

Artificial Intelligence (AI) as a Catalyst for Business and Social Development in Nigeria

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Abstract

This study examined the impact of Artificial Intelligence (AI) on business and social development in Nigeria, focusing on the relationships among AI technology adoption, AI infrastructure availability, fintech, employment opportunities, poverty reduction, and business productivity in the short and long run. The study was motivated by the growing role of AI and digital technologies in transforming business operations, financial services, employment, and social welfare, alongside Nigeria's challenges in translating technological advancement into inclusive and sustainable development. An Autoregressive Distributed Lag (ARDL) econometric approach was employed using time-series data from the Central Bank of Nigeria (CBN) Statistical Bulletin and World Development Indicators (WDI) covering 2000–2024. The analysis examined both short-run and long-run relationships among Financial Technology (FINTECH), AI

Technology Adoption (AITECH), AI Infrastructure Availability (INFRASIT), Employment Opportunities (EMP), Poverty Reduction (POV), and Business Productivity (BPROD). The findings indicate that fintech, employment opportunities, and business productivity have positive and statistically significant relationships in both the short and long run, suggesting that improvements in digital financial services and employment contribute to business productivity and broader economic development. AI technology adoption has a negative and statistically insignificant relationship with business productivity in the current period but becomes positive and statistically significant after a one-period lag in the short run, indicating that businesses may require time to integrate AI effectively. However, poverty reduction, AI technology adoption, and AI infrastructure availability show negative and statistically significant relationships with business productivity in both periods, suggesting that technological and social-development improvements do not automatically generate productivity gains where complementary infrastructure, skills, finance, and institutional capacity are inadequate. The study concludes that AI has considerable potential to support business productivity and social development in Nigeria, provided complementary factors are strengthened. It recommends investment in digital and physical infrastructure, AI and digital skills, fintech innovation, productive employment, SME support, financial inclusion, and effective AI governance, alongside integrating poverty-reduction programs with employment, entrepreneurship, and digital-skills initiatives.

Keywords: Artificial intelligence, business productivity, fintech, employment opportunities, poverty reduction, AI infrastructure, social development, Nigeria.

1.1 Introduction

Artificial Intelligence (AI) has emerged as a major driver of technological and socioeconomic transformation, with growing applications in business, government, healthcare, education, agriculture, finance, and other sectors. AI enables organizations to automate routine activities, improve decision-making, reduce costs, enhance customer experience, and develop new products and services. For developing economies such as Nigeria, AI presents an opportunity to improve productivity and service delivery while addressing persistent development challenges. However, the benefits of AI depend on the

availability of digital infrastructure, skilled human capital, data, finance, and appropriate regulatory institutions (National Information Technology Development Agency [NITDA], 2024).

The trajectory of AI in Nigeria has moved from limited research and experimentation toward increasing institutionalization, investment, and business adoption. This shift is reflected in the development of Nigeria's National Artificial Intelligence Strategy, which identifies AI as an instrument for economic growth, innovation, social inclusion, improved governance, and human development (NITDA, 2024). Similarly, the establishment of the National Centre for Artificial Intelligence and Robotics (NCAIR) and the Nigeria Artificial Intelligence Research Scheme demonstrates increasing government commitment to building a domestic AI ecosystem. In 2024, the government, through NCAIR and Google, also established a ₦100 million AI Fund to support Nigerian start-ups developing AI-driven solutions (Federal Ministry of Communications, Innovation and Digital Economy [FMCIDE], 2024).

Nigerian businesses are growing but remain largely at an early or selective stage. Recent evidence shows that Nigerian firms are applying AI, particularly in customer service, marketing, financial services, agriculture, healthcare, and product development. A survey of Nigerian CEOs found that 67% expected AI to contribute to new product and service development, while 81% expected AI to become integrated into business processes and workflows over the following three years (PwC Nigeria, 2025). Nevertheless, more recent evidence indicates that adoption remains concentrated in specific use cases rather than being fully integrated across organizations; only 9% of Nigerian CEOs reported applying AI extensively to strategic decision-making (PwC Nigeria, 2026).

From a social-development perspective, AI is increasingly being explored as a means of improving access to healthcare, education, agricultural information, financial services, and public services. Nigerian start-ups are already developing AI applications to address local problems, including healthcare demand prediction, agricultural advice, and business support. Thus, the trajectory of AI is increasingly extending beyond business efficiency toward inclusive development and the provision of solutions to social problems (PwC Nigeria, Lagos Business School, & Microsoft, 2025).

Despite these opportunities, important constraints remain. Nigeria faces shortages of advanced AI skills, inadequate computing and digital infrastructure, high implementation costs, data limitations, and concerns relating to privacy, cybersecurity, ethics, and potential employment displacement. These challenges create a critical development paradox: AI can increase productivity, innovation, and access to services, but unequal access to AI capabilities could also reinforce existing digital and socioeconomic inequalities (NITDA,

2024; PwC Nigeria et al., 2025). Consequently, the emerging Nigerian experience can be characterized by rapid growth in AI awareness and investment, expanding but uneven business adoption, increasing government support, and growing experimentation with AI for social development. Understanding whether this technological transformation translates into measurable improvements in business performance and broader social welfare therefore provides an important basis for empirical investigation.

1.2 Objective of the Study

The main objective of this study is to examine the impact of AI on business and social development in Nigeria. The specific objective is to:

- i. Assess the relationship between AI adoption and business and social development in Nigeria.

1.3 Research Question

To achieve the above stated objective, this study seeks to answer the question:

- i. What relationship exists between AI adoption and business and social development in Nigeria?

1.4 Research Hypothesis

In order to achieve the above-stated objective, the hypothesis for this study stated in null form is;

- i. There is no significant relationship between artificial intelligence adoption and overall business and social development in Nigeria.

2.0 Literature Review

2.1 Conceptual Literature

2.1.1 The Concept of Artificial Intelligence in Businesses in Nigeria

Artificial Intelligence (AI) is one of the most significant technological developments influencing contemporary economic, business, and social activities. The concept generally refers to the development of computer systems and machines that can perform tasks that ordinarily require human intelligence, such as learning, reasoning, problem-solving, decision-making, language processing, prediction, and recognition of patterns. AI encompasses technologies such as machine learning, deep learning, natural language

processing, computer vision, robotics, and generative AI. In practical terms, AI enables computer systems to analyze large volumes of data, identify patterns, and generate outputs or make decisions with varying levels of human intervention.

In the Nigerian context, artificial intelligence can be understood as the application and development of intelligent digital technologies to address economic, business, and social challenges while improving productivity, innovation, and the quality of services available to citizens. The Federal Ministry of Communications, Innovation and Digital Economy (2024) recognizes AI as an important national capability with the potential to contribute to economic growth, social development, technological advancement, and human well-being. Nigeria's National Artificial Intelligence Strategy (NAIS) was developed to provide a framework for responsible and inclusive adoption of AI in the country.

The Nigerian concept of AI therefore extends beyond the use of sophisticated computer systems by technology companies. It includes the application of AI across sectors such as agriculture, healthcare, education, financial services, manufacturing, telecommunications, transportation, government administration, and small and medium-sized enterprises (SMEs). The National AI Strategy identifies AI as a potential instrument for improving productivity and innovation in agriculture, manufacturing, and services, while also supporting the creation of new industries and employment opportunities.

AI has become increasingly relevant to business development in Nigeria because businesses can use intelligent technologies to improve efficiency, reduce costs, understand customers, and support managerial decision-making. Nigerian businesses can employ AI-powered systems for customer service through chatbots, fraud detection in financial transactions, demand forecasting, digital marketing, inventory management, automated accounting, recruitment, data analysis, and personalized customer experiences. The National Artificial Intelligence Strategy (Federal Ministry of Communications, Innovation and Digital Economy, 2024) identifies economic growth and competitiveness as one of the major objectives of AI adoption in Nigeria. The strategy emphasizes the use of AI to improve productivity and innovation across agriculture, manufacturing, and service industries; create new industries and jobs; attract investment; and improve Nigeria's competitiveness in the global economy.

For SMEs, which form an important part of Nigeria's entrepreneurial environment, AI can provide opportunities to perform activities that would otherwise require substantial financial and human resources. For example, a small business can use AI-powered applications to analyze customer behavior, automate responses to customers, create marketing content, forecast demand, and improve business decisions. Consequently, AI can

potentially enable smaller Nigerian enterprises to compete more effectively in increasingly digital markets.

However, the adoption of AI by Nigerian businesses is not without challenges. The National AI Strategy identifies limitations involving infrastructure, funding, talent, data availability, partnerships, and ecosystem development. Nigeria's limited broadband penetration, physical infrastructure constraints, and shortage of specialized technical skills can restrict the ability of businesses to effectively adopt AI technologies.

2.1.2 Artificial Intelligence and Social Development in Nigeria

The concept of AI in Nigeria also encompasses its contribution to social development. Social development involves improving people's quality of life, expanding access to essential services, reducing inequality, developing human capabilities, and creating opportunities for individuals and communities. AI can contribute to social development by supporting improvements in healthcare, education, agriculture, financial inclusion, and public services. For example, AI can assist healthcare professionals with disease detection and diagnosis, help educational institutions personalize learning, support farmers with information and prediction tools, and enable financial institutions to develop more effective services for underserved populations.

Nigeria's National AI Strategy specifically identifies social development and inclusion as a major objective. It proposes using AI to improve access to healthcare, education, and financial services while addressing challenges such as poverty, inequality, and climate change. It also emphasizes empowering citizens with the skills and knowledge required to participate in an AI-driven economy. The application of AI to education is particularly significant in Nigeria because technology can support personalized learning, automated assessment, educational content development, and access to learning resources. Similarly, AI-enabled agricultural systems can support farmers through weather prediction, crop monitoring, pest identification, and improved decision-making. These applications demonstrate that AI is not only a business technology but also a potential instrument for improving social welfare.

2.2 Theoretical Framework

The theories discussed above provide a useful foundation for understanding the role of Artificial Intelligence (AI) in business and social development in Nigeria. They explain the factors that influence the adoption and use of AI, as well as how AI can contribute to organizational performance, innovation, productivity, and broader social development.

2.2.1 The Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was propounded by Fred D. Davis in 1989. The Technology Acceptance Model (TAM) explains the factors that influence individuals' willingness to accept and use artificial intelligence. The model emphasizes perceived usefulness and perceived ease of use as major factors determining technology adoption.

In the Nigerian business environment, organizations and individuals are more likely to adopt AI when they perceive that it can improve productivity, reduce operating costs, enhance customer service, support decision-making, and increase profitability. For example, businesses may use AI for customer support, data analysis, marketing, accounting, recruitment, and inventory management. However, if employees or business owners perceive AI as complicated, expensive, or difficult to operate, they may be reluctant to adopt it. The theory is therefore relevant because it helps explain the human factors that can either encourage or discourage AI adoption in Nigeria. It also provides a basis for examining the importance of digital literacy, training, and users' perceptions in achieving the benefits of AI.

2.2.2 The Diffusion of Innovation Theory

The Diffusion of Innovation Theory was developed by Everett M. Rogers in 1962. The Diffusion of Innovation Theory explains how new technologies spread within organizations and society. AI is an emerging technology whose adoption in Nigeria is occurring at different rates across industries, businesses, and social sectors. The theory helps explain why some Nigerian businesses, particularly technology companies, banks, telecommunications companies, and fintech organizations, may adopt AI earlier than smaller or less technologically developed businesses. Factors such as the perceived advantages of AI, compatibility with existing business practices, complexity, opportunity to experiment with the technology, and visibility of its benefits can influence the rate of adoption.

The theory is also useful in explaining the spread of AI beyond businesses into areas such as education, healthcare, agriculture, public administration, and financial services. Therefore, the Diffusion of Innovation Theory provides an appropriate framework for understanding how AI can gradually become integrated into Nigerian economic and social activities.

2.3 Empirical Literature

Artificial Intelligence (AI) has emerged as one of the most influential technologies shaping contemporary economic and social development. Recent Nigerian literature shows that AI is increasingly being examined in relation to small and medium-sized enterprises (SMEs),

entrepreneurship, marketing, human-resource management, education, skills development, and sustainable development. However, the literature also identifies significant challenges, particularly inadequate digital infrastructure, financial constraints, limited technical skills, data governance concerns, organizational resistance, and ethical issues. The following studies provide a current understanding of the relationship between AI, business development, and social development in Nigeria.

According to Adegbuyi et al. (2024), who examined the role of artificial intelligence in the management of small and medium-sized enterprises in Southwest Nigeria, using primary data collected from 355 SME respondents. The findings indicated that although 75% of respondents were aware of AI technologies, only about 55–63% demonstrated deep understanding of industry-specific AI applications. The researchers identified financial constraints, inadequate technological infrastructure, insufficient technical manpower, organizational and cultural resistance, regulatory challenges, and data privacy and security concerns as major barriers to AI adoption. The study is important because SMEs are major contributors to employment, entrepreneurship, and economic activity in Nigeria. It demonstrates that awareness of AI alone does not guarantee effective adoption. For AI to contribute to business and social development, Nigerian enterprises require affordable technologies, skilled workers, supportive organizational cultures, adequate infrastructure, and appropriate government policies.

Similarly, Muktar et al. (2024) investigated the role of AI capabilities in the growth of SMEs in Nigeria, focusing on firms in Southwest Nigeria. The researchers studied 322 SMEs across manufacturing, hospitality, information and communication, and administrative and support services. Using principal component analysis and structural equation modelling, they found positive relationships between AI innovation indicators, employment indicators, and SME growth. The study concluded that AI applications have strong direct, indirect, and total effects on SME growth. This study provides direct empirical evidence linking AI with business growth and employment in Nigeria. Its importance to social development lies in the fact that stronger SMEs can generate employment, stimulate innovation, improve incomes, and contribute to economic diversification. It therefore supports the argument that AI can influence social development indirectly through improved business performance and employment creation.

Also, Bali et al. (2024) conducted a systematic review of emerging trends in AI for education in Nigeria. The researchers reviewed 74 relevant publications and found growing application of AI-related technologies in Nigerian education, including student-performance prediction, e-learning platforms, adaptive learning, and other computer-supported learning systems. However, more sophisticated applications such as intelligent tutoring systems,

learnable robots, and advanced learning-management systems remain relatively limited. The authors also identified inadequate infrastructure and limited internet access as important obstacles. Education is a central component of social development. The findings demonstrate that AI can improve learning, student engagement, personalized instruction, and skills development. The study also shows that the social benefits of AI depend on Nigeria's ability to address infrastructure and digital-access inequalities.

Further, Anekwe et al. (2025) examined AI and the Sustainable Development Goals (SDGs) in Nigeria from a conceptual perspective. The study considered AI's contribution to environmental, social, and economic development and identified sectors such as agriculture, healthcare, energy, and urban planning where AI could support development. The authors argued that AI has the potential to accelerate Nigeria's progress toward the SDGs. However, they stressed that infrastructure, data governance, equitable access, job displacement, and data privacy must be addressed to ensure that AI produces inclusive and sustainable outcomes. This study is directly relevant because it connects AI with both economic and social development. It provides a broader framework for examining AI beyond business profitability by considering poverty, inequality, employment, environmental sustainability, healthcare, and social equity.

Furthermore, Rabiou et al. (2025) conducted a systematic review titled "Artificial Intelligence Adoption for Skills Development in Nigeria: A Systematic Review and Roadmap for TVET Transformation." The researchers synthesized 51 peer-reviewed studies published between 2019 and 2025. Their review identified five major areas: awareness and readiness, institutional capacity, implementation barriers, robotics and computational thinking, and ethical and policy considerations. The study found strong interest in AI but significant deficiencies in infrastructure, lecturer expertise, policy coordination, and ethical governance. Skills development is a critical link between AI, business, and social development. Businesses require workers who can effectively use AI technologies, while society requires educational systems capable of preparing young people for changing labor markets. The study therefore suggests that investment in AI education and vocational training is necessary for Nigeria to convert technological progress into employment and broader social benefits.

More so, Olayanju (2025) examined AI readiness and adoption in digital marketing among Nigerian enterprises, with particular attention to SMEs. The study noted that AI technologies such as machine learning, chatbots, and predictive analytics are changing marketing practices, while adoption among Nigerian enterprises remains uneven. The study is important to the business dimension because AI-enabled digital marketing can improve customer relationship management, market analysis, personalization, and decision-making.

At the same time, uneven adoption suggests that differences in skills, resources, and technological readiness could create disparities between businesses and regions.

Onenyi et al. (2026) examined AI-enabled human-resource analytics adoption capability and operational performance among Nigerian SMEs. Their study surveyed 296 respondents from SMEs in Lagos, Abuja, Port Harcourt, and Kano. Using partial least squares structural equation modelling, the researchers found that technological readiness and organizational support were significant components of AI-enabled HR analytics capability. AI-enabled HR analytics capability was positively associated with operational performance, with the model reporting a coefficient of $\beta = 0.626$ and explaining approximately 39.2% of the variance in operational performance. This study is particularly important because it extends the AI-business literature beyond marketing and general productivity to human-resource management. It shows that AI can support workforce planning, employee management, and organizational performance. It also reinforces the argument that organizational readiness and infrastructure are prerequisites for successful AI implementation.

Ojeleye et al. (2026) investigated AI-enhanced entrepreneurial competence and SME performance in Nigeria, focusing on registered SMEs in Abuja. Grounded in Dynamic Capabilities Theory, the study considered how entrepreneurs can use AI to identify opportunities, make strategic decisions, and reconfigure organizational resources in response to technological change. The study highlights the importance of the human element in AI adoption. AI technology alone may not improve business performance unless entrepreneurs possess the competence to integrate it into business strategy. This is relevant to social development because stronger entrepreneurial capacity can contribute to employment creation, innovation, and economic participation.

Nwosu (2026) examined the effect of AI and digital marketing on the performance of SMEs in Anambra State, Nigeria. The study adopted a survey design and used least-squares regression to analyze data collected from selected SMEs in Awka. The findings showed that AI and digital marketing had positive and significant effects on SME performance. The study recommended addressing financial and infrastructural barriers to AI adoption and providing SMEs with technical and financial assistance. The study provides recent empirical evidence that AI can produce measurable improvements in Nigerian SME performance. It also supports the argument that government and other stakeholders need to provide financial, technical, and infrastructural support if the benefits of AI are to extend to smaller businesses.

3.0 Methodology

3.1 Research Design

This section outlines the empirical strategy employed to investigate the impact of artificial intelligence (AI) in business and social development in Nigeria. The design adopted in this study is an ex post facto (after the fact) design. Hence, this study used secondary sources of information and therefore time series data sourced from various publications of the Central Bank of Nigeria Statistical Bulletin and World Development Indicators (WDI). The models for this study were estimated using data on AI in business and social development indicators, which include artificial intelligence technology adoption (AITECH), fintech (FINTECH) as a measure of social development, employment opportunities (EMP), poverty rate (POV), artificial intelligence infrastructure (INFRASST), and business productivity (BPROD) as the dependent variable for the period 2000-2024. A multiple regression analysis was used, predicated on various data diagnostics, including Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests, and the bound testing method for co-integration and the autoregressive distributed lag technique (ARDL) were employed in this study to determine the long and short run relationship between the impact of AI in business and social development in Nigeria within the specified time frame.

3.2 Model Specification:

The model for this study is anchored on the, hence the model is as specified below:

3.2.1 AI in business and social development equation:

$$BSD = F(AI) \quad \text{Equation 3.1}$$

Equation 3.1 states that business social development is dependent upon artificial intelligence variables. In demystifying the above model, the business social development and artificial intelligence in business will be capture by the following variables listed below. It follows that Equation 3.1 will be the formula presented by Equation 3.2 as follows:

$$BPROD = F(FINTECH, AITECH, EMP, POV, INFRASST) \quad \text{Equation 3.2}$$

The functional form of the model for AI in business and social development equation for this study is given as:

(The econometric form of the model)

$$BPROD_t = a_0 + a_1FINTECH_t + a_2AITECH_t + a_3EMP_t + a_4POV_t + a_5INFRASST_t + U_t \quad \text{Equation 3.3}$$

Linearizing it, we will have:

$$\ln BPROD_t = a_0 + a_1 \ln FINTECH_t + a_2 \ln AITECH_t + a_3 EMP_t + a_4 POV_t + a_5 \ln INFRAST_t + U_t \quad \text{Equation 3.4}$$

Where:

$BPROD_t$ = Business Productivity as a measure of business and social development in time t

POV_t = Poverty rate in time t

$FINTECH_t$ = Financial technology adoption in time t

$AITECH_t$ = Artificial intelligence adoption in time t

$INFRAST_t$ = AI infrastructure in time t

U_t = Error term

A Priori Expectation shows that $a_1(+)$, $a_2(-)$, $a_3(+)$, $a_4(-)$ and $a_5(-)$.

4.0 Data Presentation, Analysis and Discussion of Findings

4.1 Descriptive statistics and matrix of correlations

Table 4.1: Descriptive Statistics

	BPROD	FINTECH	EMP	POV	INFRAST	AITECH
Mean	58.67	67.15	58.56	65.52	5.74	1.27
Median	59.33	12.40	57.56	61.90	6.20	1.20
Maximum	60.41	402.80	65.42	150.70	7.90	5.40
Minimum	53.31	0.20	53.91	33.10	2.50	0.10
Std. Dev.	2.01	107.55	3.57	26.25	1.75	1.31
Skewness	-1.05	1.88	0.59	1.55	-0.52	1.27
Kurtosis	3.19	5.65	1.99	5.74	1.95	4.87
Jarque-Bera	4.66	22.09	2.49	17.86	2.29	10.38
Probability	0.09	0.00	0.29	0.00	0.32	0.01
Sum	146.68	167.87	146.40	163.80	143.60	31.70
Sum Sq. Dev.	96.99	277.61	305.59	165.42	73.12	41.21
Observations	25	25	25	25	25	25

Researcher Computation (2026)

Table 4.1 presents the descriptive statistics of the variables used in the study from 2000 to 2024. The results show that business productivity (BPROD) recorded an average value of 58.67% and about 59.33%, with a maximum and standard deviation of 60.41% and 2.01%, indicating moderate business productivity over the study period that is not translated to improve social development, while fintech (FINTECH) had a high mean value of 67.15% and a maximum of 402.8%, suggesting a high rate of financial technology adoption in Nigeria within the period under review. Employment opportunities (EMP) record an average of 58.56% and a maximum and standard deviation of 65.42% and 3.57%, respectively, indicating a high level of moderate rate of employment and therefore reflecting greater attention to be paid on employment generation. Meanwhile, POV exhibited a considerable high rate, as reflected by the mean value of 65.52% and maximum of 150.70% as well as a high standard deviation of 26.25%, indicating a high multidimensional poverty rate within the study period. Also, AI infrastructure (INFRAST) exhibited a low average of 5.74% and a maximum of 7.90%, implying substantial low AI infrastructure availability. Moreover, AI technology adoption (AITECH) exhibited a low average of 1.27% and a maximum of 5.40%, indicating considerable low AI technology adoption and application within the period under review. The skewness result shows that no variable is positively skewed, showing a weak distribution. The result of the kurtosis shows that BPROD, FINTECH, POV, and AITECH are leptokurtic (kurtosis > 3), indicating peaked distributions, while EMP and INFRAST are platykurtic (< 3), showing weak distribution. The Jarque-Bera probabilities indicate that all the variables are normally distributed.

Table 4.2: Correlation Matrix

	BPROD	FINTECH	EMP	POV	INFRAST	AITECH
BPROD	1					
FINTECH	-0.66	1				
EMP	0.03	-0.49	1			
POV	-0.11	-0.44	0.43	1		
INFRAST	0.21	-0.50	0.33	-0.07	1	
AITECH	-0.38	-0.12	-0.07	0.72	-0.21	1

Source: Researcher's computation (2026), using E-Views 9.

The correlation matrix of the variables is as shown in Table 4.2 above. From the table, therefore, BPROD has a positive correlation coefficient with EMP and INFRAST. This therefore indicates that the variables tend to move in the same direction. Meanwhile, FINTECH, POV, and AITECH have a weak negative correlation (-0.66, -0.11, and -0.38),

indicating that as BPROD increases, FINTECH, POV, and AITECH tend to decrease. Also, from the table, there exists a positive correlation coefficient between EMP and POV, INFRAS, POV and AITECH, and INFL, respectively. FINTECH exhibits a negative relationship with EMP, POV, INFRAS, and AITECH; EMP and AITECH; and POV and INFRAS, as well as INFRAS and AITECH, respectively.

4.2 Unit Root Test

The Augmented Dickey-Fuller and the Phillips-Perron unit root tests were conducted to examine the stationarity condition of the variables. As indicated in Table 4.4 below, FINTECH and INFRAS are stationary at level in ADF and PP, while AITECH, BPROD, POV, and EMP were stationary after first differencing in both ADF and PP. In other words, the variables are integrated of order zero and one (i.e., I(0) and I(1)). Where some of the variables are I (0) while others are I (1), one suggests the problem of unit root in the equations. It becomes imperative to perform co-integration tests to determine the presence of an equilibrium relationship amongst the variables in each equation. The study adopts the ARDL bound testing technique for co-integration, as the variables are integrated of diverse orders (i.e., order zero and order one).

Table 4.3: ADF and Philip-Perron Unit Root Test Results

Variables	ADF			PP		
	Level	1 st Difference	Order of integration	Level	1 st Difference	Order of integration
BPROD	-2.482721	-6.478923	I(1)	-	-	I(1)
AITECH	1.630779	-3.129674	I(1)	-	-	I(1)
FINTEC	-4.171342	-	I(0)	-	-	I(0)
H	-2.507924	-4.710536	I(1)	-	-	I(1)
POV	-1.766741	-5.959214	I(1)	-	-	I(1)
EMP	-3.755602	-	I(0)	-	-	I(0)
INFRAS						
T						

Source: Researcher's computation (2026), using E-Views 9.

Note: Mackinnon critical values for ADF at 1, 5 and 10% levels are -3.60, -2.93 and -2.60 respectively, and for PP are 3.605, 2.936 and 2.606, respectively. ** means significant at 5% level.

4.3 Lag Length Selection

Table 4.4: Lag length criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-374.8115	NA	9694872.	33.11404	33.41026	33.18854
1	-145.7479	318.6972	0.558845	16.32590	18.39941	16.84738
		69.26485	0.027477	12.52985	16.38066	13.49832
2	-66.09329	*	*	*	*	*

Source: Researcher's computation (2026), using E-Views 9.

The efficiency and validity of an error correction model depends on the lag structure. The study used VAR lag order selection criteria to determine the lag lengths. The study employed the Akaike Information Criterion (AIC) and Schwarz Criterion (SC) and the result shows two optimal lag lengths for model of the impact of artificial intelligence (AI) in business and social development in Nigeria as shown in Table 5 above. In order to reduce the possibilities of underestimation whilst maximizing the likelihood of recovering the true lag (Venus, 2004), the study used three and four as the maximum lag lengths, respectively.

4.4 Co-integration Test Results

From the bound testing result reported in Table 4.7 below, long run relationship exists amongst the variables in all the estimated equations, given that the values of the F-statistic are greater than the critical values at five per cent level in both the upper and the lower bounds. Therefore, the null hypothesis of absence of co-integration is rejected, while the study proceeds to estimate the long run coefficient of each of the equations.

Table 4.5: Co-Integration Test Results

5% critical value					
Equation	K	F-Stat	I (0)	I (1)	Outcome
BPROD (AITECH, FINTECH, EMP, POV, INFRAS)	5	8.15	2.62	3.79	co
integrated					

Note: K =number of parameters

4.5 Findings, Presentation and Analysis of Econometric Results of the Long Run Coefficients of the Impact of AI in Business and Social Development in Nigeria Equation Results.

Table 4.6: Dependent variable: BPROD

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFINTECH	0.089317	0.022278	4.009122	0.0015
POV	-0.000041	0.000195	-2.209675	0.0372
EMP	0.009400	0.003253	2.889763	0.0127
LNAITECH	-0.088895	0.019860	-4.476103	0.0006
LNINFRAS	-0.320376	0.101783	-3.147632	0.0077
C	3.739895	0.143404	26.079354	0.0000

Source: Researcher's computation (2026), using E-Views 9.

The long-run relationship between AI in business and social development in Nigeria's equation variables is presented in Table 4.8 above. Based on the ARDL long-run estimates, the findings reveal the following insights.

The coefficient for fintech (FINTECH) is positive and statistically significant, indicating that a unit increase in FINTECH results in 8.93% increases in business and social development in Nigeria (BPROD). This finding is in line with an a priori expectation, indicating that AI can strengthen fintech services through automated credit assessment, fraud detection, customer analytics, personalized financial services, and predictive decision-making. By combining AI with Fintech, businesses can make faster and more accurate financial decisions, reduce operational inefficiencies, identify business opportunities, and manage financial risks more effectively.

Conversely, the coefficient of poverty reduction (POV) is negative and statistically significant, indicating that a unit rise in POV results in a -0.04% decrease in BPROD. This result is in line with an a priori expectation, suggesting that AI-driven improvements in business productivity in Nigeria may, in the absence of inclusive complementary policies, be associated with weaker poverty-reduction outcomes because productivity gains can be unevenly distributed, labor-displacing, and concentrated among technologically capable firms.

More so, employment opportunities (EMP) exhibit a positive but statistically significant relationship with BPROD. Therefore, a one-unit increase in EMP is associated with 0.09% increases in BPROD. This result is in line with a priori expectations, showing

that employment expansion and productivity growth can be mutually reinforcing in Nigeria's AI-driven economic transformation. Greater employment opportunities increase the utilization and development of human capital, while AI can enhance workers' capabilities and enable businesses to produce more efficiently and develop new products and services.

The coefficient of artificial intelligence technology adoption (AITECH) is negative and statistically significant. Hence, a unit rise in AITECH will lead to 8.88% decreases in BPROD. This result is not in line with a priori expectations, suggesting that the expansion of AI technology adoption in Nigeria has not necessarily translated into higher business productivity in the long run. Instead, the negative and significant relationship may reflect the costs of technological adjustment, inadequate infrastructure, shortages of skilled labor, weak organizational readiness, inefficient implementation, and the diversion of scarce business resources toward AI investment.

Finally, the coefficient for AI infrastructure (INFRAST) is negative and statistically significant, indicating that a one-unit increase in INFRAST will lead to a -32.03% decrease in BPROD. This finding is in line with an a priori expectation, indicating that greater availability of AI infrastructure is associated with lower business productivity under the prevailing Nigerian economic conditions, suggesting that infrastructure expansion may be occurring without sufficient complementary skills, resources, reliability, and organizational capacity to generate the expected productivity benefits.

In summary, the long-run analysis highlights the complex interplay between the impact of AI in business and social development in Nigeria. While financial technology (FINTECH) and employment opportunities (EMP) positively influenced business and social development in Nigeria, others, such as poverty reduction rate (POV), AI technology adoption (AITECH), and AI infrastructure (INFRAST), posed significant challenges. These findings underscore the need for the Nigerian government to focus on pursuing a coordinated approach in which AI technology adoption, infrastructure development, business productivity, employment creation, and poverty reduction are treated as interconnected components of national development. Such an approach would increase the likelihood that the long-run benefits of AI are widely distributed across firms, workers, and households and ultimately contribute to Nigeria's sustainable economic and social development.

4.6 Findings, Presentation and Analysis of Econometric Results of the Short Run Dynamics of the Impact of AI in Business and Social Development in Nigeria Equation Results.

Table 4.7: Dependent variable: BPROD

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNFINTECH)	0.074495	0.012444	5.986286	0.0000
D(POV)	-0.000034	0.000161	-0.211156	0.8360
D(EMP)	0.007840	0.001863	4.208109	0.0010
D(LNAITECH)	-0.010728	0.010345	-1.037021	0.3186
D(LNAITECH (-1))	0.069013	0.010450	6.604373	0.0000
D(LNINFRAST)	0.435334	0.330952	1.315398	0.2111
CointEq(-1)	-0.834055	0.140204	-5.948873	0.0000
R-squared	0.913229	Mean dependent var	4.069130	
Adjusted R-squared	0.853157	S.D. dependent var	0.036170	
S.E. of regression	0.013861	Akaike info criterion	-5.420521	
Sum squared resid	0.002497	Schwarz criterion	-4.926828	
Log likelihood	72.33599	Hannan-Quinn criter.	-5.296359	
F-statistic	15.20222	Durbin-Watson stat	2.298449	
Prob(F-statistic)	0.000016			

Source: Researcher's computation (2026), using E-Views 9.

The short-run dynamics of the relationship between AI in business and social development in Nigeria (Equation Results) are as presented in Table 4.9 and reveal several significant findings.

The coefficient for financial technology (FINTECH) is positive and significant in the short run, indicating that a unit increase in FINTECH will result in a 7.44% increase in BPROD. This result is in line with an a priori expectation, indicating that fintech serves as an enabling mechanism through which technological innovation translates into economic activity. AI may improve forecasting, customer management, marketing, production planning, risk assessment, and automation, while fintech provides the financial infrastructure necessary for businesses and consumers to transact within this increasingly digital economy. The combination of AI and fintech can therefore generate complementarities: AI improves the efficiency of decision-making and business processes, while fintech improves the efficiency and accessibility of financial transactions and services.

Also, the coefficient of poverty headcount rate (POV) is negative and insignificantly related to BPROD in the short run; therefore, a unit rise in POV will result in a -0.03% decrease in BPROD. This result is in line with an a priori expectation, suggesting that the benefits of AI-driven economic transformation are not automatically reaching poorer

households or translating into immediate productivity improvements. AI can potentially enhance efficiency, automate routine tasks, improve decision-making, reduce operational costs, and create new business opportunities.

More so, employment opportunities (EMP) exhibit a positive and significant relationship with BPROD in the short run. Therefore, a one-unit increase in EMP is associated with 0.07% increases in BPROD in the short run. This result is in line with a priori expectations, showing that employment creation is an important mechanism through which AI-driven economic transformation can contribute to business performance and social development in Nigeria.

The coefficient of AI technology adoption (AITECH) is negative and insignificantly related to BPROD in the current period and positive but significant at the first period lag of the short run; therefore, a unit rise in AITECH will lead to a -1.07% decrease in BPROD in the current period and a 6.90% increase after a period lag of the short run. The result of the current period is not in line with a priori expectation, while the result of the first period lag aligns with theoretical expectation, suggesting that AI adoption does not produce an immediate statistically significant productivity gain and may involve temporary adjustment pressures. In contrast, the positive and significant first lag demonstrates that, after businesses have had time to learn, adapt, and integrate AI into their operations, AI adoption becomes a significant driver of productivity. The evidence therefore suggests that AI technology adoption in Nigeria has a delayed but positive productivity effect in the short run, reinforcing the importance of complementary investments in skills, infrastructure, organizational capacity, and effective technology integration for achieving sustainable business and social development.

Finally, the coefficient for AI infrastructure availability (INFFRAST) is positive and insignificantly related to BPROD in the short run, indicating that a one-unit increase in INFFRAST will lead to 43.53% increases in BPROD in the short run. This result is in line with an a priori expectation, indicating that AI infrastructure availability has a potentially productivity-enhancing effect on Nigerian businesses, but its immediate contribution is limited in the short run. The positive coefficient indicates that better infrastructure creates favorable conditions for AI-driven productivity improvements, while the insignificant coefficient suggests that the benefits require complementary resources, effective adoption, organizational adjustment, and sufficient time to materialize. Thus, AI infrastructure should be viewed as an enabling foundation rather than a standalone determinant of business productivity. Its contribution to Nigeria's business and social development is likely to become more substantial when infrastructure expansion is combined with improvements in skills, finance, digital literacy, institutional capacity, and effective AI adoption.

The ECM coefficient (-0.834055) is correctly signed and statistically significant, indicating that approximately 83% of short-run disequilibria adjust to the long-run equilibrium within a year. The t-statistic (-5.948873) confirms the significance of the ECM at the 5% level.

The R-squared value (0.913229) and adjusted R-squared (0.853157) demonstrate that approximately 91% of the variation in BPROD is explained by the included variables (both current and lagged), with 9% attributable to factors outside the model. The F-statistic (15.20) confirms the joint significance of the model's variables, ensuring a good overall fit. Additionally, the Durbin-Watson statistic (2.29) indicates no autocorrelation, affirming the reliability of the results for forecasting and policy formulation.

The stability test using the cumulative sum (CUSUM) test in figure 4.1 below further shows that the variables included in the BPROD equation were stable within the period of the study. This is evidenced by the swing of the trends within the CUSUM bound at the $\pm$ five percent significance level. The study, therefore, infers that the equation is stable and consistent to be adopted for economic policies and forecasts.

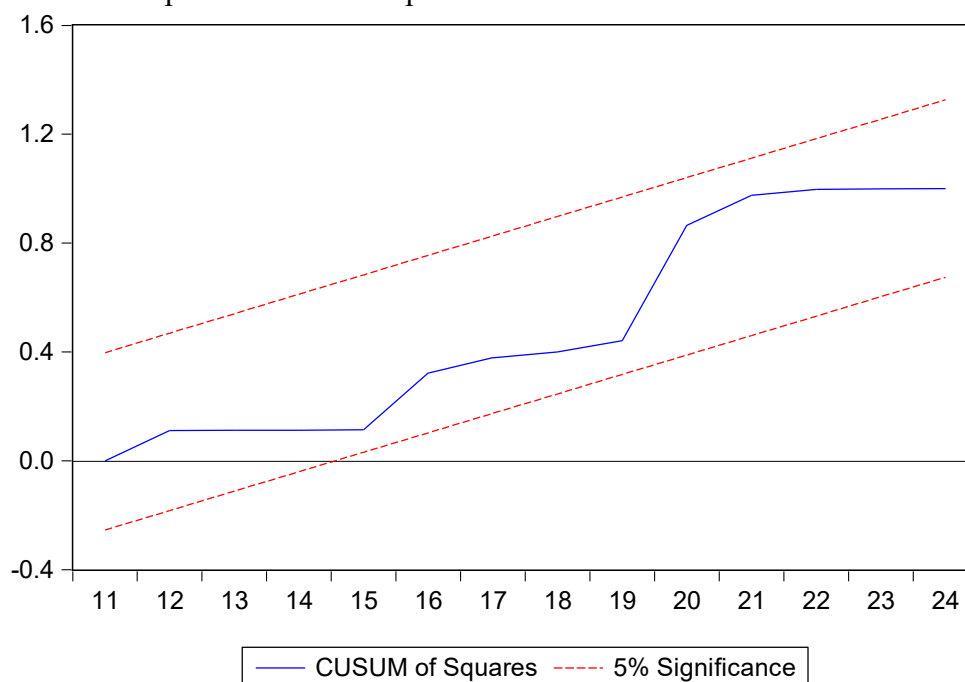


Figure 4.1: AI in Business and Social Development in Nigeria equation CUSUM.

4.7 Discussion of Findings

The short-run and the long-run ARDL dynamics show an intriguing insight, as the regression result offers a positive and significant relationship between two key variables of AI in

business: financial technology adoption (FINTECH) and employment opportunities (EMP), which interacted with the dependent variable social development in Nigeria proxied by business productivity (BPROD). The result suggests that increases in AI, fintech, and employment should be viewed as complementary rather than isolated components of economic development. When supported by adequate infrastructure, skills, finance, and appropriate institutions, their interaction can generate sustained improvements in business productivity while simultaneously contributing to broader social development. The persistence of the positive and significant relationship across both periods reinforces the view that strengthening Nigeria's digital financial ecosystem and creating productive employment opportunities can help maximize the economic and social benefits of AI. This finding is in tandem with the views of Ojeleye, Bakare, and Muktar (2026), Nwosu (2026), and Muktar, Ufua, and Okorie (2024), who opined that AI introduction fosters business productivity, social development, financial inclusion, and employment generation.

However, poverty reduction rate (POV), AI technology adoption (AITECH), and AI infrastructure availability (INFRASIT) showed an expected negative and significant relationship with business productivity and social development in Nigeria in both the long and short run periods under review, suggesting that Nigeria has not yet fully converted improvements in social welfare and AI-related technological capacity into corresponding productivity gains. In the short run, the negative effect may reflect adoption costs, adjustment difficulties, and inadequate complementary resources. In the long run, its persistence points to deeper structural constraints, including skills gaps, infrastructure deficiencies, high technology costs, limited organizational capabilities, and weak integration of AI into productive business activities.

The models were estimated using the error correction mechanism (ECM), and the outcome of the key urbanization and economic development equations revealed a positive and significant relationship among the variables in both the short run and long run. The result of the heteroscedasticity shows the absence of heteroscedasticity. Therefore, the errors are homoscedastic. Hence, the long-run results succeed all tests and are thus useful for analyses and forecasting.

The error correction coefficients in all the estimated models met the three criteria for their acceptability given that they are negative, fractional, and statistically significant. Consequently, the estimated result confirms the presence of a long-run relationship among the variables in the models. It also shows that the speed of adjustments is moderate in all the estimated models. The value of the adjusted R-squared implies that the models have a good fit, as the independent variables have high explanatory powers. The Durbin-Watson statistic connotes absence of autocorrelation in the estimated equations. The study, therefore, accepts

the null hypotheses of no serial correlation in the models. This further implies that the error terms of different periods are not serially correlated. The stability test using the cumulative sum tests showed that the variables included in all the models were stable within the period of the study.

5.0 Conclusion

The study examines the impact of AI in business and social development in Nigeria using data from 2000 to 2024, adopting the autoregressive distributive lag model (ARDL). The study observed that changes in the ratios of financial technology (FINTECH) and employment opportunities (EMP) interacted with dependent variable business and social development in Nigeria. In addition, the study revealed a negative impact of poverty reduction rate (POV), AI technology adoption (AITECH), and AI infrastructure availability (INFRAST) on social development in Nigeria. The finding supports the fact that Nigeria has not yet fully converted improvements in social welfare and AI-related technological capacity into corresponding productivity gains.

5.1 Recommendations

Therefore, we recommend that government and policymakers should increase investment in reliable digital and physical infrastructure, AI and digital skills development, fintech innovation, productive employment, SME support, financial inclusion, and effective AI governance and also integrate poverty-reduction programs with productive employment, entrepreneurship, and digital-skills initiatives. A coordinated policy approach that combines AI adoption, fintech development, human-capital investment, infrastructure improvement, and inclusive employment creation is essential for ensuring that AI contributes to sustainable business productivity and broad-based social development in Nigeria.

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