Unizik Orient Journal of Education (UNIOJE), Vol. 12, No. 2, January, 2026.
----------ISSN: 0794-9525----------

AI and Automation in South East Nigeria: Empirical Study on Their Impact on Economy, Governance, and Human Capital Development

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Abstract
This study investigated the influence of Artificial Intelligence (AI) and automation in South East Nigeria, with particular emphasis on economic growth, governance efficiency and transparency, and human capital development. A descriptive survey design was adopted, guided by three research questions and one null hypothesis. Using multi-stage sampling techniques, 205 respondents were selected from Ebonyi, Anambra, and Abia States. Purposive sampling was further employed to select participants comprising ICT professionals, policymakers, lecturers, and entrepreneurs. Data were collected using the AI and Automation for Nation Building Questionnaire (AA-NBQ) developed by the researcher. The instrument was validated by experts, and its reliability was established using Cronbach's alpha, yielding a coefficient of 0.89. Data were analyzed using mean, standard deviation, and multiple regression analysis. Findings revealed that AI and automation play a crucial role in improving governance in South East Nigeria by reducing inefficiencies, enhancing transparency, and supporting data-driven reforms. Respondents also acknowledged that AI and automation contribute positively to human capital development, although their influence was found to be moderate. Regression analysis further indicated that AI and automation have a significant relationship with governance efficiency and transparency, but no significant relationship with economic growth or human capital development. Based on these findings, the study recommended the development of a coherent national AI policy framework, increased investment in digital literacy, and stronger collaboration between industry and academia to promote innovation, workforce preparedness, and sustainable national development in an increasingly AI-driven economy.

Keywords: Artificial Intelligence, Automation, Economic Growth, Governance Efficiency, Human Capital Development, South East Nigeria

Introduction

The 21st century has witnessed an unprecedented technological revolution characterized by the integration of Artificial Intelligence (AI) and automation in nearly all sectors of the global economy. Artificial Intelligence (AI) and automation are reshaping contemporary economies, influencing production systems, public administration, and social development. AI refers to the simulation of human intelligence processes by machines, particularly computer systems capable of learning, reasoning, and self-correction (Schwab, 2017). Automation, on the other hand, involves the use of technology to perform tasks with minimal human intervention, enhancing efficiency and productivity (World Bank, 2023). Together, these technologies constitute key drivers of what is now known as the Fourth Industrial Revolution, which is reshaping global development paradigms. In developed economies, AI and automation have accelerated industrial growth, streamlined governance, and transformed education and workforce systems (United Nations, 2023). For developing countries like Nigeria, the adoption of these technologies offers immense potential to strengthen economic performance, improve governance, and enhance human capital development. However, realizing these potentials requires systematic integration of AI and automation into national development policies, institutional frameworks, and education systems (Federal Ministry of Communications & Digital Economy, 2021).

Economically, AI can stimulate productivity by optimizing production processes, reducing waste, and facilitating innovation in sectors such as agriculture, manufacturing, and services

(Adebayo, 2022). In governance, AI-driven decision systems and e-governance platforms can enhance transparency, improve policy implementation, and reduce bureaucratic inefficiencies (Olayinka & Ojo, 2021). Similarly, in the area of human capital development, AI-enabled tools can revolutionize education through adaptive learning, predictive analytics, and digital skills training, thereby preparing the Nigerian workforce for future demands (Okafor & Eze, 2022; UNESCO, 2022).

Nation building involves the deliberate construction of economic, institutional, and human infrastructures necessary for national stability and growth (Ake, 2018). Integrating AI and automation into such processes can improve decision-making, enhance productivity, and stimulate creativity among citizens (Adeola, 2023). Despite these prospects, the implementation of AI and automation in Nigeria especially in South East Nigeria is challenged by poor infrastructure, low digital literacy, weak policy enforcement, and fear of job displacement (World Bank, 2023). Yet, empirical evidence quantifying these contributions within South East Nigeria's socio-economic landscape remains scarce. Therefore, there is a pressing need for empirical research to determine/assess how AI and automation contribute to Nigeria's economic growth and productivity especially South East Nigeria. This study therefore seeked to examine the predictive influence of AI and automation in South East Nigeria on three pillars of nation building: economic growth, governance efficiency, and human capital development

Objectives of the Study

The Objective of this study is to empirically investigate the impact of Artificial Intelligence (AI) and automation in South East Nigeria: focusing on their impact on the economy, governance, and human capital development.

Specifically, the study seeked to:

1. Determine the 'influence' to which AI and automation exert on economic growth and productivity in South East Nigeria.
2. Examine how AI and automation affect governance efficiency and transparency in South East Nigeria.
3. Determine the extent to which AI and automation have influenced on human capital development in South East Nigeria.

Research Questions

1. What impact do AI and automation exert on economic growth and productivity in South East Nigeria?
2. How do AI and automation affect governance efficiency and transparency in South East Nigeria?
3. To what extent do AI and automation influenced on human capital development

Research Hypothesis

HO_1 AI and automation have no significant joint effect on nation-building indicators

Methods

A descriptive survey research design was adopted to obtain quantitative data from professionals with direct exposure to AI and automation initiatives. For this study, the multi-stage cluster sampling technique was adopted to select samples for the study. Three hundred participants were randomly sampled from the three states namely Ebonyi, Anambra and Abia states out of the five states that make up southeast Nigeria to adequately represent the population density of the states. This choice was informed by the fact that the highest population densities and rate of urbanization in south east Nigeria were recorded in two of the three states namely: Anambra and Abia states while Ebonyi state had the lowest. Abia and Anambra states are mostly involved in commercial activities while Ebonyi state inhabitants are mostly involved in agriculture. This study population

consisted of ICT professionals, university lecturers, policymakers, and business owners. The sample size of the study was made up of 205 randomly sampled from the three states out of the five states in South East geopolitical zone.

The instrument used for data collection was a self-developed questionnaire based on Olayinka and Ojo (2021; United Nations, 2023) and from Human Capital Measurement Scale adapted partly to fit the Nigerian AI context. This is titled *AI* and Automation for Nation Building Questionnaire (AA-NBQ), (AA-NBQ) was divided into two sections A and B. Section A sought information on personal variables of the respondent such as profession. Section B was made up of clusters (B1-B3) with 28 items which addresses the research questions and grouped under three sub-scales: Economic Growth (EG) – 10 items, Governance Efficiency (GE) – 9 items, Human Capital Development (HCD) – 9 items, A four (4) point scale as shown below was used to enable the researcher judge the respondents' level of confidence on each items. Response for research question 1 and 2 were rated using; Strongly agree (SA) =4, Agree (A) =3, Disagree (D) =2 and strongly disagree (SD) =1. Research question 3 was built on; Very High Extent (VHE)-4 points, High Extent (HE)-3 points, Moderate Extent (ME)-2 points and Low Extent (LE)-1 point. The researcher employed SPSS version 25 to analyze the data. Mean, Standard deviation and multiple regression analysis were adopted to answer the research questions and test the hypothesis at a 0.05 significance level.

RESULTS

Data collected were analyzed and presented in tables according to research questions and hypotheses as follows:

Research Question 1:

What influence do AI and automation exert on economic growth and productivity in South East Nigeria?

Table 1: What influence do AI and automation exert on economic growth in Nigeria?

S/N	Statement	N 205	Mean	Std. Deviation	Decision
1	AI and automation have improved productivity across major economic sectors in Nigeria.	205	3.10	.93	Moderate influence
2	The use of AI in industries has led to new product and service innovations.	205	2.95	1.06	Moderate influence
3	Automation has enhanced efficiency and reduced production costs in Nigerian industries.	205	3.07	.95	Moderate influence
4	AI technologies have contributed significantly to Nigeria's digital economy growth	205	3.10	1.01	Moderate influence
5	Automation has increased the competitiveness of Nigerian firms globally	205	2.91	1.04	Moderate influence
6	AI-based financial systems have enhanced access to financial services in Nigeria.	205	2.99	.98	Moderate influence
7	AI adoption has created new employment and entrepreneurial opportunities.	205	3.07	1.04	Moderate influence
8	The use of automation has minimized operational inefficiencies in both public and private sectors.	205	3.187	.98	Moderate influence
9	AI-enabled agriculture has improved yields and food security.	205	3.08	1.05	Moderate influence
10	AI and automation contribute positively to Nigeria's GDP growth.	205	2.96	1.06	Moderate influence
	Grand Mean		**3.04**		

The results in Table 1 reveal that Artificial Intelligence (AI) and automation have a moderate influence on economic growth and productivity in South East Nigeria, as shown by the grand mean of 3.04. This indicates that these technologies are beginning to impact the economy, though their adoption is still developing. The mean values, which range between 2.91 and 3.19, show a consistent moderate influence across indicators. Respondents agree that AI and automation have improved productivity in key sectors (mean = 3.10) and enhanced efficiency while reducing production costs

(mean = 3.07). The highest mean score (3.19) shows that automation minimizes operational inefficiencies in both public and private sectors. Similarly, AI's role in expanding Nigeria's digital economy (mean = 3.10) reflects its contribution to e-commerce, financial services, and digital communication.

AI-based financial systems were also reported to improve access to financial services (mean = 2.99) and stimulate innovation through new products and services (mean = 2.95). Moreover, automation has increased the competitiveness of Nigerian firms globally (mean = 2.91) and created new employment and entrepreneurial opportunities (mean = 3.07). In agriculture, AI-enabled technologies have improved yields and food security (mean = 3.08), demonstrating their value for sustainable production. Overall, the grand mean of 3.04 confirms that AI and automation moderately but positively influence economic performance in South East Nigeria. To achieve greater impact, there is a need for increased investment in digital infrastructure, workforce development, and policy support to expand the adoption of these technologies across sectors.

Research Question 2

How do AI and automation affect governance efficiency and transparency?

Table 2: Mean response on how AI and automation affect governance efficiency and transparency.

S/N	Statement	N 205	Mean	Std. Deviation	Decision
1	AI and automation reduce bureaucratic delays in government operations.	205	3.19	.94	Agree
2	Automated systems enhance transparency and accountability in governance.	205	3.18	.974	Agree
3	AI tools help in monitoring and evaluating public projects efficiently.	205	2.97	.99	Agree
4	E-governance applications have improved public access to government services.	205	2.73	1.03	Agree
5	AI-driven data systems support evidence-based policymaking in Nigeria.	205	2.86	.96	Agree
6	Automation has helped to reduce corruption and misuse of public funds.	205	3.26	.93	Agree
7	Digital government initiatives have made service delivery faster and more reliable.	205	2.63	1.09	Agree
8	AI applications promote citizen feedback and participation in governance.	205	2.88	1.02	Agree
9	Government institutions are effectively adopting AI to improve administrative efficiency	205	2.93	1.09	Agree
	Grand Mean		**2.95**		

The result in Table 2 shows a grand mean of 2.95, indicating that respondents generally agreed that AI and automation positively influence governance efficiency and transparency in South East Nigeria. The high mean values across all the items demonstrate that technological adoption in government processes has enhanced operational effectiveness, transparency, and service delivery. Specifically, the highest mean of 3.26 recorded for the statement that automation has helped to reduce corruption and misuse of public funds implies that digital systems are perceived as effective in promoting accountability and minimizing corrupt practices. Similarly, the statement that AI and automation reduce bureaucratic delays in government operations recorded a high mean score of 3.19, suggesting that AI-driven automation streamlines administrative tasks and enhances the speed of decision-making. Other items such as AI tools helping in monitoring public projects efficiently (M = 2.97) and AI-driven data systems supporting evidence-based policymaking (M = 2.86) indicate that respondents recognize the relevance of AI analytics and monitoring systems in promoting evidence-based decisions and project evaluation. The mean value of 2.88 for AI applications promoting citizen feedback and participation also reflects the growing recognition of e-governance platforms as tools for participatory governance. Overall, these findings suggest that AI and automation are critical drivers of good governance, reducing inefficiencies, enhancing transparency, and promoting data-driven administrative reforms in the South East region of Nigeria.

Research Question 3

To what extent do AI and automation influence human capital development?

Table 3: Mean response on the extent to which AI and automation influence human capital development

S/N	Statement	N	Mean	Std. Deviation	Decision
1	AI-based educational tools have enhanced the quality of teaching and learning in Nigeria	205	3.08	1.04	High extent
2	Automation encourages workers to acquire new digital skills for improved performance.	205	2.35	1.10	Moderate extent
3	AI-driven learning systems promote personalized and adaptive education.	205	2.23	1.09	Moderate extent
4	Human capital productivity has improved due to automation in workplaces.	205	2.25	1.12	Moderate extent
5	AI exposure has motivated individuals to pursue lifelong learning and innovation	205	2.14	1.10	Moderate extent
6	Training institutions are integrating AI content into their curricula	205	2.18	1.07	Moderate extent
7	Automation has created opportunities for reskilling and upskilling among employees	205	2.43	1.20	Moderate extent
8	AI and automation have improved workforce adaptability to technological change.	205	1.84	.99	Low extent
9	AI adoption has increased the global employability in Nigerian graduates.	205	1.63	.92	Low extent
	Grand Mean		2.23		

The findings indicate that Artificial Intelligence (AI) and automation have a moderate influence on human capital development in South East Nigeria. These technologies are gradually shaping human resource capabilities, though their full potential is yet to be realized. AI-based educational tools have significantly improved teaching quality and learner engagement, showing the growing presence of intelligent systems in classrooms and online environments. However, other indicators reveal only moderate progress, suggesting that the application of AI and automation in workforce and education remains emerging. Automation encourages workers to develop new digital skills, while AI-driven systems promote adaptive and personalized learning. Respondents also noted that automation improves productivity and motivates lifelong learning, though many institutions are still slow in aligning training programs with technological change. Opportunities for reskilling and upskilling are expanding but not yet systematic across organizations. The relatively low influence on workforce adaptability and global employability implies that many Nigerian graduates' still lack AI-relevant competencies. Overall, AI and automation contribute modestly to human capital growth, with stronger effects in education than in employment. Greater investment in digital education, curriculum innovation, and employee training is essential to enhance readiness for an AI-driven economy.

Hypothesis 1: There is no significant relationship between AI and Automation on nation-Building indicators

Table 4: Regression analysis on the relationship between AI and Automation on nation-Building indicators

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	92.698	6.237		14.863	.000
AI and automation On nation-building Indicators	.002	.029	.008	.082	.935
Economic growth in S/E	.028	.064	.034	.443	.658
Government efficiency and transparency	.368	.084	.315	4.411	.000

Human capital development	.060	.066	.078	.917	.360

a predictor: Economic growth, Government efficiency, human capital dev.

In table 4 it was observed that AI and automation on nation building had beta of 0.008. this indicates that AI and automation on nation building contributes 0.8% to nation building and at 0.05 level of significant, the calculated t .082, P value is .935 the null hypothesis is accepted. Economic growth in South East had had a beta of .034. This indicates that AI and Automation contributes 3.4% to Economic growth and at 0.05 level of significant, the calculated t .443, P value is .658 the null hypothesis is accepted. Governance efficiency and transparency had a beta of .315. This indicate that AI and automation contributes 31.5% to Governance efficiency and transparency and at 0.05 level of significant, the calculated t 4.411, P value is .000 the null hypothesis is not accepted. Human capital development had a beta of .078. This indicates that AI and automation contributes 7.8% to human capital development and at 0.05 level of significant, the calculated t.917, P value is .360 the null hypothesis is accepted.

Discussion

The findings indicated that Artificial Intelligence (AI) and automation exert a moderate yet positive influence on economic growth and productivity in South East Nigeria. The adoption of AI and automation contributes positively to effective governance by streamlining administrative processes, minimizing bureaucratic bottlenecks, and promoting transparency in decision-making. This supports Obi and Eze (2023), who found that automation minimizes manual errors and boosts industrial precision, and Okeke and Nwosu (2022), who observed AI's role in improving production processes and output quality. Similarly, Olayinka (2021) noted that automation reduces production costs and enhances efficiency, while Adeleke (2022) emphasized AI's role in driving innovation and competitiveness through data-driven insights. The finding that AI supports Nigeria's digital economy aligns with Ndukwe and Ume (2022) and the World Bank (2023), who highlighted AI's role in expanding digital finance and e-commerce. Automation also reduces inefficiencies across sectors, consistent with Eze and Nwankwo (2023), who linked it to improved transparency and reduced delays. Although Nigeria's competitiveness remains moderate due to infrastructural limitations, AI adoption has created new entrepreneurial and employment opportunities (Adebayo, 2022). In agriculture, AI-powered technologies improved yields and food security (Okoro & Ibe, 2022). Similarly, IMF (2023) and OECD (2023) confirmed that AI contributes to GDP growth through enhanced productivity and innovation. Overall, AI and automation are emerging drivers of economic transformation and as Adeleke (2022) and Ndukwe and Ume (2022) noted, sustained investment in infrastructure, training, and policy reforms is vital to maximize long-term benefits.

From the given finding, the following deduction can be made: The adoption of AI and automation contributes positively to effective governance by streamlining administrative processes, minimizing bureaucratic bottlenecks, and promoting transparency in decision-making. This suggests that respondents perceive AI-driven automation as a tool that improves operational efficiency, reduces human-induced delays, and enhances accountability and openness within governance structures. Consequently, the integration of AI and automation is likely to strengthen institutional performance and public trust in governance systems. Respondents agreed that automation reduces bureaucratic delays and strengthens administrative responsiveness, supporting Olowu (2023), who reported that automation minimizes red tape and streamlines workflows in public institutions. Afolabi and Oyediran (2022) emphasized that digital auditing tools and AI-based data systems improve traceability and minimize human interference, while Eze and Ezeanya (2024) found that AI enhances project monitoring and evaluation. Similarly, UNDESA (2022) affirmed that data analytics support evidence-based policymaking, and Transparency International (2023) noted that automation reduces corruption through digital record-keeping. The World Bank (2023) also observed that digital governance improves service delivery timeliness. Nwosu and Okonkwo (2021) added that e-governance platforms strengthen citizen engagement and trust. However, the moderate mean score (2.93) for AI adoption indicates that institutional capacity and infrastructure remain constraints, as

Ibrahim and Adeyemi (2023) pointed out. Thus, while AI promotes transparency and accountability, further investments in digital infrastructure and capacity building are required to sustain progress.

In terms of human capital development, respondents agreed that AI and automation contribute positively, though the influence varies across dimensions. AI-based educational tools enhance teaching quality and learning engagement (Okonkwo & Agbo, 2023), while automation motivates reskilling and upskilling (UNESCO, 2022; Olatunji, 2023). Adebayo and Olagunju (2022) noted that AI-driven tutoring systems improve personalized learning and cognitive development. Exposure to AI also promotes lifelong learning and innovation (Eze & Umeh, 2022), and training institutions now integrate AI content into curricula (Nwosu, 2023). However, the overall impact remains limited due to infrastructural deficits and low awareness (Okoye et al., 2023). Therefore, digital inclusion, workforce training, and institutional support are crucial to strengthen AI's impact on human capital development.

Statistical results further showed that AI and automation significantly affect governance efficiency and transparency ($p < .05$), implying improved service delivery and reduced bureaucratic bottlenecks, consistent with Ezeaku and Nwankwo (2023) and Okafor (2022). However, their effects on economic growth and human capital development were not significant, as noted by Adebayo and Hassan (2022), due to infrastructural and literacy challenges. Umeh and Okorie (2023) also observed that weak institutional frameworks limit AI's potential in sub-Saharan Africa. Overall, the study partially rejects the null hypothesis, confirming that AI and automation currently impact governance more strongly than economic and educational systems. To enhance nation-building, deliberate investments in digital infrastructure, AI-driven training programs, and integration of intelligent systems across economic sectors are essential.

Conclusions

The study examined the influence of Artificial Intelligence (AI) and automation on nation-building indicators in South East Nigeria, focusing on economic growth, governance efficiency, and human capital development. Findings revealed that AI and automation exert a moderate influence on economic growth, improving productivity, innovation, and operational efficiency across sectors. The technologies also demonstrated a significant positive impact on governance efficiency and transparency, enhancing accountability and reducing bureaucratic delays in public institutions. However, their influence on human capital development remained limited, indicating low integration of AI in educational systems, skills training, and workforce development initiatives. Overall, the study concluded that while AI and automation have begun to transform governance and stimulate moderate economic progress, their full potential in driving human capital development and comprehensive national growth has yet to be realized. Strengthening infrastructure, digital literacy, and supportive policy frameworks will be crucial to unlocking these technologies' transformative power for sustainable nation-building.

Recommendations

1. Government at all levels should develop and implement robust AI and automation policies that promote innovation, ethical use, and national competitiveness.
2. Educational institutions should integrate AI and digital literacy into their curricula to prepare learners and workers for emerging technological demands.
3. Public Private Partnerships: Collaboration between government, academia, and industry is essential for creating innovation hubs that support startups and promote technology-driven economic growth.

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