technology adoption can be developed. This dual perspective provides a structured approach to identifying and addressing the technological, organizational, and behavioral impediments to adoption, offering valuable insights into overcoming barriers and facilitating successful implementation.

Methodology

A systematic literature review (SLR) was adopted to examine the existing scholarly publications on digitalization and subcontracting. A systematic literature review involves comprehensive searches of relevant studies on the subject of study(Saunders, Lewis & Thornhill, 2016). SLR employs a scientific, transparent, and replicable procedure that involves a thorough assessment of the literature based on the analysis of previous studies (Mase, 2020). The major impediments hindering digitalization in construction subcontracting were identified at this stage of the study.

The authors followed the preferred reporting items for systematic reviews and meta-analyses (PRISMA) 2020 to conduct the SLR (Matthew et al., 2021). The data were acquired from Scopus and Web of Science databases. The query strings, keywords, used for the search were: ("subcontracting" or "construction projects") and ("Digitalization" or "information systems").

Regarding the exclusion criteria, the authors discarded: duplicate articles; and articles written in other than English language. Book chapters and book reviews were also excluded. The filtering involved screening relevant articles based on the following inclusion criteria: Studies done in the context of developing countries were included. Studies on social sciences; engineering; decision sciences; business, management, and accounting were encompassed. Studies conducted from 2020-2024 were included. The procedure followed for the article selection is presented in Figure 1.

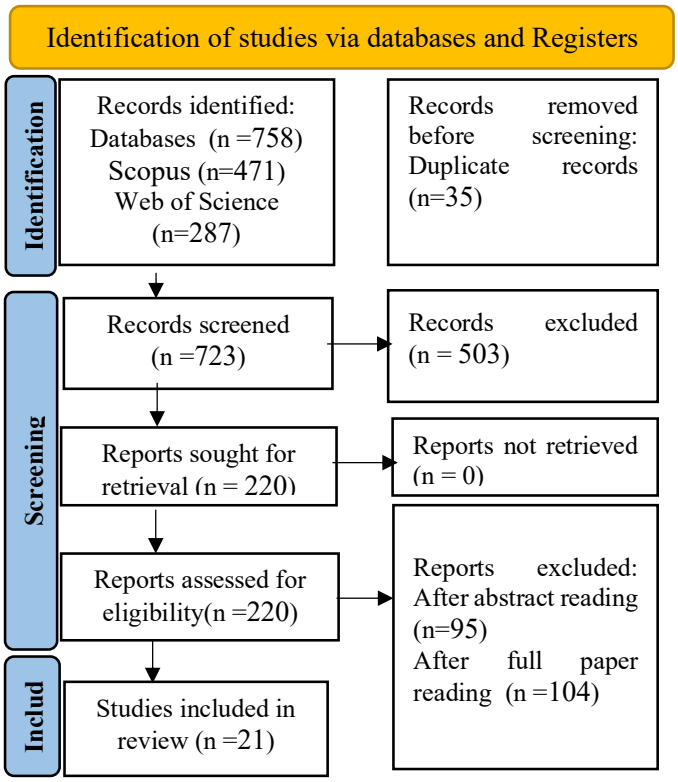


Figure 1: PRISMA 2020 flow diagram for identification of studies for synthesis

Results and Discussion

The 21 studies were then reviewed to identify what has been studied on the topic of digitalization in construction subcontracting. The studies were analysed to explore the major impediments that hindered the adoption of digitalization in construction subcontracting.

The thematic analysis of the screened articles was done using ATLAS.ti25 software for exploring the different impediments that hindered the adoption of digitalization in construction subcontracting. Using ATLAS.ti25, codes were initially generated from the quotations extracted from the 21 articles. Subsequently, meaningful code groups were established from related codes. The categories(code groups) and codes with their references are illustrated in the Sankey diagram in Figure 2.

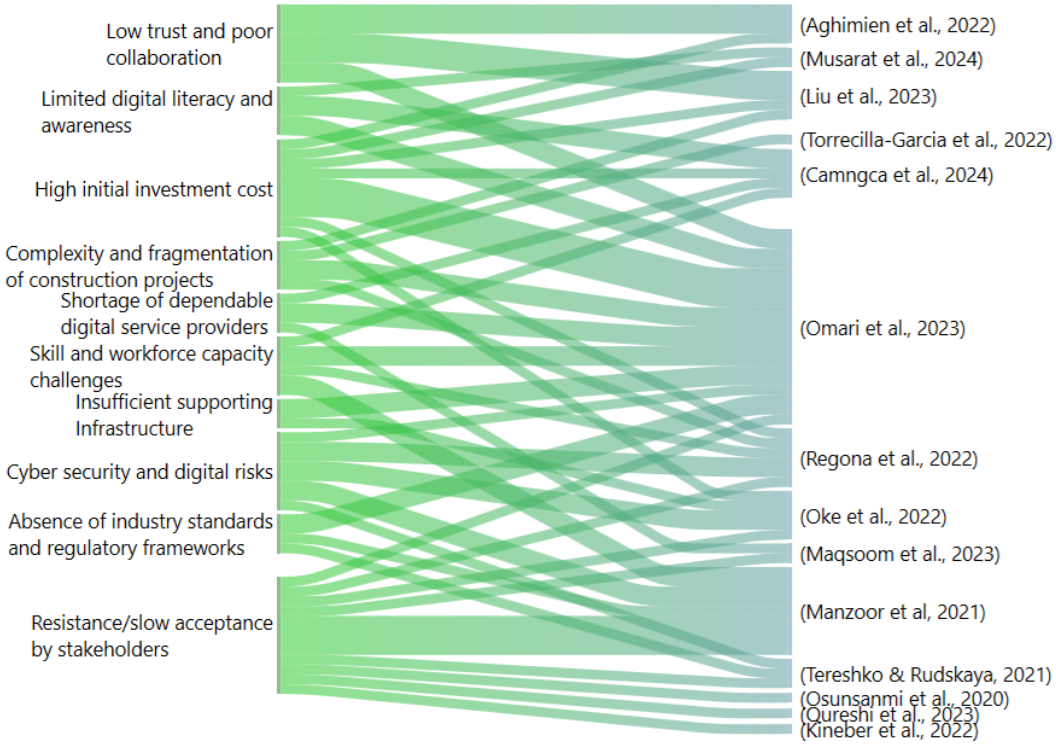


Figure 2: Sankey diagram of the barrier categories with their references

Low trust and poor collaboration among stakeholders

Low trust and poor collaboration among stakeholders are significant barriers to the adoption of digitalization in construction subcontracting. Trust is essential for effective collaboration, and when the contractor, subcontractor, and other parties lack confidence in each other's capabilities or intentions, it leads to reluctance in sharing information and resources (Liu et al., 2023). This distrust can stem from previous negative experiences, perceived competition, or a lack of transparency in operations. The absence of a fair benefit distribution mechanism can exacerbate this issue, as the project stakeholders may feel that their contributions are undervalued, leading to further mistrust (Omari et al., 2023).

Moreover, effective collaboration requires clear communication, aligned goals, and mutual understanding among all parties involved. However, the construction industry often faces challenges due to the diverse interests and objectives of various stakeholders, which can lead to conflicts and misalignment. It is instrumental to establish a project core team that can facilitate communication and coordinate efforts among stakeholders to ensure that their needs and expectations are met (Liu et al., 2023). Without such collaboration, the potential benefits of digitalization, such as improved efficiency and reduced costs, may not be realized, as stakeholders may be unwilling to adopt new technologies that require joint efforts and shared responsibilities.

Limited digital literacy and awareness

Limited digital literacy and awareness pose significant barriers to the adoption of digitalization in construction subcontracting. Many stakeholders in the construction industry, including subcontractors, often lack the necessary skills and knowledge to effectively utilize digital tools and technologies. This gap in digital literacy can lead to resistance against adopting new systems, as individuals may feel overwhelmed or intimidated by the complexity of digital solutions. Furthermore, without adequate training and support, workers may struggle to understand the benefits of digitalization, resulting in a lack of motivation to engage with these technologies. This situation is exacerbated by the fact that many construction firms do not prioritize digital literacy training, leaving employees ill-equipped to navigate the digital landscape (Omari et al., 2023; Jahangir et al., 2024).

Additionally, the awareness of digitalization's potential benefits is often limited among construction stakeholders. Many individuals may not fully grasp how digital tools can enhance efficiency, improve project management, and reduce costs. This lack of awareness can lead to skepticism about the value of investing in digital technologies, further hindering their adoption. Moreover, the construction industry has traditionally been slow to embrace change, and this cultural inertia can perpetuate outdated practices that do not leverage digital advancements. To overcome these barriers, it is essential for organizations to implement comprehensive training programs that not only enhance digital skills but also promote a culture of innovation and openness to change. If the contractor and subcontractor are working in a long-term partnership approach, joint training programs would be invaluable. By fostering an environment where digital literacy is prioritized, the contractor, subcontractor and other project stakeholders can better position themselves to embrace digitalization and reap its benefits in subcontracting work (Hassan et al., 2024; Liu et al., 2023).

High initial investment cost

The construction industry is characterized by large-scale projects that often require substantial financial resources for the integration of digital technologies. This includes not only the purchase of advanced software and hardware but also the costs associated with training personnel and maintaining these systems (Osunsanmi et al., 2020). Many construction firms, particularly smaller subcontractors, may find it challenging to allocate the necessary funds for such investments, leading to a reluctance to adopt digital solutions. The perception that these technologies require a considerable upfront investment can deter stakeholders from pursuing digitalization, as they may prioritize immediate project costs over long-term benefits.

Moreover, the financial burden associated with high initial investment costs can create a cycle of hesitation within the industry. Stakeholders may fear that the return on investment (ROI) from digitalization will not justify the upfront costs, especially in an industry that has traditionally been slow to change. This skepticism can lead to a lack of commitment to investing in digital tools, further perpetuating the status quo of outdated practices. As a result, the construction industry may miss out on the efficiency and productivity gains that digitalization can offer. To overcome this barrier, industry leaders and policymakers need to develop strategies that reduce the financial risks associated with digital adoption, such as providing subsidies or financial incentives for technology investments (Omari et al., 2023).

Complexity and fragmentation of construction projects

The complexity and fragmentation of construction projects are significant challenges that directly impact subcontracting within the industry. Construction projects are often characterized by their temporary nature, diverse stakeholders, and intricate interdependencies among various tasks and processes. This complexity can lead to fragmented communication and coordination among subcontractors, general contractors, suppliers, and other stakeholders involved in a project (Hamledari & Fischer, 2021). When project teams are composed of multiple subcontractors and contractors, the lack of a unified approach can result in conflicting instructions and unclear responsibilities, slow down the decision-making process, and lead to project delays. The fragmented nature of construction projects often exacerbates these issues, as different teams may prioritize their objectives over collaborative goals, further complicating the integration of digital technologies.

Moreover, the fragmentation of construction projects can hinder the effective implementation of digitalization efforts. Digital tools and technologies, such as Building Information Modeling (BIM), are designed to enhance collaboration and streamline processes across various project phases. However, when projects are fragmented, the potential benefits of these technologies are not fully realized. Stakeholders may be hesitant to adopt digital solutions if they perceive that their efforts will not be supported by other parties involved in the project. This lack of cohesion can lead to underutilization of digital tools, ultimately stalling the digital transformation of the construction industry. To address these challenges, it is essential to foster a culture of collaboration and integration among all stakeholders, ensuring that digitalization efforts are aligned with the overall project goals and that all parties are engaged in the process (Musarat et al., 2024).

Shortage of dependable digital service providers

The shortage of dependable digital service providers is a significant barrier to the adoption of digitalization in construction subcontracting. In an industry that relies heavily on collaboration among various stakeholders, the availability of reliable digital service providers is crucial for implementing effective digital solutions. Subcontractors often depend on these providers for essential services such as Building Information Modeling (BIM), project management software, and other digital tools that enhance efficiency and communication. However, when there is a lack of dependable service providers, subcontractors may face challenges in accessing the necessary technology and support, leading to delays in project execution and increased costs. This situation can create a reluctance among subcontractors to invest in digitalization, as they may fear that inadequate support will hinder their ability to leverage these technologies effectively(Musarat et al., 2024).

Moreover, the absence of reliable digital service providers can exacerbate the fragmentation often seen in construction projects. When subcontractors are unable to find trustworthy partners for digital solutions, it can lead to inconsistent technology adoption across different teams and phases of a project. This inconsistency can result in miscommunication, data silos, and inefficiencies, ultimately undermining the potential benefits of digitalization. As a result, subcontractors may be hesitant to fully embrace digital tools, fearing that the lack of reliable support will prevent them from achieving the desired outcomes. To overcome this barrier, it is essential for the construction industry to foster partnerships with reputable digital service

providers and to create a supportive ecosystem that encourages collaboration and innovation (Liu et al., 2023).

Skill and workforce capacity challenges

Skill and workforce capacity challenges represent a significant obstacle to the adoption of digitalization in construction subcontracting. This refers to the gap in the capacity of manpower in managing the digital ecosystem in construction subcontracting. The construction industry often grapples with a shortage of proficient skilled labor in modern digital tools and technologies. This skills gap can lead to inefficiencies and impede the successful implementation of digital solutions. Subcontractors, in particular, may find it difficult to recruit workers who possess the necessary digital competencies, resulting in a continued reliance on outdated practices. Many construction firms have not prioritized training programs aimed at enhancing their workforce's digital skills, leaving employees ill-prepared to navigate the complexities of contemporary digital tools (Camngca et al., 2024).

Additionally, the age and experience of the workforce can complicate the situation further. Older employees may be less familiar with new technologies, creating a generational divide in digital literacy within teams. This lack of familiarity can lead to resistance against adopting new digital tools, as employees may feel overwhelmed or intimidated by the changes. Financial constraints faced by many subcontractors can also limit their ability to invest in training and development programs that would enhance their workforce's digital capabilities. Consequently, the construction industry risks missing out on the potential benefits of digitalization, such as improved efficiency, better project management, and enhanced collaboration among stakeholders (Omari et al., 2023).

Insufficient supporting Infrastructure

Insufficient supporting infrastructure is a significant barrier to the adoption of digitalization in construction subcontracting. The construction industry relies heavily on robust technological infrastructure to facilitate the implementation of digital tools and processes. However, many subcontractors and also contractors face challenges due to inadequate internet connectivity, outdated hardware, and insufficient software systems. For example, slow internet speeds can hinder communication and data sharing, making it difficult for teams to collaborate effectively. Participants in various studies have noted that network issues and prolonged downtime can significantly affect workflow and efficiency, leading to delays in project execution (Camngca et al., 2024).

Furthermore, the lack of modern technological infrastructure can exacerbate the challenges of digitalization. When subcontractors and contractors do not have access to reliable digital tools, they may struggle to implement advanced technologies such as Building Information Modeling (BIM) or project management software. This situation can lead to a reliance on manual processes, which are often less efficient and more prone to errors. As a result, subcontractors may be hesitant to invest in digitalization, fearing that their existing infrastructure will not support the necessary changes. To address these barriers, the construction industry needs to invest in upgrading its technological infrastructure, ensuring that all stakeholders have access to the tools and resources needed to embrace digital transformation (Camngca et al., 2024).

Cyber security and digital risks

Cybersecurity and digital risks present significant challenges to the adoption of digitalization in construction subcontracting. As construction projects increasingly rely on digital tools and technologies, the potential for cyber threats grows. Subcontractors and contractors often handle sensitive data, including project plans, financial information, and personal details of employees. A breach in cybersecurity can lead to severe consequences, including financial losses, reputational damage, and legal liabilities. The construction industry has been historically slow to adopt robust cybersecurity measures, which can leave subcontractors and contractors vulnerable to attacks. This lack of preparedness can deter firms from fully embracing digital solutions, as they may fear the repercussions of potential cyber incidents (Musarat et al., 2024).

Moreover, the complexity of construction projects, combined with the fragmented nature of subcontracting, can exacerbate cybersecurity risks. Different stakeholders often use various digital platforms and tools, which can create inconsistencies in security protocols and increase the likelihood of vulnerabilities. When subcontractors and contractors are unable to ensure the security of their digital systems, they may hesitate to share information or collaborate with other parties, further hindering the digitalization process. To mitigate these risks, the construction industry should pay attention to cybersecurity training and invest in comprehensive security measures. By fostering a culture of cybersecurity awareness and implementing robust protective measures, subcontractors can better navigate the digital landscape and leverage the benefits of digitalization without compromising their security(Musarat et al., 2024).

Absence of industry standards and regulatory frameworks

In the construction industry, where multiple stakeholders are involved, the lack of standardized practices can lead to inconsistencies in how digital tools and technologies are implemented. Subcontractors and contractors may find it challenging to navigate the digital landscape without clear guidelines, which can result in hesitance to invest in digital solutions. This uncertainty can create a reluctance to adopt new technologies, as firms may fear that their efforts will not align with industry expectations or regulatory requirements (Musarat et al., 2024)

Furthermore, the absence of regulatory frameworks can complicate collaboration among subcontractors and other stakeholders. When different parties operate under varying standards, it can create barriers to effective communication and data sharing, which are essential for successful digital integration. This fragmentation can lead to inefficiencies and increased project risks, ultimately undermining the potential benefits of digitalization. To address these challenges, industry leaders and policymakers must establish clear standards and regulatory frameworks that promote consistency and collaboration across the construction sector. By doing so, subcontractors can better navigate the digital landscape and leverage the advantages of digitalization in their projects (Omari et al., 2023).

Resistance/slow acceptance by stakeholders

Subcontractors, contractors, and other construction project stakeholders often exhibit reluctance to embrace new technologies due to different factors, including fear of change, lack of understanding of digital tools, and concerns about the potential disruption to established workflows. This resistance can stem from a conservative mindset prevalent among senior project leaders, who may be skeptical about the benefits of digitalization. As a result, the slow acceptance of digital tools can hinder the overall progress of digital transformation within the

industry. Moreover, the fragmented nature of construction projects can exacerbate this resistance (Camngca et al., 2024; Liu et al., 2023).

Different stakeholders may have varying levels of digital literacy and differing attitudes toward technology adoption, leading to inconsistencies in how digital tools are utilized across projects. This lack of cohesion can create barriers to effective communication and collaboration, further slowing the acceptance of digitalization. To overcome these challenges, project leaders should foster a culture of openness and innovation, providing training and support to stakeholders to enhance their understanding of digital tools. By aligning the interests and needs of all parties involved, stakeholders can be motivated to engage in digital strategies, ultimately facilitating a smoother transition to digitalization in construction subcontracting (Camngca et al., 2024).

Conclusions

Subcontracting plays a pivotal role in the construction industry, and the integration of contractors and subcontractors through digital tools can significantly enhance project outcomes. Project Management Information Systems (PMIS), Building Information Modeling (BIM), and other digital technologies provide effective platforms to improve collaboration, streamline communication, and ensure better coordination between contractors and subcontractors. However, digitalization faces challenges in subcontracting, including low trust and poor collaboration among project stakeholders, complexity and fragmentation of construction projects, limited digital literacy and awareness, high initial investment cost, and the absence of industry standards and regulatory frameworks.

Addressing these impediments requires fostering a collaborative environment where contractors and subcontractors align their efforts through targeted interventions. Contractors should take the lead by supporting subcontractors in adopting compatible systems and providing training to build their digital capacity. Subcontracting practices can also benefit from standardized workflows and shared platforms to enhance transparency and accountability. By strengthening digitalization in subcontracting, the construction industry can unlock the full potential of subcontracting, driving efficiency and delivering superior project performance.

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FACTORS AFFECTING PROJECT PERFORMANCE IN THE SELECTED MUNICIPALITIES OF GAUTENG PROVINCE, SOUTH AFRICA: A CASE OF EXPANDED PUBLIC WORKS PROGRAMME ROUTINE CIVIL WORKS

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Abstract

This study investigates factors influencing the performance of the Expanded Public Works Programme (EPWP) routine civil projects in selected Gauteng municipalities. Public infrastructure projects in South Africa face challenges such as incomplete execution, poor performance, inadequate materials, lack of competent project managers, inefficiencies, and insufficient support or equipment. These issues persist despite efforts by the government and scholars to address why EPWP projects often fail or remain incomplete, prompting this study to investigate overlooked factors.

A quantitative approach was employed, using descriptive and correlational research designs. The study sampled 254 employees from the EPWP routine civil works in the City of Ekurhuleni, Johannesburg, and Sedibeng District Municipality. Respondents included managers, supervisors, general employees, and support staff. Data analysis was performed using SPSS version 28.0, employing descriptive statistics, reliability and validity tests, Exploratory Factor Analysis, correlation, and regression analyses.

Key findings reveal that workplace diversity, goal clarity, team relationships, and organisational commitment significantly influence team effectiveness, strongly predicting project performance. Together, these factors account for 58.9% of the variance in team effectiveness and 77.9% in project performance. Strategic recommendations suggest municipalities prioritize workplace diversity, clear goals, strong team dynamics, and organizational commitment to improve team effectiveness and project outcomes.

The study underscores the need for municipalities to allocate resources toward these factors, emphasizing their critical role in achieving successful EPWP project execution. Limitations and recommendations for future research were also outlined, focusing on further improving project outcomes in the public works sector. The study acknowledges the omission of the integration of digital tools to enhance team communication, improve project monitoring, or increase community engagement in EPWP projects, which future studies may incorporate.

Keywords: workplace diversity, goal clarity, team relationship, organisational commitment, team effectiveness, project performance.

1. Introduction

The performance of public infrastructure projects, including those under the Expanded Public Works Programme (EPWP), is critical for achieving developmental objectives such as job creation, poverty alleviation, and infrastructure improvement (Hlabane et al., 2019). In Gauteng province, South Africa, the EPWP routine civil works projects implemented by selected municipalities are designed to deliver essential services while empowering local communities through labour-intensive methods (Department of Public Works, 2015). Municipalities are experiencing a high number of unsuccessful projects, even though several studies have documented the factors that affect project performance and, ultimately, its success, often called the critical success factors (Garbharran et al., 2012; Mwakajo & Kidombo, 2017). According to Jitpaiboon et al., (2019), one explanation can be found in the general formulations of critical success factors. Tabassi et al. (2017) found a direct relation between success and clarity on the one hand and consensus regarding success criteria on the other. Site managers need more specific guidance to fulfil the criteria and thus achieve successful projects (Lindhard & Larsen, 2015).

Project performance in municipal contexts is often challenged by inadequate funding, limited technical expertise, and inconsistent stakeholder engagement. According to Muthomi and Awiti (2017), resource allocation and project management practices play a pivotal role in determining the success or failure of infrastructure initiatives. Similarly, Naidoo (2018) highlights that organisational capacity and political interference are significant determinants of project outcomes in South Africa's public sector projects. External factors such as economic conditions, labour dynamics, and regulatory frameworks further compound these challenges. In the EPWP context, labour-intensive construction approaches require robust training and effective supervision to meet quality and productivity standards (Hlabane et al., 2019). Without adequate investment in capacity building and workforce motivation, these projects may fail to achieve their intended outcomes, such as sustainable job creation and infrastructure improvement (Naidoo, 2018).

The civil industry struggles with project success, often failing to meet the "golden triangle" of time, budget, and quality (Jitpaiboon et al., 2019). Globalisation demands attention to additional critical factors (Carvalho et al., 2015). In South Africa, EPWP projects face frequent failures in areas like grass cutting and sign installation, with success relying on dimensions like budget, time, and quality (Aubry, 2015; Liu & Deng, 2015). Team performance and dynamics are crucial but challenged by individual traits and project management structures (Hlabane et al., 2019; van der Hoek et al., 2018). Despite governmental efforts, challenges persist, highlighting the need for improved team collaboration and strategies (Department of Public Works and Infrastructure, 2021).

The infrastructure sector in South Africa underpins around 80% of government activities, playing a crucial role in economic development through labour-intensive public projects (Minister of Public Works, 2020). The government has increased funding for infrastructure to boost the economy, yet many Expanded Public Works Programme (EPWP) projects face delays and low success rates (Statistics South Africa 2021). Despite their significance for financial improvement, these projects often encounter challenges that hinder their performance (Jitpaiboon et al., 2019). Existing studies highlight general critical success factors but fail to provide actionable, context-specific guidance for site managers and project teams, limiting their ability to enhance outcomes. This study addresses this gap by focusing on the key factors influencing EPWP routine civil works projects in Gauteng municipalities.

It aims to provide practical recommendations to improve project performance, effectiveness, and sustainability.

2. Theoretical framework and hypotheses development

This study used the goal-setting theory as a foundational basis to examine the factors that influence the performance of EPWP projects through team effectiveness.

2.1 The Expanded Public Works Programme (EPWP)

The EPWP was initiated at the 2003 Growth and Development Summit to address unemployment through temporary employment, skills training, and wages (Department of Public Works, 2019). It aimed to halve unemployment by 2015 (Van der Walt, 2014) under the theme "More jobs, better jobs, decent work for all." EPWP contributes to “Decent employment through inclusive economic growth” by creating work opportunities in infrastructure, non-state, environment, culture, and social sectors (The SA Construction Market Report, 2023). Labour-intensive methods engage many participants while fostering economic growth, skill development, and poverty alleviation (Aghimien et al., 2019). Addressing challenges and enhancing skill development within the programme is essential to maximise its benefits.

The challenges of the Expanded Public Works Programme (EPWP)

The EPWP faces significant challenges, including low wages, lack of discipline among participants, limited training duration, and delayed stipend payments (Aghimien et al., 2019). Improved coordination, management, communication, and funding are critical to enhancing its effectiveness. Restricted communication is another major hurdle (Van der Walt, 2014), and accountability is often lacking in local communities, negatively impacting all stakeholders (Mbeki, 2014). Issues such as improper fund transfers across financial years complicate auditing and accountability (Van der Walt, 2014). Additionally, wage inconsistencies, with participants waiting 2-5 months for stipends, lead to demotivation (Aghimien et al., 2019). Discipline issues, including tardiness and noncompliance, further challenge the programme's success (Department of Public Works, 2022).

3.2 Applicability of Goal-Setting Theory

The goal-setting theory examines how goals influence performance at individual and team levels (van der Hoek et al., 2018; Latham & Locke, 2013). It emphasizes that specific, challenging goals paired with appropriate feedback enhance performance (De Jong et al., 2020). In team-based civil projects like EPWP, project success hinges on group performance linked to organisational and behavioural outcomes (Lindhard & Larsen, 2015). Research shows that individuals perform better with specific, ambitious goals than general ones (Asmus et al., 2015). Effective goal-setting fosters unified action aligned with organisational vision and significantly impacts employee behaviour and management practices (Konstantara & Galanakis, 2022). It also serves as a primary motivation source, driving individuals to achieve their targets (De Jong et al., 2020). Managers view goal-setting as essential for improving and sustaining performance, making it a foundational framework for studying factors affecting team performance and EPWP project success.

3.3 Factors influencing project performance

These include workplace diversity, goal clarity, team relationships, and organisational commitment.

Workplace diversity and project team effectiveness

Diversity is a subjective spectacle created by individuals who, based on their distinctive social personalities, sort others as similar or dissimilar (Rafaqat et al., 2022). With a diverse team, a company can develop more creative ideas and have a large talent pool (Usher & Barak, 2020; Zhu & Mostafavi, 2017). These two factors help improve the team's effectiveness and, as a result, the organisation's overall performance (Wu *et al.,* 2019; Hogan & Huerta, 2019). Some scholars maintain that diversity enables an organisation to draw talented employees from a larger pool, increase its ability to innovate, and better satisfy customer needs (Wu *et al.,* 2019; Hogan & Huerta, 2019). Fredette and Bernstein (2019) maintain that workplace diversity brings about employee motivation and satisfaction, ultimately leading to team productivity and effectiveness (Eriksson et al., 2020). Makhdoomi and Nika (2018) adopted a review methodology by conducting a literature search concerning workforce diversity and team effectiveness from 1990 to 2014. The findings show an empirical relationship between workplace diversity and team effectiveness. Therefore, the following is posited:

H_1: Workplace diversity positively influences project team effectiveness in EPWP projects.

Goal clarity and project team effectiveness

The relationship between goal clarity and organisation effectiveness can be explained as employees being “more aware of higher-level objectives and priorities” through goal setting and “that they must help to carry out” (Mwakajo & Kidombo, 2017). There is ample literature citing research done by scholars to support the positive relationship between goal clarity and organisational effectiveness. The research works of Park and Choi (2020) revealed that goal clarity consistently increased productivity. Interestingly, Zavyalova *et al.* (2020) conceptualized increased productivity as ‘organisation effectiveness. Goal-setting theory suggests that a clear understanding of performance goals through specific guidance will yield higher performance than merely encouraging employees “to do their best” and not offering a clear direction toward goals and expected behaviours (Slowiak & Lakowske, 2017). Gonzalez-Mule *et al.* (2016) also demonstrated that greater team autonomy may enhance team effectiveness by clarifying the organisation’s goals and communicating performance information for work teams. In their study, van Van der Hoek et al. (2018) found that goal clarity influences team performance in the public sector, in which team performance was measured by both effectiveness and efficiency. Also, Park and Choi (2020) found a causal relationship between goal clarity and the dependent variable perceived effectiveness of public sector organisations in Islamabad, Pakistan. Based upon these arguments, the following is posited:

H_2: Goal clarity positively influences project team effectiveness in EPWP projects.

Team relationship and project team effectiveness

Workplace relationships are critical to achieving organisational objectives, as strong team cohesion and trust positively impact effectiveness and project performance (Greenberg et al., 2019; Senaratne & Udawatta, 2018). Despite being intangible, relationship issues among team members can lead to project abandonment, lawsuits, or inefficiency (Dada, 2014). A study by Caniëls et al. (2019) ranked relationship issues second among four significant

factors affecting project outcomes, emphasizing their importance despite all other available resources. Empirical evidence highlights the influence of personality and relationships on team effectiveness and productivity (Beltrán-Martín & Bou-Llusar, 2018; Hogan & Huerta, 2019). Studies also show that high team trust enhances cohesion, performance, and satisfaction (Senaratne & Udawatta, 2018; Zuo et al., 2018). Zincirkiran et al. (2015) found a positive correlation between team relationships, organizational commitment, and performance in a study involving Turkish hospitals, reinforcing the integral role of relationships in improving team and organisational outcomes. Hence, this study posits the following:

H_3: Team relationship is positively associated with project team effectiveness.

Organisational commitment and project team effectiveness

Organisations are more efficient when employees have a high organisational commitment (Mothe & Nguyen-Thi, 2021). The probability of employees with high commitment exhibiting negative behaviours such as absenteeism, dismissal, and work delay is less than those with lower commitment. Employees who adopt the organisation's objectives and work collaboratively are expected to increase the organisation's competitiveness (Zhu & Mostafavi, 2017). Besides, employees with higher commitment express positive opinions about the environment. This facilitates organisations' recruiting of qualified staff members (Hogan & Huerta, 2019). When employees take action with the insight of commitment, it enhances team effectiveness, produces satisfaction and reduces burnout (Lee, 2019; Fredette & Bernstein, 2019). In addition, it leads employees to perform with higher performance (Zavyalova et al., 2020), which may be productivity and effectiveness. Blessing (2018), in his study of organisational commitment and teamwork among male and female lecturers at Kampala International University Uganda, revealed a significant relationship between organisational commitment and teamwork. It has also revealed that commitment leads to team effectiveness and performance. Hence, this study posits that:

H_4: Organisational commitment is positively associated with project team effectiveness.

Team effectiveness and project performance

Team structures play a vital role in managing complex projects, as diverse professional experiences and coordinated decision-making within teams enhance project performance (Le & Lei, 2019; Tabassi et al., 2017). Grounded in goal-setting theory, employee effectiveness contributes to higher productivity (Le & Lei, 2019). Dasí et al. (2021) and Łabedzki (2021) affirmed that goal-setting improves effort, performance, and productivity in most cases. Effective teams yield multiple benefits, including improved productivity, reduced managerial micromanagement, better intra- and inter-team collaboration, and enhanced service quality and customer satisfaction (Abdullah et al., 2023). Team effectiveness is also directly linked to organizational success through strategic leadership (Agbejule & Lehtineva, 2021). However, the relationship between team effectiveness and project performance remains uncertain. While Abdullah et al. (2023) identified a strong correlation in Saudi construction projects, Le and Lei (2019) found it insignificant, suggesting team effectiveness alone cannot predict project success. These mixed findings highlight the need for further investigation into whether team effectiveness impacts project performance in South Africa. Based on the mixed results, this study posits the following:

H_5: Project team effectiveness positively influences the performance of EPWP projects.

3.4 Conceptual Model of the study

This study developed the conceptual framework presented in Figure 1.1 to conceptualise the relationship between workplace diversity, goal clarity, team relationship, organisational commitment, team effectiveness and performance of EPWP projects. Workplace diversity, goal clarity, team relationship and organisational commitment form the predictor variables, with team effectiveness acting as the mediating variable and EPWP project performance being the outcome variable.

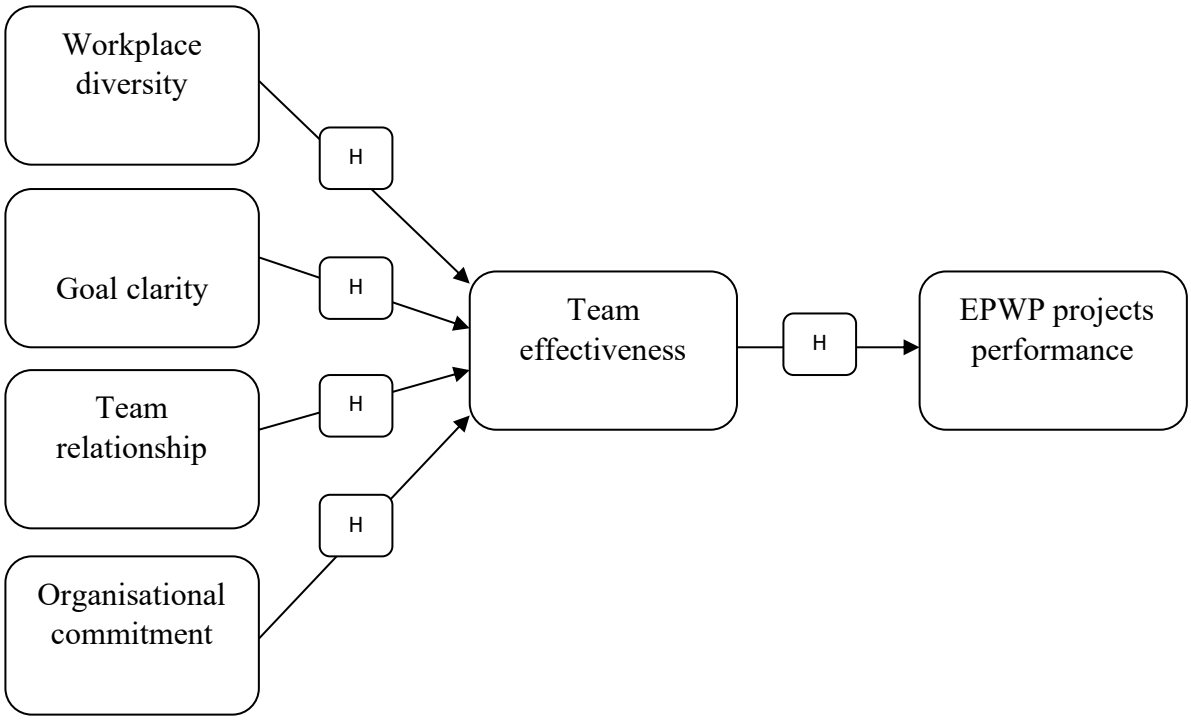


Figure 1.1: Conceptual framework

4. Methodology

Consistent with the positivist research paradigm, this study followed a quantitative research approach, employing descriptive and correlational research design, especially a single-cross-sectional design, since data were collected once from the respondents (Brown et al., 2018). This study contained no risk for the employees involved. Ethical clearance was obtained from the university committee before undertaking the study to ensure that the study adhered to the ethical principles. A nonprobability convenience sampling method was employed to identify the employees of the EPWP projects from municipalities in Gauteng province. Both males and females from all racial groups constituted the sample. The City of Ekurhuleni Metropolitan, City of Johannesburg Metropolitan and Sedibeng District Municipality were used to draw the sample. EPWP employees were visited to complete the questionnaire at their workstations. This study sample size was pegged at n=300, and after screening and cleaning the data, the final sample size included n=254 usable questionnaires, representing 84.6 per cent response rate.

Six subcategories of information about the respondents were provided in the sample profile (demographic): gender, age, race, educational background, name of the municipality they

belong to and work experience. In addition, a further four factors (workplace diversity, goal clarity, team relationship and organisational commitment) five-item scales each respectively adopted from Weiliang, Mun, Chern, Fong and Yuan (2011), van der Hoek, Groeneveld and Kuipers (2018), Dada (2014) and Van Straaten Theron and Dodd (2013). Team effectiveness was measured with five items adopted from Mahembe and Engelbrecht (2014). Section D required information on project performance with scale measurements adopted from Popaitoon and Siengthai (2014). A six-point Likert scale anchored along 1(Strongly disagree), 2(Disagree), 3(slightly disagree), 4(slightly agree), 5(Agree) and 6(Strongly agree) was applied in the study.

4.1 Results and Discussion

Sample profile

The study findings show a significant difference in males (67.7%) and females (32.3%). A gender difference is due to more male employees in hard labour projects like the one used in this study (EPWP routine civil/construction). Most employees are between 30 and 41 years old, representing a combined 62.6 percent. Most respondents were Black-African (66%), which is typical considering that most government employees are from Black communities. Most of the sampled EPWP routine construction employees hold either a Diploma or Degree as the highest qualifications (33.3%) and (n=73; 28.7), respectively. The results show that most respondents were from the City of Johannesburg Metropolitan (44.1%), followed by Sedibeng District Municipality with 29.5%. Based on work experience, most respondents have between 8 – 11 years of experience working at EPWP (29.1%), followed by 26.8 percent with 4 - 7 years of experience.

4.2 Descriptive statistics of the constructs

Descriptive statistics results related to the constructs of the study to establish the perception of employees towards the identified factors (workplace diversity, goal clarity, organisational commitment, team relationship), team effectiveness and project performance in EPWP routine construction in the Gauteng province.

Table 1: Mean and standard deviation of constructs

Variables	Sample size(N)	No of items	Means	Standard deviation	Skewness	Kurtosis
	Predictor variables					
WPD	254	6	3.8589	.80655	-.505	.103
GC	254	5	4.0890	.81437	-.721	.471
TM	253	6	3.8570	.78910	-.567	-.156
OC	254	5	3.4118	.99104	-.157	-.348
Mediating variable						
TE	254	6	3.6530	.92722	-.321	.070
Outcome variable						
PP	254	6	3.9181	.96183	-.428	-.190
Scale: 1= Strongly disagree, 2=disagree, 3=slightly disagree, 4= slightly agree, 5= agree, 6=Strongly agree						
WPD= Workplace diversity; GC= Goal clarity; TM =Team relationship; OC= Organisational commitment; TE= Team effectiveness; PP= Project performance						

The study's findings, summarized in Table 2, show mean values for constructs ranging from 3.4118 to 4.0890, suggesting that respondents agree on the presence of workplace diversity, goal clarity, team relationships, organizational commitment, team effectiveness, and project performance in Gauteng province's EPWP routine projects. Standard deviations ranged from ±0.78910 to ±0.99104. Despite the large sample size (n=254), the central limit theorem supports the normality assumption. Skewness (-0.721 to -0.157) and kurtosis (-0.348 to 0.471) values fall within acceptable limits (-2 to +2), confirming satisfactory univariate normality. This validates the assumption of normality in the data.

4.3 Exploratory Factor Analysis (EFA)

Initially, a Harman one-factor score test was conducted by running the preliminary EFA on the sample data. In contrast, the unrotated factor solution was examined to determine the number of factors necessary to account for the variance in the variables. The single factor that emerged yielded one general factor accounting for approximately 26.89% of the covariance among the measures, concluding that standard method variance is not a problem. Table 3 presents exploratory factor analysis results.

Table 2: Exploratory factor analysis results

No	Construct and items	KMO & Bartlett's test	% Variance explained	Communalities	Factor loadings
	Workplace diversity	**.872 (p<0.001)**	**67.467**		
B1:	Fair treatment is given to all employees, whether they are male or female			.706	.840
B2:	I am positive about gender diversity in this workplace			.734	.857
B3:	I am positive about age diversity in this workplace.			.660	.813
B4:	I am positive about ethnic diversity in this workplace.			.707	.841
B5:	The difference in educational background does not encourage conflict			.580	.761
B6:	Different languages that are used to communicate do not create problems among employees			.061	.247
	Goal clarity	**.857 (p<0.001)**	**61.513**		
B7:	We have clear and planned team goals			.611	.782
B8:	In our team, we know what our responsibilities are			.682	.826
B9:	We closely cooperate to achieve our goals			.622	.789
B10:	Explanations are clear of what has to be done			.668	.817
B11:	I know exactly what is expected of me			.492	.701
	Team relationship	**.870 (p<0.000)**	**57.264**		
B12:	We have a lot in common in this team			.712	.844

No	Construct and items	KMO & Bartlett's test	% Variance explained	Communalities	Factor loadings
B13:	I have a favourable relationship with this team			.697	.835
B14:	I always get help from the team members			.656	.810
B15:	I am pleased with the relationship I have with this team			.678	.824
B16:	My co-workers are easy to work with			.635	.797
B17:	There is a culture of harmonious working relationships in this team			.058	.240
	Organisational commitment	**.849 (p<0.001)**	**63.272**		
B18:	I would be very happy to spend the rest of my career with the organisation			.527	.726
B19:	I would be reluctant to leave this organisation.			.694	.833
B20:	Under no circumstances will I voluntarily leave this organisation before the project is completed.			.690	.830
B21:	I feel that the working hours are more flexible in this organisation			.679	.824
B22:	I feel that the induction training programs are adequate to start working from day one			.573	.757
	Team effectiveness	**.896 (p<0.001)**	**61.157**		
C1:	There is an effective communication within the team			.540	.735
C2:	There is constructive feedback between management and employees			.550	.741
C3:	We all work towards achieving the project goals			.647	.805
C4:	This team responds with agility to new demands			.641	.801
C5:	This team successfully meets its work targets			.695	.834
C6:	There is mutual accountability and trust within the team			.704	.839
C7:	Employees' morale is always high			.504	.710
	Project performance	**.860 (p<0.001)**	**61.014**		
D1:	We ensure customer satisfaction			.605	.778
D2:	We manage cost-effectively			.650	.806
D3:	We meet time requirements			.637	.798
D4:	We ensure the quality of deliverables			.585	.765

No	Construct and items	KMO & Bartlett's test	% Variance explained	Communalities	Factor loadings
D5:	We achieve scope objectives			.574	.758

Exploratory Factor Analysis using principal axis factoring with Varimax rotation evaluated construct validity. A seven-iteration convergence limit was set. Data suitability was confirmed with a strong KMO value (0.854) and significant Bartlett's test ($\chi 2$ = 8,304.213, $p < 0.01$). Factors were extracted using Eigenvalues greater than one and a cumulative variance threshold of over 60%. Four unique factors emerged as expected: workplace diversity, goal clarity, team relationship, and organizational commitment, alongside team effectiveness and project performance. These factors explained 60–68% of the variance, except team relationship (57.264%). Team effectiveness and project performance explained 61.157% and 61.014%, respectively. Factor loadings ranged from 0.701 to 0.857, and commonalities from 0.492 to 0.734. Items B6 and B17 showed low psychometric properties and were removed as their loadings and commonalities were below acceptable thresholds (0.50 and 0.20, respectively). The remaining items demonstrated satisfactory validity (Malhotra et al., 2017).

4.4 Reliability and Validity Assessments

The results of the psychometric properties are presented in Table 4.6.

Table 3: Psychometric properties analysis results

Constructs	Items	Factor loadings	Cronbach Alpha	Item-to-total correlation	Rho A	C.R.	AVE
Workplace diversity	B1	0.840	0.833	0.766	0.873	0.800	0.757
	B2	0.857		0.680			
	B3	0.813		0.592			
	B4	0.841		0.659			
	B5	0.761		0.544			
Goal clarity	B6	0.782	0.843	0.571	0.904	0.813	0.755
	B7	0.826		0.498			
	B8	0.789		0.542			
	B9	0.817		0.450			
	B10	0.701		0.743			
Team relationship	B11	0.844	0.830	0.578	0.911	0.814	0.626
	B12	0.835		0.649			
	B13	0.810		0.579			
	B14	0.824		0.649			

Constructs	Items	Factor loadings	Cronbach Alpha	Item-to-total correlation	Rho A	C.R.	AVE
	B15	0.797		0.604			
Organisational commitment	B16	0.726	0.853	0.545	0.966	0.901	0.664
	B17	0.833		0.484			
	B18	0.830		0.526			
	B19	0.824		0.529			
	B20	0.757		0.698			
Team effectiveness	C1	0.735	0.892	0.669	0.969	0.912	0.688
	C2	0.741		0.586			
	C3	0.805		0.519			
	C4	0.801		0.700			
	C5	0.834		0.563			
	C6	0.839		0.528			
	C7	0.710		0.586			
Project performance	D1	0.778	0.839	0.550	0.889	0.944	0.764
	D2	0.806		0.552			
	D3	0.798		0.529			
	D4	0.765		0.547			
	D5	0.758		0.765			
Recommended value		**Above 0.50**	**Above 0.70**	**Above 0.30**	**Above 0.70**	**Above 0.70**	**Above 0.50**

4.4.1 Reliability Assessment

This study assessed reliability using Cronbach's alpha coefficient (Cronbach α), composite reliability test and Rho_A. A construct's Cronbach's alpha is deemed reliable or acceptable when the cut-off value is equal to or greater than 0.70 (Brown et al., 2018). All the constructs' internal consistency indicators ranged from 0.833 - 0.892, indicating the reliability of all the constructs and their respective Cronbach Alpha values above the required cut-off value of 0.7. in addition, composite reliability values ranged from 0.800 to 0.944, showing satisfactory internal consistency. The results in Table 3 indicate the reliability of all the constructs because their respective Rho_A values are above the required threshold value of >0.7 (ranging from 0.873 - 0.969). The item-to-total correlation was another reliability indicator with a threshold value equal to or greater than 0.3 (Babbie, 2017). All items to total correlations showed satisfactory cut-offs, with all above 0.45.

4.4.2 Validity Analysis

In this study, construct validity (convergent and discriminant) was assessed.

- **Convergent validity analysis results**

Convergent validity was determined using the factor loadings and the AVE. As Anderson and Gerbing (1988:412) suggested, the required cut-off limit must be equal to or above 0.5. As advanced by Malhotra (2015), adequate convergent validity is determined when factor loadings and AVE are equal to or higher than the required minimum threshold of 0.5. In this study, AVE values ranged from 0.626 to 0.764, indicating that convergent validity is acceptable.

- **Discriminant validity**

The Pearson correlation coefficient (*r*) was used to measure the degree of linear association between the variables, as proposed by Pandey (2020). The results are presented in the form of a correlation matrix and presented in Table 4.

Table 4: Correlation analysis results

Research construct	**Construction correlation**					
	WPD	**GC**	**TR**	**OC**	**TE**	**PP**
Workplace diversity	1					
Goal clarity	0.333	1				
Team relationship	0.912	0.326	1			
Organisational commitment	0.169	0.142	0.193	1		
Team effectiveness	0.246	0.188	0.268	0.760	1	
Project performance	0.214	0.190	0.248	0.609	0.799	01
** Correlation is significant at the 0.01 level (2-tailed) **Note: WPD= workplace diversity; GC= Goal clarity; TR= Team relationship; OC= Organisational commitment; TE= Team effectiveness; PP= Project performance**.						

Table 5 shows significant positive correlations ranging from (r=0.142; p<0.01) and (r=0.912; p<0.01). These positive correlations indicate acceptable discriminant validity. All square roots of AVE exceeded correlations with other constructs.

4.5 Regression analysis

This section reports and interprets the regression analysis results from two models. The first model presents the results of the factors (workplace diversity, goal clarity, team relationship, and organisational commitment) and team effectiveness. The second model presents the regression results between team effectiveness and project performance.

Model 1: Factors Influencing Team Effectiveness

Table 6 presents the regression model summary of the factors influencing team effectiveness within the EPWP projects in Gauteng municipalities.

Table 5: Regression model summary (Model 1)

Independent variables: Factors	**Dependent variables: Team effectiveness**			**Tol**	**VIF**
	Beta (β)	***T-stat***	**Sig.** (P)		
Workplace diversity	.312	1.118	<.001	.168	5.959
Goal clarity	.445	1.034	<.001	.885	1.130
Team relationship	.603	1.026	<.001	.166	6.039
Organisational commitment	.728	17.474	<.001	.955	1.047
R=0.767[a]; R Square=0.588; Adjusted R Square=0.582; Sig. P<0.001; F=88.662; Tol= Tolerance; VIF=variance inflation factor					

Multicollinearity tests confirmed acceptable tolerance (>0.1) and VIF (<10) values for independent variables. Regression analysis ($R^2 = 0.582$) revealed that workplace diversity (WPD), goal clarity (GC), team relationship (TR), and organizational commitment (OC) explained 58.2% of the variance in team effectiveness in EPWP projects. Beta coefficients indicated that all four factors positively predict team effectiveness: WPD (β=0.312), GC (β=0.445), TR (β=0.603), and OC (β=0.728). TR and OC contributed the most to the variance, explaining 60.3% and 72.8%, respectively, compared to 31.2% and 44.5% for WPD and GC. These findings highlight TR and OC as the strongest predictors of team effectiveness and project performance.

Model 2: Team effectiveness and project performance

Table 6 reports the regression analysis between team effectiveness and project performance.

Table 6: Regression model summary (Model 2)

Independent variable: **Team effectiveness**	**Dependent variable: Project performance**			Tol	VIF
	Beta (β)	T- Statistics	Sig. (P)		
Team effectiveness	.779	19.726	<.001	1.000	1.000
R=0.779[a]; R^2 Square=0.607; Adjusted R Square=0.605; Sig. P<0.001; F=389.108; Tol=Tolerance; VIF=variance inflation factor					

Multicollinearity tests showed acceptable tolerance and VIF values. Regression analysis (R^2=0.605) revealed that team effectiveness explains 60.5% of the variance in EPWP project performance. A strong positive relationship was found (β=0.779), indicating that a 1-unit increase in team effectiveness leads to a 0.78-unit increase in project performance. These findings highlight that effective teams significantly enhance project performance in organisations.

4.5.4 Hypotheses results

The results of the hypotheses testing are presented in Table 7.

Table 7: Hypotheses testing results

Suggested path	Hypothesis	T statistics	P values	Path coefficients β	Decision
Workplace diversity → Team effectiveness	**H_1**	1.118	0.001	0.312	**Supported**
Goal clarity → Team effectiveness	**H_2**	1.034	0.001	0.445	**Supported**
Team relationship → Team effectiveness	**H_3**	1.026	0.001	0.603	**Supported**
Organisational commitment → Team effectiveness	**H_4**	17.474	0.001	0.728	**Supported**
Team effectiveness → Project performance	**H_5**	19.726	0.001	0.779	**Supported**
Significance level <0.05; * significance level <0.01; *** significance level <0.001**					

Table 7 represents suggestions for hypotheses (H1, H2, H3, H4 and H5). The table indicates that all the posited hypotheses are accepted.

5. Discussion of Results

The study's findings confirm that workplace diversity significantly enhances team effectiveness (H1, β = 0.312; p = 0.001), improving it by 31.2% in EPWP projects within Gauteng municipalities. This aligns with Ahmad and Rahman (2019), who highlight that diversity fosters innovation and skill development, and Mat et al. (2021), who emphasize the role of diverse environments in expanding employee capabilities. A diverse workforce enriches team dynamics and outcomes. Goal clarity also positively impacts team effectiveness (H2, β = 0.445; p = 0.001), contributing to a 44.5% improvement. This indicates that clear objectives enhance performance, resonating with Akgün and Ali's (2020) findings that goal clarity promotes higher employee performance. Clarity in expectations ensures better team alignment, fostering increased efficiency and productivity in EPWP projects.

Team relationships emerged as a strong predictor of team effectiveness (H3, β = 0.603; p = 0.001), leading to a 60.3% improvement. Strong team dynamics, such as cohesion and mutual support, significantly elevate team performance. Amiruddin et al. (2021) corroborate these findings, emphasizing that well-organized teams with robust leadership and reward systems maintain higher morale and motivation. Organisational commitment showed the highest

influence on team effectiveness (H4, β = 0.728; p = 0.001), accounting for a 72.8% increase. This aligns with Alberca et al. (2023) and Bjardianto and Pardomuan (2021), who found a robust positive correlation between commitment and teamwork. Commitment fosters a sense of purpose, significantly strengthening team outcomes. Finally, team effectiveness strongly impacts project performance (H5, β = 0.779; p = 0.001), enhancing it by 77.9%. Effective teamwork is closely linked to better project outcomes, as Gómez et al. (2017) supported. These findings underscore the importance of fostering team effectiveness to drive organizational success.

6. Contributions of the study to theory and practice

The theoretical and practical contributions are detailed in the subsections below.

Theoretical contributions

This study developed and tested a conceptual model incorporating workplace diversity, goal clarity, team relationships, and organisational commitment as factors influencing project performance in EPWP projects, with team effectiveness as a mediator. The model explains 59% of project performance, demonstrating high reliability and validity. Its holistic approach addresses gaps in fragmented and contradictory prior research, offering insights into enhancing team effectiveness and project performance in South African municipalities. There was, therefore, a call to consolidate the previously neglected factors and determine their impact in different setting previously neglected factors and their impact in different settings, such as South African municipalities. The proposed model can be a foundation for future studies in public institutions and other industries worldwide.

Practical contributions

To respond to project management challenges, this study has made significant practical contributions, which are discussed in the details below.

Many EPWP projects in South African municipalities, such as Johannesburg Metro, Ekurhuleni, and Sedibeng District, face delays or incomplete execution. This is due to inadequate implementation of key factors like workplace diversity, goal clarity, team relationships, and organisational commitment. Understanding these factors' impact on team effectiveness and project performance can help municipalities devise strategies to enhance outcomes. This study provides valuable insights into these dynamics, guiding resource allocation to improve team and project performance. It also offers critical information for businesses, government institutions, and decision-makers, addressing essential project management challenges to boost EPWP performance across South African municipalities, particularly in Gauteng.

7. Limitations and recommendations for future avenues

In assessing the findings of this study, it should be noted that the study is by no means without limitations, which offer avenues for future research. These limitations and associated areas for future research are discussed.

This study focused on three municipalities in Gauteng province, limiting generalizability across South Africa due to regional variations in market dynamics, employee behaviour, and cultural influences. Future research could expand to multiple provinces or regions for broader insights. Non-probability convenience sampling, a focus on a single construction project (EPWP), and a sample size of 254 respondents further restrict generalizability to the entire

South African construction industry. Focusing on public infrastructure projects in South Africa would enhance the originality of the study. Additionally, larger, more representative samples are recommended to enhance reliability and reduce error margins. The study employed a single cross-sectional design, collecting data at one point in time. Longitudinal studies could provide insights into how workplace diversity, goal clarity, team relationships, and organisational commitment evolve and influence EPWP project performance over time. A purely quantitative approach was used; incorporating qualitative methods, such as interviews or focus groups, could yield deeper insights. Cross-industry comparisons within EPWP projects could also uncover additional influencing factors.

Future research could include other mediators and outcome variables to enhance understanding. Also, the integration of digital tools may enhance team communication, improve project monitoring, or increase community engagement in EPWP projects, which the study neglected. Addressing these limitations would expand knowledge on team effectiveness and project performance, offering actionable recommendations to improve productivity and business outcomes in public institutions and construction projects.

8. Conclusions

The primary aim of this study was to investigate the factors influencing the performance of EPWP projects in the municipalities in Gauteng. This study developed and tested a conceptual model that incorporated workplace diversity, goal clarity, team relationship and organisational commitment (predictor variables), team effectiveness (mediator variable) and project performance (outcome variable) to understand different variables influencing project performance within the EPWP in the Gauteng municipalities. It made theoretical contributions by developing and testing the conceptual model and enhancing the understanding of project performance, especially from the government's perspective. It was found that the factors explain up to 58.2% of the variance in team effectiveness at EPWP projects. Practical contributions exposed areas where decision-makers/policymakers and municipalities could improve their efforts in predicting EPWP project performance within the municipalities.

The study opens up avenues for future research to expand the findings obtained and deal with the limitations. While the factors predicting team effectiveness can be helpful in project performance, corresponding efforts should be made to enhance the predicting power of some factors (workplace diversity and goal clarity) with below 45 percent predicting power on team effectiveness. These efforts may result in improved project performance in municipalities.

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Declaration of conflict

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THE IMPACT OF STRUCTURAL COMPLEXITY ON THE AFRICAN RISK CAPACITY PROGRAM

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Abstract

The inherent peculiarity of international development projects and programs makes them complex. The limited project complexity research tailored to this sector motivated the need to identify complexity factors that cause disruptions resulting in these projects performing poorly. Literature indicates that the dominant types of complexities faced are structural, sociopolitical, and emergent complexity. The study explores complexities faced by these projects with a specific focus on structural complexity to better understand how this impacts on project delivery. This paper therefore focuses on two objectives, the identification of structural complexity factors in the selected case study, plus insights on the PM strategies and tools applied to handle structural complexities experienced. A case study analysis of the African Risk Capacity program with a specific focus on Zimbabwe at country level was conducted. Ten interviews were conducted and program documents reviewed resulting in the identification of dominant structural complexity factors that caused disruptions, namely multiple project funding and project reporting. The research findings also provide project management insights that were applied on this program, enabling the ability to handle the structural complexities experienced.

Keywords: Structural complexity, international development projects, capacity development, disaster risk finance, Africa

Introduction

There are similarities between international development (ID) projects and traditional projects, but there are also differences. ID projects experience much higher levels of complexity. They conform to the traditional definition of a project, they are temporary in nature, unique, multidisciplinary with a defined scope and resources. They also conform to the application of a project life cycle, types of projects, have multiple diverse stakeholders, collaboration with multiple partners, require application of competent project management (PM) tools and techniques to manage implementation constraints of time, cost, and quality (Golini, Kalchschmidt & Landoni, 2015; Ika *et al.*, 2020a). They also experience optimism or pessimism bias, either believing a high likelihood of success or less likelihood of experiencing disruptions on their project. They may also experience strategic misrepresentation, when promoters of the projects deliberately manipulate cost and benefit estimates to make projects look good on paper, increasing the chances of project approval and funding (Flyvbjerg & Sunstein, 2016, p. 984; Ika et al., 2020a, p. 550).

ID projects aim to provide socio-economic assistance to targeted, specially designated groups of beneficiaries, for issues such as poverty alleviation, improving standards of living, capacity building, human rights protection, basic physical and social infrastructure development (Ika et al., 2020a, 2020b).
How ID projects are funded adds a layer of complexity originating from political or social institutions in high-income countries flowing to low-and-middle-income countries (Ika et al., 2020a; Rahman & Baranyi, 2018). Funders set the agenda and conditions of cooperation with the recipient country, with power relations influencing the project delivery environment, resulting in unequal stakeholder relations. There has been a shift in the last fifteen plus years with the emergence of funders from the low-and-middle-income countries represented by China, India, and African governments (Rahman & Baranyi, 2018). The recent dismantling of USAID the largest bilateral development agency in the world donating about $40 billion per year, which has significantly disrupted the global ID sector is a case in point (Munro, 2025).

1. Project complexity literature

Complex projects consist of ambiguity and uncertainty, interdependency, non-linearity, unique local conditions, autonomy, emergent behaviours, and unfixed boundaries (Bakhshi et al., 2016). When complexity is poorly understood and managed, project failure becomes the norm, especially as project managers often apply linear approaches in a non-linear environment with complexities that only become apparent when they stumble across them. No amount of planning could have prepared them as these unanticipated complexities emerge as the project unfolds, requiring the ability to adapt - to not jeopardise project performance (Kutsch & Hall, 2020; Ramalingam, 2013). The definition applied in this study is

> "*Complexity is a property of a project that consists of many varied parts with a multitude of existing and emerging interrelations, which make it difficult to understand, foresee and control its overall behaviour. Or the degree to which funders and managers understand the cause-and-effect relationships between the different parts of the project"* (Ika, 2022, p. 3).

There are multiple project complexity (PC) schools of thought, with three that are dominant: the System of Systems perspective; the complexity theories perspective; and the PMI perspective (Bakhshi et al., 2016). A systematic literature review of the latter was conducted by Maylor and Turner (2017) resulting in an integrated complexity framework with three

dimensions, namely structural, sociopolitical, and emergent. For the purposes of this research Maylor's Complexity framework was adopted as the conceptual frame with which data was collected, analysed and interpreted. Note that this paper strictly focuses on the structural dimension.

Structural complexity is the number of sub-systems of a project and their inter-relationships derived from political, economic, geographic, socio-cultural, historic, demographic, and environmental factors. It increases with various factors such as the number of people involved, project type, scope breadth and variety, size, budget scale, multiple locations and time zones, project team experience, interfaces and interdependencies within a project (Geraldi et al., 2011; Maylor & Turner, 2017).

1.1 The peculiarity of the international development landscape

ID Projects seek to contribute directly or indirectly to achieving the challenges of sustainable and equitable poverty reduction and or the improvement of living standard in the Global South (Ika et al., 2020a). They aim to improve the living conditions of the poor and vulnerable (Golini et al., 2017). Programs and projects vary from large multi-billion-dollar reconstruction projects to small micro-finance projects, and the sectors include infrastructure, agriculture, education, transportation, water, sanitation, hygiene, macroeconomic reforms, small business development, strengthening parliamentary systems and civil society movements, climate change, women empowerment, and humanitarian relief (Eichenauer & Reinsberg, 2017; Manning, 2017; Richey & Ponte, 2014). They are often public sector projects and programs that deliver goods or services via "hard" projects like civil works, railroads, and power plants. They also deliver "soft" projects in sectors such as education, health, human development, and capacity building.

1.1.1 Funding of International Development Projects

ID projects are predominantly funded from taxes from sources such as the national treasury of high-income country governments, personal donations, foundations, and philanthropists. In 2018 the total development aid donated by Organization for Economic Cooperation Development (OECD) countries amounted to approximately US$153 billion. This excludes non-OECD countries such as Brazil, Russia, India, China, South Africa (BRICS) and others. It also excludes aid donated by philanthropists in their individual capacity (OECD, 2019). The funding is predominantly via concessional loans, grants and guarantees, and often delivered via technical assistance or direct funding into a recipient country's national treasury. A large portion of the funding is categorised as bilateral and multilateral aid with multitudes of organisations that participate from the commitment of the funding right down to country beneficiaries. Funding agencies include United Nations (UN) agencies; global north Development Finance Institutions (DFIs) such as the German Federal Ministry for Economic Co-operation & Development (KfW), World Bank agencies; global south regional development banks such as the African Development Bank (AfDB), Development Bank of Southern Africa (DBSA), New Development Bank (former BRICS bank), Chinese Development Bank; international donor agencies such as the United States Agency for International Development (USAID) and the United Kingdom Foreign, Commonwealth and Development Office (UKFCDO). Other funders include middle income country governments, philanthropic institutions and individuals, foundations such as the Gates Foundation and others (Ika et al., 2020a; Rahman & Baranyi, 2018).

1.1.2 Implementation of International Development Projects

In many cases ID projects are implemented by government agencies, Non-Profit Organisations and Non-Governmental Organisations, sometimes in collaboration with

multinational firms and local partners. Interorganisational collaboration on projects has given rise to Project Network Organisations (PNOs), which have increasingly become an important form of organising for shorter product life cycles, flexible mobilisation, and for coordination of dispersed resources and expertise (Manning, 2017, p. 1399). PNOs are a collaboration between legally independent yet operationally interdependent individuals and organisations to strategically set up core project teams and flexible partner pools that sustain beyond a singular project, resulting in the formation of stable project-based alliances that facilitate learning and knowledge transfer across projects (Manning, 2017, p. 1407). For example, in larger donor-funded projects, consortiums are set up with a prime contractor with one or more subcontractors as a partner network to deliver one or more projects. Depending on the project scope of work area of specialisation, the prime contractor and subcontractor roles are interchangeable amongst the same partners, with some eventually merging to form a single organisation.

1.2 Structural complexity in international development projects

Structural system flaws: There is a structural gap between those who pay for ID projects (funders) and those who are meant to benefit from ID projects (recipients). The system does not enable the poor and vulnerable beneficiaries to provide feedback directly to the donors on the services or products received. The feedback loop between recipients and decision-makers is broken as only donors have political leverage over the decision-making process. This broken feedback loop explains the origins of the ownership problems that occur where donors can impose decisions on recipients, without the latter having a say in the process (Martens, 2005). Funding agencies, implementers, researchers, and the media are the 'middlemen' in this relationship, and the information provided is haphazard and 'tweaked' towards promoting a specific 'agenda' or brand, thus the lack of confidence in their provision of an unbiased balanced account of their performance (Cosgrave, 2007).

Funder proliferation and recipient fragmented absorptive capacity: Some donors fund multiple projects in developing countries haphazardly in excessive numbers with limited harmonisation or coordination amongst funders. This results in fragmentation by recipient countries with too many donors financing too many projects in an uncoordinated way. This 'generosity' has unintended consequences, making development ineffective in developing countries that do not have the requisite absorptive capacity at local human and institutional levels to effectively coordinate and structure the offers and program design capability required to avoid 'grabbing funding with all hands' followed by a rush to implement poorly conceptualised programs, increasing the likelihood of failure (Oh & Kim, 2015). Recipient countries spend a significant amount of time complying with multiple donor country funding reporting requirements, leaving little time to focus on the development of their communities and countries (Cox & Norrington-Davies, 2019; Lannon & Walsh, 2020; Roberton & Sawadogo-Lewis, 2022). Research indicates that aid proliferation has a negative impact on the economic growth of recipient countries, recommending a shift from proliferation to coordination and harmonisation of development efforts between donors and recipients, in alignment with the Paris Declaration for Aid Effectiveness (Oh & Kim, 2015).

Accountability traps: Development organisations focus on accountability for results required for reporting project performance to external stakeholders, with less focus on managing for results that use performance information to inform better internal decision-making. Thus, the strong culture and dominance of monitoring and evaluation (M&E) on ID projects. Accountability is complex, dynamic, and systematic due to the interdependent nature of the various levels and forms of accountability, requiring an objective perspective on the challenges of accountability and its appropriateness to the context (Ika, 2012). These are also

referred to as accountability dilemmas, where on the one hand funding agencies need to account to their country parliaments and domestic pressure groups on how the funding was spent, versus being accountable to the beneficiaries in recipient countries (de Renzio, 2016).

1.3 Adaptive complexity response insights in international development projects

Scholars have advocated for adaptive approaches to deal with complexities in ID projects, arguing that systemic issues are often ignored; individuals are blamed for lack of progress or being corrupt when in fact the system of incentives is the problem; agents themselves are often locked into ecosystems and organisational practices beyond their control, as is the case in the ID aid food chain, and interactions between developed and developing country role players (Andrews et al., 2013). Proposals include the development of frameworks that see opportunity in ambiguity rather than paralysis; moving away from the classical ID adage of "one problem, one solution, one instrument;" replacing reductionist thinking with systems thinking and facilitating adaptive management, as problems evolve, and solutions emerge.

2. Methodological Approach

An interpretivist philosophical lens was adopted as the researcher assumed that the social world is based on subjectivity, driven by the interest of the researcher, thus cannot be separated by the subject under study. Further, the PC construct is not simplistic, it is open to the interpretations and perceptions of the researcher. An inductive approach was adopted to establish a good understanding of the research context and the meaning attached to the disruptive events caused by PC. A case study strategy was selected, and data was collected via a blend of face to face and virtual interviews. The participants interviewed were divided into subgroups of project funders, designers and project implementers to gain multiple perspectives of the case under study.

2.1 Case selection

Table 2.1 Africa Risk Capacity Program Profile

Project Background and Objectives	Project Funding
African continent, with a focus on Zimbabwe. Capacity building for disaster risk financing and management. Joint African Union (AU) and the UN World Food Program (WFP) initiative to establish a disaster risk financing facility for drought management in Africa. Build capacity within AU member states to manage catastrophic risks, enable countries to strengthen their disaster risk management systems and access rapid and predictable financing when disaster strikes.	Capital contributions from the UKFCDO and KfW. Multiple international donor agency grants

ARC was jointly setup by the AU and the WFP to establish a disaster risk financing facility for drought management in Africa. Capital contributions were provided by the UK and German government agencies, as illustrated in Table 2.1. Additional grant funding was provided by multiple international donor agencies, and member states pay an annual premium when they join the program. The program builds capacity within AU member states to manage catastrophic risks, enabling countries to strengthen their disaster risk management systems and access rapid and predictable financing when disaster strikes. This is as a response to protect food security and livelihoods of vulnerable populations. It aims to improve the timeliness of responses and capacity building within African member states to better plan, prepare and respond to drought and other catastrophe risks by directly linking funds to defined contingency plans.

Member states are provided with capacity building services and access to state-of-the-art early warning technology, contingency planning, disaster management leadership, risk pooling and transfer facilities. This is via an annual project timeline for each country involving different stages with a specific scope of work. The country engagement encompasses all interactions held with a country including supporting the technical work stream. This is run as an annual project for each member state. Engaging countries takes time with the country engagement process moving through several defined phases for new countries and a separate set of phases for countries already in the risk pool. There are externals factors such as social, political, or institutional instability, and fiscal constraints that may delay some of the phases. As a novel offering on the African continent, the program has made good strides with 19 member states that had joined the risk pool. Some member countries have experienced disasters receiving pay-outs facilitating quick responses to affected populations.

2.2 Data collection, coding, and analysis

Interview participants were identified with the assistance of ARC Agency representatives and the Zimbabwe country representative. Secondary data was collected and reviewed, documents included the strategic framework and annual reports.

Demographic profile of participants

Ten participants were interviewed, and their demographic profiles are illustrated in Table 2.2. There were three program funders, three program designers, and four program implementers. They all had a direct role in the project in their different capacities as international funders,

ARC implementation agency and in-country government officials. The minimum time spent on the program was two years, up to eight years plus. At least half of the participants had received formal or professional PM training.

Table 2.2 Demographic profile of participants

Interview Code	Role in Program	Highest Education Level	PM Training	Years on Program
ARC1	Project Funder	PhD, Economics	In-house training	4
ARC2	Project Funder	MSc, Environmental Reconstruction	None	8+
ARC3	Project Funder	MA, Public Administration and Policy	In-house training	2+
ARC4	Project Designer	MA, Accounting	Prince2	5
ARC5	Project Designer	MA, Agriculture and Applied Economics	PGD, Project planning and management	4+
ARC6	Project Designer	MBA, Project Management	Prince2 and Managing Successful Programmes (MSP)	4
ARC7	Project Implementer	MA, Business and Finance	PMBoK	4
ARC8	Project Implementer	MA, Finance	None	2
ARC9	Project Implementer	Diploma, Weather Analysis and Forecasting Advanced Diploma, Computer Science	None	5
ARC10	Project Implementer	MA, Child Rights and Childhood Studies	Monitoring & Evaluation	6+

The transcribed data collected was coded using a coding frame developed based on the dimensions of the research constructs, which were analysed using Atlas.ti software. Quotations associated with specific codes were generated, themes constructed and refined.

3. Findings

The data collected was analysed and synthesized, with the results compared to literature. The findings indicated a lower-than-expected structural complexity at 33% which can be attributed to the influence and engagement by the UK and German government development funding institutions that provided long term capital contributions, thus their active involvement in institutional building of ARC is 'minding' their investment.

3.1 Participant experiences of structural complexity

The most-mentioned contributing factors to structural complexity were *multiple funders* and *projecting reporting at 27% and 24% respectively*, as illustrated in Figure 3.1.

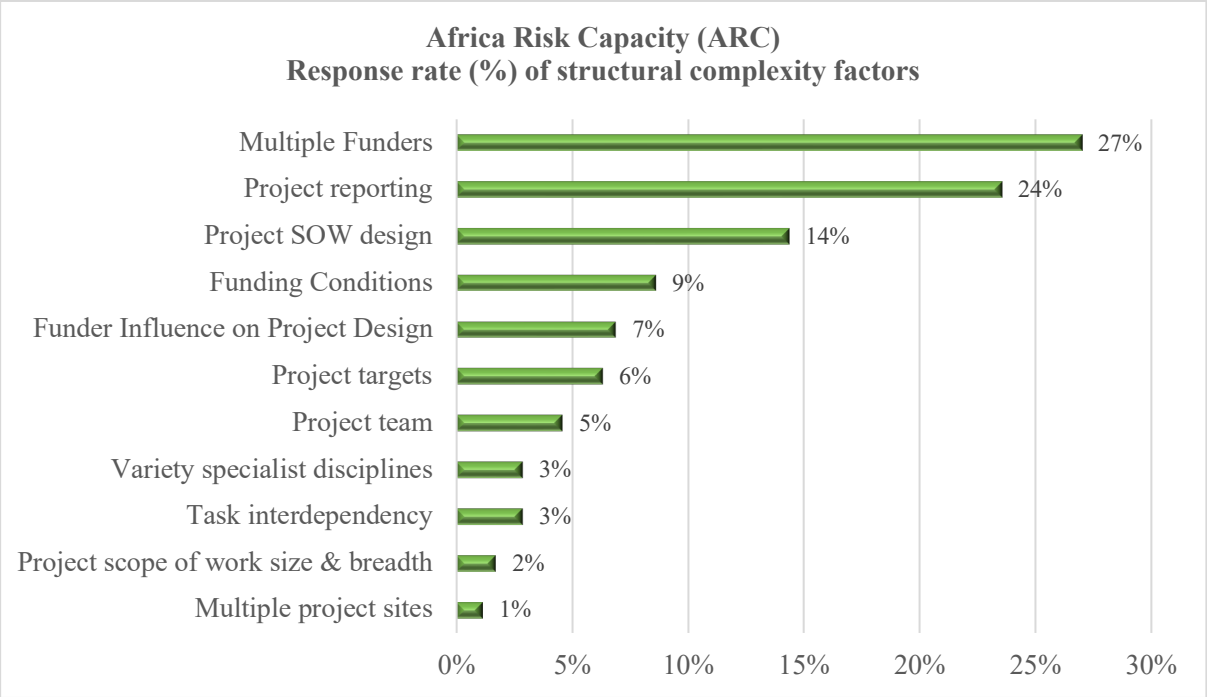


Figure 3.1 Structural Complexity response rates

3.1.1 Multiple funders

The ARC program had multiple funders that provided multiple types of funding such as capital contributions, grants, and insurance premium subsidies. Capital contribution support is provided in the form of 20-year interest free loans for the institutional development of ARC. The UKFCDO was a key stakeholder that provided capital investment when ARC was established. A capital contribution of £30 million 20-year 0% interest loan was provided for institutional development. The UKFCDO also provided grant support for ARC projects such as premium financing so that members would pay the cost of premiums via the Africa Disaster Risk Financing Program (ADRiFi) in collaboration with the AfDB. Grant finance was put into a multi donor trust fund and the AfDB used the African Development Fund professional resources to help countries pay their premiums for drought and cyclone cover.

Similarly, the KfW have supported ARC since it was established. In 2013, KfW provided $48 million capital investment for ARC limited and has continued to support ARC. KfW also provided grant funding for the ARC agency, as well as premium financing for member

countries. Funding was also provided for product development of the humanitarian product, ARC Replica, and the tropical cyclone product.

The development capital provided meant that the UKFCDO and KFW are members of ARC Limited. They are a donor to ARC Agency, and a Class C member of the insurance company, ARC Limited. A Class C member of ARC Ltd is a person or entity that has provided at least $25 million in returnable capital with the expectation that the capital will be returned without interest. This also gives the UKFCDO and KfW an active seat in the governance of ARC Ltd with voting rights. International government agencies and philanthropic foundations that provided grant funding include Canada, France, the EU, Switzerland, the USA, and the Rockefeller Foundation.

Due to the complexity of ARC having to deal with multiple funders and donors, a donor coordination group was formed where each donor nominated a representative as a member of the group, enabling coordinated donor positions with ARC so that they do not have to deal with multiple separate opinions. Despite these efforts, harmonization challenges were still experienced.

Interestingly, some participants indicated that the complexity is not limited to the coordination of multiple donors, but that there was an added complexity of tracking and monitoring the funding within some of the donors themselves, especially the larger ones whose government provides different types of funding via diverse mechanisms and tiers. For example, a country may fund ARC at a global level, but also through bilateral support to countries.

> *"For example, in Africa we fund the World Bank, but also have grant funding for productive development, the INSureResilience fund. It's really complex to make sure that nothing is funded twice and that the solutions which are created, go hand in hand." (Project funder, ARC1)*

Participants indicated there was an issue of inconsistent participation in the ARC program linked to premium payments. With all the competing interests on constrained country budgets it was hard for them to prioritize paying premiums. They recognized that this requires more effort in terms of advocacy and knowledge transfer to these countries. Building an insurance market takes time, especially given the context where disaster insurance is new. The idea being that over time there will be a cultural shift with more countries joining the fund given that drought is common, and floods may become more common as climate change has become more aggressive, making the option of an insurance policy more attractive, which is quicker, before the humanitarian assistance kicks in.

> *"Risk pooling allows much cheaper insurance, which is a huge cost, even to a country. It gives them the cover they need, at a cost-effective price. The ARC technical assistance empowers countries to take over and own the mechanism. ARC is strong and regionally owned, an excellent mechanism for Africa." (Project funder, ARC2)*

Initially, donors thought that if countries could see the value of insurance payouts they would want to take on the costs themselves. They did not recognize how hard it would be to convince countries to take on proactive risk management when they only receive a payout maybe every three or four years. Donors also underestimated the increasing climate risk that was increasing faster than country ability to cope. The impact of climate change increased

costs, and COVID massively impacted some country's ability to pay premiums. In response the ARC international donors proactively set up the ADRiFi as a premium subsidy fund in partnership with the AfDB providing countries access to the concessional funds to subsidise country insurance premiums.

3.1.2 Project reporting

At the most senior political level ARC is required to submit reports to the AU which has its own rules and reporting requirements. At a funding level, funding comes with expectations that require accountability and transparency. Thus, ARC Ltd is required to provide quarterly reporting as per the conditions of the capital investment. At the end of every financial year full audited financial statements and program performance reports are required. Results indicate that ARC Ltd was intentionally structured such that the seed capital contribution resourced organizational and program requirements. Each funder contributes to that resource envelope; thus, reporting is not funder-specific, but one report is done for all funders, reducing the reporting complexity.

Initially, at a donor level, each had a different template that ARC was required to use for reporting, which was time consuming. This was eventually harmonized across donors who agreed on a standard template. During negotiations ARC intentionally advises new donors that only one report is issued to all donor institutions supporting ARC, mitigating the complexity of reporting to each institution that supports ARC separately.

> *"The funds are put in a pool used to implement the ARC strategy, which shows what we are going to do in the next five years, and this strategy is operationalized through annual work plans, annual programs, and budgets. The donors then know what their resources are going towards, what component is going to human resources and that going to different program activities." (Project designer, ARC5)*

Twice a year ARC submits a single harmonized report to all donors and partners using a Results Based Framework as a progress update report of how the set targets have been met, and an annual report. At the halfway point, the report indicates what was planned, how likely it is to achieve it, and if unlikely, what the reasons are. Or how many countries were targeted, if this was not reached, reasons need to be provided. An opportunity to provide context of why certain things did not happen the way they were planned exists. The donors have significant influence on the reporting requirements, not just in terms of where the money goes, but in terms of how things are done, thus the insistence on a log frame designed M&E system that seeks to capture what they - the donors - consider to be the key performance areas that need to be attained. For instance, the number of countries with an insurance policy, and the number of countries that have renewed their policies. ARC has a centralized M&E unit responsible for collating these reports.

A key element of reporting is when a country receives a payout. The funders require ARC to conduct a full process audit to verify that the approved contingency plan was implemented, and that the funding has reached the targeted beneficiaries. A USA consultancy firm - Kimetrica - was engaged to co-develop the process audit with the ARC team, an ongoing process which involves the member countries as a learning tool. It was not intended to be a punitive sanctions mechanism, but a way to learn, and improve. The capital funders were involved from inception in setting up the governance of ARC Ltd, the agreements with all the

bylaws, how the member capital contributions would be incorporated into the audited reports, how losses would be shared; all that information is required in the audited reports.

> *"When a very large payout goes to a country after a disaster, that's unfortunately when decision making is often ad hoc or panicked, it's suboptimal. Beneficiary spot checks are conducted to check that the aid was received quickly and on time and it was good quality. There's a full process audit of the payout, checking the contingency plan was delivered on as agreed. And there's a financial audit of the response to check that all the money can be verified, that all of it was spent as was expected."(Project funder, ARC2)*

When there is a payout to a member country, authority is sought from the Ministry of Finance to transfer it to the implementing agents who then start to work with other external stakeholders. They are then required to provide interim status reports on how they are utilizing the funds. Thus, the reporting is not once-off, interim reports are required until the implementation is finalized and a final report is done. Reporting is tailored in alignment with the implementation plan. When the implementation is done a progress report is required providing an account of how the payout was spent, detailing how much was paid, how many people were paid, and whether there were any challenges.

3.2 Project management practices applied

Participants indicated that the key PM practices applied on the project in an attempt to respond to disruptions were *PM strategies and tools* at 67% and *project governance* at 33%. A number of PM practices were applied at both program and project levels, broadly segmented into the project planning, project monitoring and information systems, and project stakeholder management. The main PM strategies and tools applied were the *annual project plan* and the *risk pool model.*

3.2.1 Annual work plan

The crux of the ARC program is to provide capacity building to member countries to better plan, prepare, and respond to extreme weather-related events and natural disasters. Therefore, a significant part of the capacity building is planning. ARC program member countries are assisted to develop contingency, operational, and final implementation plans at progressive phases of the country engagement project life cycle – from signing up as a program participant to payout disbursement to beneficiaries.

> *"We've got the contingency plan which is supposed to set out how the response is done. A country cannot get an insurance policy unless there is a pre-approved contingency plan. When it becomes clear that a payout needs to be made, then there is a further process to refine that contingency plan into a final implementation plan." (Project designer, ARC4)*

3.2.2 Risk pool model

Another key aspect of the ARC program is the risk pooling model. At a broader program level ARC is one of a few disaster risk pools in the world, playing a significant role as a continental risk pool contributing to the global disaster risk finance architecture. The aim is to provide a risk pool so that drought or tropical cyclones will not affect the entire African continent at the same time. If there is drought in West Africa, it is likely to be better in

southern or East Africa. The principle of risk pooling is that countries pay an average annual cost every year, which is the insurance premium. But the country does not get a payout every year, and when a payout does occur the country might get eight times that back every fourth year or so. Using the basic principle of insurance, a country must pay in the good years too, otherwise, the scheme would just go bankrupt.

> *"In many ways the program was visionary, it was well ahead of his time, there are now four risk pools in the world. ARC has been set up well, it is robust, and well managed. And it has such potential to grow and do good things, which is why we put a lot of money, and a lot of political capital into ARC. We really want and need them to succeed." (Project funder, ARC2)*

At a country level ARC provides a software-based risk pool model that countries are capacitated to customize by providing specific risk parameter data sets tailored to that country context. The customization process is quite taxing requiring a lot of country information that needs to be fine-tuned.

3.2.3 Project governance

Project governance was the second most mentioned PM practice applied. At the top of the ARC program governance structure is the AU Executive Council which consists of the Conference of African Ministers of Finance. This is the key decision-making body given that ARC was established as a specialized agency of the AU. The next governance level down after the AU is the Conference of Parties (CoP) which consists of ARC Agency African member states. This is a key decision-making body that meets annually to make decisions on programs, finance, and all elements of the ARC program. This appears to create some level of complexity for the ARC team due to the various levels of knowledge and understanding of the member country representatives in the work they do, especially with new members that have the power to make key decisions about ARC without full knowledge of disaster risk financing and management. In addition, as the number of member countries grow; representation numbers of the CoP grow, adding another layer of complexity.

> *“I know that we serve the CoP as the representatives of the African countries, but it is not ideal. There are just too many parties, it is not a very meaningful way to run an institution that needs to deliver. If there is a big issue and it must go to the CoP, politics become part of it. When people must vote, the lobbying and other things detract from the proper process, then they end up not happening. It's not a good structure at all." (Project designer, ARC4)*

The next governance level down is the ARC Group board, a governance body that consolidates both ARC Agency and ARC Ltd. Participants indicated that previously there was the ARC Ltd board and an Agency board, and governance reform resulted in a body that consolidates both sides, creating the ARC group board. The ARC Ltd board still exists as it is an insurance company that is required to have a board from a private sector corporate governance perspective. The ARC group board was restructured to include the ARC capital

funder representatives, the UK and Germany, as members of the group board. Donor representatives are not members but are invited to attend board meetings as observers.

The governance structure then devolves to the ARC Agency management and ARC Ltd management. Each of them has a separate executive management team as ARC Ltd operates as a private sector company, regulated under private law.

4. Discussion

The findings on project funding and associated reporting are not explicitly discussed in PM literature (Maylor & Turner, 2017), indicating that these are not a typical complexity factor in traditional projects. However, these findings are supported by ID literature that suggests that funding institutional requirements in the form of multiple unique funders: public, private, multilateral, and philanthropic, sometimes with all of them on one project, each with different PM practices and reporting requirements, are complexities derived from the context within which ID projects are funded (Ika et al., 2020a). Where multiple funders in the form of bilateral, multilateral, DFIs and others result in adverse effects of transaction costs, with different funders requiring the implementation agencies and recipients (beneficiaries) to comply with different project funding regulations, procedures (Oh & Kim, 2015) and stringent monitoring and reporting requirements (Ika et al., 2020a).

Consequently, compliance with these different regulations and procedures as a condition of funding creates an administrative burden resulting in overstretched civil servants in recipient countries and implementing agencies producing quarterly reports, spending a significant amount of time complying with multiple donor funding reporting requirements, instead of focusing on core project initiatives with accountability trumping development work. This has led to criticism on the effort versus value, and compliance rather than meaningful contribution to lessons learnt (Cox & Norrington-Davies, 2019; Lannon & Walsh, 2020; Ramalingam, 2013; Roberton & Sawadogo-Lewis, 2022).

The cumbersome reporting to multiple funders often leads to *accountability traps* with ID organisations focusing on accountability for results required for reporting project performance to external stakeholders (de Renzio, 2016; Ika, 2012). For example, on the one hand funding agencies need to account to their country parliaments and domestic pressure groups on how the funding was spent, and on the other hand be accountable to the recipient country beneficiaries. The nature of ID projects is that funders may not implement projects: in some cases, they appoint implementing agencies (contractors) to deliver projects, making ID projects contract-based (Freeman & Schuller, 2020). This in turn leads to the commodification of project reporting documentation by implementing agencies in exchange for the contract award. Therefore, contractors are required to produce project reports (Hohn, 2013) for accountability on how funds were spent, but this has also created a development sector industry where these reports legitimise the implementing agency's reputation, influencing their ability to obtain additional development contracts (Freeman & Schuller, 2020; Gent et al., 2015). Thus, the strong culture and dominance of M&E on ID projects which has been criticised, arguing that the design of M&E systems and frameworks prescribed by funding agencies is weak - as the evaluation criteria applied are insufficient for learning and accountability, with widespread positive bias and inconsistent evaluation standards (Clements, 2020).

Structural complexity factors found in PM literature such as scope, multiple project sites, and size that are prevalent in traditional projects (Maylor & Turner, 2017; San Cristobal et al. 2020) can be used to gain insight into ID projects (Ika et al., 2020a). However, the research findings showed that not all complexity factors are important in an ID context, illustrated by

the relatively inconsequential presence of complexity factors such as multiple project sites, size, and task interdependency and others. This is supported by ID literature that indicates that not all complexity factors are equally important in different contexts, their order of importance is influenced by their context (Ruoslahti, 2020). PC factors highlight the importance of the context in assessing PC (de Rezende et al., 2022). Consequently, the ID context results in the dominance of structural complexity factors such as funding and project reporting.

5. Conclusion

The results in this case revealed that multiple funders and project reporting were identified as the main structural complexity-contributing factors. It also revealed that the application of PM practices such as harmonization across multiple donors can assist with handling structural complexity by sharing and absorbing the risks brought about by the stress and shocks of extreme weather events and their economic multiplier effects on food insecurity and poverty faced by African governments, many of which are already overburdened by underlying social challenges. The establishment of the ARC program provided the capacity building that enabled member countries on the importance of the collection and analysis of critical data that informs disaster related interventions, especially for the risk modelling tool. This did not protect Zimbabwe from experiencing a drought but the ability to receive an insurance payout enabling quick distribution to affected beneficiaries enabled the recovery process.

5.1 Research contribution to theory

Gajic and Palcic (2019) developed a framework for complexity analysis in ID that does not cover structural complexity factors such as multiple project funders and project reporting, in contrast to the findings of this research. The former applied a Delphi method based on the limited existing research on PC in ID projects. The structural complexity identified in this study presents an opportunity to add new insights to the ID literature as multiple project funding and the associated reporting are contributing factors in an ID context since project funding is predominantly provided via multilateral and bilateral agencies, DFIs, and foundations. The latter prescribes strict project accountability reporting requirements (Freeman & Schuller, 2020; Ika & Hodgson, 2014; Oh & Kim, 2015).

5.2 Practical recommendations

The identification of structural complexity factors enables project funders to factor them into their design decisions, funding conditions, and governance processes. For example, these factors can now be specifically included as a requirement of implementing agency key personnel in the bidding documents and included into the SoW in the technical assistance or capacity building component. This would facilitate the development project practitioners competencies to better manage complex projects in the ID sector.

Funders are also encouraged to authorise an environment that enables implementing partner practitioners to work through complexity given the specific local context. For example, the application of the problem driven iterative approach (PDIA) (Andrews et al., 2013) would enable adaptive management versus compliance with externally predetermined solutions. Authorising latitude for experimentation enables the emergence of context-driven pathways as a response to complexity. In addition, it enables financial flexibility in budgets to accommodate variations or changes (within reasonable thresholds) to facilitate timely adaptation in response to the context on the ground. The prevailing funder systems that

reward the commodified project reporting compliance need to transition towards adaptive resource allocation and accountability that enable project decision-makers on the ground the flexibility to modify activities and associated budgets that are compatible with the realities on the ground. Instead of ‘penalising’ contractors or practitioners that practice this, incentives could be provided instead to drive adaptive management of projects.

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THE IMPLICATION OF ARTIFICIAL INTELLIGENCE IN MARITIME SUPPLY CHAIN: A COMPARATIVE STUDY, PORT OF TEMA, TAKORADI AND ROTTERDAM

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Abstract

This comparison study examines the implications of artificial intelligence for driving Port Productivity for the Ports of Tema and Takoradi in Ghana, Africa, and the Port of Rotterdam in Europe. The artificial intelligence utility theoretical framework was used as the basis for this research, as it aligns with the ability of port management to make proper decisions based on the utility of different AI options. The research then examines the current technology used at these selected ports and its implications. A comparison table was developed using critical parameters such as technology, ranking, security, safety, sustainability, maintenance of infrastructure, and port community systems to distinguish the two ports. The research noted the importance of artificial intelligence in enhancing port efficiency from the selected ports used as case studies. This research uses Quantitative Research Design with a special focus on Data Envelopment Analysis, which is a non-parametric tool used to evaluate port efficiency. The Malmquist Productivity Index (MPI) determines the drivers of Port Productivity for the selected Ports from 2017-2021. The data was obtained from the website of the respective port. The findings show that technology has been the driving force for all the ports under examination. However, the Port of Rotterdam has benefited more from the use of artificial intelligence in terms of an increase in port productivity. This is evidenced by the port of Rotterdam having an MPI of 2.62, which shows progress, whilst the Port of Tema and Takoradi have an MPI of 1.02 and 0.88, which implies little progress in terms of port productivity and application of technology. The study ends by recommending the contextualisation and customization of AI for the Ghanaian Ports.

Keywords: artificial intelligence, ports, Rotterdam, Tema, Takoradi

1. Introduction

There are no smart ports in Africa as of the time of this research. The focus of this research is to compare the implications of artificial intelligence on ports such as Rotterdam in Europe and their Ghanaian counterpart in Africa. Clemente et al. (2023) state that "Seaports are at the forefront of global trade networks, serving as hubs for maritime logistics and the transportation of goods and people". Port and terminal operators are experiencing growing complexity and rapidly accelerating demands, which puts the ports under pressure to modernize (Behdani, 2023). Many ports in Africa are categorized as traditional ports, while ports that use artificial intelligence are known as smart ports. Artificial intelligence is the foundation for Smart ports (Sinay, 2021). Smart ports integrate information and communication technologies within smart applications, ultimately improving port management (Al-Fatlawi, & Motlak, 2023). These advancements in artificial intelligence have the potential to facilitate the development of advanced route optimization algorithms and autonomous navigation systems, enabling vessels to navigate more safely and efficiently while minimizing their environmental impact (Ioanid & Andrei, 2020).

Ghana is an African coastal nation located in West Africa. Like many other coastal nations, the seaport is a major source of revenue for the nation. Ghana is a developing economy, where the seaports assume increasingly significant importance as conduits for resource utilization, job creation, and revenue generation (Baafi, 2024). This is because international trade is the engine of the global economy (Kornher, Sakyi, & Tannor ,2024). The seaports have a pivotal role to play in international trade, since the volume of shipments and cargoes is best transported by sea. Shipments in the form of medications, construction materials, consumer goods, etc, are transported from origin to destination by vessels in large volumes.

Zhang, Yang, & Luo, (2024) affirm that "a port is not only a business unit serving multiple users, such as shippers, freight forwarders, and shipping companies, but also an engine for regional economic development". The Port of Tema and Takoradi are the gateways for import and export into the Ghanaian economy. Even though Ghana has made substantial investments in its seaport infrastructure to increase its export capacity and seaport efficiency (Kornher et.,al 2024) states, that there is a need to evaluate the productivity of the Port of Tema and Takoradi. Port productivity is an index that is crucial to different stakeholders: port management, shipping companies, freight forwarders, manufacturers, and consumers, among others (Gonzalez & Quesada, 2024). Port and terminal efficiency are critical to the container shipping industry due to their significance in enhancing the competitive advantage of ports within a region (Tetteh, Atsunyo, & Boateng, 2024).

This research is focused on the implications of artificial intelligence on the port productivity of the port of Rotterdam and Ghana. This is a comparison study, where the port of Rotterdam is used as a benchmark not only for the port of Ghana but for other traditional ports as well. The following sub-section 1.1 examines the port profile; 1.2 examines other ports and the application of AI at such ports; section 1.3 discusses the theoretical framework; section 1.4 is the methodology section; section 1.5 discusses the results; section 2 concludes the research.

1.1 Artificial Intelligence

Behdani (2024) defines an artificially intelligent port as Port 4.0, which is a "port that leverages advanced technologies to digitally transform key business processes, improve security, and increase operational efficiency and port sustainability".

Stoyanova (2023) attests that the port industry has several obstacles, such as increased cargo transportation environmental concerns and operational difficulties. Artificial Intelligence has the potential to solve these multifarious challenges and enhance efficiency and productivity (Stoyanova, 2023). AI can augment operational efficiency, boost ship traffic management, and automate container handling activities within Indonesian ports (Safuan, & Syafira, 2024). Pournader et al., (2021) attests that the application of Artificial intelligence can be categorised into learning, decision making and sensing and interacting. The sophisticated planning required for maritime transportation involves challenges such as unpredictable weather, diverse types of cargo kinds, and changes in port conditions, all of which can raise operational expenses (Dinh, et., al 2024). This is the basis for the adoption of artificial intelligence. Lehmacher, et.,al (2022), states that Artificial intelligence and machine learning can help to understand and predict traffic volumes and enable the simulation of alternative solutions to smooth flows and reduce congestion (Ioanid, & Andrei, 2020). Ioanid, & Andrei (2020) attests that the evolution of AI, in maritime applications has significantly transformed the industry, enhancing navigational precision, operational efficiency, and environmental sustainability.

1.2 Port Profile

The Port Of Tema is the largest in Ghana. Situated on the country's eastern coast, it stretches over a 5.5 million square metres of land area. (Ghana Ports and Habours Authority, 2024). Tetteh, Atsunyo, & Boateng, (2024) states that the Port of Tema doubles as Ghana's largest port despite intense competition from neighboring ports such as Lomé, Abidjan, and Cotonou. Nevertheless, the port has risen to gain the status of a transshipment hub of the West African region (Tetteh, Atsunyo, & Boateng, 2024). More than 85% of Ghana’s international trade is done through the ports of Tema (GPHA, 2024).

The Port of Takoradi is Ghana’s premier commercial Port to facilitate Ghana’s international trade (GPHA, 2024). The Port is strategically located to provide a cost-effective route to and from Europe, America, and Asia (GPHA, 2024). It is positioned to service the northern hinterland of Ghana and the international trade of the three Sahelian landlocked economies of Burkina Faso, Mali, and Niger. In 2021, the Port handled 25% of Ghana’s seaborne traffic, 61% of Ghana’s seaborne exports, and 18% of Ghana’s seaborne imports (GPHA,2024).

The Port of Rotterdam is the largest in Europe (Port of Rotterdam, 2024). Notteboom, Pallis and Rodrigue (2022) confirm that the port of Rotterdam in 2022, handled 467 million tons of freight, including 14.4 million TEUs of container traffic. These figures make Rotterdam the fifth most important bulk port in the world as well as the 10th largest container port (Notteboom et al, 2022). Even though Ghanaian agricultural companies and farmers have used AI to provide real-time data on weather patterns, crop diseases, and commodity prices (ITA, 2024), the Ghanaian Port and Harbour Authority is yet to operationalize artificial intelligence (Pallis and Rodrigue ,2022)

1.2 Case Study: Ports and Artificial Intelligence

The Port of Rotterdam is transforming into a digital port. Port of Rotterdam (2024) states that a digital port with smart infrastructure is necessary to fully utilise the potential of artificial intelligence (AI)

Ports that make use of Artificial Intelligence
Table 1 shows a list of top world ports that make use of artificial intelligence and in which dimension it is applied

Table 1: Ports that make use of Artificial Intelligence

	Application of AI
Port of Los Angeles	Make use of autonomous cranes and container trucks to transport cargo within the terminal.
Port of Hamburg	Machine Learning Modules
King Abdulaziz Port in Dammam	Operational efficiency, reduce costs, and improve service delivery
Jeddah Islamic Port	Uses AI to improve port operations.
Port Singapore	Scheduling, Automated Vehicle, Security, Digital Port@SG, Vehicle Traffic Management
Port of Valencia	Reducing congestion, Predicting Truck flow, Advanced Port surveillance, AI Uncloaking Pilot.
Port of Barcelona	Virtual Doors and Virtual Gates, a system that makes it possible to control, expedite and optimize the passage of the more than 4,000 trucks that pass through the port area daily.

Source: Author's Compilation, 2024

1.3 Application of Artificial Intelligence at the Port of Rotterdam

According to Gazar et al., (2023), the importance of AI is expected to increase and reshape the maritime sector. Port of Rotterdam (2024) attests that artificial intelligence is applied under the following themes: Asset Life Cycle; Operations Optimisation; Virtual Energy System; and Nautical Safety. Figure 1 describes the areas, such as making infrastructure smarter by including sensors that alert the port management when the specific infrastructure needs to be repaired or serviced. At the Port of Rotterdam, Port Call Optimisation (PCO) makes vessels visit safely and efficiently (Port of Rotterdam,2024). This process reduces emissions from vessels in transit, in and around ports, terminals, and port cities, and at the same time, ensures more safety, compliance with the regulations, and lower costs for shipping lines, shippers, terminals, and ports (Port of Rotterdam,2024).

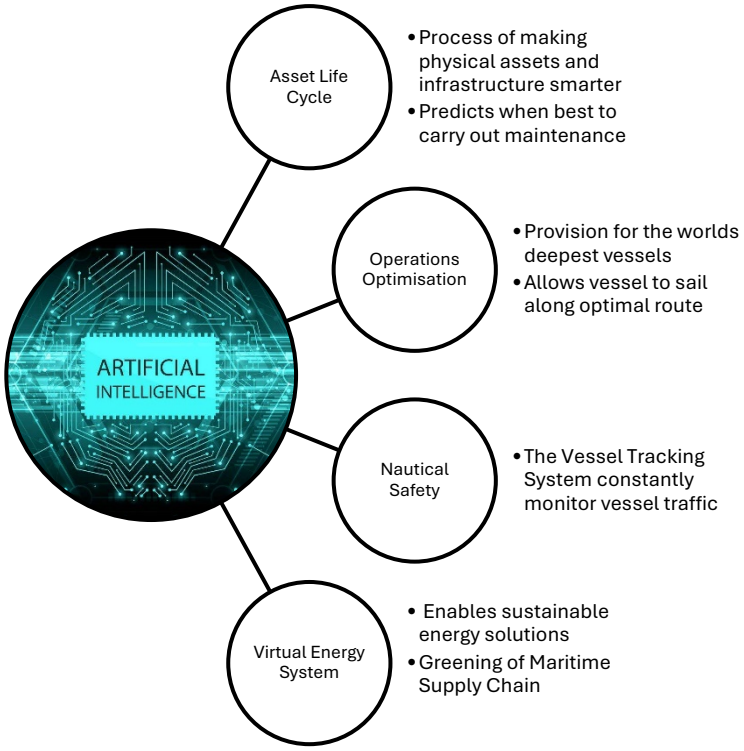


Figure 1: The Application of Artificial Intelligence at the Port of Rotterdam

Source: Adapted from the Port of Rotterdam

1.4 Theoretical Framework

The theoretical framework for this study is the theory of utility in artificial intelligence. According to Yang and Liu (2023), a suitable utility model can serve as a guide in the selection of reasonable strategies to make credible decisions to solve problems. Due to the complexity and interwovenness of port operations and processes, artificial intelligence provides a portfolio of solutions. It is up to the port stakeholders to attribute weightings to these plausible solutions so that they can make the best decision. Bales (2023) confirms that the expected value of a decision in terms of an

AI-generated solution is a probability-weighted sum of the value of the decision's possible outcomes.

1.5 Research Methods

This is a Quantitative Research Design that makes use of panel data to calculate efficiency. This is a retrospective study design. The measurable parameters of inputs are obtained from the website of the respective port statistics. The inputs are the number of container berths, the number of tug boats, the number of cranes, and the length of the quay, whilst the outputs are vessel visits and container throughput. This secondary data for 2017-2021 is sourced from the Port of Rotterdam and Ghana Port and Harbour statistics. This time frame was selected based on data availability. This data set has been confirmed and validated by another source, such as the World Bank CPPI (2023) report. The sampling technique used is nested purposive sampling because the Port of Rotterdam is among the few smart ports that have applied Artificial Intelligence. The Malmquist productivity Index is a non-parametric tool for evaluating port productivity over a period. Malmquist (1953) first introduced the Malmquist total factor productivity index before its conversion to the framework of DEA. Malmquist (1953) defined a quantity index (QI) as a ratio of distance functions, where it evaluates an observation relative to an indifference curve (IC). This research uses the DEA-MPI method to examine the efficiency, technology, and drivers of productivity from 2017 to 2021 for the Port of Tema, Takoradi, and Rotterdam. The following shows the importance of the inputs and outputs

Inputs: Number of Container Berths: When the vessel berths at the port, it offloads and unloads the containers (Jiang et al., 2024). Hence, port congestion at the quayside can be prevented when there are more berths. Number of Cranes: These are used for the on-loading and off-loading of containers from the vessel. This is a key determinant for port productivity (Ningrat et al., 2024). Number of Tugs: Vessels can run the risk for running aground if they are not guided by tugs. Tugs are very important navigational tools for vessels entering the ports because they assist in navigating the unknown terrain (Bošnjak, et al, 2021). Length of Quay: This is crucial for port productivity as it determines the length, weight, type, and size of the vessel, which can be assessed and given an allocation at a particular time for an unused berth in the port. (Jeong et al, 2024).

Outputs: Container Throughput: The output of a container terminal is critical for port employment. (Ayesu et al, 2024). Vessel Visits: Chu et al (2023) posit that the punctuality of vessel visits or calls is crucial for port operations.

The MPI shows the regression and progression of decision-making units, such as ports, from one period to the other. The two periods are the efficiency change and the technology change. Negar and Rostamy-Malkhalifeh, (2017) state that the MPI expresses that the regression and progress of a unit from one period to the next depends not only on its efficiency changes during these two periods, but also on technological changes in the population, or boundary shift of the evaluated population in the same period Equation 1 is the MPI formula. The Pim-Dea V.3.0 software, developed by Emrouznejad and Thanassoulis (2011), calculates the efficiency change for the selected ports from 2017 to 2021.

Figure 1 shows the Malmquist equation. The Malmquist equation is the product of efficiency change and technological change.

$$M(Y_{t+1}, X_{t+1}, X_t) = \underbrace{\frac{D^t(Y_{t+1}, X_{t+1})}{D^t(Y_t, X_t)}}_{\text{Efficiency change}} \underbrace{\frac{D^t(Y_{t+1}, X_{t+1})}{D^{t+1}(Y_{t+1}, X_{t+1})} X \frac{D^t(Y_t, X_t)}{D^{t+1}(Y_t, X_t)}}_{\text{Technology change}}$$

Equation (1): The Malmquist Productivity Index Formula.

Source: Malmquist (1953)

Where:

Xt and Xt+1 input vectors of dimension at time t and t +1

Yt and Yt+1 corresponding k- output vectors

Dt and Dt+1 denote an input

$D(x,y) = \max(\rho: (s/\rho s \in L(y)$ (1)

Where L(y) represents the number of all input vectors with which a certain output vector y can be produced, that is L(y) = (x: y can be produced with x).

P in equation (2) can be understood as a reciprocal value of the factor by which the total inputs could be maximally reduced without reducing output.

M= measures the productivity change between periods t and t+1. Productivity declines if M<1, remains unchanged if M=1, and improves if M>1.

According to Negar and Rostamy-Malkhalifeh (2017), the results of the MPI can be interpreted as:

DMU0, MPU0>1: A progress occurs in period t+1 ratio to t.

DMU0, MPU0< 1: A regression occurs in period t+1 ratio to t.

DMU0, MPU0= 1: No progress or regression occurs in period t+1 ratio to t.

According to Yang (2024) the limitation of the study is the inability to globally rank DMUs, the efficiency values are definite numerical values however, they are unable to reflect potential efficiency changes, and they fail to adequately reflect the degree of the decision maker's preference.

1.6 Results

Efficiency Change

The Pim DEA soft ware was used to analyse the data sets. This is a concept that measures how a port's best practices change over time (Muhammad et.,al, 2020). Table 2 shows the efficiency change for the ports of Rotterdam. Tema and Takoradi. In comparison, all the ports show stability in terms of efficiency change.

Table 2: Efficiency Change

	2017-2018	2018-2019	2019-2020	2020-2021
Port of Tema	1	1	1	1
Port of Takoradi	1	1	1	1
Port of Rotterdam	1	1	1	1

Source: Author's Compilation, 2024

Technology Change

This refers to the introduction and adoption of new products, manufacturing methods, communication tools, and business processes driven by advancements in technology (Marshall, 2001). From Table 3, the Port of Tema and Takoradi struggled in terms of port productivity, with index below 1 for the port of Takoradi. An index of Technological change below 1 shows decline in technological adoption and implementation. This is because they are traditional ports and implementation of AI has not taken place. In the case of the Port of Rotterdam, the level of technology change is above 1 which shows progress and increase.

Table 3: Technology Change

	2017-2018	2018-2019	2019-2020	2020-2021
Port of Tema	1	0.74	1.12	1.21
Port of Takoradi	1.12	0.86	0.68	0.84
Port of Rotterdam	3.16	1	2.98	3.34

Source: Author's Compilation, 2024

The Malmquist Productivity Index

The MPI is a management tool that measures the productivity of a Decision Making Unit (DMU) over time (Tone, 2004). It is used to evaluate the growth of Total Factor Productivity (TFP) and the changes in efficiency and technology (Tone, 2004). The Port of Takoradi has an average of 0.88 , which is an MPI of less than 1, this means a decline in productivity. The Port of Tema also has on average, an MPI of 1.02, which is barely. The implication of this is that the impact of technology is not reflected in the port productivity. The Port productivity for Tema and Takoradi is low cause of the level of technology. The Port of Rotterdam has, on Average an MPI of 2.62. This is greater than, and it means that the port is progressing and very productive.

Table 4: The Malmquist Productivity Index

	2017-2018	2018-2019	2019-2020	2020-2021
Port of Tema	1	0.74	1.12	1.21
Port of Takoradi	1.12	0.86	0.68	0.84
Port of Rotterdam	3.16	1	2.98	3.34

Source: Author's Compilation, 2024

Differences between the Port of Rotterdam and Ghana Ports and Harbours

This section examines the major differences between the Port of Rotterdam and Ghana Ports and Harbours. Table 5 shows the various parameters for comparisons. The parameters for comparison includes, the type of port, location, global ranking, technology, port community system, collaboration with experts and intermodal

transport. These parameters are included to serve as areas for improvement for developing ports.

Table 5: The Differences between the Ports of Rotterdam and Ghana Ports and Harbours

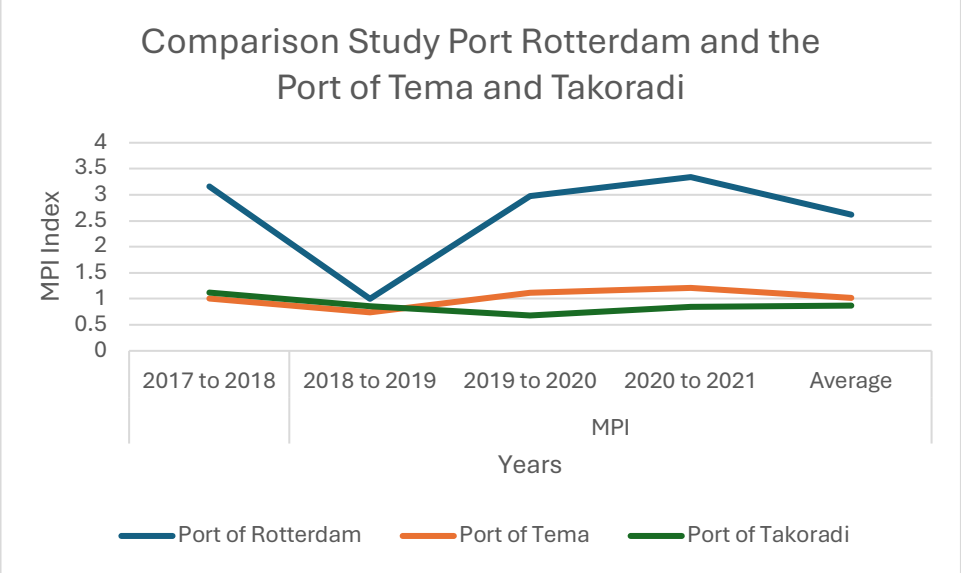
Parameter	Ports of Rotterdam	Ghana Ports and Harbours
Type of Port	Smart	Traditional
Ranking	Hub Port: Best in Europe	Hub Port: Best in West Africa
Location	Europe	Africa
Technology	HAMIS- Haven Management Information System Artificial Intelligence Twin Digitalisation Machine Learning Quay Connect	Unipass document system (GPHA,2025) Paperless port process (Addy and Ansong, 2024) Ghana National Single Window (Addy and Ansong, 2024). Ghana Integrated Cargo Clearance System (GICCS)
Sustainability	Various green port strategies. The continuous application of AI algorithms in monitoring and evaluating carbon emissions	Growing; Still Developing; Much room for improvement
Security	Application of Technology in Security and Surveliance	Much room for improvement
Port Community System	Port Base Port Community System.	Global Communication Network (GCNet)
Maintenance	Application of Technology in the maintenance of port infrastructure	Not Yet

Collaboration with Experts	Universities, Industry Experts, Ports, International Organisations	Universities, Industry Experts

Source: Author's Compilation, 2024

2. Conclusions

The purpose of this research is to motivate for the adoption of AI tools within the African port context, since AI can improve port competitiveness. Three ports were examined to check on their various level of productivity. Figure 2 displays that the Port of Takoradi on average, has an MPI of 0.88, which is an MPI of less than 1; this means a decline in productivity. The Port of Tema also has on average an MPI of 1.02, which is barely. The implication of this is that the impact of technology is not reflecting in the port productivity. The Port of Rotterdam has on Average an MPI of 2.62. This is greater than one and it means that the port is progressing and very productive. The Port of Rotterdam is used as a benchmark for not only the Ports in Ghana but all other African ports that are yet to implement artificial intelligence. Sinay (2021) affirms that Digital Smart Ports using AI can handle an increase in cargo and traffic, optimize employee working hours, cut human error, and make the supply chain more productive. AI improves overall efficiency (Sinay, 2021).



Source: Author's Compilation, 2024

It is up to the GPHA to determine which AI tool will provide optimal utility to solve port operational issues. This study recommends that the Ghanaian Ports and Harbours management customise and contextualise artificial intelligence by engaging teams of experts in the area of artificial intelligence. Customisation refers to developing AI tools that are specific to addressing port operational issues. Contextualisation refers to mapping out solutions based on the uniqueness of the Ghanaian port environment. Therefore, the first step is to identify areas where there are Port operational deficiencies. The second step is to determine if artificial intelligence is a plausible solution to port operational deficiency. The third step will be to do a cost-benefit

analysis before implementation. The Port of Tema and Takoradi should invest in collaborating and engaging with experts and other Ports like Rotterdam in the space of technological advancement for inputs and guidance. Addy and Ansong (2024) also recommend a technological upgrade for the Port of Tema. In addition, Maritime policy enactment and implementation is quite critical for the Ghanaian maritime stakeholders. Further research should be in the place to examine hindrances and limitations to the adoption of AI in Ghanaian Ports.

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TRANSFORMING PROJECT MANAGEMENT EDUCATION: SETTING AGENDA FOR INTEGRATION OF SUSTAINABILITY IN PROJECT MANAGEMENT PROGRAMS

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Abstract

Integration of sustainability in management education is intensifying. Management education is demanding integrations which are in the core courses, at horizontal and multiple level, are multidisciplinary and promote critical, reflective and creative thinking. On this background, this paper explores the background of the discipline of project management and integration of sustainability in the discipline. Literature reviewed so far indicate presence of white spaces and establishes the need for such integrations at program level. While examination of domain, it touches upon the need, scope and tensions of these integrations. This is a preliminary paper which is mainly based on the review of related literature. It concludes by presenting emerging research themes in (a) scope of sustainability integration in project management; (b) pedagogical strategies, and (c) challenges in the integration of sustainability in project management and research inquiries under each theme which needs further investigations.

Keywords: education for sustainability, project management education, sustainability integration, research agenda.

Introduction

The institutions of higher education are part of complex system of society and therefore cannot remain away from the climate and societal changes impacting the whole ecosystem. Realizing which, business schools like other higher learning institutions are getting actively involved in. To equip the next generation to handle challenges of climate change and to develop their ability to contribute towards sustainability-oriented future (Napier, Harvey and Usui, 2008), they are integrating sustainability in their research, operations, and curriculum (Godemann et al., 2023). Still, the integration of sustainability in management education remained limited, fragmented and ineffective (Viswanathan 2012; Wilhelm 2008) as it requires change in the visions, values, systems and practices of business schools. It was also noted that besides many efforts of sustainability integration in curriculum, its in-depth integration in core courses needs urgent attention (Godemann et al., 2023).

It is important to note that the scope of application of discipline of project management is expanding with the growing demand for sustainability understanding and skill sets (Silvius and Schipper, 2018). It is interesting to note that projects are always considered tools to ensure efficiency, effectiveness and integrations in business processes, especially in dynamic and complex situations (Yiu, 2008) and adding triple bottom line (TBL) to business practices and outcomes extends the roles, responsibilities and scope of applications of projects in business domain (Silvius and Schipper, 2024).

Based on this backdrop, this review based preliminary paper examines theoretical domains of project management, project management education and integration of sustainability in project management education with an objective of identifying white spaces for transforming project management education, its scope, and its challenges in the context of integrating sustainability. It is important to note that this paper is a conceptual work, fully based on literature review and project practice observations and is not presenting an empirical study. Rather, it aims to set a research agenda and conceptual framework for future empirical investigations into the integration of sustainability in project management education. By analyzing existing literature and identifying gaps, this paper serves as a foundation for future studies that will empirically investigate the questions raised herein. This paper contributes to advancing debate on the integration of sustainability in the core courses of project management education for the effective promotion of sustainability awareness and skill development in the turbulent times.

Background

Project management discipline has witnessed diverse perspectives like 'hard' systems perspective which emphasizes on planning and control dimensions (Kerzner, 2017); perspective based on organizational design literature which advocates for a spectrum of organizational structures ranging from functional to project-based (Turner, 1999); and the holistic perspective which is based on 'management of projects' framework (Shenhar & Dvir, 2007) which enables projects to be context-aware, ready to align, integrate and learn from both internal and external environments (Rwelamila, 2024).

Project management has evolved significantly from traditional methodologies focusing primarily on efficiency and control (Kerzner, 2017). Over time, the need for a broader approach has emerged, expanding the scope of project management into more adaptive, flexible frameworks. For instance, Shenhar and Dvir's (2007) "Management of Projects" framework emphasizes context awareness, learning, and alignment with dynamic environments, marking a shift toward

an agile and integrated project management approach. Similarly, Turner (1999) introduced a spectrum of organizational structures that allows for flexibility ranging from functional to project-based setups, further demonstrating the discipline's growth.

The scope of project management has now broadened further, recognizing that projects are no longer isolated mechanisms of control but are increasingly seen as strategic tools that can influence broader societal outcomes (Silvius & Schipper, 2018). Sustainability has become a critical consideration, as project managers are expected to integrate Triple Bottom Line (TBL) thinking—balancing economic, environmental, and social impacts—into their decision-making processes (Yiu, 2008). This evolution demonstrates a clear link between the broadening of project management scope and the emerging sustainability agenda. This trend is equally reflected in the growth of project management education, where sustainability is increasingly considered vital for developing future-ready professionals.

In the context of higher education, business schools and institutions have begun embedding sustainability into their core systems and curricula, though the integration remains somewhat fragmented (Godemann et al., 2023). This is echoed in the project management domain, where the demand for sustainability-oriented competencies has influenced program design. However, a comprehensive integration at the program level still poses significant challenges, necessitating a more organized and systemic approach.

Previous research has highlighted the gaps in integrating sustainability into project management education. For instance, Martens and Carvalho (2017) found that while 73% of project management programs mention sustainability, only 8% offer comprehensive integration across their curricula. Similarly, Silvius et al. (2017) analyzed 25 project management textbooks and found that sustainability concepts were mentioned in only 40% of them, with less than 15% providing in-depth coverage. These findings underscore the fragmented nature of sustainability integration in project management education, justifying the need for a more comprehensive approach as advocated in this paper.

Sustainability in Management Education

Literature indicates that conventionally management education was focused on preparing graduates 'for work' and often ignored if they were equipped for challenges in life or can work for welfare of self, environment and society (Clarke et al. 2006). Over period, sustainability is identified as a critical knowledge area for future business leaders. However, the current state of sustainability integration in management education demonstrates varying levels of implementation. Figueiró and Raufflet (2015) identified four approaches to sustainability integration in management education: (1) stand-alone courses (vertical integration which is limited in scope), (2) integrated throughout the curriculum, (3) specialized programs, and (4) interdisciplinary approaches. Their findings revealed that while stand-alone courses were the most common approach (present in 68% of surveyed institutions), integrated approaches across the curriculum were found in only 23% of institutions. It is also noted that the integration of sustainability in management education curriculum in programs was limited to offering sustainability as minor or major, and in a very few instances the integration was noted at the program level (Arevalo et al., 2020). The need to integrate sustainability in all core courses in a program is highlighted while noting that effectiveness of such integration goes up when the integration is in-depth in each discipline in place of marginal presence of sustainability related contents (Godemann et al., 2023; Figueiró et al., 2022). Besides the depth of integration, focus

on interdisciplinary, multidisciplinary, transdisciplinary integration to promote holistic, critical thinking in systemic fashion is also highlighted to improve the outcomes (Figueiró et al., 2022; Kopnina, 2020).

The statistics and discussions covered in earlier paragraphs highlight the predominance of limited and fragmented approaches to sustainability integration in management education, reinforcing the need for integrative, systemic, innovative and comprehensive strategies as proposed in this paper. It also highlights the need for sustainability integration approaches which ensure development of sustainability mindset especially from systemic perspective, flexible, innovative and collaborative attitudes with the necessary skills to handle the current and future radical changes.

Possibilities for Transformative Project Management Education: Setting a Research Agenda for Integrating Sustainability

The demand for integrating sustainability into project management education has intensified in recent years as the global landscape shifts toward more sustainable development goals. Silvius and Schipper (2018) argue that project management is inherently positioned to drive sustainable outcomes through its temporary and goal-oriented nature. However, the integration of sustainability into project management programs has often been slow and fragmented (Viswanathan, 2012), primarily due to the traditional focus on technical aspects rather than holistic, sustainability-driven education.

Moreover, embedding sustainability into project management programs is not merely about adding new topics but requires a paradigm shift in how project management is conceptualized and taught (Figueiró et al., 2022). This shift requires an understanding of sustainability not only as a concept but as a dynamic component affecting project outcomes, processes, and stakeholders (Sabini and Vuorinen, 2024; Holbrook, 2018). The integration of sustainability also necessitates changes in the underlying values, systems, and pedagogical approaches of business schools (Wilhelm, 2008). In this sense, sustainability becomes a fundamental part of the program's structure, influencing everything from the objective of program, the contents of curriculum, the strategies and tools of pedagogy, choice of case studies to the methods of assessment.

The integration of sustainability in project management education matters significantly for several reasons. First, projects are increasingly recognized as critical vehicles for implementing sustainable development initiatives. Marcelino-Sádaba et al. (2015) found that 65% of sustainability initiatives in organizations are implemented through projects, emphasizing the pivotal role of project managers in driving sustainable outcomes. Second, the employment market increasingly demands sustainability competencies from project managers. According to Silvius and Schipper (2018), 78% of project management job postings now include sustainability-related responsibilities. Third, integrating sustainability into project management education aligns with the broader goals of the United Nations' Sustainable Development Goals (SDGs), particularly SDG 4 (Quality Education) and SDG 12 (Responsible Consumption and Production).

Moreover, the practical implications of integrating sustainability into project management education are significant and multifaceted. For graduates, enhanced sustainability competencies

improve employability and career prospects. Silvius and Schipper (2018) report that project managers with sustainability expertise command 15-20% higher salaries than those without. For organizations, employing project managers with sustainability competencies leads to improved project outcomes, reduced environmental impacts, enhanced stakeholder satisfaction, and stronger alignment with corporate social responsibility goals (Martens & Carvalho, 2017). For society, the broader impact includes progress toward sustainable development goals, reduced environmental degradation, and improved social equity (Goedknegt, 2012).

To navigate through the current situation and enhance the integration of sustainability in project management education, several approaches can be taken. At the institutional level, universities can adopt sustainability-focused mission statements and strategic plans, create sustainability-focused centers or institutes, and establish partnerships with industry and community organizations focused on sustainability (Godemann et al., 2023). At the program level, Martens and Carvalho (2017) suggest incorporating sustainability competencies into program learning outcomes, integrating sustainability concepts across all core courses, and using authentic assessment methods that reflect real-world sustainability challenges. At the course level, instructors can use case studies, simulations, and project-based learning to engage students with sustainability concepts in practical contexts (Figueiró et al., 2022).

The current level of integration across project management courses varies significantly. Martens and Carvalho (2017) found that while most project management programs claim to address sustainability, the actual integration is often superficial and limited to elective courses or brief mentions in core courses. Silvius et al. (2017) identified that only 12% of project management programs integrate sustainability across their entire curriculum. This gap between intention and implementation underscores the need for a more comprehensive and systemic approach to integrating sustainability into project management education.

The role of sustainability in project management education is twofold: to foster the development of skills that enable future project managers to execute projects in ways that contribute to sustainable development, and to equip them with the tools and mindset needed to innovate within the sustainability space (Godemann et al., 2023). However, to achieve these goals, educators must overcome significant challenges, including curriculum fragmentation and the lack of comprehensive integration across project management courses.

Our approach to integrating sustainability in project management education considers both project-level and organizational-level perspectives. At the project level, we focus on equipping future project managers with the knowledge and skills to incorporate sustainability considerations into project planning, execution, and evaluation. This includes understanding the environmental, social, and economic impacts of project decisions and using tools like sustainability impact assessments and stakeholder engagement methods (Martens & Carvalho, 2017). At the organizational level, we address how project management practices can be aligned with organizational sustainability strategies and how projects can serve as vehicles for implementing sustainability initiatives throughout the organization (Goedknegt, 2012). This dual perspective ensures that project managers are prepared to drive sustainability at both the micro (project) and macro (organizational) levels.

Often drive for integration of sustainability in education is advised to be wary of neocolonial assumption used in (sustainable) development discourse which ignores contextuality while promoting universality (Kopnina, 2020). Therefore, it would be interesting to explore in what

manner sustainability integrations in project management education may benefit from respecting diversity of approaches and proactively seeking the knowledge base and indigenous practices in developing countries and communities. Moreover, to be effective, sustainability integration in curricula should be extensive which means it should cover aspects of requirement, process, outcome and evaluation of project success (Silvius and Schipper, 2018).

Literature also highlights that the integration of sustainability in project management discipline is going to be challenging due to contrasting nature of sustainability and project management w.r.t boundaries and timelines (Sabini et al, 2020). In this regard it will be interesting to know issues faced in integration of sustainability in project management programs.

To fully integrate sustainability into project management programs, we propose a path that includes: (1) Curriculum redesign that embeds sustainability across all core courses rather than treating it as an add-on or elective topic; (2) Faculty development to ensure instructors have the knowledge and skills to integrate sustainability into their teaching; (3) Industry partnerships to ensure curriculum relevance and provide students with real-world sustainability challenges; (4) Development of sustainability-focused teaching materials and case studies specific to project management; (5) Implementation of assessment methods that measure students' sustainability competencies in project contexts and (6) Application of critical, dynamic, participatory, problem-solving, student-centred, reflective and experiential pedagogical approaches (UNESCO, 2024; Ajiga et al., 2025; Figueiró et al., 2022).

Based on the discussions above, following themes and their respective research questions are emerging:

Theme 1: Defining the Scope of Sustainability in Project Management Education

Reviewed literature clearly indicates the integration of sustainability in project management expands the focus from ‘iron triangle’ to triple bottom line value creation, adds to complexity, demands approaches to be more holistic, adaptive, precautionary proactive and less predictive in ensuring equitable participation and communication with mindset shift in project leadership (Silvius, Schipper, and Huemann, 2024; Silvius, and Schipper, 2024; Sabini and Silvius, 2023). It seems integration of sustainability in project management poses additional demands to the educators who intends to offer education on sustainable project management. On this backdrop, following research questions emerge:

(a) What are the critical sustainability competencies that should be integrated into project management curricula?

(b) How should the traditional project management framework be transformed to accommodate sustainability principles?

(c) What role does stakeholder engagement play in the development of sustainability-focused project management education?

(d) How can Triple Bottom Line (TBL) considerations be woven into the core components of project management education?

(e) How do sustainability competencies in project management vary across different industries and contexts?

(f) What are the key differences between sustainability integration at the project level versus the organizational level?

(g) How can project management education bridge the gap between theoretical sustainability concepts and practical implementation?

Theme 2: Pedagogical Strategies for Sustainability Integration

In the literature review, it emerged that the sustainability integration in management education will be more effective with the use of critical, dynamic, participatory, problem-solving, student-centered, reflective and experiential pedagogical approaches through transformational, active, experiential, collaborative, contextualized and service learning (UNESCO, 2024; Ajiga et al., 2025; Figueiró et al., 2022). These discussions have contributed to the emergence of following research questions:

(a) What teaching methods are most effective in imparting sustainability-related knowledge and skills in project management?

(b) How can project management educators use contextual case studies to highlight successful sustainability integration in projects?

(c) What role does experiential learning play in developing sustainability-oriented project managers? (d) How can educators assess students' understanding and application of sustainability in project management contexts?

(e) How can digital technologies and simulations enhance sustainability education in project management programs?

(f) What role do indigenous knowledge systems and diverse cultural perspectives play in sustainability-oriented project management education?

(g) How can project management education promote systems thinking and long-term perspective as core sustainability competencies?

Theme 3: Challenges in Integrating Sustainability into Project Management Curricula

Literature reviewed seems to be unanimous on ensuring addition of new skills set to the competencies. Roorda et al, (2019) stresses on seven sustainability competencies ranging from responsibility, emotional intelligence, systems orientation, future orientation, personal involvement and action skills with the disciplinary competencies. Researchers in project management education also emphasis on the integration of these competencies within the disciplinary skill sets while focusing on interdisciplinary to transdisciplinary systemic approaches (Sabini and Vuorinen, 2024; Figueiró et al., 2022). Silvius and Schipper, (2024) indicated that innovative knowledge base for integration of sustainability in project management may emerge bottom-up from practice and stress on the need for holistic, adaptive and less predictive approach. On this backdrop, following research questions emerge:

(a) What are the major barriers in integrating sustainability into project management programs, particularly in developing countries?

(b) How can business schools overcome institutional resistance in embedding sustainability across curricula?

(c) What external factors (e.g., government regulations, industry demands) drive or hinder sustainability integration in project management education?

(d) How can interdisciplinary and multidisciplinary collaboration be encouraged to support sustainability education in project management?

(e) How do resource constraints affect the implementation of sustainability-focused project management education?

(f) What strategies can overcome the inherent tensions between short-term project objectives and long-term sustainability goals?

(g) How can accreditation standards and professional bodies better support sustainability integration in project management education?

Conclusions

In conclusion, integrating sustainability into project management education is not only timely but essential, given the growing complexity of global challenges. Project management, as a discipline, has evolved beyond its traditional focus on efficiency to become a key driver of sustainability outcomes. However, the path toward fully integrating sustainability into project management programs remains complex, adaptive, collaborative, requiring changes at multiple levels, from curriculum design, pedagogy to institutional values. Establishing a clear research agenda can guide educators and institutions in overcoming these challenges, fostering the development of project managers who are not only technically skilled but also sustainability oriented. As this paper highlights, the integration of sustainability into project management education is not an option but a necessity, and the research agenda proposed here provides a roadmap for future work in this critical area.

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UNDERSTANDING INFRASTRUCTURE GAPS IN WATER AND SANITATION SERVICE DELIVERY IN MOPANI DISTRICT, LIMPOPO

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Abstract

Rural communities in South Africa continue to face inadequate service delivery challenges, highlighting persistent disparities compared to urban areas under the new democratic framework. This study explored the pertinent causes of the infrastructure gaps in the delivery of water and sanitation services in the Municipality of Mopani District of Limpopo province. A qualitative research design was used, using semi-structured interviews. The interviews were conducted with eight personnel from Mopani District Municipality. The thematic analysis of the interview transcripts confirmed seven infrastructure delivery challenges pointed out in other prior studies. This includes poor project delivery (poor project management), shortage of skilled manpower in the municipality, and rapid population growth. Most of the projects for water services delivery at the Mopani district are completed late and with poor quality due to revenue shortfalls, a gap in project monitoring, and a lack of project accountability. The additional new challenges identified in this study regarding the delivery of water services in the Mopani district are revenue shortfalls, unplanned settlements, and illegal water connections (water theft). To address these issues, the municipality and key stakeholders must develop targeted strategies and foster collaborative efforts to enhance water and sanitation service delivery at the district.

Keywords: Challenges, Infrastructure, Interviews, Municipality, Service delivery

Introduction

Before the transition to democracy in 1994, many rural communities in South Africa depended on borehole water, as well as non-purified water from wells, rivers, and dams to meet their basic needs. After 1994, the government committed to improving the basic services for water, sanitation, electricity, roads, health care, education etc. The commitment is legislated in the Constitution of South Africa (1996) Section 27(b) where it states that "everyone has the rights to food and water".

South Africa is faced with poor service delivery. The government needs to bridge the gap of poverty and inequality by improving the basic conditions of living for disadvantaged and vulnerable communities by developing infrastructure to connect and provide access to basic services. The construction of public infrastructure projects is regarded as one of the fundamental tools for enhancing the socioeconomic conditions of community development (Hussain et.al, 2022).

The most predominant Infrastructure development sectors including transportation and logistics, energy, and water and sanitation are faced with project delivery challenges. Water is the most important and scarce commodity for living inhabitants including human use and has recently been experienced as a scarcity commodity in many regions of South Africa (Aiyetan, and Das, 2021). Rural water infrastructure has traditionally been overshadowed by urban infrastructure (Omarova, et.al. 2019).

This needs to change as the Sustainable Development Goals call for access to water for all. The Sustainable Development Goals of South Africa, SDG 6 "Clean Water and Sanitation" from the Country Report (2023) seeks to ensure the availability and sustainable management of water and sanitation for all by 2030. It further illustrates the fundamental human right to have access to clean water and sanitation. South African Global Sustainable Development Goals (SDG) expressed the urgent need for action to address the challenges for water and sanitation access particularly for vulnerable populations.

The Annual Report for 2022/23 by the Department of Cooperative Governance (DoCOG) under Access to Basic Services highlighted the following issues: The number of households with improved access to water sources has increased by four percent. There was a significant increase in the Eastern Cape province by 17.8% and Kwazulu-Natal province by 10.0% provinces while there is a notable decline in the following provinces: Mpumalanga (-5.3%), Limpopo (3.8%), and Free State (3.7%). Households in Limpopo and Mpumalanga experienced the most water supply interruptions 56.6% and 54.4% respectively. According to Matlakala and Kallon (2020), the existing infrastructure in Limpopo province does not meet the water supply demand.

General water is essential for human life while in turn is declared a scarce resource (Pilusa and Kanyane, 2020). The commitment by the government to improve these basic services, especially in rural areas means there must be a commitment to infrastructure development, refurbishment, and upgrading if there are areas that already have existing infrastructure. According to Hussain et.al (2022) the absence of infrastructure projects in the local communities will pose a risk of a devastating impact on living standards, adverse impact on quality of life, more expenditure on health care and education, lower economic growth, and increased unemployment.

According to Matlakala and Kallon (2020) in their case study about water shortage in Limpopo, the existing pumping systems capacity does not meet the demand of the community hence the community tends to make illegal connections. Pilusa and Kanyane (2020) state that most of the local government spheres are uptight in addressing the backlog

of services due to limited capacity to realize the set targets. The communities are infuriated by such performance of lack of services and demonstrate their frustrations by protests. Poor or non-existent infrastructure puts the municipalities at risk of not meeting their obligations. This study aimed to explore the above-stressed and other pertinent causes of the infrastructure gaps in the delivery of water and sanitation services in the Municipality of Mopani District of Limpopo province.

Literature Review

The study provides a literature review on the provision of water to the community based on the availability and capacity volume of infrastructure and the challenges that affect the delivery of projects for infrastructure development. The study also explores the impact of inadequate water supply to the community.

Assessment of infrastructure capacity and availability

Most water infrastructure in Limpopo and Mpumalanga are very old and not maintained resulting in the loss of quality water and the system does not last longer. As the population increases over the years, the scarcity of water also increases due to the lack of water supply systems in the Limpopo and Mpumalanga Provinces (Matlakala, et al., 2023). The provinces have the challenge of building stakeholder support for resource management strategy.

Limpopo and Mpumalanga Provinces experience a high challenge of water supply and access due to lack of water management services (Matlakala, et al., 2023). Lack of institutional capacity in relation to access to clean water and sanitation affects many municipalities in Limpopo to render basic services.

Capacity management is the ability to balance the demand from customers and the capability of the service delivery system to satisfy the said demand. Institutional capacity is a continuous process to handle changes in structural conditions over time that require constant modification to meet ever-emerging challenges (Pilusa and Kanyane, 2020).

Population growth and periodic drought escalated high affliction of water demand and effective distribution while the communities experienced the scarcity of water (Pilusa and Kanyane, 2020). In Limpopo, the existing pump system does not meet the demand for water supply to the community, and in turn, some members of the community make illegal connections. The illegal connection increases the demand, and the pump system design becomes very low and overloaded. This will end up collapsing the system and the municipalities will be conceived as mismanaging the resources (Matlakala and Kallon, 2020).

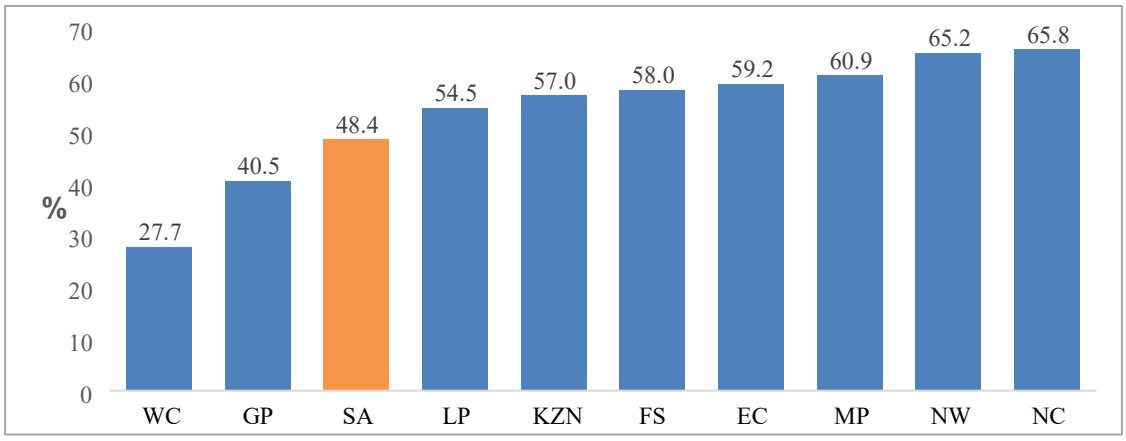


Figure 1. Percentage household water supply interruptions per province

Abbreviations: WC = Western Cape; EC = Eastern Cape; NC = Northern Cape; FS = Free State; KZN = KwaZulu Natal; NW = North West; GP = Gauteng; MP = Mpumalanga; LP = Limpopo; SA = South Africa (Source: Census 2022)

Figure 1 indicates the percentage status of household interruptions reported per province in South Africa. Only two provinces are below the average of 48.4%. Figure 1 illustrate the unreliable and inconsistent water supply systems in South Africa as most provinces have a failure rate above 50%. This shows that the availability of water provision without interruptions in South Africa is minimal and can only be experienced by one province which is Western Cape (WC). Water sector challenges are increasingly caused by insufficient water maintenance practices and investment, and aging infrastructure that is operated to the point of collapse. Deterioration of infrastructure is caused by the exit of skilled personnel (Govender, 2019).

Infrastructure development project delivery challenges

Lack of relevant infrastructure, drought, and low investment in water supply militate against water security. The South African Human Rights Commission SAHRC (2018) is monitoring the commitment made by the government to provide access to water to all households in 2030. This study assesses the capacity and the rate of government if they will be able to develop water infrastructure to meet the obligation.

Since the dawn of democracy in 1994, strides have been made to improve the well-being of citizens in most rural areas like in the aspect of electricity reaching almost all the communities, however, water allocation programs remain stagnant (Mpongwana, Shumba, and Bracking, 2022).

The demands for watercourses are constantly rising due to population growth and changes in lifestyle (Daus et al., 2019). Rural infrastructure development is connected to the reduction of poverty and increasing the standard of living through agricultural productivity, employment opportunities, and non-farm employment (Hussain et al., 2022). Infrastructure project delivery is affected by delays in project completion, cost overruns, poor quality of work, poor fund utilization, and poor service delivery (Aiyetan and Das, 2021).

Water-related infrastructure projects are faced with the challenges of delays and project delivery and require significant attention to improve the situation. Inflexible fiscal policies and high budget deficits lead to a lack of adequate funding resulting in poor infrastructure

development and project delivery (Aiyetan and Das, 2021). New infrastructure development in support of the National Development Plan (NDP) 2030 needs to include funding that resonates with infrastructure life-cycle planning and is inclusive of infrastructure maintenance costs Govender, 2019).

Inadequate water supply impact to the community

The modeling of the homeland with the ideology of separate development deliberately enforced low levels of subsistence living through political, social, and economic discrimination (Robinson, 2015). The model of homelands impoverished the locals and subjective to unemployment and infrastructure underdevelopment where basic services like electricity, water, sanitation, education, and health care were inadequately delivered to the rural communities (Robinson, 2015).

Water is a basic need, and everyone has a right to access water daily, but most areas have access to water which are contaminated and poses a serious health risk that can lead to hunger and poverty (Matlakala et.al. 2023). In some areas, the community accesses water from the boreholes provided by the municipality and some by households for themselves. Some of the communities buy water from the neighbors who have boreholes and sometimes depend on the rainwater. Water from boreholes is distributed without being treated and is not portable enough to the risk of health hazards (Matlakala and Kallon, 2020).

The impacts of water security in Africa are loss of livestock, low yields, low water supply for irrigation, shortage of domestic water, and lower food production (Nephawe et al. 2021). Water use restriction is applied in areas that have low yield from boreholes and inconsistent water supply to manage water resource use (Rankoana, 2020). Infrastructure delivery constraint affects the community and inhibits economic growth, social development, and reduction of poverty, inequality, and unemployment (Gnade, 2017).

Drought and climate change impact

Most of the African countries including South Africa are vulnerable to drought and climate change causing a water crisis. Agriculture constitutes 60% of employment in Africa and production is battling to keep pace due to population growth and the impact of drought and climate change (Nephawe et al., 2021).

Food production from irrigation is expected to increase and this will cause global concern for access to water. The adoption of sustainable water management in irrigation development programs is essential for water security. According to Rankoana (2020), the climate of most parts of the African Continent may be classified as arid and semi-arid with the risk of high drought.

Operations and management of water systems

Public infrastructure as an essential enabler demands effective maintenance for the optimum delivery of much-needed services. South African infrastructure is in a state of rapid deterioration and is adversely affecting economic growth (Govender, 2019). South Africa’s infrastructure is on the path of dysfunction and collapse due to a lack of maintenance

practices and strategy. Another challenge is the substandard functioning of existing infrastructure due to compromised maintenance practices (Govender, 2019).

Some municipalities are spending more on the maintenance of breakdown pipes due to aging infrastructure that spans more than 30 years, and this is exacerbated by increased population growth and mushrooming of informal settlements (Pilusa and Kanyane, 2020).

Good governance and water management strategy are essential to address the needs of users and create a good relationship between the users and operators. The establishment of a conducive environment for access to water as an essential goodwill uplift socially and economically depressed rural economies (Makhathini, Mlambo, and Mpanza, 2020).

Methodology

The methodology outlines the systemically design methods to address the aim and or objectives of the study. This study aimed to explore the above-stressed and other pertinent causes of the infrastructure gaps in the delivery of water and sanitation services in the Municipality of Mopani District of Limpopo province. A qualitative research approach could enable to explore the pertinent causes of the infrastructure gaps in the delivery of water and sanitation services in the Municipality of Mopani District of Limpopo province.

Purposive sampling is relevant for this study to assess Mopani District Municipality on the lack of infrastructure development. The semi-structured interviews were conducted with the employees of Mopani District Municipality focusing mainly on the employees working for water and sanitation services. The interviews were conducted to collect data to comprehend the causes of infrastructure gaps affecting the delivery of water services in the District of Mopani, Limpopo Province. A thematic analysis was done on the interview transcripts.

Results and Discussion

All the respondents during data collection are working in the project management and water services Operations and Maintenance divisions except one manager who represented the Municipal Manager and is knowledgeable about the works within the municipality.

The interviews confirmed the seven causes of the infrastructure gaps in the delivery of water and sanitation services in the Municipality of Mopani District of Limpopo province that were underscored in prior studies. These confirmed variables with the semi-structured interviews are discussed next.

Results

Ageing infrastructure

Aging infrastructure is a concern to the respondents as it takes a level of water services backward, it needs a replacement plan with a budget while the municipality is battling to keep pace with new development of infrastructure for water services. Below are some of the transcripts of respondents in the interview regarding aging infrastructure.

Increasing backlog

The backlog for infrastructure development to provide access to water by all households is increased due to new dwelling settlements that are not planned and communicated with the municipality to make provision for services.

Vacant positions and organogram

The filling of vacancies for the water service department will allow the municipality to provide quality and sustainable water with the utilization of current infrastructure. The employees wish to expand the organogram to have more specialists and an additional workforce.

Timelines for infrastructure delivery

Infrastructure development to enable all households to have access to water in their yards and or within 200m has no timelines for short, medium, and long-term planning. Below are some of the transcripts of respondents in the interview regarding timelines for infrastructure delivery.

Infrastructure project delivery

Infrastructure project delivery is affected by various issues: some projects are not completed in time and some are stalled, cost overrun, poor quality, and poor fund utilization. The challenges for infrastructure project delivery are caused by community and small business protests, poor project management and planning, insufficient budget, and political interference.

Budget

The high demand for infrastructure development is not in line with the budget availability. The budget is allocated as available and not according to the demand for infrastructure. Municipalities work according to what is allocated and cannot have proper long-term plans and timelines to provide access to water services.

Poverty and equality

The lack of infrastructure for water services worsens the situation of poverty within the community. The community will not be able to create scale farming for food security. Inadequate water supply makes the community unable to afford to buy water from those who have boreholes. The poor who cannot afford to buy water will be subjected to poverty and sickness.

New explored variables

There are three new variables explored from the semi-structured interview that were not identified in the literature review but are also causes of the infrastructure gaps in the delivery of water and sanitation services in the Municipality of Mopani District of Limpopo province. These variables were stressed in the interviews and explored through a thematic analysis done on the transcripts of the interviews.

Revenue shortfalls

The municipality is not fully successful in collecting revenue for cost recovery of operation and maintenance and new project development. These services are rendered by the municipality to the community free of charge.

Unplanned settlement

New settlements are established without consultation with the municipality which later demand basic water services. Unplanned settlement is arranged with the leaders of the community normally the Traditional Leader without the involvement of the municipality. New settlement were supposed to be planned with the municipality in order to include the municipal services. This increases the backlog of infrastructure development and increases the number of households without access to water.

Illegal connections

Illegal connections are made by some community members due to inconsistent water supply. Illegal connections also cause water shortage and contamination. Illegal connections are mostly happening in new developments.

The interrelationship between the three variables are additions to the municipality challenges of developing infrastructure. The development of new unplanned settlement will lead to illegal connections by tempering with the surrounding infrastructure. The unplanned settlement will add to the demand of water supply from the municipality whereas there are no infrastructure to render water and sanitation services. The unplanned settlement increases the demand for infrastructure development but the municipality is battling with the current demand due to budget constraint and non-revenue collection due to the status of indigent beneficiaries.

Discussion of results

The aging infrastructure has a challenge of constant breakdowns that need rapid maintenance and the delivery of water to be inconsistent. Ageing infrastructure needs a replacement plan which requires a budget, but the municipality is battling to raise funds for services rendered. The municipality is providing water services to the community at no cost but is expected to conduct operations and maintenance at their own cost. The new variable on revenue shortfall is a major concern as the communities that are receiving water for free are poor and the government has given them the status of indigent beneficiaries, meaning to receive free services from the municipality. The municipality is not collecting revenue from water billing and rates and taxes compared to the urban municipalities, so the level of services is not the same, and the response time during water interruptions.

Rapid population growth influences the evolution of unplanned settlements that come with the demand for water services. Unplanned settlement is arranged with the leaders of the community normally the Traditional Leader without the involvement of the municipality. New settlements were supposed to be planned with the municipality in order to include municipality services. This increases the backlog of infrastructure development and increases the number of households without access to water.

The municipality is trying by all means with the current workforce to deliver maximum output for water services but there are critical specialized positions that are not filled and some are not in the organogram of the municipality. The critical positions for specialists that are not in the organogram are mainly related to water services whereas the municipality holds a status of Water Service Authority (WSA).

The municipality has no timelines for infrastructure delivery whether in short-, medium- or long-term planning. According to research results, it is confirmed that the backlog for households without access to water is available in the municipal technical reports but no clear plan to address it.

Poverty and inequality. Those who can afford they drill boreholes for themselves, and neighbors buy water from them. Some community members get access to water through their own arrangements but there are still some of the communities who cannot afford to buy water.

The infrastructure for water services around the jurisdiction of Mopani District Municipality is not sufficient. There are no sufficient dams and the hot temperature conditions make the municipality restrict water services. The research results indicated that the municipality is

dependent on government grants to develop infrastructure for water services which is not enough. Some development has to be postponed to the other upcoming years due to budget constraints. The municipality will not catch up on the delivery of infrastructure and eradication of backlog as it is dependent on grants and no other means of revenue generation to assist with the infrastructure development and maintenance.

The research results indicated that some projects are not completed and will need a budget to complete them with no clear reasons for incompleteness. Some of the projects are executed in phases due to budget constraints and will be done in multiple years. This prolongs the duration of the project and the access to water is delayed while the backlog is increasing.

Some projects are completed with poor quality and will experience breakdowns within a year of the liability period. The poor quality of projects are the shortfalls of skilled personnel and the minimal budget allocation on the particular project. The research results indicated that some projects are completed but not at the level of expectation due to project implementation and project management-related problems.

Conclusions

The findings of this research highlight that the availability and capacity of water infrastructure in Mopani District Municipality remain inadequate to meet the needs of all households. This deficiency has far-reaching consequences, including illegal water connections, community protests, poor living conditions, poverty, and inequality. Efforts to bridge the infrastructure gap have been hindered by ineffective project management and implementation.

To address this issue, the municipality needs to develop and implement both medium- and long-term infrastructure programs, supported by adequate budgeting. While short-term measures should focus on operations, maintenance, and addressing staffing shortages, the extent of infrastructure improvements will largely depend on the available financial resources. The municipality is not collecting revenue from water billing compared to the urban municipalities, which necessitates the need to secure another sustainable funding.

Furthermore, the National Government should reassess the backlog and the municipality's progress in expanding water access. Additional funding and strategic intervention will be essential to accelerate infrastructure development and ensure that all households have reliable access to clean water. Towards this, the three spheres of government (National, provincial, and district) should work on digitalization regarding existing infrastructure, the demand for water access, including new developments, the deficiency of infrastructure, and the funding to determine the timelines and monitor the progress.

Limitations of the study

The data collection for research results focused on the Mopani District Municipality by conducting semi-structured interviews with personnel. The information from the study can be used for other municipalities with similar settings. The interviews for data collection could have been extended to other stakeholders from government departments to give more information.

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UNLOCKING THE DIGITAL EDGE: EXPLORING E-PROCUREMENT DRIVERS IN THE AGE OF SMART TENDERING

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Abstract

This study develops a conceptual framework based on the Organizational Buying Behavior model. The paper aims to explore the key factors that influence e-procurement purchasing decisions in businesses and to create a conceptual framework. The proposed framework includes four main antecedents: environmental, organizational, buying center, and individual factors, which are hypothesized to significantly enhance e-procurement decision-making. A systematic sampling method was used, selecting 10% of the population from the KwaZulu-Natal Department of Transport database of 1,600 service providers, resulting in a sample of 160 participants. Out of these, 149 service providers completed the questionnaire, achieving a high response rate. The study employs Partial Least Squares Structural Equation Modeling to analyze the relationship between these antecedents and e-procurement adoption. The results show that all four factors significantly influence e-procurement decisions, with buying center factors having the strongest impact. The study emphasizes the importance of these antecedents in promoting e-tendering adoption, improving procurement efficiency, strengthening buyer-supplier relationships, and enhancing post-contract delivery outcomes. To ensure wider adoption, organizations should focus on developing digital procurement capabilities, improving training programs, and implementing supportive policies that encourage e-procurement integration. Additionally, the use of digital tools such as eDesigns and Building Information Modeling facilitates collaborative design and visualization, ensuring more accurate project planning and better coordination among stakeholders.

Keywords: building information modeling, buying center factors, e-procurement, organizational buying behavior, procurement technology,

1. Introduction

The rapid advancement of digital technologies is transforming procurement practices across industries. In the era of smart tendering, e-procurement has emerged as a strategic tool that enhances efficiency, transparency, and cost-effectiveness in supply chain management. The integration of emerging technologies such as Artificial Intelligence (AI), robotics, Building Information Modeling (BIM), and blockchain is reshaping procurement by automating processes, reducing risks, and improving decision-making (Schmidt & Wagner, 2020).

Traditional procurement methods often suffer from inefficiencies, delays, and compliance issues, which can be mitigated by adopting smart procurement solutions. However, despite these advancements, organizations face challenges in fully embracing e-procurement due to varying internal and external factors. Understanding these adoption drivers is crucial for unlocking the full potential of digital procurement systems. This study examines the key factors influencing e-procurement adoption within the KwaZulu-Natal Department of Transport, using the Organizational Buying Behavior model as a guiding framework. It explores how environmental, organizational, buying center, and individual factors shape e-procurement purchasing decisions and evaluates their relative impact on adoption. The study further develops a conceptual framework that integrates these factors to enhance digital procurement efficiency. In addition, it proposes strategic recommendations for improving e-tendering adoption by leveraging digital transformation and emerging technologies such as artificial intelligence, Building Information Modeling (BIM), and blockchain. By addressing these aspects, the research provides insights into optimizing e-procurement processes and ensuring seamless digital integration within KwaZulu-Natal Department of Transport and public sector procurement.

1.1 Objectives

- To enhance e-procurement adoption within the KwaZulu-Natal Department of Transport
- To improve procurement efficiency by reducing cycle time and documentation errors.
- To strengthen buyer-supplier relationships and post-contract delivery outcomes.
- To foster digital procurement capabilities among procurement officers and suppliers.
- To implement supportive policies for e-procurement integration.
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2. Literature Review

This part offers a thorough analysis of previous research that is pertinent to the goals of the study. Based on the organizational buying behavior model, it explores the several aspects that affect e-procurement decisions. This section is organized into sub-sections that explore environmental, organizational, buying center, and individual factors, offering a detailed analysis of each antecedent. By synthesizing findings from previous studies, the literature review establishes a solid foundation for the conceptual framework and highlights gaps in the current knowledge, thereby justifying the need for this research.

2.1 Antecedents of the Proposed Conceptual Framework

The organizational buying behavior model forms the foundation for the proposed conceptual framework. Organizational e-procurement adoption is influenced by the organization's buying behavior, which, according to the Webster and Wind model, is shaped by four key variables: environmental, organizational, buying center, and individual factors. These variables collectively impact on the organization's decision-making process. (Webster & Wind, 1972).

Based on this model, the following hypotheses are formulated:

H1: E-procurement purchase decisions are significantly and favorably impacted by environmental considerations.

H2: Organizational considerations have a major and favorable impact on decisions about e-procurement purchases.

H3: Buying center factors significantly and positively affect e-procurement purchasing decisions.

H4: Individual factors contribute significantly and positively to e-procurement purchasing decisions.

Figure 2.1 below shows that the use of e-tendering (UOET) is positively correlated with the perceived usefulness (PU) and perceived ease of use (PEOU) of e-tendering. Furthermore, it suggests that UOET positively impacts procurement performance (PP), the buyer-supplier relationship post-contract, and the delivery status of both parties after contract completion.

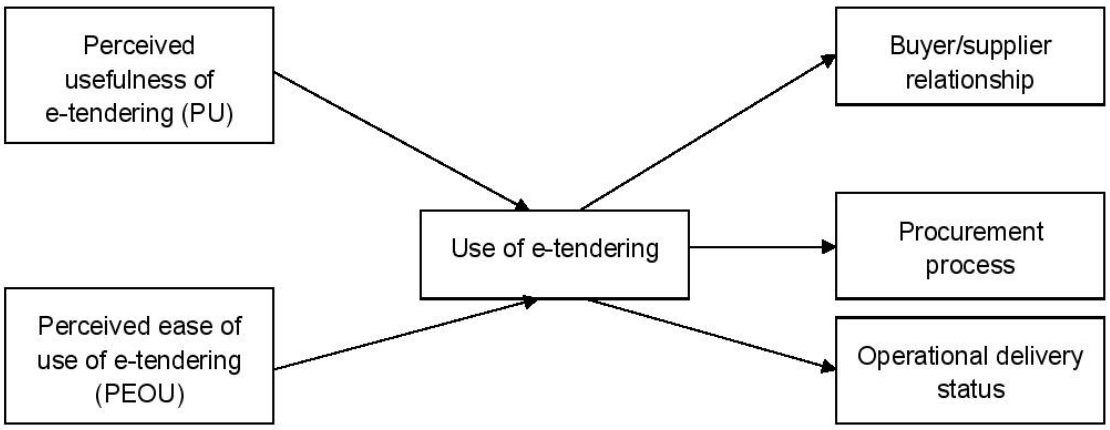


Figure 2.1: Proposed conceptual framework

Note: Developed by Author (2023)

2.2 Webster and Wind's Organizational Buying Behavior Model

The Webster and Wind organizational buying behavior model (1972) explains how organizations make purchasing decisions by considering multiple influencing factors. It identifies four key sets of variables that shape organizational buying behavior:

1. 1. Environmental Factors: Organizational purchasing decisions are influenced by external factors such the political, economic, cultural, legal, technological, and physical settings as well as the marketing tactics of competitors.
2. Organizational Factors: The company's goals, objectives, policies, structure, and resources define its decision-making processes and influence its purchasing behavior.
3. Interpersonal Factors: Relationships among individuals within the buying center affect decision-making dynamics, coalition formation, and internal loyalties.
4. Individual Factors: Personal characteristics, including risk tolerance, creativity, problem-solving approach, and past experiences, determine an individual’s influence on purchasing decisions.

Each of these categories includes task-related (directly affecting purchasing) and non-task-related (indirectly influencing purchasing) variables. The model is comprehensive, analytical, and widely applicable, making it relevant for studying e-procurement, where factors like political, economic, and technological environments play a significant role in shaping organizational buying behavior.

2.3 Defining Key Technologies in Digital Procurement

The following key technologies enhance procurement in the digital era:

- Artificial Intelligence (AI): Enhances supplier evaluation, automates contract management, and predicts procurement needs (Russell & Norvig, 2021).
- Robotics: Streamlines document processing, order tracking, and inventory management (Van der Aalst, 2016).
- Building Information Modeling (BIM): Facilitates material estimation, supplier coordination, and cost forecasting (Azhar, 2011).
- Blockchain Technology: Ensures data integrity, prevents fraud, and enhances trust between stakeholders (Saberi et al., 2019).2.4 Comparison of Digital Procurement Systems

E-procurement platforms vary in their capabilities and adoption across industries and public institutions. The table 2.1 below provides an overview of procurement systems and their functionalities in different sectors in South Africa:

Table 2.1 Comparison of procurement processes

Procurement System	Advertising Tenders	Supplier Registration	Bid Submission	Evaluation Process	Award Notification	Paper Submission Required
SAP Ariba (e.g., Sasol)	Integrated tender announcements within the ERP system.	Centralized supplier database with qualification criteria.	Electronic submission through the SAP Ariba portal.	Automated compliance checks; supports manual and automated evaluations.	Notifications via the portal and email.	No
Coupa (e.g., Exxaro)	Tenders advertised through the Coupa Supplier Portal.	Self-service registration with real-time onboarding.	User-friendly electronic submission with document upload features.	Automated scoring and analytics; customizable workflows.	Instant notifications through the portal and email.	No
eThekwini Municipality	Tenders posted on the official municipal website.	Registration through the Supplier Self-Service (SSS) portal.	Physical submission of tender documents into designated tender boxes.	Manual evaluation by procurement officials; status tracking available.	Notifications through official channels; public posting of awards.	Yes
City of Cape Town	Tenders advertised on the official city website and local media.	Online supplier registration with verification processes.	Physical submission of tender documents into designated tender boxes.	Combination of manual and automated evaluations; transparent criteria.	Official notifications via website and direct communication.	Yes
eTender Portal (KwaZulu Natal Department of Transport)	Centralized platform for all public entity tenders.	Uniform registration applicable to multiple entities.	Standardized electronic submission; accessible nationwide.	Standard evaluation procedures; ensures compliance with public procurement laws.	Public announcements on the portal; direct notifications to bidders.	No

Data compiled from Sap News (2021), Exxaro (2025), City of Cape Town (n.d.), eThekwini Municipality (2025), National Treasury of South Africa (n.d.) and Sasol (2025)

The comparative analysis of these systems highlights the growing preference for electronic procurement platforms that eliminate paper-based processes and improve efficiency. Private sector procurement platforms such as SAP Ariba and Coupa leverage AI-driven automation and real-time data analytics to streamline tendering and supplier management (Mikalef & Gupta, 2021). In contrast, public sector procurement, such as eThekwini Municipality and the City of Cape Town, still relies on physical submissions, demonstrating a lag in full digital adoption. However, centralized portals like the e-tender Portal, SAP Ariba and Coupa offer a standardized electronic submission system to ensure compliance with public procurement laws (Saberi et al., 2019). Embracing these digital innovations enables organizations to fully leverage e-procurement, improving efficiency, cutting costs, and enhancing accountability in procurement operations. This study explores these technological advancements, highlighting their impact on procurement transformation and the strategic advantages they offer in the evolving digital landscape.

3. Methodology

This study adopted a pragmatic research philosophy, emphasizing practical solutions to address the research problem. A quantitative approach was implemented, incorporating widely

recognized redesign methods such as streamlining, re-sequencing, and centralization to enhance process efficiency.

3.1 Pilot Study

A pilot study was conducted with 58 respondents who attended KwaZulu Natal Department of Transport tender briefing. The original questionnaire was revised according to participant feedback to enhance clarity and ensure construct validity. The revised version underwent expert review before distribution.

3.2 Main Study and Data Collection

For the main study, a sample was drawn from a population of 1,600 service providers registered with KwaZulu Natal Department of Transport. To ensure a representative sample, every tenth service provider on the list was selected, yielding a final sample size of 160 participants. The questionnaire was distributed to all selected respondents, and 149 completed responses were received, resulting in an exceptionally high response rate of 93%.

A structured Likert-scale questionnaire was utilized for data collection, with responses measured on a five-point scale. To maintain consistency in data interpretation, negatively worded items were reverse-coded. Preliminary data screening involved analyzing score distributions using histograms and skewness values. Cronbach's alpha coefficients were also computed to assess each scale's internal consistency.

3.2.1 Data Analysis and Validation

To enhance the reliability of the analysis, the study mitigated potential multicollinearity issues and assessed discriminant validity among key research constructs. Strict ethical protocols were followed, including protecting respondent anonymity, safeguarding the intellectual property of the KwaZulu-Natal Department of Transport, and obtaining informed consent from both participants and the organization.

Data analysis was conducted using partial least squares structural equation modeling, a technique well-suited for complex models and exploratory research. This method was chosen for its effectiveness in evaluating relationships within the study’s framework, particularly in the context of e-tendering adoption.

3.2.2 Reliability Analysis

The reliability of the measurement scales assessment used Cronbach’s alpha, with all constructs demonstrating high internal consistency:

- **Buying Centre Factors:** $\alpha = 0.92$
- **Environmental Factors:** $\alpha = 0.88$
- **Organizational Factors:** $\alpha = 0.85$
- **Individual Factors:** $\alpha = 0.83$

Since all reliability coefficients exceeded the widely accepted threshold of 0.70, the scales were deemed suitable for further statistical analysis.

4. Data analysis

The following components were considered in relation to e-procurement buying decisions:

1. E-procurement buying decisions are positively impacted by physical environmental elements.
2. E-procurement buying decisions are positively impacted by technological environmental elements.
3. Buying decisions in e-procurement are influenced by economic environmental factors.
4. Buying decisions made through e-procurement are heavily influenced by political environmental factors.
5. Legal environmental considerations have a beneficial impact on e-procurement buying decisions.
6. The decision-making process in e-procurement is influenced by cultural contextual elements.

Table 4.1 Explained variance

Component	***Initial Eigenvalues***			***Extraction Sums of Squared Loadings***			***Rotation Sums of Squared Loadings***		
	Total	*% of Variance*	*Cumulative %*	*Total*	*% of Variance*	*Cumulative %*	*Total*	*% of Variance*	*Cumulative %*
1	13.291	83.070	83.070	13.291	83.070	83.070	5.732	35.824	35.824
2	1.599	3.746	86.817	1.599	3.746	86.817	3.853	24.084	59.909
3	1.409	2.553	89.370	1.409	2.553	89.370	2.821	17.634	77.542
4	1.308	1.926	91.296	1.308	1.926	91.296	2.201	13.754	91.296
5	.277	1.729	93.025						
6	.223	1.396	94.421						

Extraction Method: Analysis of Principal Component.

Source: Author's analysis

4.1 Exploratory Factor Analysis

The purpose of exploratory factor analysis was to find patterns among variables in order to minimize data complexity and reveal the underlying structure inside the dataset. The extraction method used for the analysis was Principal Component Analysis. The findings, including Initial Eigenvalues, Extraction Sums of Squared Loadings, and Rotation Sums of Squared Loadings, are shown in Table 4.1. Kaiser's criterion dictated that only factors with Eigenvalues higher than 1 were kept. The results indicated that four components met this criterion, collectively explaining 91.296% of the total variance. The first component had the highest Eigenvalue of 13.291, explaining 83.070% of the variance, while the second, third, and fourth components contributed 3.746%, 2.553%, and 1.926%, respectively. The high cumulative variance suggests that these four factors sufficiently capture the structure of the dataset.

To enhance interpretability, Varimax rotation was applied, redistributing variance across the factors. After rotation, the variance explained by the first factor decreased to 35.824%, while the second, third, and fourth factors accounted for 24.084%, 17.634%, and 13.754%, respectively. This adjustment improved the clarity of factor distinctions and allowed for a more balanced representation of the dataset’s variance across the four retained components.

4.2 Rotated Component Matrix (RCM)

The analysis results are best interpreted by examining Table 4.2, the Rotated Factor Matrix. Factor rotation enhances readability, ensuring that each factor distinctly explains or predicts specific phenomena. This process maximizes clarity by aligning factors with related items, allowing each factor to account for multiple variables effectively.

Table 4.2: Rotated Component Matrix

Component	Buying Centre Factors	Environmental Factors	Organisational Factors	Individual Factors
Learning of buyers affects e-procurement buying decision	.795			
Motivation of buyers affects e-procurement buying decision	.791			
Leadership positively affects e-procurement buying decision	.774			
Buyers positively affect e-procurement buying decision	.640			
Buying technology positively affects e-procurement buying decision	.610			

Technological environmental factors positively affect e-procurement buying decision	.756		
Economic environmental factors positively affect e-procurement buying decision	.678		
Physical environmental factors positively affect e-procurement buying decision	.590		
Cultural environmental factors positively affect e-procurement buying decision	.735		
Legal environmental factors positively affect e-procurement buying decision	.615		
Organisational climate positively affects e-procurement buying decision		.557	
Organisational structure positively affects e-procurement buying decision		.660	
Organisational goals positively affect e-procurement buying decision		.591	
Personal and organisational objectives positively affects e-procurement buying decision			.803
You are motivated by organisational structure of e-tendering			.764
You learn from organisational environment of e-tendering			.724

Analysis of Principal Components is the extraction method. Varimax with Kaiser Normalization is the rotation method.

Source: Author's analysis.

The rotation matrix table presents the items and factor loadings for the rotated factors, with loadings below 0.40 excluded for clarity (Guadagnoli & Velicer, 1988). Based on an in-depth

analysis, as shown in Table 5.14, four key factors were identified: Buying Centre Factors, Environmental Factors, Organisational Factors, and Individual Factors.

- The first factor (Buying Centre Factors) includes five items and accounts for 83.070% of the variance in the buying decision-making process.
- The second factor (Environmental Factors) consists of five items, explaining 3.746% of the variance.
- The third factor (Organisational Factors) comprises three items and contributes 2.553% to the variance.
- The fourth factor (Individual Factors) contains three items, explaining 1.926% of the variance.

4.3 Impact of Identified Factors on Organisational Buyer Behaviour

The study tested the following hypotheses:

- Ha1: Environmental factors influence e-procurement buying decisions.
- Ha2: Organisational factors influence e-procurement buying decisions.
- Ha3: Buying centre factors influence e-procurement buying decisions.
- Ha4: Individual factors influence e-procurement buying decisions.

As indicated in Table 4.3, the fitted regression model is statistically significant ($p < 0.05$), demonstrating that:

- Buying centre factors ($\beta = 0.346$, $p < 0.000$) have the greatest impact on organisational buyer behaviour.
- Environmental factors ($\beta = 0.293$, $p < 0.000$) also significantly affect e-procurement buying decisions.
- Organisational factors ($\beta = 0.203$, $p < 0.05$) play a role in the decision-making process.
- Individual factors ($\beta = 0.188$, $p < 0.05$) contribute but to a lesser extent.

Among these, buying centre factors exert the strongest influence on organisational buyer behaviour, suggesting that aspects such as learning, motivation, leadership, and buyer perception are key drivers of e-procurement decisions.

Table 4.3: ANOVA

Model		***Sum of Squares***	***Df***	***Mean Square***	***F***	***Sig.***	***Durbin-Watson***	
1	Regression	164.022	4	41.006	734617.468	.000[b]	1.832	
	Residual	.009	159	.000				
	Total	164.031	163					
a. Dependent Variable: Organisational buyer behaviour								
b. Predictors: (Constant), Individual factors, Environmental factors, Organisational factors, Buying centre factors								
Coefficients[a]								
Model		*Unstandardized Coefficients*		*Standardized Coefficients*	*t*	*Sig.*	*Collinearity Statistics*	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-3.744	.002		-1640.820	0.000		
	Buying centre factors	.312	.002	.346	143.525	.000	.059	3.038
	Environmental factors	.268	.001	.293	191.240	.000	.145	2.896
	Organisational factors	.178	.002	.203	113.308	.000	.106	1.443
	Individual factors	.176	.002	.188	78.010	.000	.058	1.145
a. Organisational buyer behaviour is the dependent variable								

Source: Author's analysis

5. Presentation and discussion of Findings

To ensure confidentiality and protect the anonymity of respondents and participating companies, the study's findings were presented to KwaZulu Natal Department of Transport in an aggregated format. This approach upheld ethical research principles while providing valuable insights into the factors influencing e-tendering adoption

5.1 Summary of Findings on Factors Affecting E-Procurement Buying Decisions

Using Webster and Wind's (1972) organizational buying behavior model as a guide, this study looked at how several factors affected the KwaZulu-Natal Department of Transport's e-procurement purchasing decisions. Environmental, organizational, buying center, and individual characteristics were the main components that were examined. Their impact on the decision-making process varied, according to the results of statistical tests used to determine their relevance.

5.1.1. Environmental Factors

Hypothesis (H1) proposed that environmental factors significantly impact e-procurement buying decisions. The statistical analysis ($\beta = 0.293$, $p<0.000$) confirmed a positive effect; however, these factors—comprising technological, economic, physical, cultural, and legal influences—accounted for only 3.75% of the variance. This suggests that while external environmental factors play a role, the majority (over 96%) of e-procurement decisions are driven by other influences. These findings align with the Webster and Wind (1972) model, which acknowledges external environmental influences on organisational buying behaviour.

5.1.2. Organisational Factors

Hypothesis (H2) tested the rolle of organisational factors—such as organisational climate, structure, and goals—on e-procurement decisions. The statistical results ($\beta = 0.203$, $p<0.05$) confirmed a positive relationship, but these factors explained only 2.55% of the variance in decision-making. This indicates that more than 97% of e-procurement decisions are influenced by factors other than the organisational environment. The findings are consistent with existing literature, including Kotler et al. (2013) and the Webster and Wind (1972), which emphasize the role of internal policies, objectives, and structures in shaping procurement behaviours.

5.1.3. Buying Centre Factors

Hypothesis (H3) examined the impact of buying centre factors—such as buyer learning, motivation, leadership, and the use of procurement technology—on e-procurement decisions. Statistical analysis ($\beta = 0.346$, $p<0.000$) revealed a strong positive effect, with these factors accounting for 83.07% of the variance in decision-making. This indicates that buying centre factors are the most influential determinants of e-procurement decisions at KwaZulu Natal Department of Transport. The study backs up earlier studies by Webster and Wind (1972) and others that outline important roles in the purchasing process, such as gatekeepers, buyers, influencers, deciders, and users. Notably, leadership emerged as an additional factor in this study, suggesting an area for further research.

5.1.4. Individual Factors

Hypothesis (H4) investigated whether individual factors—such as personal and organisational objectives, motivation, and learning—affect e-procurement decisions. The statistical test ($\beta = 0.188$, $p<0.05$) confirmed a significant effect, but these factors accounted for only 1.93% of the variance, making them the least significant contributors. The study aligns with previous research by Kwon and Zmud (2007), Drew (2003), and Walczuch et al. (2000), which suggest that individual perceptions, knowledge, and motivation can influence ICT adoption. However, in an

organisational setting, such decisions are typically shaped by collective decision-making rather than individual preferences.

This study confirms that buying centre factors exert the strongest influence on e-procurement decisions at KwaZulu Natal Department of Transport, while environmental, organisational, and individual factors play relatively minor roles. The findings align with established procurement and organisational behaviour theories, though certain unique elements, such as leadership within the buying centre, suggest areas for further research.

6. Conclusion and Recommendations

6.1 Conclusion

This study used Webster and Wind's (1972) Organizational Buying Behavior model to examine the major factors influencing the KwaZulu-Natal Department of Transport's adoption of e-tendering. The study found that the main antecedents influencing e-procurement decisions were buying center, environmental, organizational, and individual factors.

Findings indicate that buying center factors exert the strongest influence ($\beta = 0.346$, $p < 0.000$), followed by environmental factors ($\beta = 0.293$, $p < 0.000$), organizational factors ($\beta = 0.203$, $p < 0.05$), and individual factors ($\beta = 0.188$, $p < 0.05$). Despite these influences, more than 96% of procurement decisions remain driven by factors beyond the studied antecedents.

To bridge the knowledge gap, this study outlines a practical implementation flow in the form of a model, as illustrated on figure 6.1, to accelerate e-tendering adoption, enhance procurement efficiency, strengthen buyer-supplier relationships, and improve post-contract delivery outcomes.

6.2 Recommendations

Organizations should adhere to a defined implementation framework that integrates blockchain, robots, artificial intelligence (AI), and Internet of Things (IoT) technologies throughout the procurement process to ensure the smooth adoption of e-tendering.

Figure 6.1 below is a model which outlines a digitally integrated project implementation framework, emphasizing emerging technologies like AI, blockchain technology, IoT, robotics, and automation across different project phases.

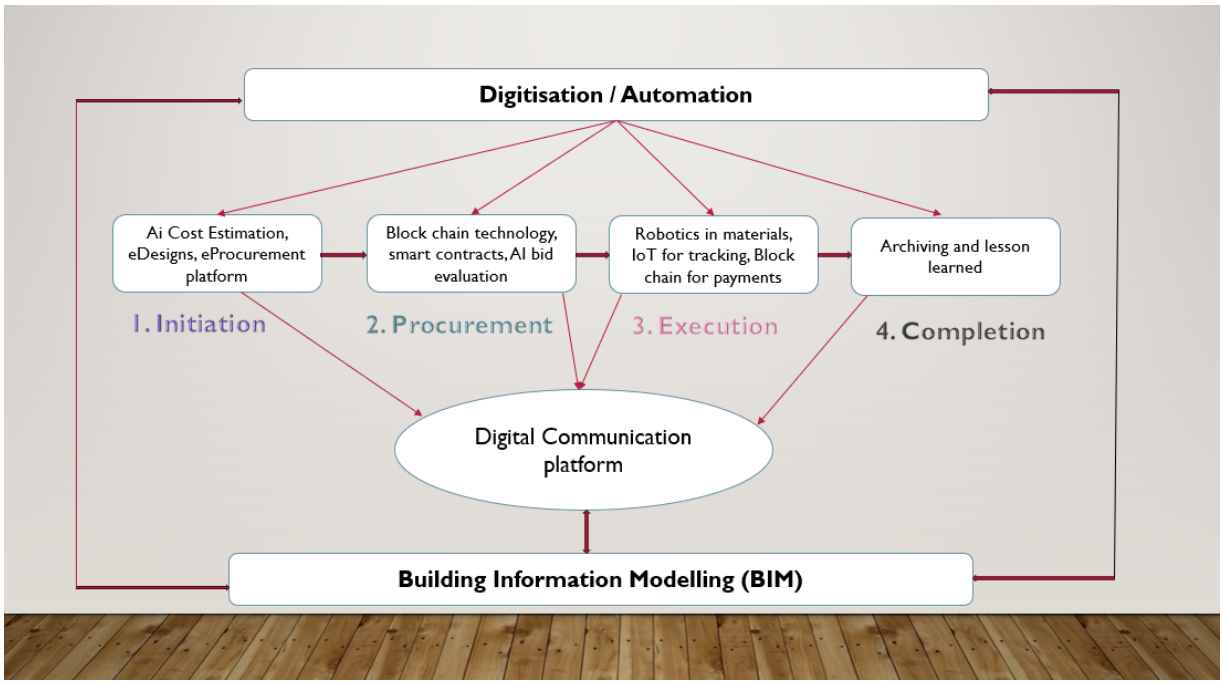


Figure 6.1 Project digitisation model (source: Author's own work (2025))

Project digitisation Model integrates digital transformation and automation across four key project processes. It leverages AI, blockchain, IoT, robotics, and BIM to enhance efficiency, transparency, and collaboration. This model fosters a data-driven, automated, and secure project implementation approach. The proposed digitization model integrates digital transformation and automation across four core procurement processes: planning and design, procurement and contracting, execution and monitoring, and closure and knowledge management. Throughout the procurement process, this strategy improves efficiency, transparency, and collaboration by utilizing emerging technology.

Artificial intelligence (AI) is essential for cost estimation during the planning and design stage, as it enhances forecasting and budgeting accuracy. Furthermore, collaborative design and visualization are made easier by digital tools like eDesigns and Building Information Modeling (BIM), which ensure more accurate project planning and stakeholder coordination. The procurement and contracting phase are optimized through the implementation of eProcurement platforms, which streamline bid management and supplier selection. Blockchain technology, combined with smart contracts, ensures secure, transparent, and automated contract execution, reducing fraud risks and improving compliance. Furthermore, AI-driven bid evaluation enhances the fairness and efficiency of contractor selection, minimizing human bias and expediting decision-making processes.

Robotics in material handling greatly increases productivity during the execution and monitoring phase by automating labor-intensive jobs, lowering errors, and boosting overall efficiency. Real-time tracking of project progress and material flow is made possible by the Internet of Things

(IoT), which facilitates better resource management and prompt interventions. Additionally, blockchain technology is employed for payment processing, ensuring secure and traceable financial transactions that enhance accountability and reduce disputes between stakeholders. In the closure and knowledge management phase, digital communication platforms facilitate seamless coordination and stakeholder engagement throughout the project lifecycle. These platforms enable efficient reporting and documentation, improving transparency in procurement operations. The integration of archiving mechanisms ensures that lessons learned from previous projects are systematically captured, providing valuable insights for continuous improvement. Finally, digitization and automation are embedded across all phases, promoting a streamlined, efficient, and fully integrated procurement system. By implementing this digitization model, organizations can drive digital procurement transformation, ensuring enhanced efficiency, transparency, and operational effectiveness in e-tendering adoption.

6.3 Ensuring the adoption of e-tendering

The next crucial step is to ensure continuous acceptance, even though this study has identified the main antecedents impacting the adoption of e-tendering, including organizational, buying center, environmental, and individual characteristics. Organizations must put in place organized initiatives that promote digital readiness, reduce opposition, and maximize procurement efficiency in order to close this gap. Building digital procurement skills through the integration of cutting-edge technologies like blockchain, robotics, artificial intelligence (AI), and the Internet of Things (IoT) throughout the procurement stages is an essential component of this process. Through IoT-enabled monitoring systems, these technologies can optimize resource tracking, promote transparency, expedite and automate procurement procedures, and improve supplier evaluation.

In addition to technological integration, implementing targeted training and capacity-building programs is essential. Many procurement officers and suppliers may lack the necessary digital literacy to engage effectively with e-tendering platforms. To address this, structured training programs should be introduced, along with certification initiatives that incentivize compliance with digital procurement processes. Pilot workshops and hands-on demonstrations should also be conducted to ensure stakeholders are adequately prepared before full-scale deployment. Establishing supportive policies and incentives is another fundamental component of ensuring e-tendering adoption. Organizations should consider offering financial or operational incentives, such as expedited approvals for compliant suppliers, while gradually enforcing e-tendering policies to allow time for adaptation. Additionally, regulatory adjustments should include provisions for technical and financial support, particularly for small and medium enterprise (SMEs), to ensure equitable participation.

A phased implementation approach is recommended to minimize disruptions and allow for iterative improvements. In the short term (0–6 months), organizations should establish a dedicated implementation team, develop standardized e-tendering protocols, and initiate digital training programs. In the medium term (6–18 months), pilot implementations should be introduced, starting with high-value projects exceeding R20 million, alongside supplier onboarding initiatives and performance monitoring frameworks. A fifty percent decrease in the

procurement cycle time and a thirty percent decrease in documentation errors are anticipated gains during this phase. In the long term (18–36 months), organizations should fully integrate e-tendering into all major procurement operations, establish a center of excellence for continuous improvement, and develop knowledge-sharing platforms to enhance industry collaboration.

Proactive stakeholder involvement and successful change management techniques are needed to overcome opposition to the adoption of e-tendering. Companies should create an advisory team to offer continuing assistance, hold frequent consultations to resolve concerns, and create a clear communication strategy that informs stakeholders of the advantages of e-tendering. By establishing urgency, assembling a group of advocates for digital transformation, and integrating digital procurement as a fundamental organizational procedure, Kotter's Eight-Step Change Model can help direct this shift. Furthermore, a dedicated technical support system should be built to assist procurement officers and suppliers in navigating the move to e-tendering.

6.4 Conclusion

Individual, organizational, buying center, and environmental factors all have a substantial impact on the adoption of e-tendering in procurement, with buying center factors having the biggest influence, as this study has shown. Although buyer-supplier relationships, efficiency, and transparency are all improved by digital procurement, its successful use necessitates systematic tactics that go beyond simply identifying its antecedents. Organizations must concentrate on developing proactive policies, implementing focused training programs, onboarding suppliers, and integrating cutting-edge technologies like blockchain, AI, BIM, and IoT in order to close this gap. E-tendering adoption can be accelerated by the KwaZulu Natal Department of Transport through the implementation of a staged action plan that includes pilot projects, performance monitoring, and a full-scale digital transformation. This ensures efficient procurement procedures and long-term sustainability.

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