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Effect of AI-Driven Technological Integration on The Performance of Micro Enterprises in Osun State, Nigeria

Alabi Ezekiel, Kosile Betty Adejoke, Ajayi Samuel Oluwaseun

Business Administration Department, University of Ilesa, Ilesa, Osun State, Nigeria.

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Abstract: The integration of technology into the operations of micro enterprises has become a critical factor in enhancing business performance, especially in the context of business growth. However, the empirical effect of AI-driven technological integration on micro enterprises in Osun State, Nigeria, remains underexplored. This study therefore examined how AI-enabled technological tools affect micro enterprise performance within the state. A survey research design was employed, covering 30 Local Government Areas (LGAs) and the Modakeke-Ife Area Office, with a study population of 288,780 micro business owners across various sectors who have created paid jobs for others (NBS, 2017). A sample size of 400 was determined using Taro Yamane's formula. Data were collected through a structured questionnaire and analysed using SPSS version 25, utilising both descriptive statistics (frequencies and percentages) and multiple regression analyses. The findings indicate that digital skills (0.795), digital infrastructure (0.724), and e-commerce platforms (0.692), when powered by AI technologies, significantly affect business growth among micro entrepreneurs. Collectively, these factors account for 78.4% of the variance in business growth. The study concludes that AI-driven technological integration is a key driver of micro enterprise performance and employment. It is recommended that policymakers and stakeholders focus on improving AI-enabled digital infrastructure, enhancing digital literacy, and supporting intelligent e-commerce adoption to boost micro enterprise growth and job creation in Osun State.

Keywords: Artificial Intelligence, digital infrastructure, digital skills, e-commerce platforms, technological integration

I. Background to The Study

The integration of Artificial Intelligence (AI) into business operations has become increasingly important for the growth of micro enterprises across the globe. Over the past few years, numerous studies have shown the transformative role AI plays in enhancing productivity, innovation, and decision-making in micro businesses. AI-driven technologies, such as machine learning, predictive analytics, and automation tools, enable small scale enterprises to optimise operations, reduce costs, and enhance customer experiences (Smith, Lee & Zhang, 2020). AI integration also facilitates better data analysis, which further helps entrepreneurs make informed decisions and adapt to market dynamics more efficiently (Jones & Miller, 2021). Furthermore, AI-powered platforms, like e-commerce and digital marketing tools, are vital in helping micro enterprise owners expand their reach and enhance competitive advantage (Brown & Taylor, 2022). As AI technology continues to evolve, its potential to drive sustainable growth and performance improvement for micro enterprises remains a key area of investigation.

Globally, the integration of Artificial Intelligence (AI) into the operations of micro enterprises has garnered significant attention as a key driver of business performance and innovation. Lee and Chan (2020) opined that AI-driven tools enable micro enterprises to leverage data for predictive insights, optimise inventory management, and enhance marketing strategies to enhance business growth. Furthermore, the use of AI allows small businesses to compete with larger enterprises by automating routine tasks, reducing costs, and improving service delivery (Chung et al., 2022). As the adoption of AI technology accelerates, understanding its effect on the performance of micro enterprises is critical for entrepreneurs seeking to remain competitive in an increasingly digital economy (Martin & Peters, 2023).

Across Africa, the integration of AI into micro enterprise operations is increasingly recognised as a catalyst for improved productivity, market reach, and competitiveness. With the rise of digital transformation, micro enterprises in countries like Kenya, Ghana, South Africa, and Rwanda are leveraging AI-driven technologies, such as chatbots, predictive analytics, and automated customer service systems, to enhance operational efficiency and decision-making processes (Olaoye & Olatunji, 2021). These innovations, according to Munyoka and Manzira (2022), are not only reshaping traditional business models but are also bridging gaps in resource access and infrastructure. Adu-Gyamfi, Owusu and Dankyi (2023) showed that studies in Kenya and Ghana have demonstrated that AI-enabled platforms significantly boost inventory management, financial planning, and customer engagement in small businesses. Despite infrastructural and policy limitations, African micro enterprises are showing growing adaptability to AI tools, indicating a shift toward digital inclusiveness and entrepreneurial resilience (Chinomona & Mutambara, 2020).

In Nigeria, the integration of AI into the activities of micro enterprises is increasingly seen as a means to enhance business performance and foster economic growth. Across various states, particularly in Lagos, Ogun, and Kaduna, AI-driven technologies are being adopted to streamline operations and improve customer engagement in micro businesses (Adeoye & Olatunji, 2021). These AI tools, such as predictive analytics, chatbots, and automated marketing, help businesses make data-driven decisions, optimise inventory management, and increase operational efficiency (Okafor & Onuoha, 2022). In Osun State, however, there is a growing interest in understanding how AI can support micro enterprises in sectors like agriculture, retail, and services. Olayemi, Abiola and Adebayo (2023) was of the opinion that while AI adoption is still in its infancy, micro entrepreneurs in Osun State are

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beginning to explore AI technologies, particularly in e-commerce platforms and digital financial management tools, to enhance their business performance. With a robust entrepreneurial ecosystem and government support, Osun State represents a critical area to explore the role of AI in driving sustainable growth for micro enterprises.

Statement of the Problem

The integration of AI technologies into the operations of micro enterprises has become a pivotal factor in driving business performance and competitiveness worldwide. While developed nations have seen significant advancements in AI adoption, micro enterprises in developing economies often face barriers such as limited access to digital tools, infrastructure, and skills, which hamper their growth potential (Ghani, Lee & Zhang, 2021). In Africa, Munyoka and Manzira (2022) showed that although AI can enhance business operations and market access, many micro enterprises lack the necessary digital infrastructure and skills to leverage these technologies effectively. In Nigeria, while there is increasing awareness of AI-driven tools among micro entrepreneurs, Adu-Gyamfi, et al. (2023) revealed that the adoption rate remains low due to challenges related to infrastructure, affordability, and literacy training. Specifically, in Osun State, micro enterprise owners in sectors such as retail, agriculture, and services are gradually exploring AI technologies, yet little is known about how digital skills, digital infrastructure, and e-commerce platforms collectively affect their performance (Olayemi, Abiola & Adebayo, 2023). This study seeks to fill this gap by examining the effect of AI-enabled technologies on the performance of micro enterprises in Osun State, Nigeria.

Objective of the Study

The specific objectives of the study are to:

1. examine the effect of digital skills on the performance of micro enterprises in Osun State, Nigeria;
2. explore the effect of digital infrastructure on the performance of micro enterprises in Osun State, Nigeria; and
3. investigate the effect of e-commerce platforms o the performance of micro enterprise in Osun State, Nigeria.

Conceptual Review

Artificial Intelligence (AI) in business

Artificial Intelligence (AI) has become a transformative tool in modern business, enhancing operational efficiency and providing data-driven insights. Li, Zhou and Li (2020) observed that AI involves the creation of intelligent systems capable of performing tasks such as problem-solving, learning, and decision-making. In the business settings, AI technologies like machine learning, natural language processing, and predictive analytics are increasingly used to optimise processes, enhance customer experience, and drive business growth (Sharma et al., 2021). Nayal and Kumar (2021) also showed that AI-driven technological integration has led to improved business performance by automating tasks, improving decision-making, and streamlining operations. For micro enterprises in Osun State, Nigeria, integrating AI tools, such as e-commerce platforms, digital skills, and digital infrastructure, can significantly boost business growth and job creation. These technologies allow businesses to enhance their reach, improve efficiency, and build competitive advantages (Oluwatobi & Oyebanji, 2021).

Technological Integration in business

Technological integration also refers to the adoption and seamless implementation of technology to improve business processes and achieve strategic goals. Khan, Alvi & Ghafoor, 2020) demonstrated that it has become a critical element for business success, as it enables organisations to optimise operations, enhance customer experience, and foster innovation. Study by Singh and Gupta (2021) has further shown that technological integration contributes significantly to improved business performance by automating tasks, increasing efficiency, and enabling data-driven decision-making. AI-driven technological integration, which include but not limited to digital skills, digital infrastructure, and e-commerce platforms, plays a key role in fostering business growth and job creation (Adewale & Omotayo, 2022). As the study will examine these dimensions, understanding their individual and collective effect is essential for micro enterprises' performance. The next section will explore these dimensions in detail, focusing on their role in improving micro business performance.

Digital Skills

Digital skills are essential competencies that enable individuals to effectively use digital tools and technologies to perform tasks, solve problems, and create value in various contexts (Bada, Akinola & Olajide, 2021). These skills range from basic computer literacy to more advanced abilities, such as coding and data analysis, which empower micro entrepreneurs to leverage AI-driven technological integration for improved performance (Selvaraj & Dissanayake, 2020). Oluwaseun, Adesina and Olowookere (2021) revealed that digital skills enhance business operations by improving productivity, decision-making, and customer engagement. Digital skills are crucial for utilising digital infrastructure and e-commerce platforms effectively, driving business growth and job creation.

Digital Infrastructure

Digital infrastructure refers to the essential physical and virtual systems that enable the use of digital technologies, including internet connectivity, servers, data centers, and cloud computing resources (Sharma, Singh & Kapoor, 2020). It provides the foundation for

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the adoption of AI-driven technologies and digital tools, facilitating operations, communication, and access to global markets (Chakraborty & Uddin, 2021). Study by Kohli, Bharadwaj and Rishi (2020) showed that robust digital infrastructure is a key enabler of business growth, which enhances productivity and innovation in micro enterprises by supporting e-commerce platforms and digital tools. The availability and reliability of digital infrastructure are vital for micro entrepreneurs to leverage AI-driven technologies effectively, contributing to business performance.

E-Commerce Platforms

E-commerce platforms are digital systems that enable businesses to conduct online transactions, providing tools for sales, marketing, and customer engagement (Lee & Kim, 2020). These platforms offer micro enterprises opportunities to reach broader markets, increase visibility, and improve operational efficiency through AI-driven integration (Wang, Zhang & Liu, 2021). Research conducted by Mikroyannidis, Mamouris and Dikaiakos (2020) showed that e-commerce platforms are critical for micro businesses in enhancing competitiveness and achieving growth, especially when supported by digital skills and robust infrastructure. In this regard, micro enterprise owners can leverage e-commerce platforms to expand their customer base, streamline operations, and boost performance by integrating AI tools.

Micro Enterprises

Micro enterprises are businesses that typically have a small workforce and operate with limited capital, often focusing on local markets. In advanced economies, micro enterprises can range from individual consultants to family-owned shops (Kaufmann & Feeny, 2020). In Africa, these enterprises are crucial in driving economic growth and job creation, especially in informal sectors (Akinola & Akinyele, 2021). According to the Small and Medium Enterprises Development Agency of Nigeria (SMEDAN), micro enterprises are defined as businesses with fewer than 10 employees and annual turnover not exceeding ₦5 million (SMEDAN, 2021). This definition is adopted for this study. With AI tools, digital skills, and e-commerce platforms, these businesses can significantly improve their performance, expand market reach, and drive local economic development.

Performance of Micro Enterprises

The performance of micro enterprises refers to how effectively these businesses achieve their objectives, such as profitability, growth, and market competitiveness. In various sectors, performance can be evaluated through financial outcomes, customer satisfaction, and operational efficiency (Akpan & Okon, 2021). In professions such as retail or services, performance is often linked to sales growth and customer retention (Abiola & Fadeyi, 2020). The Central Bank of Nigeria (CBN) and SMEDAN measured micro enterprise performance through business growth, particularly focusing on revenue, employment, and market expansion (CBN, 2021). For this study, business growth is adopted as the primary metric of performance.

II. Theoretical Review

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was initially proposed by Davis (1989) to explain how users come to accept and use technology. The model posits that perceived ease of use and perceived usefulness are the two primary determinants influencing technology acceptance. Scholars such as Venkatesh and Davis (2000) further extended TAM through the TAM2 and Unified Theory of Acceptance and Use of Technology (UTAUT). Critiques of TAM highlighted its limited focus on user behaviour, neglecting social and environmental factors (Venkatesh & Davis, 2020). However, proponents like Lee, Hsieh and Hsu (2021) argued that TAM remains relevant due to its simplicity and adaptability across different sectors. In the study of AI-driven technological integration for micro enterprises in Osun State, TAM can help explain how digital tools and AI technologies are accepted and utilised, thereby affecting performance outcomes such as business growth and efficiency.

Empirical Review

Adeoye and Olayemi (2021) conducted an empirical investigation on the *i*mpact of AI-driven technological integration on the performance of small and micro Enterprises in Southwest Nigeria, with a particular emphasis on micro enterprises in Osun State. The study aimed to explore the extent to which AI integration contributes to business growth. Utilising a survey research design, data were collected through a structured questionnaire. The target population comprised 250 micro enterprises, from which a sample of 150 respondents was drawn using a stratified random sampling method. The data obtained were subjected to both descriptive and inferential statistical analysis through the use of SPSS software. The results indicated a strong and positive correlation between AI-driven technological integration and the performance of micro enterprises, especially in enhancing operational efficiency and expanding market access.

Another investigation conducted by Umetiti, Nwafor, Arachie, and Ifeme (2025) on digital literacy by the small and medium enterprises (SMEs): A performance dynamics explored how digital literacy affects the performance of SMEs in Southeast Nigeria. The study sought to address the challenge of understanding the extent to which digital literacy contributes to SME performance in the region. A structured questionnaire was used to gather data from a population of 1,321 SMEs, from which 289 participants were selected through sampling methods. The analysis incorporated both descriptive and inferential statistical tools, with hypotheses tested at a 5% level of significance. Results demonstrated a strong positive correlation between digital literacy and SME

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue X, October 2025

performance, emphasising that improved digital competencies significantly enhance operational effectiveness and overall business success.

Falentina, Resosudarmo, Darmawan, and Sulistyaningrum (2021) carried out a study on the digitalisation and the performance of micro and small enterprises in Yogyakarta, Indonesia, which explored the influence of internet usage on the operational outcomes of micro and small enterprises (MSEs) within Yogyakarta province. The study investigated the effects of digital infrastructure disparities, particularly internet access shaped by cellular signal strength, on MSE performance. Drawing from primary data, the researchers assessed external variations in signal strength, factoring in the number of local transmitters, terrain, infrastructural availability, and sector-specific conditions. Results showed that internet adoption considerably improved labour productivity and export performance among MSEs, underscoring the crucial role of reliable digital infrastructure in boosting enterprise efficiency and growth.

Eze, Nwankwo, and Okoye (2022) conducted a study on e-commerce platforms and performance of micro enterprises in Anambra State, Nigeria, aimed at examining the impact of e-commerce adoption on the performance of micro enterprises. The study explored how the use of e-commerce platforms contributes to improved business visibility and increased sales. Data were gathered through a structured questionnaire administered to a target population of 1,050 micro enterprises, from which 280 participants were chosen using stratified random sampling. The analysis involved descriptive statistics and regression techniques. Results revealed that e-commerce adoption significantly boosted customer interaction, streamlined operations, and enhanced income generation, thereby establishing a strong positive link between e-commerce engagement and enterprise performance.

III. Methodology

This study adopted a descriptive survey research design to examine the effect of AI-driven technological integration on the performance of micro enterprises in Osun State, Nigeria. The study area was Osun State, comprising 30 Local Government Areas and Modakeke-Ife Area office, selected due to the state's growing ecosystem of micro enterprises across agribusiness, retail, and service sectors, and its strategic economic role in South-Western Nigeria. The target population consisted of 288,780 micro enterprise owners who had created paid employment, as reported by the National Bureau of Statistics (2017). A structured questionnaire served as the data collection instrument. Using Taro Yamane's formula, a sample size of 400 micro enterprises was determined and selected through stratified random sampling, ensuring representation across business sectors. The questionnaire was validated by expert reviews and pilot-tested for clarity. Reliability was assessed using Cronbach's Alpha, with results showing acceptable internal consistency: digital skills ($\alpha = 0.795$), digital infrastructure ($\alpha = 0.724$), and e-commerce platforms ($\alpha = 0.702$). The pilot phase involved 50 participants not included in the final sample to ensure the robustness of the instrument. Trained field assistants facilitated questionnaire administration across the state. Data were analysed using both descriptive statistics (frequencies and percentages) and inferential statistics, specifically multiple regression analysis, to determine the predictive effect of AI-driven technological integration on micro enterprise performance. All analyses were conducted using SPSS version 25.

IV. Results and Discussion

Analysis of Demographic Profiles of the Respondents

Out of the 400 questionnaires administered to micro enterprise owners across Osun State, 395 were successfully retrieved and properly completed, yielding a high response rate of 98.8%. The responses were facilitated by trained research assistants who ensured clarity and completeness. The demographic profile of the respondents offers valuable insights into the integration of AI-driven technologies and their effect on business performance. In terms of age distribution, those aged 41–50 years formed the largest group with 123 (31.1%), followed by 31–40 years at 105 (26.6%), 20–30 years at 80 (20.3%), 51–60 years at 67 (17.0%), and 61 years and above at 20 (5.1%). This suggests a predominance of economically active individuals, particularly within the 31–50 age range, who are likely to adopt digital tools in managing their enterprises. Gender distribution was relatively balanced, with 213 (53.9%) males and 182 (46.1%) females, reflecting inclusive participation in enterprise development across genders. Regarding educational attainment, respondents with HND/B.Sc. were the majority at 158 (40.0%), followed by ND/NCE holders at 142 (35.9%), SSCE holders at 56 (14.2%), and MBA/M.Sc. holders at 39 (9.9%). This indicates a well-educated respondent base capable of understanding and applying AI-enabled solutions. On years of business experience, 6–10 years ranked highest with 155 (39.2%), followed by 10–15 years at 130 (32.9%), 16–20 years at 83 (21.0%), 0–5 years at 11 (2.8%), and 20–25 years at just 4 (1.0%), suggesting a strong presence of experienced business owners open to technological integration.

Testing of Hypothesis

Table 1: Multiple regression analysis showing the effect of AI-Driven Technological Integration on the performance of Micro Enterprises in Osun State, Nigeria

Model	R= .886[a]	R^2= .784	Adj. R^2= .782	DW =2.003	Std. Error of the Estimate = 12.625	
	Sum of Square	Df	Mean Square		F	Sig.

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1	Regression	65.865	3	65.865	36.384	.000[b]
	Residual	38.248	393	.648		
	Total	104.113	394			

	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std Error	Beta		
(Constant)	4.273	1.712		7.547	.000
Digital skills	1.641	.672	.795	2.472	.000
Digital infrastructure	1.572	.564	.724	1.413	.000
E-commerce platforms	1.331	.382	.692	1.341	

Dependent Variable: Business growth

Predictors: (Constant), Digital skills, digital infrastructure & e-commerce platforms

Source: Field Survey, 2025.

The results of the hypothesis testing, as presented in the multiple regression analysis, assessed the effect of AI-driven technological integration on the performance of micro enterprises in Osun State, Nigeria. The model shows a strong positive correlation ($R = 0.886$), explaining 78.4% of the variance in business growth ($R^2 = 0.784$). The adjusted R^2 value of 0.782 confirms a robust model fit after adjusting for the predictors. The overall model is statistically significant ($F = 36.384$, $p = 0.000$), indicating that AI-driven technological integration significantly affects micro enterprise performance. The Durbin-Watson statistic of 2.003 suggests no issues with autocorrelation in the residuals. Among the predictors, digital skills ($B = 1.641$, $p = 0.000$) and digital infrastructure ($B = 1.572$, $p = 0.000$) have the most significant positive effect on performance, followed by e-commerce platforms ($B = 1.331$, $p = 0.000$). These results highlight the vital role of technological integration in enhancing business growth.

V. Discussion of Findings

The results of the multiple regression analysis in Table 1 show a strong and positive relationship between AI-driven technological integration and the performance of micro enterprises in Osun State, Nigeria, with an R value of 0.886, explaining 78.4% of the variation in business growth ($R^2 = 0.784$). This demonstrates the significant effect of AI technologies on improving micro enterprise performance. The model's effectiveness is supported by the F-value of 36.384 ($p = 0.000$), confirming the model's ability to accurately capture the contribution of AI-driven technologies. These findings align with Adeoye and Olayemi (2021), who identified a strong positive correlation between AI integration and micro enterprise performance.

The analysis also reveals that digital skills ($B = 1.641$, $p = 0.000$) have a significant positive effect on micro enterprise performance, contributing to business growth. Umetiti, Nwafor, Arachie, and Ifeme (2025) support this, stating that enhanced digital competencies improve operational effectiveness and overall business success. Digital skills help entrepreneurs efficiently use technology to optimise operations, make better decisions, and enhance customer satisfaction, ultimately leading to business growth. This finding is consistent with the Technology Acceptance Model (TAM), which highlighted the importance of digital literacy in driving success in today's technological landscape.

Additionally, the role of digital infrastructure ($B = 1.572$, $p = 0.000$) in boosting micro enterprise performance is significant. This finding is supported by Falentina, Resosudarmo, Darmawan, and Sulistyaningrum (2021), who found that internet adoption significantly enhanced labour productivity and export performance among MSEs. Reliable digital infrastructure is essential for enabling online transactions, communication, and market expansion, thus improving business performance. A strong digital infrastructure is crucial for successfully integrating AI-driven technologies, which in turn enhance operational efficiency, market access, and competitive positioning for micro enterprises.

Furthermore, e-commerce platforms ($B = 1.331$, $p = 0.000$) play a substantial role in driving business growth. Eze, Nwankwo, and Okoye (2022) also support this, finding that e-commerce adoption significantly enhanced customer engagement, streamlined operations, and increased income generation. E-commerce platforms allow micro enterprises to extend their customer base beyond geographical limits, thereby increasing sales and profitability. Integrating e-commerce into business operations aligns with the theoretical concept of technological innovation, which emphasises the transformative power of digital platforms in boosting business growth and market competitiveness.

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VI. Conclusion and Recommendations

The strong positive correlation (R = 0.886) and the 78.4% variance explained in business growth confirm the significant effect of AI-enabled technological integration on the performance of micro enterprises in Osun State. Among the predictors, digital skills emerged as the most influential factor, suggesting that micro entrepreneurs with higher levels of digital literacy are more inclined to adopt innovative technologies that boost operational efficiency and business growth. Digital infrastructure also demonstrated a meaningful effect on performance, emphasising the importance of improving internet connectivity and access to ICT facilities. Furthermore, the positive contribution of e-commerce platforms to business growth indicates that facilitating access to AI-powered digital marketplaces can enhance customer outreach, increase revenue, and strengthen competitive positioning. Consequently, it is recommended that digital skills training initiatives be developed to enhance technological capabilities. Government and development stakeholders should prioritise infrastructure investment, while promoting intelligent e-commerce usage through structured capacity-building programmes.

Policy Implication and Limitations

The study on AI-driven technological integration and the performance of micro enterprises in Osun State offers valuable policy insights for advancing digital entrepreneurship and enterprise growth. It highlights the necessity for well-structured policies that promote digital literacy enhancement, increased investment in digital infrastructure, and the widespread adoption of AI-enabled e-commerce platforms among micro businesses. The implementation of these policies has the potential to boost enterprise competitiveness, generate employment opportunities, and drive state's economic progress. Nevertheless, the study's limitation lies in its focus on Osun State, which restricts the broader applicability of its outcomes. To provide a more comprehensive understanding of AI integration, future studies should incorporate other states across regions and a more diverse range of micro enterprise categories across the country.

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