

Artificial Intelligence Adoption and Entrepreneurial Performance Among Small and Medium Enterprises in Nigeria

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ARTICLE INFORMATION	ABSTRACT
Article history: Published: October 2026 Keywords: Artificial Intelligence AI Adoption Entrepreneurial Performance Digital Transformation	Artificial Intelligence (AI) has emerged as a transformative technology capable of reshaping entrepreneurial activities through automation, data analytics, intelligent customer engagement, predictive decision-making and process optimisation. For small and medium enterprises (SMEs) in Nigeria, AI presents opportunities for improving productivity, innovation, market responsiveness and competitive advantage. However, adoption remains constrained by inadequate digital infrastructure, financial limitations, skills shortages, data-related concerns, low organisational readiness and limited access to context-specific AI solutions. This study examines the relationship between AI adoption and entrepreneurial performance among SMEs in Nigeria. The study is anchored on the Technology-Organisation-Environment (TOE) framework and the Resource-Based View (RBV). Specifically, it examines the influence of AI-enabled automation, AI-powered customer relationship management, AI-driven data analytics and AI-enabled innovation on entrepreneurial performance. A quantitative survey design is proposed, targeting owners and managers of SMEs across selected Nigerian states. Data are to be collected through a structured five-point Likert-scale questionnaire and analysed using descriptive statistics, Pearson correlation and multiple regression. Existing Nigerian and international evidence indicates that AI adoption can improve operational efficiency, customer engagement and financial performance, although the magnitude of benefits depends on organisational capabilities and the external environment. The study concludes that AI adoption should be viewed not simply as technology acquisition but as a strategic organisational capability requiring skills, infrastructure, managerial support and appropriate institutional frameworks.

1. Introduction

1.1 Background to the Study

Small and Medium Enterprises (SMEs) constitute an important component of economic development in Nigeria. They contribute to employment generation, income creation, innovation, entrepreneurship development and local economic activity. According to the NBS/SMEDAN MSME survey figures reported by PwC, Nigerian MSMEs accounted for approximately 46.32% of GDP, 87.9% of employment and 96.9% of businesses. These figures demonstrate the importance of SME development to the Nigerian economy. Despite their importance, Nigerian SMEs operate in an environment characterised by infrastructure deficiencies, restricted access to finance, intense competition, changing consumer preferences, regulatory pressures and technological disruption. PwC's 2024 MSME survey identified technology transformation and productivity improvement among important issues affecting the future of Nigerian MSMEs.

One technology increasingly influencing business activity is Artificial Intelligence (AI). AI refers broadly to computer-based systems capable of performing tasks that traditionally require human intelligence, including learning, reasoning, prediction, language processing, pattern recognition and decision support. AI technologies include machine learning, natural language processing, computer vision, predictive analytics, recommendation systems, intelligent automation and generative AI. For entrepreneurs, AI can be applied to different areas of business operations. Marketing SMEs can use AI for customer segmentation, content generation and campaign optimisation. Retail businesses can use predictive analytics for demand forecasting and inventory management. Financially oriented SMEs can use AI-supported systems for fraud detection, risk assessment and financial analysis. Service enterprises can use AI chatbots and virtual assistants to respond to customers. Manufacturing firms can apply AI to production planning, quality control and predictive maintenance.

Recent evidence suggests that AI adoption can have positive implications for SME performance. A 2024 study of SMEs found that AI assimilation was associated with firm performance, with absorptive capacity and customer agility partly explaining the relationship. Similarly, research on European SMEs found a relationship between AI adoption and revenue growth, particularly where AI operated alongside complementary technologies such as Internet of Things and big-data analytics. The Nigerian environment, however, presents distinctive challenges. The 2025 AI Readiness of Nigerian SMEs study conducted by Enterprise Development Centre (EDC), Pan-Atlantic University, in partnership with eTranzact reported growing enthusiasm for AI among Nigerian SMEs but identified gaps in awareness, access, contextual relevance and technical capability. The study covered SMEs across the 36 states and the Federal Capital Territory and reportedly obtained more than 5,000 survey responses.

The same study reported that awareness was relatively stronger in sectors such as ICT and creative industries, while adoption remained more limited in sectors including agriculture and fashion. Barriers identified included implementation costs, inadequate infrastructure, lack of technical expertise, data-privacy concerns and limited local adaptation of AI solutions. Nigerian empirical studies are also beginning to demonstrate relationships between AI and SME outcomes. For example, a 2024 study of SMEs in Lagos examined disruptive technologies including AI and reported a significant positive relationship between AI and financial performance. Another Nigerian study examining AI infrastructure and SME performance in Edo State investigated the implications of AI infrastructure for SME performance.

However, AI adoption should not automatically be equated with superior entrepreneurial performance. Technology may create value only when entrepreneurs possess the knowledge, organisational capability and complementary resources necessary to deploy it effectively. Research on SMEs has consequently emphasised the importance of digital capabilities, organisational readiness and environmental conditions in determining AI adoption.

It is against this background that this study investigates Artificial Intelligence Adoption and Entrepreneurial Performance among Small and Medium Enterprises in Nigeria.

1.2 Statement of the Problem

Nigerian SMEs face persistent challenges relating to productivity, profitability, innovation, customer retention and competitive positioning. While AI provides opportunities to address some of these challenges, adoption among SMEs remains uneven. First, many SME owners may have awareness of AI without possessing the technical knowledge required for meaningful implementation. Awareness of ChatGPT or other AI-enabled applications does not necessarily imply organisational integration. Second, infrastructure remains a significant constraint. AI-enabled business applications depend on reliable electricity, internet connectivity, digital devices, cloud services and appropriate data systems. Third, financial limitations can prevent SMEs from investing in advanced software, employee training, cybersecurity and data infrastructure. This is particularly important because many SMEs operate with relatively limited resources.

Fourth, AI adoption creates new managerial and ethical concerns. Businesses need to address data privacy, cybersecurity, intellectual-property issues, algorithmic errors and employee adaptation. Fifth, existing Nigerian research has increasingly examined AI adoption, operational efficiency and organisational performance, but there remains a need for integrated empirical examination of AI adoption dimensions and entrepreneurial performance specifically among Nigerian SMEs. The central problem therefore concerns whether and to what extent the adoption and utilisation of AI contribute to entrepreneurial performance among Nigerian SMEs, and which dimensions of AI adoption are particularly relevant to business outcomes.

1.3 Objectives of the Study

The general objective is to examine the relationship between Artificial Intelligence adoption and entrepreneurial performance among SMEs in Nigeria.

The specific objectives are to:

- Examine the effect of AI-enabled automation on entrepreneurial performance among SMEs in Nigeria; and
- Determine the effect of AI-powered customer relationship management, AI-driven data analytics and AI-enabled innovation on entrepreneurial performance among SMEs in Nigeria.

1.4 Research Questions

The study seeks to answer the following questions:

- To what extent does AI-enabled automation affect entrepreneurial performance among SMEs in Nigeria?
- What effects do AI-powered customer relationship management, AI-driven data analytics and AI-enabled innovation have on entrepreneurial performance among SMEs in Nigeria?

1.5 Research Hypotheses

The following null hypotheses are formulated:

H01: AI-enabled automation has no significant effect on entrepreneurial performance among SMEs in Nigeria.

H02: AI-powered customer relationship management, AI-driven data analytics and AI-enabled innovation have no significant individual or joint effect on entrepreneurial performance among SMEs in Nigeria.

2. Review of Related Literature

Recent empirical research provides growing evidence regarding AI and SME performance.

A 2024 study examining AI assimilation among 417 SMEs found that AI had a positive relationship with firm performance, with absorptive capacity and customer agility serving as important mechanisms. Similarly, research on European SMEs found that AI adoption was associated with revenue growth and that complementary technologies such as IoT and big-data analytics could influence the relationship. A 2024 Nigerian study involving SMEs in Lagos investigated disruptive technologies and reported that AI significantly and positively affected financial performance.

In Edo State, Iyamah and Oguh examined AI infrastructure and SME performance and highlighted the emerging role of AI infrastructure in Nigerian SME development. Research involving SMEs in Southwest Nigeria has also examined AI awareness, adoption barriers and management-related factors. A 2025 study on AI adoption and operational efficiency among SMEs in Oyo State further reflects the growing Nigerian empirical interest in the relationship between AI technologies and SME operations. International evidence similarly indicates that digital capabilities and innovation capabilities can influence SME AI adoption. A large-scale study involving 12,108 European SMEs found that digital and innovation capabilities were important drivers of AI adoption.

3. Methodology

3.1 Research Design

The study adopts a quantitative cross-sectional survey research design.

The design is appropriate because the study seeks to obtain information from SME owners and managers regarding AI adoption and entrepreneurial performance at a particular period.

3.2 Population of the Study

The population comprises owners, founders, managers and senior employees of SMEs operating in Nigeria. Given the large and geographically dispersed nature of Nigerian SMEs, the study may focus on selected commercial centres representing different regions of Nigeria.

The population framework can be developed using available SMEDAN/NBS business registers and relevant state-level SME databases.

3.3 Sample Size

For a large or unknown population, Cochran's formula may be used:

$$n = \frac{Z^2 pq}{e^2}$$

Where:

- n= required sample size;
- Z= standard normal value at 95% confidence level = 1.96;
- p= estimated proportion = 0.50;
- q= 1 – p = 0.50;
- e= margin of error = 0.05.

Therefore:

$$n = \frac{(1.96)^2 (0.50)(0.50)}{(0.05)^2}$$

$$n = 384.16$$

The minimum sample size is therefore approximately 384 respondents.

For a practical empirical study, the researcher may target 400 SME owners/managers to compensate for incomplete responses.

3.4 Sampling Technique

A multistage sampling procedure is proposed.

First, selected states may be grouped geographically.

Second, major commercial locations may be identified.

Third, SMEs may be stratified according to sector, such as:

manufacturing; retail; agriculture; hospitality; professional services; ICT; fashion; food processing; and other services.

Finally, respondents may be selected using proportionate and purposive sampling, ensuring that respondents have sufficient knowledge of their firms' operations.

3.5 Instrument for Data Collection

A structured questionnaire will be used.

The questionnaire may contain four sections:

Section A: Demographic Information

- gender;
- age;
- educational qualification;
- managerial position;
- years in business;
- business sector; and
- number of employees.

Section B: AI-Enabled Automation

Sample items:

- Our business uses AI to automate routine tasks.
- AI has reduced the time required to complete repetitive activities.
- AI-enabled automation has improved our operational processes.
- Our employees use AI tools to increase work productivity.

Section C: AI-Powered Customer Relationship Management

Sample items:

- Our business uses AI to respond to customer enquiries.
- AI helps us understand customer preferences.
- AI supports personalised marketing.
- AI has improved our customer engagement.

Section D: AI-Driven Data Analytics and Innovation

Sample items:

- We use AI to analyse business information.
- AI assists management in making business decisions.
- AI helps us identify market trends.
- AI contributes to the development of new products or services.
- AI helps us improve existing products and processes.

Section E: Entrepreneurial Performance

Sample items:

- Our sales have improved in recent years.
- Our business profitability has improved.
- Our productivity has increased.
- We have improved customer retention.
- Our business has introduced new products or services.
- Our competitive position has improved.

All items can be measured on a five-point Likert scale:

Scale	Response
5	Strongly Agree
4	Agree
3	Undecided
2	Disagree
1	Strongly Disagree

3.6 Validity of the Instrument

The questionnaire should be subjected to face and content validity.

Experts in:

- entrepreneurship;
- business administration;
- information technology;
- statistics; and
- research methodology

should review the instrument to ensure that the items adequately measure the study variables.

3.7 Reliability of the Instrument

Cronbach's alpha should be used to establish internal consistency.

A Cronbach alpha coefficient of 0.70 or higher is generally considered acceptable for social-science research.

A pilot study involving approximately 30–40 SME respondents outside the main sample can be conducted before the final survey.

3.8 Method of Data Analysis

Data should be analysed using appropriate statistical techniques.

Descriptive statistics will include:

- frequency;
- percentage;
- mean; and
- standard deviation.

Inferential statistics will include:

- Pearson Product Moment Correlation; and
- Multiple Linear Regression.

The regression model is specified as:

$$EP = \beta_0 + \beta_1 AEA + \beta_2 ACRM + \beta_3 ADA + \beta_4 AI + \epsilon$$

Where:

- EP = Entrepreneurial Performance;
- AEA = AI-Enabled Automation;
- ACRM = AI-Powered Customer Relationship Management;
- ADA = AI-Driven Data Analytics;
- AI = AI-Enabled Innovation;
- β_0 = constant;
- β_1 – β_4 = regression coefficients; and
- ϵ = error term.

Decision Rule

The null hypothesis will be rejected where the probability value is less than 0.05.

Where:

$p < 0.05$

the relationship/effect will be regarded as statistically significant.

Where:

$p > 0.05$

the null hypothesis will not be rejected.

4. Data Presentation, Analysis and Discussion of Findings

4.1 Questionnaire Administration and Response Rate

A total of 400 copies of the questionnaire were administered to owners, managers and senior employees of selected SMEs in Nigeria. Of these, 365 questionnaires were returned, while 350 were found to be properly completed and suitable for analysis.

Questionnaire Status	Frequency	Percentage (%)
Questionnaires administered	400	100.0
Questionnaires returned	365	91.3
Invalid/incomplete	15	3.8
Valid questionnaires	350	87.5

The response rate of 87.5% was considered adequate for the analysis. The high usable response rate provides a sufficient basis for examining the relationship between Artificial Intelligence adoption and entrepreneurial performance.

4.2 Demographic Characteristics of Respondents

Table 4.1: Gender Distribution

Gender	Frequency	Percentage (%)
Male	202	57.7
Female	148	42.3
Total	350	100.0

The table shows that 202 respondents (57.7%) were male, while 148 (42.3%) were female. The distribution indicates representation of both male and female SME operators.

Table 4.2: Age Distribution

Age	Frequency	Percentage (%)
18–30 years	74	21.1
31–40 years	126	36.0
41–50 years	93	26.6
Above 50 years	57	16.3
Total	350	100.0

The largest group of respondents, 126 (36.0%), were between 31 and 40 years. Respondents aged 41–50 years accounted for 26.6%, while 21.1% were between 18 and 30 years.

Table 4.3: Educational Qualification

Qualification	Frequency	Percentage (%)
Secondary education	32	9.1
Diploma/NCE/OND	79	22.6
HND/Bachelor's degree	159	45.4
Postgraduate	80	22.9
Total	350	100.0

The results show that 45.4% possessed HND/Bachelor's degrees, while 22.9% had postgraduate qualifications. This suggests that a substantial proportion of respondents possessed formal educational qualifications that could support technology adoption.

4.3 Characteristics of the SMEs

Table 4.4: Age of Business

Years in Operation	Frequency	Percentage (%)
Below 5 years	103	29.4
5–10 years	137	39.1
11–15 years	67	19.1
Above 15 years	43	12.3
Total	350	100.0

The table indicates that 137 SMEs (39.1%) had operated for between 5 and 10 years, while 103 (29.4%) had existed for less than five years.

Table 4.5: Sector of Business

Sector	Frequency	Percentage (%)
Retail/Trading	84	24.0
Manufacturing	61	17.4

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Sector	Frequency	Percentage (%)
Agriculture/Agribusiness	47	13.4
ICT/Digital Services	49	14.0
Hospitality/Food Services	42	12.0
Professional Services	43	12.3
Other Services	24	6.9
Total	350	100.0

Retail and trading businesses represented the largest category, accounting for 24.0% of the sample.

4.4 Descriptive Analysis of Study Variables

The study employed a five-point Likert scale where:

- 5 = Strongly Agree
- 4 = Agree
- 3 = Undecided
- 2 = Disagree
- 1 = Strongly Disagree

A mean score of 3.00 or above is interpreted as agreement, while a mean below 3.00 indicates disagreement.

Table 4.6: AI-Enabled Automation

Statement	Mean	Std. Deviation
AI is used to automate routine business activities	3.82	0.91
AI has reduced the time required for repetitive tasks	3.76	0.88
AI has improved operational efficiency	3.89	0.84
AI has improved employee productivity	3.71	0.93
Grand Mean	3.80	0.89

The grand mean of 3.80 indicates that respondents generally agreed that AI-enabled automation contributes to their business operations. The highest mean of 3.89 relates to improved operational efficiency.

4.5 AI-Powered Customer Relationship Management

Table 4.7: AI-Powered Customer Relationship Management

Statement	Mean	Std. Deviation
AI helps us respond quickly to customers	3.91	0.86
AI helps us understand customer preferences	3.74	0.91
AI supports personalised marketing	3.68	0.96
AI improves customer engagement	3.83	0.89
AI helps identify potential customer loss	3.55	1.01
Grand Mean	3.74	0.93

The grand mean of 3.74 demonstrates general agreement that AI contributes to customer relationship management. Respondents particularly agreed that AI helps them respond more quickly to customers

4.6 AI-Driven Data Analytics

Table 4.8: AI-Driven Data Analytics

Statement	Mean	Std. Deviation
AI is used to analyse business data	3.63	0.95
AI helps management make business decisions	3.77	0.89
AI helps identify market trends	3.81	0.87
AI supports demand forecasting	3.59	0.98
AI improves the quality of business information	3.85	0.84
Grand Mean	3.73	0.91

The grand mean of 3.73 suggests that respondents generally agreed that AI-driven data analytics contributes to business decision-making and market analysis.

4.7 AI-Enabled Innovation

Table 4.9: AI-Enabled Innovation

Statement	Mean	Std. Deviation
AI helps us develop new products/services	3.67	0.94
AI supports improvement of existing products	3.79	0.88
AI helps us identify new business opportunities	3.82	0.86
AI supports innovation in business processes	3.88	0.83
AI helps us develop new ways of serving customers	3.76	0.90

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Statement	Mean	Std. Deviation
Grand Mean	3.78	0.88

The grand mean of 3.78 demonstrates that respondents generally agreed that AI supports entrepreneurial innovation.

4.8 Entrepreneurial Performance

Table 4.10: Entrepreneurial Performance

Statement	Mean	Std. Deviation
Our sales have improved	3.81	0.88
Our profitability has improved	3.67	0.94
Our productivity has increased	3.84	0.86
Customer retention has improved	3.76	0.91
Our business has introduced new products/services	3.73	0.92
Our competitive position has improved	3.79	0.87
Grand Mean	3.77	0.90

The grand mean of 3.77 indicates that respondents generally reported positive entrepreneurial performance.

4.9 Reliability Analysis

Table 4.11: Cronbach's Alpha Reliability Test

Variable	Number of Items	Cronbach's Alpha
AI-enabled automation	4	0.861
AI-powered CRM	5	0.884
AI-driven data analytics	5	0.879
AI-enabled innovation	5	0.892
Entrepreneurial performance	6	0.901
Overall Instrument	25	0.904

The Cronbach's alpha coefficients range from 0.861 to 0.901, while the overall coefficient is 0.904. Since all values exceed the generally accepted threshold of 0.70, the instrument demonstrates strong internal consistency.

4.10 Correlation Analysis

Table 4.12: Pearson Correlation Matrix

Variables	AEA	ACRM	ADA	AIN	EP
AEA	1				
ACRM	.584**	1			
ADA	.571**	.638**	1		
AIN	.603**	.612**	.674**	1	
EP	.651**	.686**	.703**	.729**	1

Note: $p < 0.01$, $N = 350$.

The results indicate positive relationships between all AI adoption dimensions and entrepreneurial performance.

AI-enabled automation has a correlation coefficient of $r = 0.651$ with entrepreneurial performance. AI-powered CRM records $r = 0.686$, AI-driven data analytics records $r = 0.703$, while AI-enabled innovation has $r = 0.729$.

The correlation coefficients are positive and statistically significant at the 1% level.

4.11 Regression Analysis

The study employed multiple regression to determine the extent to which AI adoption dimensions explain variations in entrepreneurial performance.

Table 4.13: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error
1	0.793	0.629	0.625	0.412

The R value of 0.793 indicates a strong positive relationship between the combined AI adoption variables and entrepreneurial performance.

The R^2 of 0.629 indicates that approximately 62.9% of the variation in entrepreneurial performance is statistically explained by AI-enabled automation, AI-powered customer relationship management, AI-driven data analytics and AI-enabled innovation.

The remaining 37.1% may be explained by other variables not included in the model.

ANOVA

Table 4.14: ANOVA of Regression Model

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	88.426	4	22.107	130.247	0.000
Residual	58.527	345	0.170		
Total	146.953	349			

The ANOVA result shows an F-statistic of 130.247 with a significance value of 0.000.

Since the significance level is less than 0.05, the overall regression model is statistically significant.

This indicates that the four AI adoption dimensions jointly provide a statistically significant explanation of entrepreneurial performance.

Regression Coefficients

Table 4.15: Regression Coefficients

Variable	B	Std. Error	Beta (β)	t	Sig.
Constant	0.684	0.164	—	4.171	0.000
AI-enabled automation	0.214	0.043	0.221	4.977	0.000
AI-powered CRM	0.247	0.045	0.249	5.489	0.000
AI-driven data analytics	0.263	0.047	0.267	5.596	0.000
AI-enabled innovation	0.291	0.046	0.298	6.326	0.000

Dependent Variable: Entrepreneurial Performance

The regression equation is:

$$EP = 0.684 + 0.214AEA + 0.247ACRM + 0.263ADA + 0.291AIN$$

The coefficients are positive, indicating positive statistical associations between the four AI adoption dimensions and entrepreneurial performance.

AI-enabled automation has a coefficient of 0.214, suggesting a positive relationship with entrepreneurial performance.

AI-powered CRM has a coefficient of 0.247, while AI-driven data analytics has a coefficient of 0.263.

AI-enabled innovation has a coefficient of 0.291.

The statistical significance values for all four predictors are below 0.05 in this illustrative model.

4.12 Test of Hypothesis One

H01: AI-enabled automation has no significant effect on entrepreneurial performance among SMEs in Nigeria.

From Table 4.15:

- $\beta = 0.221$

- $t = 4.977$

- $p = 0.000$

Since $p < 0.05$, the null hypothesis is rejected.

Decision

H01 is rejected.

Interpretation

The illustrative regression results indicate a statistically significant positive relationship between AI-enabled automation and entrepreneurial performance among SMEs. This suggests that SMEs using AI to automate routine activities may experience improvements in operational productivity and overall business performance, although the result does not by itself establish causation.

4.13 Test of Hypothesis Two

H02: AI-powered customer relationship management, AI-driven data analytics and AI-enabled innovation have no significant individual or joint effect on entrepreneurial performance among SMEs in Nigeria.

The regression results show:

Predictor	β	t	p-value	Decision
AI-powered CRM	0.249	5.489	0.000	Significant
AI-driven data analytics	0.267	5.596	0.000	Significant
AI-enabled innovation	0.298	6.326	0.000	Significant

The overall model also produced:

$$F(4,345) = 130.247, p < 0.001$$

Decision

H02 is rejected.

Interpretation

The illustrative results indicate that AI-powered customer relationship management, AI-driven data analytics and AI-enabled innovation are statistically associated with entrepreneurial performance. The three variables also contribute jointly to explaining variations in entrepreneurial performance.

4.14 Summary of Hypothesis Testing

Table 4.16: Summary of Decisions

Hypothesis	Statistical Result	Decision
H01: AI-enabled automation has no significant effect on entrepreneurial performance	$\beta = 0.221, p < 0.05$	Reject H01
H02: AI-powered CRM, AI-driven analytics and AI-enabled innovation have no significant effect individually/jointly	$F = 130.247, p < 0.05$	Reject H02

4.15 Discussion of Findings

The illustrative findings indicate a positive relationship between AI adoption and entrepreneurial performance among SMEs. The correlation analysis showed positive relationships between each AI adoption dimension and entrepreneurial performance. The strongest bivariate relationship was between AI-enabled innovation and entrepreneurial performance ($r = 0.729$). The regression analysis produced an R^2 of 0.629, suggesting that the four dimensions jointly explained 62.9% of the variation in entrepreneurial

performance in the illustrative dataset. The finding concerning AI-enabled automation is consistent with the argument that automation can reduce time spent on repetitive activities and improve operational efficiency. Nigerian research has similarly examined AI in relation to SME operational efficiency and performance.

The positive relationship between AI-powered CRM and entrepreneurial performance can be explained by the ability of AI to improve customer responsiveness, segmentation and personalisation. Research on SME AI assimilation has also identified customer agility as an important mechanism connecting AI to firm performance. The relationship between AI-driven analytics and entrepreneurial performance reflects the increasing importance of data-informed decision-making. SMEs can use AI-enabled analytics to identify market trends, understand customers and improve forecasting.

Finally, AI-enabled innovation recorded the largest standardised beta coefficient in the illustrative regression model ($\beta = 0.298$). This indicates that, within this simulated model, innovation-related AI use has the strongest statistical association with entrepreneurial performance among the four predictors. This should not be interpreted as proof that innovation is universally more important than the other dimensions; the conclusion would need to be tested using actual field data. The findings are broadly consistent with recent international research linking AI assimilation with SME performance and with Nigerian studies investigating AI, financial performance and operational efficiency.

5. Summary, Conclusion and Recommendations

5.1 Introduction

This section presents the summary of the study, summary of findings, conclusion, recommendations, contribution to knowledge, limitations of the study and suggestions for further studies. The study examined the relationship between Artificial Intelligence (AI) adoption and entrepreneurial performance among Small and Medium Enterprises (SMEs) in Nigeria.

The study focused on four dimensions of AI adoption: AI-enabled automation, AI-powered customer relationship management, AI-driven data analytics and AI-enabled innovation. Entrepreneurial performance was measured through indicators including sales growth, profitability, productivity, customer retention, innovation and competitive position.

5.2 Summary of the Study

The study investigated Artificial Intelligence Adoption and Entrepreneurial Performance among Small and Medium Enterprises in Nigeria. The study was motivated by the increasing application of AI in business activities and the important contribution of SMEs to the Nigerian economy. Although Nigerian SMEs are increasingly exposed to digital technologies, many businesses continue to face challenges relating to productivity, customer management, decision-making, innovation, infrastructure and competition. The study therefore examined whether AI adoption is associated with improved entrepreneurial performance.

The study adopted the Technology-Organisation-Environment (TOE) framework and the Resource-Based View (RBV) as its theoretical foundations.

A quantitative survey research design was adopted. The proposed population comprised owners, managers and senior employees of SMEs in Nigeria. A sample of 400 respondents was proposed, while the illustrative Section Four analysis was based on 350 valid responses. Data were proposed to be collected using a structured questionnaire based on a five-point Likert scale ranging from Strongly Agree to Strongly Disagree.

The study formulated two major hypotheses:

H01: AI-enabled automation has no significant effect on entrepreneurial performance among SMEs in Nigeria.

H02: AI-powered customer relationship management, AI-driven data analytics and AI-enabled innovation have no significant individual or joint effect on entrepreneurial performance among SMEs in Nigeria.

Descriptive statistics, Pearson correlation and multiple regression were proposed for analysing the data.

5.3 Summary of Findings

Based on the illustrative results presented in Section Four, the following findings were obtained.

5.3.1 AI-Enabled Automation and Entrepreneurial Performance

The descriptive analysis produced a grand mean of 3.80 for AI-enabled automation.

The regression analysis produced:

- $\beta = 0.221$
- $t = 4.977$
- $p < 0.001$

The result indicates a statistically significant positive relationship between AI-enabled automation and entrepreneurial performance in the illustrative dataset.

Therefore, the first null hypothesis was rejected.

This suggests that the use of AI to automate routine business processes may be associated with improved productivity and entrepreneurial performance.

5.3.2 AI-Powered Customer Relationship Management

AI-powered customer relationship management recorded a grand mean of 3.74.

The regression analysis showed:

- $\beta = 0.249$
- $t = 5.489$
- $p < 0.001$.

The illustrative result indicates a statistically significant positive relationship between AI-powered customer relationship management and entrepreneurial performance. This suggests that AI-supported customer engagement, personalised marketing and customer-response systems may contribute to SME performance.

5.3.3 AI-Driven Data Analytics

AI-driven data analytics produced a grand mean of 3.73.

The regression results showed:

- $\beta = 0.267$
- $t = 5.596$
- $p < 0.001$.

The result indicates a statistically significant positive relationship between AI-driven data analytics and entrepreneurial performance. This suggests that AI-supported analysis of customer, sales, market and operational data may assist SMEs in making more informed business decisions.

5.3.4 AI-Enabled Innovation

AI-enabled innovation recorded a grand mean of 3.78.

The regression analysis produced:

- $\beta = 0.298$
- $t = 6.326$
- $p < 0.001$.

The illustrative result indicates a statistically significant positive relationship between AI-enabled innovation and entrepreneurial performance. The finding suggests that AI can support SMEs in developing new products and services, improving existing offerings and identifying new business opportunities.

5.3.5 Joint Effect of AI Adoption on Entrepreneurial Performance

The multiple regression model produced:

- $R = 0.793$
- $R^2 = 0.629$
- Adjusted $R^2 = 0.625$
- $F(4,345) = 130.247$
- $p < 0.001$.

The R^2 of 0.629 indicates that the four AI adoption dimensions jointly accounted for approximately 62.9% of the variation in entrepreneurial performance in the illustrative model.

The remaining 37.1% may be associated with other factors not included in the model and random error.

The overall regression model was statistically significant.

5. Conclusion

Based on the illustrative findings, the study concludes that Artificial Intelligence adoption has an important statistical relationship with entrepreneurial performance among SMEs.

AI-enabled automation can support operational efficiency by reducing repetitive activities and improving the speed of business processes. AI-powered customer relationship management can enhance customer engagement and responsiveness. AI-driven data analytics can support evidence-based decision-making, while AI-enabled innovation can facilitate product, service and process development. The findings are consistent with the theoretical position of the Technology-Organisation-Environment framework, which suggests that technological adoption is influenced by technological, organisational and environmental factors. They are also consistent with the Resource-Based View, which emphasises the importance of combining technological resources with organisational capabilities. However, AI should not be regarded as a substitute for effective entrepreneurial management. The value obtained from AI depends on the quality of implementation, employee competence, data quality, infrastructure, managerial support and the business environment. The study therefore concludes that AI adoption represents a potentially important strategic capability for Nigerian SMEs, but the benefits depend on effective integration into business processes.

6. Recommendations

6.1 SMEs Should Adopt AI Strategically

SME owners and managers should identify specific operational and strategic problems that AI can solve before investing in AI technologies. Rather than adopting AI simply because it is technologically fashionable, entrepreneurs should assess expected benefits in terms of productivity, cost reduction, customer satisfaction, innovation and revenue growth.

6.1.1 SMEs Should Invest in AI-Related Skills

Entrepreneurs should provide continuous training for employees on:

- AI applications;
- data analytics;
- generative AI;
- digital marketing;
- cybersecurity;
- prompt engineering;

- automation tools; and
- responsible AI use.

The effectiveness of AI adoption depends significantly on the ability of employees to use the technology effectively.

6.1.2 SMEs Should Use AI to Improve Customer Management

SMEs should explore AI-enabled tools for:

- customer enquiries;
- customer segmentation;
- personalised marketing;
- customer feedback analysis;
- recommendation systems;
- customer retention; and
- automated customer support.

However, automated customer interaction should be monitored by employees to prevent inappropriate responses and maintain service quality.

6.1.3 SMEs Should Develop Data-Driven Decision-Making

SMEs should maintain accurate records of:

- sales;
- customers;
- inventory;
- expenses;
- revenue;
- marketing performance; and
- customer behaviour.

These data can provide the foundation for AI-driven analytics and forecasting.

6.1.4 MEs Should Use AI to Support Innovation

Entrepreneurs should use AI to support:

- product development;
- service improvement;
- market research;
- business-model development;
- process improvement; and
- identification of emerging customer needs.

AI should complement entrepreneurial creativity rather than replace human judgement.

6.2 Government Should Improve Digital Infrastructure

Government agencies should strengthen:

- broadband connectivity;
- electricity supply;
- digital infrastructure;
- technology-access programmes; and
- digital entrepreneurship centres.

Reliable infrastructure is essential for effective AI adoption.

6.3 Government and Development Agencies Should Support SME AI Adoption

Government agencies, development-finance institutions and entrepreneurship-support organisations should provide affordable technology financing, training and advisory services to SMEs.

Special programmes could be developed for smaller businesses that cannot independently afford advanced AI solutions.

6.4 AI Developers Should Develop Nigerian Context-Specific Solutions

Technology companies should develop AI applications that address Nigerian business realities.

Such applications should consider:

- local market conditions;
- Nigerian consumer behaviour;
- local languages where appropriate;
- small-business budgets;
- Nigerian regulatory requirements; and
- sector-specific business needs.

6.5 SMEs Should Establish AI Governance Policies

Businesses using AI should develop policies covering:

- customer-data protection;
- cybersecurity;
- employee access;
- accuracy verification;
- intellectual property;
- confidential information; and
- human oversight.

This will help minimise the risks associated with inappropriate AI use.

6.6 SMEs Should Measure AI Investment Outcomes

Entrepreneurs should periodically assess AI investments using measurable indicators such as:

- sales growth;
- profitability;
- productivity;
- customer retention;
- operational cost;
- response time;
- innovation output; and
- customer satisfaction.

This will enable businesses to determine whether AI investments are generating measurable business value.

7. Contribution to Knowledge

The study contributes to existing knowledge in several ways.

First, it conceptualises AI adoption as a multidimensional construct consisting of AI-enabled automation, AI-powered customer relationship management, AI-driven data analytics and AI-enabled innovation.

Second, the study links these AI dimensions to entrepreneurial performance within the Nigerian SME context.

Third, the study applies both the TOE framework and Resource-Based View to explain AI adoption and performance.

Fourth, the study provides a structured empirical model that can be tested across Nigerian SMEs.

Finally, the study provides a basis for entrepreneurs, policymakers, researchers and educational institutions to examine AI adoption as part of contemporary entrepreneurship development.

8. Limitations of the Study

The study has several potential limitations.

First, the study relies on questionnaire responses, which may be affected by respondents' perceptions and self-reporting.

Second, a cross-sectional research design captures respondents' views at a particular point in time and therefore provides limited evidence about changes in performance over several years.

Third, differences between sectors may affect the usefulness of particular AI applications.

Fourth, the availability and quality of AI technologies may vary considerably across Nigerian states and business locations.

Finally, the illustrative Section Four results used in this draft are not a substitute for actual field data.

9. Suggestions for Further Studies

Future studies should:

- conduct longitudinal research to examine SME performance before and after AI adoption;
- compare AI adoption between micro, small and medium-sized enterprises;
- investigate AI adoption across specific Nigerian sectors such as agriculture, manufacturing, retail, education, hospitality and financial services;
- examine the moderating effect of managerial support on AI adoption and entrepreneurial performance;
- investigate the mediating role of organisational innovation;
- examine the relationship between generative AI and entrepreneurial creativity;
- investigate AI adoption and SME internationalisation;
- examine cybersecurity and data-privacy challenges associated with SME AI adoption; and
- conduct comparative studies across Nigeria's geopolitical zones.

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