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ABSTRACT

The small and medium enterprises (SMEs) in Kenya face huge challenges as the rate of adoption of technological innovation is very low, hence stifling their growth, competitiveness, and overall performance. This study was conducted through desk research that elicited the key drivers and barriers impacting the adoption of technological innovation, to better understand the dynamics affecting SMEs in Kenya. The purpose of this study was to develop the understanding of key drivers and barriers that impacts the adoption of technological innovation by Kenyan SMEs. This study was conducted with particular focus on four key objectives; to examine the extent of adoption of technological innovation by SMEs in Kenya, to identify drivers and barriers to adoption of technological innovation, to determine impact of organizational and government policies as a factor to adoption of technological innovation, and finally to provide recommendations to enhance the adoption of technological innovation. Technological innovation is closely linked to numerous benefits such as economic growth and competitiveness of the business among others. However, despite these advantages, uptake of innovations in SMEs in Kenya remains worryingly inadequate. This study found out that organizational and operational drivers such as the perception of usefulness, compatibility and changes in the organizational culture are key factors that facilitate the uptake of innovations among SMEs in Kenya. On the other hand, the main challenges or barriers that hinder adoption of technological innovation are costs of innovations, lack of technical skill and inadequate infrastructure. The study highlights the need for a multifaceted approach targeting policymakers, financiers and private sector players to move Kenya forward, to create the right environment that facilitates successful digital transformation and triggers growth among Kenyan SMEs.

***Keywords**: Technological Innovation, SMEs, Adoption, Drivers, Barriers*

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INTRODUCTION

Technological innovation is becoming one of the key drivers of economic growth and sources of competitive advantage among enterprises all over the world. In the context of Kenya, the adoption of technological innovation by small and medium-scale enterprises (SMEs) in the country has shown positive correlation with higher productivity, output, efficiency, and overall market share (Nyaware, 2019). Kimathi (2020) writes that that the micro, small, and medium enterprises (MSMEs) in Kenya are leading in the adoption and implementation of technology and equipment in the country. However, despite the numerous benefits enjoyed by SMEs from technological innovation, the rate at which technological innovation is being adopted by SMEs in Kenya remains quite low compared to their counterparts in developed economies (Xavir et al., 2022). The authors revealed that majority of the firms in Kenya uses the most basic digital technologies to carry out the day-to-day business operations, with only a few adopting sophisticated forms of technology in their business processes.

Technological innovation has different dimensions, for example; digital technologies, information and communication technologies (ICT) as well as relatively newly evolved technologies such as artificial intelligence, internet of things (IoT), or cloud computing. The adoption of technological innovation can be related to perceived usefulness, ease of use, compatibility with existing systems, and relative cost of adoption. SME performance can be measured in various ways for example performance could be related to profitability, market share, growth, and also operational efficiency. Technological innovation adoption could impact or influence business success and SME performance through providing capabilities to enhance process efficiency, improve on customer experience, provide real-time decision support through data driven methods. However, the extent to which the adoption of technological innovation by SMEs in Kenya impact on business success and subsequently SME performance could have non-linear relationship, and moderating variables could influence technological innovation adoption by SMEs in Kenya. These moderating variables include but are not limited to the organization's culture, areas of leadership support, the employees' skills and competence, access to financial resources, and so forth. Government policies and regulations could also act as a facilitator or barrier to the adoption of technological innovation by SMEs. Understanding barriers and drivers of technological innovation adoption could provide actionable insights to policy makers, industry players, and SME owners themselves towards developing strategies aimed at increasing the adoption of technological innovation that would contribute or enhance the long-term sustainability and growth of SMEs.

Statement of the Problem

The slow rate of technological innovation uptake by the SMEs in Kenya may present a significant risk to their potential business advancement and competiveness in the economy. This is because technology is the backbone of a modern business firm. An observation made on a recent press-release by Safaricom (n.d) indicates the "sluggishness" of technologies at the disposal of the average SME firm in the country. Only 2% of the country's agribusiness firms have a form of web presence, 37% of the SMEs has websites, and only 43% of the firms have some form organizational emails (Safaricom, n.d). Again, according the International Finance Corporation (IFC), less than 7% of the MSMEs in Kenya have reported that they use digital technologies in their operations. Most said they see "no need" to have the technology (IFC, 2023). Several factors account for the low innovation in technology uptake among Kenyan small business firms. It includes inadequate financing, lack of technical skills and knowledge, poor infrastructure, and resistance to change.

Low adoption of technology innovation is a major problem among Kenyan SMEs because it limits the ability to increase output efficiency, improve customer experience, and gain a competitive edge

in the market. Failure to adopt technological innovations will see them stagnate in terms of growth and lose market shares, thus ultimately devastating the business, cause worker retrenchment, and also contribute to the overall economic stagnation. This has become a problem not only in Kenya but across other developing nations. While various studies have explored the challenges that hinder the adoption of technology, a number of international organizations have also noted the urgent need to create an enabling environment for SMEs to sustain technological innovations. The International Monetary Fund (2020), for example, has suggested that supportive policies in the economy can help small and medium enterprises (SMEs) to make the most of digital technologies and outlined the need for supportive macroeconomic and financial policies, including the provision of finance and capacity-building. Furthermore, Benard et al. (2021) have also assessed the relationship between SMEs in developing countries and outlined the urgent need to keep SMEs out of the so-called "digital-divide". Unless this problem of slow adoption of technology innovations in Kenyan SMEs is taken seriously and solved, Kenya will not attain its economic growth and development agenda as spelt out in Kenya Vision 2030. This blueprint seeks to transform the country into a newly industrialized, middle income-nation (Maluki, 2021). This growth will only be realized through industrialized activities which requires SMEs to optimally perform with the support of adopting technological innovation. Failure to address this problem will see the country deviate away from achieving the vision as well as the SDGs that seek to promote economic growth, industry innovation and decent work among others.

Purpose of the Study

The purpose of this study was to explore the key drivers and barriers influencing the adoption of technological innovations among small and medium-sized enterprises (SMEs) in Kenya.

Objectives of the Study

- To examine the extent of technological innovation adoption among SMEs in Kenya.
- To investigate the key drivers that facilitate the adoption of technological innovations by Kenyan SMEs.
- To analyze the major barriers hindering the adoption of technological innovations among SMEs in Kenya.
- To assess the influence of organizational factors in moderating the relationship between technological innovation adoption and performance of SMEs.
- To evaluate intervening effect of government policies and regulations in promoting or inhibiting technological innovation adoption among Kenyan SMEs.

METHODOLOGY

The study adopted a desktop research design, where information literacy skills are used to search, retrieve, analyze and synthesize relevant literature, reports, and other data sources. Desktop research is the best practice approach for understanding a topic when the focus is on the synthesis of information from the reviews of other studies rather than gathering new empirical data (Helms et al., 2018). The desktop research methodology is the best suited for this study because it seeks to understand the drivers and barriers of technological innovation adoption among SMEs in Kenya through the synthesis of knowledge and findings from previous empirical studies, academic sources, industry insights, and literature. It was appropriate for this study because it allows for a comprehensive understanding of the phenomenon by drawing insights from a wide range of sources. Desktop research has been used in a wide variety of empirical studies across domains, such as the analysis of activities that integrate sustainability teachings in universities (Barth, 2013), and the critical success factors of e-learning in Saudi Arabian universities (Alhabeeb Rowley, 2017). All these studies demonstrate the effectiveness of desktop research to analyze and synthesize key perspectives and identifying gaps in the existing research. In

conducting the desktop research for this study, a systematic literature search was performed using academic databases such as Google Scholar, Scopus, and Web of Science, as well as relevant government and industry sources. The search strategy included a combination of keywords related to technological innovation adoption; SMEs; technology; drivers of technology adoption; barriers of technology adoption; organizational factors and the role of the government in technology adoption in Kenya. The retrieved literature was critically analyzed, synthesized, and structured according to the theoretical framework and objectives of the study.

THEORETICAL FRAMEWORK

Theory 1: Technology-Organization-Environment (TOE) Framework

The Technology-Organization-Environment (TOE) theory proposed by Tornatzky and Fleischer in 1990 represents a powerful theoretical underpinning for understanding the adoption of technological innovations within organizational contexts (Chong & Olesen, 2017). According to Chong & Olesen (2017), this theory argues that there are three key factors that influence the adoption of new technologies; the technological, organizational, and environmental contexts. The technological context refers to the attributes and characteristics of the innovation invention, including its relative advantage, compatibility, complexity, trialability and observability. The organization context includes elements such as organizational structure, culture, resources and management support that can enable or disable technology adoption. Finally, the environmental context includes external factors in the form of industry structure, competitive pressures, socio-legal regulations and government policies that can influence the adoption or rejection of an innovation.

The technology-organization-environment (TOE) can be considered as an overarching lens to understand the factors underlying technological innovation adoption and its implications for firm performance. With respect to the technological context, perceptions of usefulness, ease of use, compatibility with existing systems, and the cost of adoption are all determinants of whether an innovation is adopted or not. In the organizational context, TOE posits the importance of organizational culture, garnering leadership support, employee skills and training, and the availability of financial resources in the organization and how these factors enable or hinder technology adoption and implementation. External factors in the environment, which are a part of the TOE framework, include policies, government regulations, and industry trends. The theory argues that these external factors influences whether or not the technological innovation us adopted by the SMEs.

An advantage of using the TOE framework for the current study is that it enables the researcher to investigate the factors related to the drivers and barriers of technology innovation adoption among SMEs in Kenya. By looking at the technology, organization and environment contexts, the researcher can clearly understand the underlying factors influencing the adoption of digital technologies, ICTs, and Industry 4.0 innovations among Kenyan SMEs. In the technological context, the dimensions and indicators of technological innovation adoption (e.g., perceived usefulness, ease of use, and compatibility) align with the factors that impact the adoption of technological innovation among Kenyan SMEs. Furthermore, in the organizational context, some of the moderating variables such as the organizational culture, leadership support, and employee skills are related to the dimensions of organizational innovation adoption, and could result in changes in the level of technological innovation adoption. Lastly, in the environmental context, the government policies and regulations and the intensity of competition are important factors that impact the adoption of technological innovation. Looking at the theoretical gap, although the TOE framework provides a useful lens to understand technological innovation

adoption, it fails to adequately account for the specific challenges and constraints faced by SMEs, particularly in developing economies like Kenya, where factors such as limited resources, infrastructure deficiencies, and skill gaps may play a more prominent role.

Theory 2: Diffusion of Innovations (DOI) Theory

The Diffusion of Innovations (DOI) theory provides a conceptual framework for understanding how new ideas, practices, or technologies spread in a social system over a period of time. The theory was developed by Everett M. Rogers in 1962 (Karnowski & Kümpel, 2016). It suggests that there are five essential characteristics that influence the rate adoption of an innovation, and they include relative advantage, compatibility, complexity, trialability, and observability (Soon, Lee, & Boursier, 2016). Relative advantage indicates how much better is a perceived solution to known alternatives in a specific context. Likewise, compatibility reflects the perceived fitness that it presents in the users' value system. Complexity refers to how difficult it is to understand or use an innovation. Trialability involves the ease of experimenting on the issue at hand on a limited basis. And finally, observability concerns the extent to which the results and consequences of an innovation are visible to others. This Diffusion of Innovations (DOI) theory offers additional insights into the aspects affecting the rate at which an innovation is adopted. The theory emphasizes perceived characteristics of innovations relative advantage, compatibility, complexity, trialability and observability, which correlate directly with perceived ease-of-use, usefulness, compatibility with existing technology, and one's ability to test (trialability) an innovation before a full-scale adoption ('observability'). These key variables have been outlined in this research. The DOI theory also provides insights into how organizational factors – such as leadership support and employee skills – can either hinder or facilitate the successful diffusion of innovations.

As such, the DOI theory directly indicates the factors which are likely to influence the decision of SMEs in Kenya to accept technological innovations, thus making it very relevant to the current study. The characteristics of innovations outlined in DOI theory can be mapped unto the variables used in this study as indicators of the adoption of technological innovation. For instance, relative advantage and compatibility relate to the perceived usefulness and compatibility of the innovations under consideration by the SMEs. Additionally, complexity relates to the ease of use and other challenges that the SMEs may face while trying to adopt these technologies within their systems. The elements of trialability and observability influence the willingness of companies to experiment/test and observe the resultant benefit from such technologies before deciding to adopt for the long term. This theoretical framework opens up the study to possibilities of explaining how perceived characteristics of technological innovations might influence the adoption decisions of Kenyan SMEs. It can also inform appropriate strategies and interventions targeted at enhancing the diffusion and adoption of technological innovations within the SME sector of Kenya. However, the DOI theory presents a theoretical gap. In particular, while DOI theory provides a structure to think about the determinants of innovation diffusion, many questions remain unanswered at the firm level, especially SMEs in developing economies who have additional challenges, such as lack of access to financial resources, infrastructure constraints and regulatory barriers.

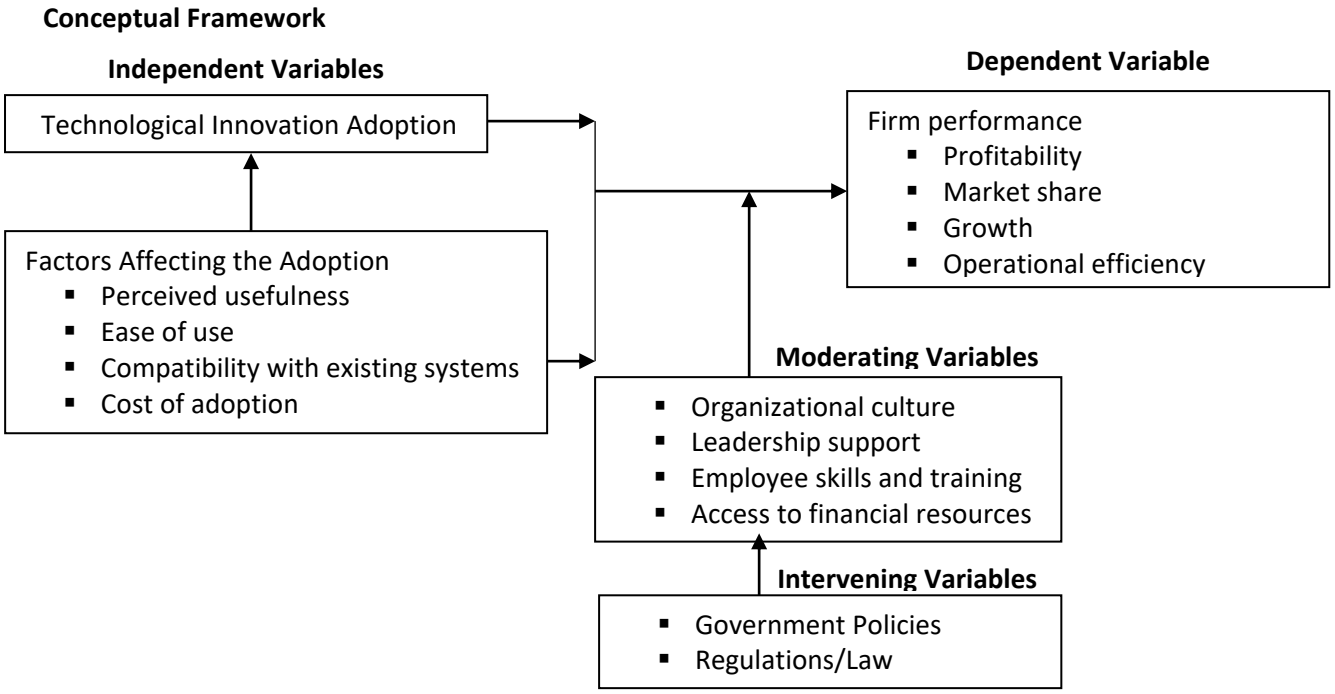

Figure 1: Conceptual Framework

EMPIRICAL LITERATURE

Numerous empirical studies have been conducted to explore drivers and barriers of technological innovation adoption by SMEs in different contexts. This section provides a critical literature review of these major research findings existing in the literature, which provides a clear synthesis related to the key variables under investigation in this study. The review is consolidated within the three main variables of this study; the independent variable (technology innovation adoption), the dependent variable (SMEs performance) and the moderating variables (organizational factors and government policies/regulations). The primary aim of this empirical literature review is to identify gaps, inconsistencies, and areas that warrant further exploration within the Kenyan SMEs landscape. The section provides a context for positioning the current study in the wider research scholarship that evaluates the antecedents (drivers and barriers) of technological innovation adoption and its impact on organizational performance within the context of SMEs.

Technological Innovation

Lin et al. (2020) define technological innovation as comprising "incremental or radical changes in technology" that occur in products, processes, and value activities. They explain technological innovation as a continuous improvement on the engineering or industrial art elements of products – encompassing evolution in the applied sciences to enable firms to offer products that are unique and differentiated, and consequently provide improved financial performance and competitive advantage (Lin et al., 2020). Technological innovation is a core capability to enable firms to adapt to dynamic environments. Hence, firms must exhibit continuous investment in research and development (R&D). Without sufficient emphasis on innovation, a firm cannot sustain its competitive edge. As stated earlier in this paper, technological innovation exhibits at least three dimensions: digital technologies, the information and communication technologies (ICT), and more recently evolving technologies such as artificial intelligence, internet of things (IoT) and cloud computing (Industry 4.0).

Ramdani, Raja, & Kayumova (2022) writes that digital technologies represent a combination of tools and systems 'that leverage digital information

and communication to improve processes, services, and products within the contexts of small and medium-sized enterprises (SMEs). They include the ICT, e-commerce platforms, enterprise systems, cloud computing, social media, Industry 4.0, Internet of Things (IoT), and business intelligence. As the authors write, the significance of digital technologies for SMEs lies in their potential to offer easier access to skills and talent, markets, financing, communication and collaboration, technologies and applications, product development and/or innovation, and reduction of bureaucratic hurdles (Ramdani, Raja, & Kayumova, 2022). Additionally, the term "Industry 4.0" has gained plenty of attention in the literature recently. Industry 4.0 refers to the emerging technologies such as artificial intelligence and blockchain technology. Specifically, Amaral & Peças (2021) delve into the concept of Industry 4.0 and its implications for small and medium-sized enterprises (SMEs). According to the authors, Industry 4.0 represents a transformative shift towards full digitalization of production processes, logistics, organizations, and supply chains, marking a new era in manufacturing paradigms. The research method applied by these authors was a full immersion investigation during 3 months aiming to evaluate the barriers holding back SMEs in terms of integrating to Industry 4.0. Through the analysis of hurdles such as economic constraints and skilled labor shortages, the study proposed digitalization propositions to aid SMEs in navigating the challenges of Industry 4.0 adoption. The findings underscored the importance of digitalization as a fundamental requirement for companies to thrive in the fourth industrial revolution (Amaral & Peças, 2021), emphasizing the need for SMEs to enhance their digital maturity to stay competitive in the evolving landscape of technological innovations.

There are several variables associated with the technological adoption innovation among the SMEs in Kenya:

1. **Perceived Usefulness and Firm Performance**

Perceived usefulness is essentially the "belief" that a system will enhance the performance of the business. The literature has shown that perceived usefulness is one of the main factors that drive the adoption of technological innovation. Firstly, Nazir & Khan (2024) investigated factors influencing the technological adoption among small and medium-size enterprises (SMEs) using the Technology Acceptance Model (TAM). The researchers found that perceived usefulness of a new technology significantly predicted the intention of SMEs to adopt a new technology, ultimately affecting performance outcomes (i.e., profitability and operational efficiency). This research, however, has an empirical gap due to the fact it was conducted within the context of one country, Pakistan, which means that the generalizability of the findings can be limited. Kimana (2020) also conducted an empirical study aiming to explore the determinants of innovation. The findings show that SMEs that perceived e-commerce usefulness for improving customer reach and sales were more likely to adopt it. The study has shown that firms that adopted e-commerce also had better performance in terms of market share and growth. However, the empirical gap that exists in this research comes from the fact that this study focused solely on e-commerce and did not consider the broader spectrum of technological innovations relevant to SMEs. Lastly, the study by Njogu (2014) sought to analyze the effect of innovativeness, including perceived usefulness, on the performance of SMEs in Nairobi County, Kenya. It was discovered that there was a positive relationship between perceived usefulness and the performance indicators of SMEs, including profitability and other performance incentives – such as market share. However, this study by Njogu (2014) has an empirical gap where it does not address the specific technological innovations and their perceived usefulness, which might vary depending on the industry.

2. **Ease of use and Firm performance**

Herzallah & Mukhtar (2016) operationalized the impact of the "perceived ease of use" on SMEs'

intention to adopt new technologies. The findings of their study showed that the perceived ease of use significantly influences the adoption of new technologies among SMEs, which in turn affects performance outcomes (operational efficiency) of the SMEs. While this study did find a significant link between perceived ease of use and the intention to adopt new technologies, the study did not distinguish between types of technological innovations since various degree of 'perceived ease of use' can apply to different types of technological innovations. This serves as an empirical gap. In addition, the study was conducted in the context of Palestine, which means it may not be generalized within the context of Kenyan SMEs. Secondly, Lam et al. (2021) studied the relationships between organizational culture, knowledge management, and innovation capability that can have an ultimate impact on firm performance. The authors found that user-friendly technologies coupled with appropriate training can enhance "ease of use" and facilitate the successful adoption of these innovations. However, the study did not explicitly focus on SMEs, which may face unique challenges in terms of resources and employee skill sets. Finally, Nugroho et al. (2017) investigated the readiness factors that can drive the adoption of technological innovation. The authors identified factors such as ease of use, the availability of resources to train employees tailored to innovative activities, and support from managers as some of the key challenges to adoption of new technologies and successful realization of performance outcomes. However, the study focused only on a particular set of SMEs located in the City of Yogyakarta in Indonesia. Thus, this one empirical study leaves us with an empirical gap, suggesting that the results may not be relied upon to understand what factors affect the performance outcomes for a sample of Kenyan SMEs.

3. Compatibility with Existing Systems and Firm performance

The literature has shown that compatibility is important as a driver of technology adoption. Ramdani et al. (2022) undertook systematic literature review on digital innovation in SMEs and found that 'compatibility with systems and processes is broadly considered as one of the dominant indicators of a technology's fit with an organization. The methodical gap presented by the study conducted by Ramdani et al. (2022) concerns the lack of empirical data to ascertain the findings. Secondly, Ghobakhloo & Ching (2019) looked at the role of compatibility in influencing the behavioral intention of SMEs to adopt technologies. The findings of the study showed that the compatibility and flexibility of technologies significantly influenced SMEs' adoption intentions, which would ultimately influence their performance. However, as an empirical gap, the study did not specify the nature of the technology (i.e., what type of technological innovation) or the levels of its compatibility (i.e., the degree of compatibility may not be the same for different innovations that impact different aspects of SME operations). Finally, Triandini, Djunaidy, & Siahaan (2013) looked at the factors influencing the adoption of e-commerce by the small and medium enterprises' (SMEs) in Indonesia. The study considered the possible factors that can hinder the adoption of e-commerce, covering a wide range of issues. While this study did not focus on compatibility, it discusses the role of supporting structures such infrastructure and technical skills that can impact the successful integration of new technologies. As a gap, the study considered conditions in Indonesia, so its findings might not be applicable to Kenya due to macroeconomic and infrastructural differences.

4. Cost of Adoption and Firm Performance

One of the most important factor that affected implementation of technological innovation is the cost. This sentiment has been reflected in the literature. To begin with, Weerasekara & Gooneratne (2023) examined the barriers of implementation of ERP systems in the SMEs. Cost was revealed in this study as one of the hindering factors towards the ERP adoption within this sector. This could indirectly affect their ability to thrive in

terms of operational performance and profitability. The empirical gap that exist in this study is that it focuses only on ERP systems and other technological innovations useful to the SME might not be applicable. Another study conducted by Indrawati (2020) wanted to see the level of funding the various SMEs have received with regards to innovation. The author concluded that funding is one of the major bottlenecks to the technology adoption in Indonesia. The high costs of technological innovation could limit the ability of these SMEs to fund these innovations, which again would affect their growth and competitiveness within the market. Nonetheless, as an empirical gap, the study did not directly examine the impact of the cost of adoption on suggested firm performance indicators (profitability and market share). Lastly, Shankar (2020) focused on global economic policy uncertainty and its effect on firms' abilities to participate in innovation activities such as launch of new products or services. While this is common to all firms, it is more relevant to SMEs in Africa who are facing the challenge of funding their core activities. Shankar (2020) revealed that these businesses required access to finance and favorable conditions of the economy to be able to innovate. The author, however, did not probe further into whether the cost of adoption directly affected the firm's performance indicators especially profitability and market share.

Antecedents to Technological Innovation Adoption

Ramdani et al. (2022) conducted a systematic literature review on digital innovation in Small and Medium-sized Enterprises (SMEs) that aimed to explore the integration of digital technologies within the context of SMEs. The study analyzed 382 articles published between 1979 and 2019, employing a systematic review approach to identify key drivers and barriers influencing the adoption of technological innovations among SMEs. The research design involved in-depth content analysis to develop a theoretical framework highlighting the antecedents (individual, technological, organizational and environmental factors), stages (processes and activities for technological innovations), and outcomes (improved organizational and business process performance) (Ramdani et al., 2022). The study contributes to the understanding of digital innovation in SMEs and provides a foundation for exploring the adoption of technological innovations in similar settings, offering valuable insights for future research in this area.

As Ramdani et al. (2022) highlights, the drivers of technological innovations in Small and Medium-sized Enterprises (SMEs) include several key factors. Firstly, SMEs are more likely to engage in digital innovation when they perceive that the new technologies will deliver benefits surpassing those of their existing technologies (Ramdani et al., 2022). This aspect correlates well with the perceived usefulness as a sub-variable under study in this paper. Additionally, according to Ramdani et al. (2022), the complexity of new technologies and the uncertainty surrounding their successful assimilation can influence SMEs' adoption decision. The perceived complications serve as a variable that impacts whether or not the firms adapt the technological systems. In concluding, the author also highlights the fact that the SMEs are more inclined to adopt technologies that align with their values, needs, and past experiences, while trustworthiness of the technologies plays a crucial role in their adoption.

The literature has also revealed a number of barriers to technological innovation in SMEs. The study conducted by Indrawati (2020) utilizes a mixed-method research approach to analyze the inhibiting factors of small and medium enterprises' (SMEs) technology innovation. The research was conducted through a survey of SMEs in Riau Province, Sumatera Indonesia, with a sample size of 277 entities that have been operating for at least five years. Data was collected using a questionnaire instrument with Likert scale measurements. The findings revealed five key inhibiting factors to SMEs' technology innovation. These factors include government support, quality of human resources,

funding of technological innovation, economic conditions, and business partners (Indrawati, 2020). The study emphasized that the biggest barrier remains the funding of technological innovation, highlighting the need for SMEs to independently invest in technological innovation to ensure business sustainability.

Technological Innovation Adoption and Firm's Performance

Lin et al. (2020) utilized a dynamic panel data modeling approach that used the system Generalized Method of Moment (GMM) estimator to measure the extent to which technological innovation affects firm performance and how ethical leadership moderated the relationship between technological innovation and firm performance. This study used a sample size of 465 IT service companies, with data collected through structured surveys and interviews. It was observed that the technological innovation and firm performance have a positive relationship (Lin et al., 2020). This study highlights the substantial impact of technological innovation on enhancing the overall performance of the firms.

Moderating Variables

Moderating Effect of Organizational Culture

Organization culture is a central variable that affects the attitudes and orientation of the organization, particularly in regards to innovation adoption and change. Lam et al. (2021) identifies organization culture as a predictor of innovation performance, suggesting that there is a positive correlation between these factors. According to the authors, if the organizations culture is hardwired towards a culture of innovation and willing to adopt new technologies, then it will serve as a driver for change. On the other hand, the study by Muljono et al. (2021) highlights that the factors that impede SMEs from adopting ICT innovation is how the organizational culture is laid out. In a similar manner, a culture that is accepting to change is more open to innovation acceptance. Both these studies have a common empirical gap in that they all fail to specifically account for how the organizational culture moderates the relationship between technological innovation adoption and firm (industry) performance.

Moderating Effect of Leadership Support

The literature has outlined leadership support as one of the crucial moderating variable. Lin et al. (2020) showed that ethical leadership is a moderating variable that influences the relationship between technological innovation and firm performance, suggesting that leadership support helps firms foster the adoption. This study, however, carries a methodical gap where it was conducted in larger IT service firms, which might have different leadership dynamics and structures compared to SMEs. In addition to this study, Ramdani et al. (2022) pointed out that leadership support plays an important role in SMEs' adoption of technological innovations. As an empirical gap, Ramdani et al. (2022) did not explore the moderating role of leadership support in the relationship between the adoption of innovation and firm performance indicators such as profitability and market share

Moderating effect of Employee skills and training

It goes without saying that employee skills and training serve as crucial elements that influences the uptake of technological innovation among the firms. Chatterjee et al. (2021) suggests that employees and training also determine how well the new technologies are actually adopted and used. Indeed, this variable is important because employee skills are necessary for the operation and maintenance of the new technologies, and the quality of training can affect how well the innovation is implemented or embedded within the business system. The empirical gap presented through Chatterjee et al. (2021) study is that the research paper has missed out the moderating effect of employee skills and training on the technology adoption-performance outcomes relationship. Lin et al. (2020) also argues that employee training and support are important in driving innovation. Their research featured large IT service companies, but as discussed earlier, this

poses an empirical gap where these companies might have differing resource capability, from organizational structures to the training system, compared to SMEs.

Moderating Effect of Access to Financial Resources

Financial resources are crucial for the implementation of and access to technologies. In the study conducted by Mushtaq, Gull, & Usman (2022), the access to financial resources was ranked as the number one factor influencing SMEs' technology adoption. The same study stressed the importance of access to financial resources in order for SMEs to be able to fund technological innovations. Moreover, Shankar (2020) points out the importance of access to finance and favorable economic conditions for SMEs to invest in innovations. Both the studies from Mushtaq, Gull, & Usman (2022) and Shankar (2020) form an empirical gap; the researchers do not explicitly consider how access to financial resources moderates the innovation-performance relationship.

Intervening effect of Government Policies

Government policies present themselves as perhaps the most significant intervening variable to the innovation-performance relationship being discussed in this paper. The study conducted by Ramdani et al. (2022) highlighted the government support, which can be in form of incentives, that are encouraging the SMEs towards digital innovations adoption. Similarly, the researches by Indrawati (2020) highlighted that the government support was one of the main reasons that gave a reason for the adoptions of technological innovations by small and medium-sized enterprises (SMEs) in Indonesia. The discussion by both authors highlight the paramount importance of the government on this complex relationship. These two studies also present an important research gap in that they do not explicitly explore the intervening role of government policies between innovation-adoption and firm performance indicators such as profitability and market share. Further, the research by Indrawati (2020) is specific to Indonesia. The contextual specificity of the research makes it difficult for the findings to be generalizable to the context of SMEs in Kenya since the policy differences between two countries are marked.

FINDINGS

The findings from this desktop research study provide valuable insights adoption of technological innovations in the small and medium enterprises (SMEs) across Kenya. Several themes and patterns have emerged from this ground-based desk research from the analysis and synthesis of existing literature, reports, and data sources.

Extent of Technological Innovation Adoption

Although technological innovation is linked to greater benefits for the firms, the studies have revealed that the huge majority of Kenyan SMEs are still low on technological innovation compared to their counterparts in developed economies. According to the report by the International Finance Corporation, less than 7% of MSMEs in Kenya reported that they use digital technologies in their business operations, with most of them saying that they see “no need” of having these technologies (IFC, 2023). Low adoption of technology, other than the reasons discussed, can also be attributed to factors such as limited financial capital, limited skills, lack of knowledge, infrastructure, and resistance to change.

Drivers of Technological Innovation Adoption

The study findings revealed that a set of key factors enables technological innovation among Kenyan SMEs, among them:

1. Perceived Usefulness and Relative Advantage: Those SMEs that perceive the usefulness of innovations in achieving their mission and vision as well as the ability to maintain a competitive advantage over their rivals will be more willing to adopt (Kithinji, 2022).
2. Compatibility with Pre-existing Systems: SMEs show greater inclination to adopt technologies that are compatible with their existing systems and processes – which means SMEs are more ready to adopt innovations that allow a ‘plug-and-play’ fit instead of ones that require

considerable management effort (Utama et al., 2022).

3. Organizational Culture and Leadership Support: A positive organization culture that encourages a culture of innovation, coupled with great leadership commitment and support in terms of allocating resources, are one of the most potent factors in smoothening the uptake of technological innovations by SMEs (Lam et al., 2021).

Barriers to Technological Innovation Adoption

The results of the study also pointed to several key obstacles to technological innovation in Kenya's SME sector, including:

1. Cost of adoption: The tremendous upfront and recurrent costs of acquiring, implementing and managing technological innovations have been identified as a top obstacle, especially for resource-constrained SMEs (Pitso, 2022).
2. Technical Skills and Knowledge Gap: Most SMEs in Kenya lack technical skills and expertise to exploit technology adoption and realise the full benefits of the innovation (Kimana, 2020).
3. Inadequate Infrastructure: Limited reliability and affordability of infrastructure such as internet connectivity, and power supply can hinder the adoption of technological innovations, particularly in rural and remote areas (Kimana, 2020).
4. Regulatory and Policy Challenges: Outdated or complex government regulations and policies regarding technology adoption, data protection and cybersecurity can be barriers if they limit or deter the adoption process, thereby creating uncertainty (Shankar, 2020).

Moderating Role of Organizational Factors and Government Policies

The study findings revealed how technological innovation adoption can be moderated by organizational factors, in this case management structure, availability of resources in the business (financial input), and staff skills. Organizations that are well managed are in a better position to fully leverage the benefits of technological innovations, leading to improved performance outcomes. In addition to this, this desktop research has also revealed that the government policy and regulatory framework have significant impacts on the adoption of technological innovations. Some factors that can moderate the adoption of technological innovations in the SME context include the supportive policy that incentivize innovation adoption, a well-defined regulatory framework, a conducive business environment, cybersecurity laws and digital privacy laws. This research call for addressing the gaps in the relationship that exists between the factors under the three study themes including drivers, barriers, and moderators as this can lead to constraining the performance outcomes for Kenyan SMEs. There is a need for collaborative efforts that involves the SMEs, policymakers, and other stakeholders to address the identified challenges and create an enabling environment for successful digital transformation in Kenya.

Empirical and Theoretical Gaps

The existing literature revealed the factors driving and hindering innovation adoption by the SMEs, moderating factors that influence the adoption trends. While it has helped deduce the findings of this paper, the literature has also revealed some gaps that calls for more investigation. Empirically, although there exists a wide body of empirical studies exploring the antecedents and outcomes of the adoption of technological innovation, most of these works do not focus on the technological innovation adoption by SMEs in the Kenyan context. Many studies focus on other geographical contexts, failing to capture the SME context in the Kenyan context. Furthermore, the review of the literature has also shown that some studies focus on specific sectors or types of innovations while excluding the other types of sectors and innovations applicable to the Kenyan SME context. Looking at the methodical gaps, the general observation is that many studies tend to be based on samples using cross-sectional data or for specific periods of time. They fail to

consider how the technology adopted changes rapidly, which may explain the variation in impacts observed on only a short timescale. There is a need to conduct some longitudinal studies or panel analysis to understand more thoroughly the actual long-term impacts of tech adoption on firm performance by considering the many factors that change over several years and decades. Lastly, while looking at the theoretical gaps, it is clear that the theories adopted in this study do not necessarily address the challenges and constraints faced by SMEs within the Kenyan context. The two theories; the Technology-Organization-Environment (TOE) framework and the Diffusion of Innovations (DOI) theory are immensely helpful, but there is a need to extend these theoretical lenses to cater to the contextual realities of the Kenyan SMEs including limited resources, infrastructure challenges, and skills gaps.

CONCLUSION AND RECOMMENDATIONS

In conclusion, this study is an in-depth analysis that has synthesized existing literature to explore the drivers and barriers to adoption of technological innovations in SMEs in Kenya. Through a close review of numerous scholarly articles, research reports, and data sources; this study has revealed the disturbingly low rates of technological innovation among the small and medium enterprises (SMEs) in Kenya. Nevertheless, the study demonstrated that perceived usefulness, compatibility, and ease of use of technologies are key factors that are significantly associated with SME's innovation adoption. Conversely, cost of innovations, inadequate technical skills, and inadequate technological infrastructure are key factors that are significantly associated with diminishing innovation adoption of technologies of the SMEs. In addition, this study has demonstrated the extent to which organizations' factors such as management structure, availability of resources, and employees' skill sets moderate the relationship between innovation adoption and SME's profitability, market share, growth, and operational efficiency. The study also identified that the Kenyan government policies and regulations directly influence innovation adoption. This study has also identified major gaps and challenges related to technological innovation adoption. When these challenges are addressed, Kenya has the greatest potential to create an enabling environment where the SMEs can prosper and ultimately spearhead the planned Kenya Vision 2030 blueprint which outlines Kenyan's development agenda.

The following actions were recommended to address the gaps identified in this study:

- Kenyan policymakers should implement a national strategy for promoting SME innovation adoption through institutional incentives, capacity-building, and regulation (e.g., regulations addressing data protection and cybersecurity) at the national level.
- Financial institutions in Kenya ought to provide more specific credit facilities and investments to the SMEs so that they can start or continue in using the technological innovations. It's important that the issue of cost is addressed because it is one of the major barriers to innovation for SMEs.
- An organizational culture that promotes invention must be developed by SME owners and managers. They need to invest in appropriate employee training and skills-development programs.

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