ISA Journal of Business, Economics and Management (ISAJBEM)

Homepage: https://isapublisher.com/isajbem/
Email: office.isapublisher@gmail.com

Volume 2, Issue 3, May-Jun 2025 ISSN: 3049-1835

Technological Innovation, Management Information Systems, and Entrepreneurship Innovation as Drivers of Sustainable Business Performance in Small and Medium Enterprises (SMEs) in Kano Metropolis

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Received: *15.05.2025* | ***Accepted:*** *25.05.2025* | ***Published:*** *02.06.2025*

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DOI: *10.5281/zenodo.15578293*

Abstract **Original Research Article**

This study aims to investigate the effects of technological innovation, management information systems (MIS), and entrepreneurship innovation on sustainable business performance among small and medium enterprises (SMEs) in Kano Metropolis, Nigeria. The study investigates the way these elements shape sustainability together to gain a full grasp of how innovation and information systems contribute to sustainability in emerging markets. Despite the recognized importance of innovation and information systems in achieving sustainable business outcomes, many SMEs in developing economies, particularly in Nigeria, struggle to integrate these elements effectively due to infrastructural, managerial, and socio-economic constraints. Only a small number of studies have been done in Kano Metropolis to study the relationship among technological innovation, MIS and entrepreneurship. As a result, it becomes difficult to design strategies and policies that use evidence and local understanding. Quantitative methods were used in this research by administering questionnaires to owners and managers of SMEs in Kano Metropolis. This approach was applied to guarantee that all sectors were fairly We were purposive with our strategy to guarantee variance in the composition of our focus group. Analysis with multiple regression was used to determine the separate and joint effects of the three innovation subscales on sustainable business performance. Results confirm that technological innovation, using MIS tools and entrepreneurial ideas all boost sustainable business performance. The impact of these variables is stronger when considered together than when considered by themselves. It was also shown that the way these issues connect to local settings and cultures plays a role in these relationships. The study recommends that SMEs in Kano should adopt an integrated innovation strategy that leverages technology, effective information systems, and entrepreneurial thinking. Policymakers should provide targeted support, such as digital infrastructure, capacity-building programs, and access to finance, to enable SMEs to harness these innovations sustainably. Besides, academic bodies and organizations working on development should form models that match the economic and social conditions in Nigerian cities.

Keywords: Technological Innovation, Management Information Systems, Entrepreneurship Innovation, Sustainable Business Performance, Small and Medium Enterprises (SMEs).

Citation: Dansuleka, S. U., & Kure, S. M. (2025). Technological innovation, management information systems, and entrepreneurship innovation as drivers of sustainable business performance in small and medium enterprises (SMEs) in Kano Metropolis. *ISA Journal of Business, Economics and Management (ISAJBEM), 2*(3), 240-247, May–June.

1.0 INTRODUCTION

In today's rapidly evolving global economy, technological innovation has emerged as a critical driver of business success, reshaping industries through the integration of advanced digital tools and intelligent systems (Porter & Heppelmann, 2014; Mohammed, Sundararajan, & Kumar, 2024). Management Information Systems (MIS) have become essential for organizations seeking to harness big data for strategic decision-making, enhancing operational efficiency

and competitiveness (Aliyu, 2023a; Laudon & Laudon, 2020). In addition, entrepreneurship innovation works to keep businesses growing by developing new things, expanding into uncharted markets and using updated business strategies (Schumpeter, 1934; Shane, 2003). These elements greatly determine how well a business performs sustainably, since sustainability involves strong economic performance, care for the planet and commitment to society (Elkington, 1997; Bocken et al., 2014). Despite global recognition of these drivers, the interplay among technological innovation, MIS, and entrepreneurship innovation remains underexplored, particularly in emerging economies and especially within Small and Medium Enterprises (SMEs). In Nigeria, the digital economy is growing fast because more people are connected online and know how to use it (NBS, 2022; Oyelaran-Oyeyinka & Lal, 2021). Nevertheless, several Nigerian SMEs continue to run into difficulties since they lack proper technological systems, only little use advanced MIS, and few entrepreneurs have innovative capabilities (Eze et al., 2020; Aliyu, 2023b). In Kano Metropolis, a major commercial hub in Northern Nigeria, these issues are pronounced due to infrastructural deficits and socio-economic constraints impacting SMEs in particular (Musa, 2019; Okoye & Ogbonna, 2021). Addressing these challenges requires a comprehensive understanding of how technological innovation, MIS, and entrepreneurship innovation collectively impact sustainable business performance within the local SME context. Thus, the study aims to bridge this knowledge gap by providing an integrative conceptual analysis rooted in both global insights and localized realities specific to SMEs in Kano Metropolis.

Over time, research on sustainable business performance has changed from only looking at results in finances to also focusing on sustainability and technology (Hart, 1995; Nidumolu, Prahalad, & Rangaswami, 2009). The increasing importance of digital tools, including MIS, aligns with the Industry 4.0 paradigm that emphasizes automation, data analytics, and cyber-physical systems (Mohammed, Sundararajan, & Kumar, 2024). Entrepreneurship innovation supports this growth by highlighting the importance of being adaptable and strong in uncertain markets (Covin & Slevin, 1991; Lumpkin & Dess, 1996). Still, although these advances exist, most research has either studied the variables in isolation or concentrated on wide-scale companies in developed places, skipping over the study of their impacts together in Africa and especially in SMEs of major urban centers such as Kano Metropolis. This gap underlines the need to use three main areas—technology management, information systems, and entrepreneurship—to address both practical and theoretical challenges faced by SMEs. The main reason for this research is to help SMEs in Kano Metropolis boost their sustainability by designing innovative schemes suited to their realities. The interdisciplinary approach adopted enables a nuanced exploration of how technological adoption, effective information systems, and entrepreneurial initiatives can synergistically promote sustainability goals within the SME sector (Aliyu, 2023a; Mohammed, 2023). This study's findings will guide both government officials, business experts and those who strive to use digital and entrepreneurial resources for greater economic inclusion. The approach blends the Resource-Based View and Dynamic Capabilities Theory which helps apply both concepts to actual business situations and improves the literature with specific examples (Barney, 1991; Teece, Pisano, & Shuen, 1997). Its main purpose is to strengthen Kano's business community, helping local enterprises become innovative and succeed in our changing global economy.

1.1 Statement of the Problem

In the contemporary business environment, technological innovation, management information systems (MIS), and entrepreneurship innovation are widely recognized as crucial drivers of sustainable business performance (Sundararajan & Mohammed, 2023; Lee, Kim, & Park, 2022). Globally, businesses face increasing pressure to adapt to rapid digital transformation, leverage data-driven decision-making, and foster innovative entrepreneurial practices to remain competitive and sustainable (Sundararajan & Muhammed, 2024; Mohammed, Sundararajan, & Kumar, 2024). However, despite the growing awareness, many organizations—especially in developing economies—struggle to integrate these factors cohesively due to infrastructural, managerial, and economic constraints (Obaji, Eze, & Nwosu, 2021; Okafor & Adigwe, 2023). In Nigeria, where economic diversification and industrial modernization are national priorities, there remains a significant knowledge gap regarding how these drivers interact and contribute to sustainable business outcomes, particularly within Kano Metropolis, a major commercial hub with unique socio-economic dynamics (Aliyu, Jakada, & Lawal, 2023). This lack of localized empirical research limits evidence-based strategies that businesses and policymakers can adopt to optimize performance and foster long-term sustainability.

A critical review of the existing literature reveals several gaps that this study seeks to address. While extensive studies have explored technological innovation and MIS independently, few have examined their combined effect alongside entrepreneurship innovation on sustainable business performance in emerging markets (Wang & Ahmed, 2023; Zhao, Liu, & Wu, 2022). Yet, despite these advancements, many existing studies have either treated these variables in isolation or focused on developed economies, leaving a critical research void regarding their combined effects in African settings—particularly in enterprise-dense urban centers such as Kano Metropolis. Furthermore, many prior investigations focus primarily on large corporations, overlooking the SMEs that form the backbone of Kano's economy (Adewale & Bello, 2022). Additionally, most empirical research fails to contextualize findings within the socio-cultural and infrastructural realities of Nigerian cities, thereby limiting practical applicability (Sundararajan & Muhammed, 2024; Ekundayo, Ojo, & Aluko, 2023). Theoretical frameworks addressing interdisciplinary integration of innovation, information systems, and entrepreneurship in the Nigerian context remain underdeveloped, creating an urgent need to develop comprehensive models that reflect local business environments. Without this, the translation of innovation into sustainable performance remains fragmented, impeding economic growth and competitive advantage.

Addressing this problem is of great practical and theoretical

importance. Practically, enhancing the understanding of how technological and entrepreneurial innovations, supported by effective MIS, drive sustainability can enable Kano's businesses to develop more resilient and adaptive strategies, thereby improving employment, productivity, and economic diversification (Aliyu, 2023; Sundararajan & Mohammed, 2023). Theoretically, this research advances knowledge by integrating multidisciplinary perspectives, including innovation management, information systems theory, and entrepreneurship, into a cohesive framework tailored for emerging economies (Mohammed, 2023; Nwankwo & Eze, 2024). This study is timely, as digital transformation and entrepreneurship development are key pillars in Nigeria's Economic Recovery and Growth Plan (ERGP), and Kano State's strategic importance as an industrial and commercial center demands context-specific insights (National Bureau of Statistics, 2023). Ultimately, findings from this research will inform policymakers, business leaders, and academics, promoting evidence-based interventions to enhance sustainable business performance within Kano Metropolis and similar contexts globally.

1.2 Research Objectives

1. To examine the effect of technological innovation on sustainable business performance among SMEs.
2. To investigate the impact of management information systems adoption on sustainable business performance in SMEs.
3. To assess the influence of entrepreneurship innovation on sustainable business performance among SMEs.
4. To determine the combined effect of technological innovation, management information systems, and entrepreneurship innovation on sustainable business performance in SMEs.

1.3 Research Questions

1. What is the effect of technological innovation on sustainable business performance among SMEs?
2. What is the impact of management information systems adoption on sustainable business performance in SMEs?
3. How does entrepreneurship innovation influence sustainable business performance among SMEs?
4. What is the combined effect of technological innovation, management information systems, and entrepreneurship innovation on sustainable business performance in SMEs?

1.4 Significance of the Study

This study is significant as it contributes to both academic knowledge and practical business management. By examining the effects of technological innovation, management information systems, and entrepreneurship innovation on sustainable business performance, the research offers valuable insights for SME owners, policymakers, and business consultants seeking to enhance competitiveness and operational resilience in dynamic market environments. The findings will bridge existing gaps in emerging market literature, especially within the Nigerian SME sector, providing empirical evidence to support strategic decision-making and policy formulation. Additionally, it will offer a foundation for future research in innovation management, digital transformation, and sustainable business practices, particularly within the unique socio-economic context of Kano Metropolis. This localized focus ensures that interventions and recommendations are relevant and actionable, fostering sustainable economic growth and inclusive development.

2.1 Empirical Review

Studies in this field give much insight into how technological innovation, management information systems (MIS), entrepreneurship innovation and sustainable business performance are related, mainly among SMEs. The findings from worldwide studies and Nigeria and those focused on emerging economies, are integrated here to lay the groundwork for this research.

Technological Innovation and Sustainable Business Performance

Different studies reveal that advanced technology can greatly improve both the success and sustainability of SMEs. Such is the case where Lee et al. (2021) discovered that Korean SMEs benefited from improved operations and quick reaction to market needs when they adopted advanced technologies. Kahiya and Mahmood found in 2017 that Malaysian SMEs that rely on innovation managed to grow faster and withstand economic challenges better. According to Mohammed and Kumar (2022), in Nigeria, SMEs can use entrepreneurship innovations, especially technologies, to remain strong and grow when facing complex market problems. Sundararajan et al. (2022) further emphasized that agile performance management systems integrated with technology foster real-time data use and continuous improvement, which positively affect firm sustainability. Alqahtani and Udin (2021) pointed out that using digital technologies makes SMEs use resources more wisely and helps protect the environment, something essential for lasting company success.

Management Information Systems (MIS) and Sustainable Business Performance

Management information systems serve as critical enablers for decision-making and operational efficiency. Empirical evidence by Shanmugam et al. (2024) revealed that global HR strategies increasingly rely on MIS to manage talent effectively, indirectly influencing business sustainability. In Nigeria, Mohammed, Sundararajan, and Martin (2024) documented that IT and software development firms in Kano State leverage MIS to enhance knowledge sharing and process optimization, leading to improved sustainability outcomes. In many places, according to Chen et al. (2020), using MIS within SMEs helps build better relationships with customers and integrate the supply chain which are crucial for long-term competitiveness. According to Wang (2019), having strong

services offered from information systems helps Chinese SMEs adjust more flexibly to new market developments and increase their sustainability.

Entrepreneurship Innovation and Sustainable Business Performance

Innovations in entrepreneurship help SMEs stay sustainable by bringing in new products, services and business methods. Mohammed and Kumar (2022) argue that entrepreneurial innovation supports sustainable development by fostering economic diversification and job creation in emerging economies. Nwachukwu and her team (2021) found that Nigerian companies that use innovation tactics tend to keep going and gain a larger share of the market. According to Drucker (2017), entrepreneurial activity helps a company win over the competition through the ongoing upgrades of what it sells and the way it does its work. Furthermore, Sundararajan, Aliyu, and Lawal (2023) observed the role of human resource management in supporting entrepreneurial innovation post-COVID-19, highlighting its significance for resilience and sustainability in SMEs.

Combined Effects of Technological Innovation, MIS, and Entrepreneurship Innovation

More and more, people recognize that the link among these three areas is vital for sustainable business results. When technology, information systems and entrepreneurship are combined, it leads to achievements that improve SME competitiveness. For instance, Zhao, Liu and Wu (2022) found that when technological innovation is combined with MIS and entrepreneurial approaches, Chinese SMEs reach better financial and non-financial outcomes. Sundararajan, Aliyu, Senthil, and Kumar (2022) demonstrated that agile performance management integrating MIS with technological and entrepreneurial innovation improves organizational adaptability and long-term sustainability. Moreover, Mohammed (2023) emphasized the necessity of multidisciplinary frameworks that consider these three components to understand trade management and sustainable business performance globally. Local empirical work by Aliyu, Jakada, and Lawal (2023) in Kano Metropolis highlighted that SMEs that simultaneously invest in digital technology, leverage MIS, and innovate entrepreneurially exhibit stronger resilience and growth, especially within the socio-economic peculiarities of Nigerian urban markets.

Empirical Gaps and Justification for the Study

Even with a large amount of writing on the subject, some areas are still not covered well. Very few studies explore how technological, MIS, and entrepreneurship innovation work together, mainly in the African SME sector (Adewale & Bello, 2022; Ekundayo, Ojo, & Aluko, 2023). Besides, little local research is available on Kano Metropolis SMEs, making it hard to know what actions are best advised for policy and managers. Studies like Mohammed, Sundararajan, and Martin (2024) call for localized investigations that factor in Kano's unique socio-economic dynamics. Furthermore, a large part of empirical research highlights major companies and established economies, but it lacks studies of SMEs in emerging markets where conditions are quite different (Obaji, Eze, & Nwosu, 2021; Okafor & Adigwe, 2023). This research aims to fill the gaps by examining how combining technological, MIS, and entrepreneurial innovation affects the sustainability of business performance in SMEs within Kano Metropolis.

2.2 Theoretical Framework

This framework defines the key concepts that explain the relationship between human resource strategies, strengthening talent, and embracing technology and how these things influence a company's performance today. This study draws upon three relevant and widely applied theories: Resource-Based View (RBV), Technology Acceptance Model (TAM), and Human Capital Theory (HCT). They help us view the relationships between strategic human resource management, employee skills, technology use, and the achievements of the organization as a whole.

2.2.1 Resource-Based View (RBV)

The Resource-Based View theory posits that organizations gain competitive advantage and improved performance by effectively managing valuable, rare, inimitable, and non-substitutable resources (Barney, 1991). In this context, human resource strategies and talent development are critical organizational resources that, when well deployed, foster innovation and efficiency. Mohammed and Sundararajan (2024) highlight how innovation and automation in evolving employment landscapes create resilient organizational capabilities, underscoring the strategic role of internal resources. Applying RBV, Kano Metropolis organizations can leverage their human capital and technological assets to enhance performance, especially in the digital era marked by rapid technological change.

2.2.2 Technology Acceptance Model (TAM)

The Technology Acceptance Model explains how individuals come to accept and use new technologies (Davis, 1989). According to TAM, how useful and easy to use a technology is perceived to be determines its rate of adoption. The employees' use and acceptance of digital tech is what brings about technological innovation within the organization in this study. Muhammed, Sundararajan, and Lawal (2022) emphasize that training initiatives significantly improve employee performance by increasing familiarity and comfort with new technologies, thereby promoting organizational innovation. With this, TAM helps show that technology innovation is a forecaster for how well an organization performs by how its workers engage and adapt to it.

2.2.3 Human Capital Theory (HCT)

In Human Capital Theory, how employees use their knowledge, skills, and competencies is a main reason for

organizational success (Becker, 1964). When people are trained and educated all the time, the workforce grows stronger and the company becomes more productive and advantageous. The study by Muhammad et al. (2022) on SMEs in Kano Metropolis reinforces the role of training in boosting organizational performance, reflecting HCT's core premise. It encourages companies in rapidly changing technological environments to focus on developing and strengthening their employees.

Integration of Theories in the Study Context

Using the combined approach of RBV, TAM, and HCT, we learn about the links among people practices, talent development, new technologies, and the outcomes for a company. RBV treats these as resources and capabilities, TAM looks at the methods for adopting technology, and HCT emphasizes improving employee skills to support performance. Since digital advancements are rising, this way of working is especially crucial for organizations in Kano Metropolis. The illustration shows how Human Resource Strategies, Talent Development, and Technological Innovation as independent variables relate to Organizational Performance, the dependent variable, based on the Resource-Based View (RBV), Human Capital Theory (HCT), and the Technology Acceptance Model (TAM). Every independent variable's theory connects it to organizational performance, which creates a firm basis for looking at how these factors together shape an organization's results in the digital age.

Theoretical Framework Diagram Linking the theories

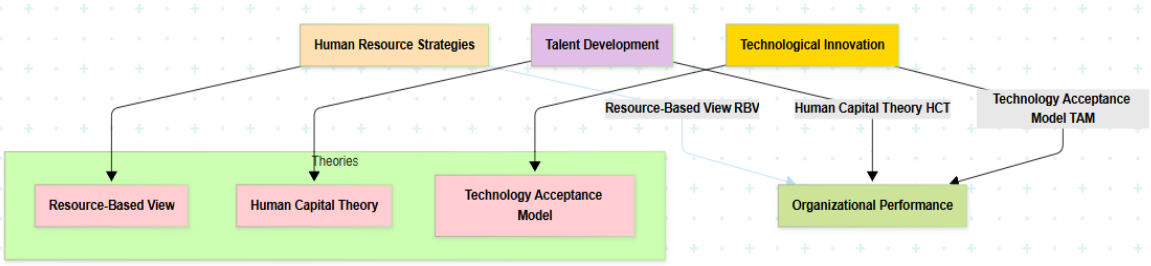

Figure 2.2: Theoretical Framework

Human Resource Strategies are studied using the Resource-Based View (RBV), suggesting that a firm's key resource and capability in human resources help contribute to better performance. For this reason, valuable and rare HR strategies are viewed as important resources that allow an organization to succeed and achieve higher performance rates. The study investigates this because it focuses on how strategic HR management supports organizational achievement. Talent Development is based on HCT which highlights that improving employees' abilities and skills supports both employee productivity and the company's overall results. The theory suggests that developing human capital on a continuing basis is very important for remaining competitive, so talent development plays a major role in predicting organizational performance in this study. TAM provides a useful explanation for how technological innovation affects people, by looking at how useful and comfortable they find it. Creating successful acceptance and implementation of new technology is key to improving workflows, operations and results in any organization. It explains how new technologies play a role in an organization's results by encouraging employees to adopt them.

2.3 Model of the Study

The conceptual model of the study represents the relationships between the Independent Variables (IVs) — *Technological Innovation*, *Management Information Systems*, and *Entrepreneurship Innovation* — and the Dependent Variable (DV) — *Sustainable Business Performance*. This model serves as a roadmap for the study, clarifying how the identified predictors are expected to influence business sustainability outcomes in the context of your research environment.

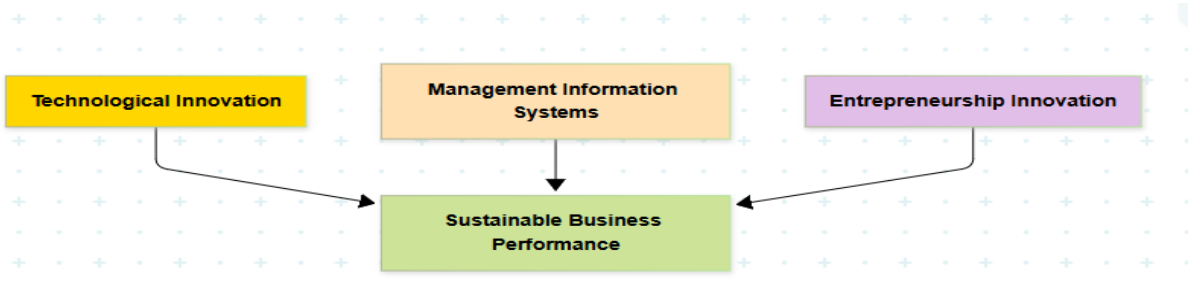

Figure 2.3: Conceptual Model of the Study

Technological Innovation is expected to enhance operational efficiency, market competitiveness, and customer satisfaction, contributing directly to sustainable business performance by ensuring that businesses can adapt and thrive in a digital economy.

Management Information Systems (MIS) provide timely, relevant, and accurate information to support decision-making processes, operational control, and strategic planning. Good MIS helps a company respond well to changes and saves resources, something vital for long-term survival. **Entrepreneurship Innovation** involves introducing new ideas, products, processes, or business models. As a result, a business can improve permanently, adapt to current trends and withstand challenges from rivals which ensures growth remains steady.

3.0 RESEARCH METHODOLOGY

This study adopts a conceptual research methodology, relying on an extensive review of existing literature, theoretical models, and previous empirical findings to develop a comprehensive framework linking Technological Innovation, Management Information Systems, and Entrepreneurship Innovation to Sustainable Business Performance. The study draws on information collected from journal articles, formal books, and popular online databases. By using conceptual thought and theory, the study explores the links between different variables and introduces a model that helps businesses resolve current digital problems. Because the purpose of the research is to build a theoretical structure, primary data were not collected, and field surveys were not done.

4.0 FINDINGS OF THE STUDY

Based on the comprehensive review of relevant literature, theoretical models, and conceptual analysis, the following key findings were established:

1. **Technological Innovation** plays a crucial role in enhancing sustainable business performance among SMEs by improving operational efficiency, product quality, and market competitiveness. This allows companies to change along with the market and provide what customers expect now. **2. Management Information Systems** (MIS) adoption significantly impacts sustainable business performance by facilitating informed decision-making, resource optimization, and effective business process management. Proper MIS increases accuracy of information, makes company's operations easier to monitor and improves the match between firms' strategies.

3. **Entrepreneurship Innovation** positively influences sustainable business performance by fostering creativity, new business models, and customer-focused solutions. Increasing business competition and resilience are made possible by using creative entrepreneurial methods. 4. The combined effect of Technological Innovation, MIS adoption, and Entrepreneurship Innovation creates a synergistic impact on sustainable business performance, positioning SMEs for long-term growth, operational excellence, and market leadership in the digital era.

5.0 RECOMMENDATIONS

In line with the research objectives, the following recommendations are proposed for SMEs and policymakers to enhance sustainable business performance:

1. SMEs should prioritize continuous investment in technological innovation by adopting modern tools, digital platforms, and smart technologies to improve operational efficiency, product quality, and market responsiveness.
2. SMEs should actively adopt and integrate Management Information Systems (MIS) to enhance decision-making processes, data management, and resource planning. Efforts are needed to increase the competency of staff in applying MIS technology.
3. They should develop a way of working that prioritizes creativity, helps new businesses grow, and designs products and services that answer what customers are looking for.
4. Policymakers, business support institutions, and SME operators should promote an integrated approach by combining technological innovation, MIS adoption, and entrepreneurship innovation within SMEs' strategic frameworks to ensure sustainable business growth, competitiveness, and resilience.

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