EFFECT OF ARTIFICIAL INTELLIGENCE ON TERTIARY INSTITUTIONS IN NIGERIA: A CRITICAL ANALYSIS

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ABSTRACT

This study is a descriptive survey design that investigated the effect of Artificial Intelligence (AI) on tertiary institutions in Nigeria. The population of the study is the total number of staff in all the tertiary institutions in Sokoto State of Nigeria. The respondents were the 1612 comprising of 530 academic staff and 1082 non-academic staff of the institutions that were sampled using the stratified random sampling. Two specific objectives, research questions and one null hypothesis were postulated to guide this study. The researcher structured a four Likert scale questionnaire titled Artificial Intelligence and Tertiary Education in Nigeria (AITEN) to elicit information from the respondents. The questionnaire was validated by expert judgement of three academic authorities; two from the department of computer science and one from educational measurement and evaluation and the reliability index was 0.79 using the Person Product Correlation coefficient formula (r). The mean and standard deviation were used in answering the research questions while the hypotheses were tested by the z-test statistical tool at 0.05 level of significance. The findings reveal that personalized learning, improved management efficiency, enhanced student engagement, innovation and competitive advantage, enhanced faculty productivity, and optimized administrative processes ere the effects of adopting AI in tertiary institutions in Nigeria. Nevertheless, the study highlights the need for strategic planning, infrastructure development, and capacity building to ensure effective AI adoption and mitigate its negative consequences.

Keywords: *Artificial Intelligence, Tertiary Education, Sokoto State*

INTRODUCTION

Tertiary institutions in Nigeria are facing numerous challenges including inadequate infrastructure, limited resources, and poor funding. To some extent, these challenges have hindered the ability of the education sector to provide high-quality education and this has led to the present decline in the

academic standards and graduate employability level experienced in the country today. In recent years, Nigeria as a country has sort for solutions to the challenges inherent in her education sector hence the sector has begun to explore innovative solutions to address these challenges including the adoption of Artificial Intelligence (AI).

Japhtani and Capelo (2018) posited that the advent of Artificial Intelligence (AI) has transformed Nigerian education sector through the AI-powered solutions by improving teaching, learning and administrative processes. AI's potential to enhance student engagement, faculty productivity, and institutional efficiency has made it an attractive technology for educational institutions in Nigeria.

This is confirmed by the assertion of Adebisi (2013) that AI has the potential to transform the education sector by improving teaching, learning and administrative processes and bring the much desired achievement of the goals of education at all levels. AI-powered solutions can help personalize learning, enhance student engagement, and optimize faculty productivity. Additionally, AI can help institutions streamline administrative processes, reduce costs, and improve decision-making (Imala and Alagoli, 2015). Despite the potential benefits of AI, its adoption in Nigerian tertiary institutions is still in its infancy stage (Campela, 2016). That notwithstanding, several institutions have begun to explore AI-powered solutions, including online learning platforms, student information systems, and learning management systems.

Some important questions have been raised about the integration of AI in Nigerian tertiary institutions. This concerns the various opportunities and challenges of AI- powered solutions and their impact on the quality of education, job displacement, and the digital divide. Obizue and Obizue (2018) observed that as AI can help address some of the educational sector's challenges but it also requires significant investments in infrastructure, training, and capacity building. This study contributes to the understanding of AI's impact on tertiary education in Nigeria, providing insights for policymakers, educators, and administrators seeking to harness the potential of AI in improving educational outcomes and institutional efficiency. This study is significant because it provides insights into the impact of AI on Nigerian tertiary institutions and the findings of this study can inform policymakers, educators, and administrators seeking to harness the potential of AI in improving educational outcomes and institutional efficiency. Additionally, this study contributes to the growing body of research on AI adoption in education, providing a unique perspective on the challenges and opportunities facing Nigerian tertiary institutions.

Olatunde and Abioye (2019) advocated that the integration of Artificial Intelligence (AI) in tertiary institutions in Nigeria is a relatively new phenomenon, and its impact on teaching, learning, and administrative processes is not yet fully understood. While AI has the potential to improve student

engagement, faculty productivity, and institutional efficiency, its adoption also poses significant challenges. In the view of Akubueze and Amaefula (2017), many Nigerian tertiary institutions lack the necessary infrastructure, including computer hardware, software, and internet connectivity, lack of technical expertise among faculty and staff can hinder the effective adoption and utilization of AI-powered solutions as well as the high costs involved in adopting AI. In light of these challenges, this study seeks to investigate the impact of AI on tertiary institutions in Nigeria, with a focus on its effects on teaching, learning, and administrative processes.

Ezeadi (2022) confirmed that there is evidence of growing body of research on AI adoption in education yet the there is still so much need for more research on the specific effects, challenges and opportunities facing Nigerian tertiary institutions because there is scarcity of studies addressing these specific area.

This main aim of this study is to address this research gap by investigating the effect of AI on Nigerian tertiary institutions. This study specifically addressed the different areas that AI is applied in tertiary institutions and the effects or benefits of integrating AI in tertiary education.

Based on the specific objectives the following research questions were formulated in this study; what are the different areas the AI can be applied in tertiary institution in Nigeria and what are the effects or benefits of AI adoption in Nigerian tertiary institutions. A null hypothesis which stated that AI has no significant effect on tertiary education in Nigeria was tested in this study.

LITERATURE REVIEW

It is important to consider some conceptual dialectics so as to explain some concept that are deemed relevant to this study.

ARTIFICIAL INTELLIGENCE (AI)

The definition of Artificial intelligence as posited by Akpan and Nwozuzu (2019) and Udekamna and Nwafor (2022) can be summarized to define Artificial Intelligence as the convergence of human ingenuity and technological innovation where machines are designed to mimic human cognitive abilities such as learning, reasoning and problem solving. It is a field that encompasses a broad range of intelligent machines that demonstrate human-like traits. Alabi (2020) described AI to the development of computer systems that can perform tasks that typically require human intelligence, such as learning, reasoning, problem-solving, perception and language understanding. Ezekoka and Uzozie (2019) advocated that AI possesses human traits like learning from experiences, adapting to

situations, generating and interpreting human language, recognizing and responding to visual and audio inputs thereby resolving complex problems through logical reasoning and decision making.

TERTIARY INSTITUTIONS

Obizue and Obizue (2018) defined tertiary institutions as the educational institutions that provide education beyond the secondary level hence they are also known as post-secondary institutions. These institutions offer a wide range of academic, vocational, and professional programs that lead to certificates, diplomas and degrees.

The Universities, Polytechnics, Colleges of Education, School of Health, Technological and Technical Institutes, Vocational Schools are the various tertiary institutions in Nigeria (Udekamma and Nwafor, 2022).

In the words of Alabi (2020), tertiary institutions plays important role in the nation which include providing opportunities for social mobility, enabling individuals from diverse backgrounds to access higher education and improve their socio-economic prospects, developing the knowledge and skills required for the modern workforce and contributing to economic growth by providing a skilled and educated workforce, driving innovation, and fostering entrepreneurship.

APPLICATION OF ARTIFICIAL INTELLIGENCE IN NIGERIAN TERTIARY INSTITUTIONS

This talks about the various department, units and areas of usage where Artificial intelligence can be applied or adopted in tertiary institutions in Nigeria.

AI can be applied or adopted in various areas in Nigerian tertiary institutions to enhance the quality of education and improve administrative efficiency. According to Imalah and Alagoli (2015), Obizue and Obizue (2018), Alabi (2020) and Ezeadi (2022) the following are the areas or aspect where AI is applied in tertiary institution.

CURRICULUM DEVELOPMENT

AI helps in optimizing course materials by developing personalized and adaptive curricular

STUDENTS' ASSESSMENT

AI is used in assessing students performances, providing feedback and making decisions

RESEARCH AND DEVELOPMENT

AI serves a good aid and support to students, lecturers and scholars in their academic studies and research work by providing insights, analyzing data and identifying patterns

INSTITUTION MANAGEMENT

Most institutions adopt the AI in their general management and administration to ensure effectiveness and efficiency at all levels. This may include teaching and learning programs, human resources and inventory management etc

SCIENCE EDUCATION

Different institutions integrate AI in their science education programs to prepare their for the demands of the digital age thereby improving students' engagement and learning outcome.

EFFECTS AND BENEFITS OF ARTIFICIAL INTELLIGENCE IN TERTIARY INSTITUTIONS

The integration of Artificial Intelligence (AI) in tertiary institutions has numerous positive effects on the education sector. According to Imalah and Alagoli (2015), Obizue and Obizue (2018), Alabi (2020) and Ezeadi (2022) the effects and benefits of AI in tertiary education are summarized as follows:

PERSONALIZED LEARNING

AI can facilitate personalized learning experiences, tailoring education to individual students' needs and abilities. AI-powered adaptive learning systems adjust the difficulty level of course materials based on students' performance.

ENHANCED STUDENT ENGAGEMENT

AI-powered tools can enhance student engagement, improving academic outcomes and increasing student motivation. AI-driven chatbots and virtual assistants provide students with regular support.

IMPROVED ADMINISTRATIVE EFFICIENCY

AI can automate administrative tasks, reducing paperwork and freeing up staff to focus on more strategic tasks. AI-powered systems can handle tasks such as student registration, grading, and feedback.

INTELLIGENT TUTORING SYSTEMS

AI-powered intelligent tutoring systems provide one-on-one support to students, offering real-time feedback and guidance. These systems help students fill knowledge gaps and improve their understanding of complex concepts.

DATA-DRIVEN DECISION MAKING

AI can analyze large datasets, providing insights that inform decision-making and drive institutional improvement. AI-powered analytics help institutions identify areas of improvement, optimize resource allocation, and predict student outcomes.

VIRTUAL LEARNING ENVIRONMENTS

AI-powered virtual learning environments provide students with immersive and interactive learning experiences. These environments simulate real-world scenarios, allowing students to practice and apply theoretical concepts.

AUTOMATED GRADING

AI-powered automated grading systems reduce the workload of instructors, freeing up time for more critical tasks. These systems provide accurate and unbiased grading, ensuring fairness and consistency.

NATURAL LANGUAGE PROCESSING

AI-powered natural language processing (NLP) enables computers to understand and generate human language. NLP-powered chatbots and virtual assistants facilitate communication between students, instructors, and administrators.

PREDICTIVE ANALYTICS

AI-powered predictive analytics help institutions predict student outcomes, identify at-risk students, and provide targeted interventions. Predictive analytics also enable institutions to forecast enrollment, optimize resource allocation, and improve strategic planning.

ACCESSIBILITY AND INCLUSION

AI-powered tools can improve accessibility and inclusion for students with disabilities. AI-driven systems provide personalized support, accommodations, and assistive technologies, ensuring equal access to education.

INNOVATION AND COMPETITIVE ADVANTAGE

AI can drive innovation in research and development, leading to new discoveries and applications. Institutions that adopt AI can gain a competitive advantage in attracting students, faculty and funding. By harnessing the potential of AI, tertiary institutions can create more personalized, efficient and effective learning environments that support student success.

CHALLENGES FACING THE ADOPTING AI IN TERTIARY INSTITUTIONS IN NIGERIA

The adoption of Artificial Intelligence (AI) in tertiary institutions in Nigeria faces several challenges and addressing these challenges will require a collaborative effort from educators, administrators, Policy-makers and industry partners (Imalah and Alagoli, 2015: Olatunji and Abioye, 2019).

By working together, it will easier to harness the potential of AI, improve education outcomes and drive economic growth in Nigeria.

Some scholars like Adebisi (2013), Akubueze and Amaefula (2017), Alabi (2020) and Ezeadi (2022) agreed on the following as the challenges in applying AI in tertiary institutions in Nigeria

INFRASTRUCTURE LIMITATIONS

Institutions suffer inadequate computer hardware and software, poor internet connectivity and bandwidth and limited access to digital resources and tools. There are also problems of unreliable power supply and frequent outages, limited access to backup power sources, such as generators and solar panels and need for energy-efficient AI solutions and infrastructure

LIMITED TECHNICAL EXPERTISE

Lack of skilled personnel to develop and implement AI solutions, limited understanding of AI concepts and applications among educators and administrators and lack of needed opportunities for capacity building and training programs are basic challenges concerning AI integration in tertiary institutions.

FINANCIAL CONSTRAINTS

This includes limited budget allocation for AI adoption and implementation, high costs of AI software, hardware, and consulting services and competing priorities for funding, such as infrastructure development and staff salaries

CURRICULUM AND PEDAGOGICAL CHALLENGES

The challenges approaches involved in integrating AI into existing curricula and pedagogical, developing new curricula and courses that focus on AI and its applications and addressing the digital divide and ensuring equal access to AI education

DATA MANAGEMENT AND SECURITY CONCERNS

There are also challenges in areas of managing and analyzing large datasets for AI applications, ensuring data security, privacy, and integrity and addressing various data bias and algorithmic decision-making concerns

REGULATORY AND POLICY FRAMEWORKS

Lack of clear policies and guidelines for AI adoption in education and the need for regulatory frameworks to address AI-related issues, such as data protection and intellectual property and even how to ensure compliance with existing laws and regulations are things of concern

SUSTAINABILITY AND MAINTENANCE

Ensuring the long-term sustainability of AI solutions and infrastructure as well as addressing maintenance and support requirements for AI systems pose problems to most institutions.

METHODOLOGY

The design used in this study is descriptive survey. The population of the study is the total number of staff of all the tertiary institutions in Sokoto State of Nigeria which the researcher cannot ascertain

at the time of this study. The respondents were the 1612 comprising of 530 academic staff and 1082 non-academic staff of the institutions that were sampled using the stratified random sampling. Two specific objectives, research questions and hypotheses were postulated to guide this study. The researcher structured a four Likert scale questionnaire titled Artificial Intelligence and Tertiary Education in Nigeria (AITEN) to elicit information from the respondents.

The questionnaire passed through the expert judgement of three academic authorities; two from the department of computer science and one from educational measurement and evaluation. The researcher modified the questionnaire based on their correction which she administered to the respondents and retrieved their responses. The reliability index of 0.79 was established using the Person Product Correlation coefficient formula (r). Mean and standard deviation were used in answering the research questions while the hypotheses were tested by the z-test statistical tool at 0.05 level of significance.

RESULTS AND ANALYSIS

The results of the study were derived from the answers from the research questions and testing of the null hypothesis

RESEARCH QUESTION 1

What are the various areas the AI can be applied in tertiary institution in Nigeria ?

Table 1: Mean and standard deviation on the ratings of academic and non-academic staff on the different areas the AI can be applied in tertiary institution in Nigeria

SN	ITEMS	X_1	SD_1	X_2	SD_2	DECISION
1	Curriculum development	3.80	0.70	3.39	0.93	Accepted
2	Science education	3.59	0.93	3.29	1.17	Accepted
3	Research and development	3.57	0.92	3.42	1.10	Accepted
4	Students' assessment	3.44	1.00	3.77	0.76	Accepted

Table 1 revealed the responses of academic and non-academic staff of Nigerian tertiary institutions on the various areas the AI can be applied in tertiary institution in Nigeria and the data on table 1showed that items 1 to 4 have weighted mean scores above the criterion mean of 2.5 and adjudged the different areas where AI can be applied in Nigeria tertiary institutions. This implies that both the academic and non-academic staff of Nigerian tertiary institutions agreed that curriculum development, science education, research and development and students' assessment are the areas that AI are applied and useful in tertiary institutions in Nigeria.

RESEARCH QUESTION 2

What are the effects or benefits of AI adoption in Nigerian tertiary institutions ?

Table 2: Mean and standard deviation on the ratings of academic and non-academic staff on the effects or benefits of AI adoption in Nigerian tertiary institutions

SN	ITEMS	X_1	SD_1	X_2	SD_2	DECISION
5	Enhanced management efficiency	3.72	0.46	3.72	0.68	Accepted
6	Personalized learning	3.53	0.98	3.66	0.58	Accepted
7	Innovation and competitive advantage	3.42	1.09	3.33	1.11	Accepted
8	Students' engagement	3.51	0.98	3.17	1.05	Accepted

Table 2 is an of array of the effects and benefits of AI in tertiary institutions in Nigeria and the weighted mean scores are also higher than the criterion score of 2.5. This indicates that the two sets of respondents generally accepted that the items in table 2 are the effects and benefits of adopting AI in Nigerian tertiary institutions. By implication, AI help Nigerian tertiary institutions to attain enhanced management efficiency, students' personalized learning, innovation and competitive advantage as well as students' engagement.

TESTING OF HYPOTHESIS

H_O: There is no significant difference in the mean ratings of academic and non-academic staff of tertiary institutions in Nigeria on the effect of AI on tertiary education in Nigeria.

Table 3: Summary of z-test analysis on the mean ratings of academic and non-academic staff on the effects of AI adoption in Nigerian tertiary institutions

Subjects	N=1612	Mean	SD	Df	z-cal	z-critical	Decision
Academic Staff	530	3.25	0.98	1610	2.64	1.96	Rejected
Non-academic Staff	1082	3.40	0.93				

The data on table 2 showed the summaries of the scores, means, standard deviations and the z-test of difference between the ratings of academic and non-academic staff on the effects of AI adoption in Nigerian tertiary institutions. The z-test calculated value stood at 2.64 while the z-critical value

stood at 1.96 using 1610 degree of freedom at 0.05 level of significance. Given this result, the z-calculated is greater than the z-critical and this indicates that there is significant difference between the mean ratings of academic and non-academic staff on the effects of AI adoption in Nigerian tertiary institutions. This give enough credence for the rejection of the null hypothesis which stated and the acceptance of the alternate hypothesis.

CONCLUSION

This study has examined the impact of AI on teaching, learning, and administrative processes in Nigerian tertiary institutions and the findings revealed that AI can improve student engagement, enhance faculty productivity, and optimize administrative processes. The researcher concludes that the integration of Artificial Intelligence (AI) in tertiary institutions in Nigeria has the potential to transform the education sector.

RECOMMENDATIONS

Based on the study findings, the researcher recommended as follows;

1. Tertiary institutions in Nigeria should promote AI adoption in tertiary institutions support the development of AI-powered educational tools and platforms so as to enjoy the carious benefits of AI adoption.
2. Tertiary institutions in Nigeria should develop strategic plans for AI adoption, taking into account their unique needs and challenges and should invest in modern infrastructure, including high-speed internet connectivity and computer hardware, to support AI adoption.
3. The Nigerian government should provide funding and support for tertiary institutions to adopt AI and develop AI-powered educational tools and platforms and also develop national policies and guidelines for AI adoption in tertiary institutions.
4. The government should promote AI education and awareness among students, faculty, and staff in tertiary institutions.
5. Institutional leaders should provide training and capacity-building programs for faculty and staff in tertiary institutions to develop the necessary skills to effectively deploy AI.

REFERENCES

Adebisi, M. S. (2021). Artificial Intelligence in Education: A Review of the Literature. *Journal of Educational Technology Development and Exchange*, 10(2), 266-279.

Akpan, E. E. and Nwozuzu, J. (2019). The Impact of Artificial Intelligence on Tertiary Education in Nigeria. *International Journal of Advanced Research in Computer Science*, 12(2), 3191-3204.

Akubueze, J. O. and Amaefula, M.O. (2017). The benefits and challenges of digital education in Nigeria. *Journal of Scientific Perspective* 8(1), 470-483

Alabi, O. O. (2020). Artificial Intelligence and Education: A Review of the Literature. *International Journal of Emerging Technologies in Learning*, 15(1), 4-15.

Bakare, G. A. (2019). The Impact of Artificial Intelligence on Student Engagement in Nigerian Universities. *Journal of Educational Technology Systems*, 48(1), 34-45.

Campela, A.M. (2016). Effect of administration of computer education on Nigerian sustainable development. *International Journal of Computer Education and Contemporary Studies,* 16(2), 344 - 356

Ezeadi, F. C. (2022). Artificial Intelligence and Machine Learning in Education: A Systematic

Ezekoka, M.U. and Uzozie, O. (2018). Computer and Information Technology: Tool for Educational Development in Nigeria. *Journal of Educational Technology*, 20(1), 237-

Obizue, E.C. and Obizue, M.N. (2018) Politics of digitalisation of education in Nigeria: Programme accreditation for quality assurance in Nigerian tertiary education. *Journal of African Research Scholars.* 4(2), 211-226

Ibrahim, A. O. (2019). The Effect of Artificial Intelligence on Academic Performance of Nigerian Universities. *International Journal of Science Education*, 14(6), 2242-2255.

Imalah, A. and Alagoli, E.M. (2020). Artificial Intelligence and Education in Nigeria: A Review of the Outcomes in Nigerian Universities. *Journal of Education and Human Development*, 10(1), 2611-2624

Japhtani, E. S. and Capelo, A. O. (2018). The Role of Artificial Intelligence in Enhancing Teaching and Learning in Nigerian Universities. *Journal of Computer Education,* 6(1), 412-426.

Ogunsola, O. O. (2019). The Role of Artificial Intelligence in Enhancing Student Learning. *Journal of Educational Computing Research*, 11(3), 144-132.

Olatunde, O. and Abioye, B.M (2019). Emerging technologies and learning outcome in Nigerian universities: A survey. *Journal of Educational Technology and Society*, 21(2), 321-335

Udekamna, A. and Nwafor, A. O. (2022). Artificial Intelligence in Nigerian Education: Challenges and Opportunities. *Journal of Educational Computing Research*, 6(2), 1337-1349.