

Adoption of Generative Artificial Intelligence Tools in Nigerian Higher Education

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ABSTRACT

The current research attempts to investigate the application of generative artificial intelligence (AI) technologies within Nigerian higher education regarding its potential, difficulties, and consequences on teaching, learning, research, and management processes. Nowadays, in times when the use of generative AI software has been growing rapidly in the educational sphere, such as tutoring, content generation, and research aids, the level of their integration into higher educational institutions in Nigeria depends on many aspects. The current research is conducted using the qualitative approach which implies a thorough analysis of the existing literature on generative AI in education, including scholarly articles, conferences' papers, and policies of the governmental bodies about generative AI. The content analysis approach in the applied in the study helps bring forth patterns related to the use of AI technology, digital readiness, academic integrity, educators' competencies, and students' engagement. From the results obtained, it can be seen that generative AI is able to aid personalized learning, effective research procedures, administration, and teaching. However, there are certain obstacles such as inadequate digital infrastructure, lack of knowledge regarding AI technology, privacy threats, ethical issues, poor internet connection, and lack of necessary policies that prevent the adoption of AI. Therefore, the conclusion drawn is that even though there are numerous opportunities that generative AI presents in improving the quality and competitiveness of education in Nigeria, it requires cooperation among different parties in order to make the adoption process successful. The following are some recommendations based on the results obtained from the study: investment in infrastructure and capacity building for academic faculties and students, formulation of ethical guidelines, and policies for the adoption of generative AI technology.

Keywords: Generative Artificial Intelligence, Nigerian Higher Education, Ethical Issues, Research tools, Education Sector

INTRODUCTION

The rise of Artificial Intelligence (AI) has affected almost all aspects of life ranging from healthcare, financial services, manufacturing industries, communications, to education. Recently, the creation of Generative Artificial Intelligence (Generative AI), which is basically an AI model that generates human-like texts, images, codes, audio, among others, has greatly impacted the field of education. Platforms such as ChatGPT, Google Gemini,

Microsoft Copilot, and Claude are becoming more prevalent in various activities in higher education institutions around the world like teaching, learning, researching, and administration. While the majority of AI models analyze and categorize information, generative AI generates information depending on the prompt given by the user. Thus, it gives an opportunity for customized learning, researching, creating curriculum, and writing (UNESCO, 2023). Given the rise of digitalization in universities, generative AI technology innovation can enhance the quality of education and efficiency of the institution.

For the most part, educational institutions worldwide are slowly but steadily welcoming the use of generative AI in order to make the process of teaching and learning more effective for their students. It enables educators to create teaching materials, organize classes, check students' assignments, come up with questions and give personalized feedback. Students can also enjoy the services of tutoring, translation, problem solving, coding, and research provided by AI (Dwivedi et al., 2023).. Finally, researchers apply the technology to analyze literature, process data, compose academic works, and think of ideas (Kasneci et al., 2023). Thus, it becomes obvious that the technology has become a useful tool for education.

In Nigeria, there has been increased adoption of technology-based devices in higher learning institutions, especially since the outbreak of the COVID-19 pandemic. Many universities, polytechnic, and colleges of education have increased their use of digital technologies in their virtual teaching and learning processes as well as in academic research and administration. The rise of generative AI has further increased these possibilities through its provision of intelligent systems to help in teaching, research, learning, and administration. Students in Nigeria are using AI systems to assist them in academic writing, revision for exams, improving language skills, computer programming, and information searching, while tutors are making use of AI tools in preparation of lessons, academic research, and content creation (National Universities Commission [NUC], 2024). This shows that the adoption of generative AI is growing into an important aspect of Nigeria's higher education system.

In spite of these encouraging developments, the use of generative AI in the higher learning institutions in Nigeria continues to face a number of obstacles. The main obstacle is that of insufficient technological infrastructure. There have been many cases where there has been unstable power supply, inadequate Internet connectivity, lack of computer labs and lack of technological infrastructure in many tertiary institutions. This makes the effectiveness of such AI educational tools very difficult to achieve especially in public and rural areas. The other problem facing the institutions is that of insufficient financial resources (World Bank, 2023).

One of the other major challenges facing the implementation of generative AI is inadequate digital literacy and AI proficiency among learners and tutors. Effective deployment of generative AI calls for the users to have sufficient technological knowledge and digital skills in order to utilize the technology effectively. Unfortunately, most lecturers have not been adequately trained on how to integrate AI in teaching, learning and research activities, while most learners lack sufficient knowledge on the ethical and academic consequences of AI-generated content (UNESCO, 2023).

Moreover, academic integrity concerns continue to feature prominently in discussions about the use of generative AI in higher learning institutions. The capacity of AI systems to create essays, research papers, coding and examination answers has raised many concerns regarding plagiarism, originality, intellectual property rights, authorship and credibility of the assessment process. It therefore follows that educational institutions are increasingly under pressure to redesign their assessment processes, develop guidelines on ethical use of AI and formulate institutional policies regulating the use of the AI (Dwivedi et al., 2023).

Nevertheless, notwithstanding all the above-stated, there is still huge potential that generative AI has to offer. Generative AI can assist in personalizing learning, increasing the engagement of learners, making research easier, reducing administrative work, promoting innovations within the curricula, and promoting efficiency. Moreover, generative AI can have a great impact in promoting inclusive education through providing learners with adaptive learning that caters for individual needs and increased access to educational materials. Nonetheless, achieving all these requires cooperation of all parties including the government, universities, tech companies, policymakers, and university lecturers. Digital infrastructure development, continued professional

development, AI literacy programs, and ethical governance are some of the critical investments necessary to encourage the responsible use of AI in the Nigerian universities (OECD, 2023).

In light of the above situation, there is an urgent need to investigate the use of generative AI in Nigerian higher education institutions in terms of the opportunities, constraints, and implications thereof. An exploration of the topic will go a long way in helping stakeholders such as policymakers, university administrators, teachers, and researchers come up with the right strategies to take advantage of the educational benefits offered by generative AI while mitigating the risks.

Statement of the Problem

Generative artificial intelligence (AI) has revolutionized higher education all over the world through the creation of advanced tools that contribute to better learning, teaching, research, and administrative functions in universities. Tools like ChatGPT, Google Gemini, and Microsoft Copilot offer opportunities for personalized learning, creation of educational material, research, and more efficient management. However, the use of generative AI in Nigeria's higher education is still in its early stages, and there are major differences in its implementation among various universities.

However, many institutions of higher learning in Nigeria have been confronted by various obstacles that make the proper incorporation of generative AI difficult. Some of the obstacles facing the use of generative AI in Nigeria include lack of adequate digital infrastructure, poor internet connectivity, poor electricity supply, lack of access to AI tools, limited financing, and lack of AI literacy among both students and teachers. In addition, the failure to develop adequate institutional policy and ethical considerations has created serious concern about academic integrity, data privacy, copyright violation, and proper use of AI-generated material. This could affect the effectiveness of generative AI and at the same time increase the risk in higher education.

Several international studies have explored the opportunities and challenges of using generative AI in education, but few empirical and review-based studies have considered how this technology can be used in higher education institutions in Nigeria. Most studies that focus on educational technology do not consider how this technology presents unique opportunities, challenges, and implications in the case of generative AI in Nigeria.

Thus, there arises the need to critically analyze the adoption of generative AI within the Nigerian higher education system in order to determine its possible advantages, the hurdles faced during its implementation, and its effects on educational practices. The results of this research will offer valuable information to policy makers, institutional managers, educators, and other stakeholders in order to formulate policies that foster the adoption of generative AI responsibly within the Nigerian higher education institutions.

LITERATURE REVIEW

Concept of Generative Artificial Intelligence

Generative AI entails the use of advanced methods of Artificial Intelligence to create original content such as texts, reports, contracts, recommendation, codes, images, and analyses of big data using deep learning models (Dwivedi et al., 2023). The difference between the traditional methods of AI and generative AI is that while traditional AI involves prediction and classification approaches, generative AI generates human-like responses for effective decision-making.

Generative Artificial Intelligence Tools in Nigerian Higher Education

The emergence of Generative Artificial Intelligence (AI) technologies is affecting the change in higher education by enhancing features related to content creation, personalized learning, research, and administrative aspects of learning. This set of technologies comprises various applications such as AI-powered writing assistants, chatbots, automated feedback, and research tools that leverage machine learning algorithms to produce human-like text and image-based content (Dwivedi et al., 2023). The adoption of Generative AI in Nigerian higher education institutions will create opportunities to enhance educational delivery and conduct research.

Generative AI tools have the potential to enable personalized learning by providing feedback, explanations, and learning materials to learners immediately in addition to traditional face-to-face classroom learning. In the case of academic personnel, Generative AI could help in preparing lessons, conducting literature review, data analysis, and other administrative activities to make them more efficient and productive (Kasneci et al., 2023). Nonetheless, the integration of Generative AI in Nigerian universities remains nascent owing to some difficulties including lack of digital infrastructure, insufficient technical skills, poor internet connectivity, and ethical considerations including academic honesty and privacy (UNESCO, 2023).

The proper use of Generative AI in Nigerian institutions of higher learning will require that certain policy measures be taken, as well as building digital capabilities, among other factors, by the academic staff and the students alike. While Generative AI can be transformative in education, the adoption of the technology in Nigerian institutions of higher learning will be highly dependent on institutional readiness and ethics.

EMPIRICAL REVIEW

In Kasneci et al.'s (2023) study “ChatGPT for Good? On Opportunities and Challenges of Large Language Models for Education”, a qualitative review was conducted whereby the researchers looked into the existing literature and the applications of large language models (LLMs) in education, especially ChatGPT. The research was done by analyzing the past research on generative AI technologies in educational settings, the practice, and new findings on the applications of generative AI technologies in education including teaching, learning, assessment, and research. According to the results of the study, generative AI offers many opportunities for education through personalized learning, automated feedback, tutoring, content creation, and better access to learning materials. The research also concluded that generative AI can help teachers to prepare lessons, develop assessments, and perform administrative functions while researchers can benefit from the assistance of AI in writing, ideation, and information synthesis. In conclusion, it was found that AI can be an effective tool for transforming higher education since it will not only help educators but will also improve efficiency and innovation in knowledge delivery. The authors suggest that the educational system should develop AI policies, educate educators and students about AI literacy, and incorporate AI technologies in a way that will complement and not substitute human teaching and academic judgments.

Tlili et al. (2023) conducted the research entitled "What If the Devil Is My Guardian Angel: ChatGPT as a Case Study of Using Chatbots in Education". In their study, the authors applied a qualitative case study method in order to examine the educational application of ChatGPT. Data was gathered by analyzing existing educational practices, technological potential of ChatGPT, as well as conversations about ChatGPT usage between teachers and students. Results have shown that ChatGPT could help students learn more effectively through immediate explanations, personal assistance, language support, brainstorming ideas, and guidance in learning. It was also found that ChatGPT could be used by teachers to create learning materials, give examples, create tests and make learning process more efficient. Thus, it is stated that there are many opportunities to improve educational experience using ChatGPT and other types of generative AI. The study recommends providing training for both teachers and students on how to use AI effectively and ethically.

A study by Dwivedi et al., (2023) “So What If ChatGPT Wrote It? Multidisciplinary Perspectives on Opportunities, Challenges and Implications of Generative Conversational AI for Research, Practice and Policy” The research involved multidisciplinary review through analysis of existing literature and policy debates on generative AI in different disciplines, including education and research. The results showed various problems associated with generative AI such as academic integrity issues, misinformation, privacy risks, copyright issues, transparency problems, and ethics concerns. Lack of digital skills and limited understanding of AI technology was also indicated as major problem in effective use of generative AI. From the study it can be concluded that while there are numerous benefits offered by generative AI, its usage poses many ethical, technical and policy related challenges which have to be managed properly. The study suggests the formulation of AI policies at institutional level, development of digital skills and good governance framework for AI.

Study by UNESCO (2023) Guidance for Generative AI in Education and Research. This study was conducted using a policy-based research methodology that involved the examination of experiences from around the world,

practices in educational technologies, and emerging findings concerning generative AI usage in the education sector. This study found several barriers to the implementation of AI in education, which include digital divide, low teacher readiness, lack of AI policies, data protection issues, and ethical concerns about AI-generated material. Developing nations face higher difficulties since they have fewer technological means. The research findings indicated that successful implementation of AI is dependent on joint efforts by governments, institutions, educators and technology companies. It suggested that investments be made in developing digital infrastructures, creating AI competencies, formulating ethics and policies to ensure equal access to AI technologies in education.

Research by Chiu et al. (2023) "Systematic Literature Review on Opportunities, Challenges, and Future Research Directions of Artificial Intelligence in Education". In this research systematic literature reviews have been used where the researchers analyzed empirical and theoretical studies conducted previously on the topic of use of artificial intelligence in the education sector. The researcher has analyzed studies that focus on AI-assisted teaching process, learning process, educational administration, and future education transformation. From this research, it is clear that the use of AI has several implications on improving educational quality through personalized learning, engagement of learners, efficient academic administration, and decision making. Overall, the study demonstrated that artificial intelligence is going to have a huge impact on the future of higher education. Nonetheless, educational institutions should consider ethical factors while using new technologies. To that end, the study suggested ongoing investments in AI research and teachers' professional development.

An OECD (2023) study on "Generative Artificial Intelligence in Education: Opportunities and Challenges". The study adopted a comparative analysis approach through examination of the evidence of generative artificial intelligence in educational systems of various countries. The results revealed that generative AI can play an important role in improving the quality of education, research output, management, and innovation in higher education. However, the challenges of governance, digital inequalities, evaluation and assessment processes, and the need for new approaches in assessing the knowledge and abilities of students were recognized in the study. The study indicated that generative AI will have a great impact on the future of higher education systems.

THEORETICAL FRAMEWORK

Technology Organization Environment (TOE)

The Technology–Organization–Environment (TOE) framework has been developed in 1990 by Louis G. Tornatzky and Mitchell Fleischer as a comprehensive theoretical framework for describing processes of adoption and implementation of innovations in organizations. As per the TOE framework, technological innovation adoption processes are affected by three interrelated aspects: technological aspect, organizational aspect and environmental aspect (Tornatzky & Fleischer, 1990). Despite the fact that the TOE framework was developed long before the emergence of Generative Artificial Intelligence (Generative AI), its broad application range makes it appropriate theoretical basis for analyzing Generative AI adoption in Nigeria higher education institutions.

The technological context deals with the nature of the technology being adopted in terms of its advantages, level of complexity, compatibility, security, and infrastructure support (Baker, 2012). Regarding Generative AI adoption in Nigerian universities, the aspect will involve issues like the availability of AI platforms, access to the Internet, infrastructure, data protection challenges, and the usefulness of Generative AI in the process of teaching, learning, research, and management. The effective application of Generative AI tools will depend on how institutions view these technologies as compatible and useful to enhance their performance.

The organizational context will look at organizational preparedness in terms of having support from leaders, financial strength, human resource capabilities, technical capabilities, and organizational culture (Tornatzky & Fleischer, 1990). Organizational readiness will be important for the adoption of Generative AI in Nigerian institutions of higher learning due to the need to invest in developing digital skills and training employees in Generative AI.

The environmental perspective refers to those outside influences that could impact the adoption of technology, including government policies, regulations, competition, and assistance from technology providers (Baker, 2012). The environmental aspects such as national initiatives for digital transformation, policy-making related to AI governance, collaboration with technology vendors, and social expectations about digital learning could influence the adoption of Generative AI at universities in Nigeria.

Thus, the TOE model is a useful one for examining Generative AI adoption in Nigerian higher education institutions since this model includes both internal organizational environment and environmental factors that shape technological innovations.

3. RESEARCH METHODOLOGY

Generally, research designs are always defined as the framework for the research process that is aimed at establishing the variables and their relationships. In the current research, the research design utilized is systematic qualitative content analysis. The research adopted the secondary data collection strategy where the sources of data and information included the published sources of information. Data were obtained from reliable sources such as published literature including scholarly journals, government publications, industry reports, and even online databases. These sources of information were subjected to systematic analysis to establish the trends and patterns associated with the research problem. The systematic search was performed using databases including Google Scholar, ResearchGate, JSTOR, and other scholarly sources. The literature search was conducted using keywords such as “generative artificial intelligence”, “Nigerian higher education”, “ethical issues”, “research tools”, “education sector”. Boolean operators such as “AND” and “OR” were used to refine the search and retrieve relevant publications. The inclusion criteria included the studies about microfinance and entrepreneurship in Nigeria and other developing countries especially those written between 2022 and 2025. All in all, 40 relevant sources were analyzed and reviewed. The gathered materials were scrutinized using content analysis.

Data Presentation and Analysis

i) Opportunities and potential benefits of generative artificial intelligence in enhancing teaching, learning, research, and administrative practices in Nigeria’s higher education institutions

The generative artificial intelligence technology has huge benefits for teaching, learning, research, and administration in higher education institutions in Nigeria. In the field of teaching and learning, there are some ways through which GenAI can help teachers and students in their studies. For instance, GenAI can help in creating customized learning materials, providing immediate feedback, and helping the learners in understanding certain concepts using personalization in explanation. Additionally, GenAI can assist teachers in developing lesson plans, conducting tests, and preparing instructional materials. This would make teaching easier and more efficient (Kasneji et al., 2023). This is one of the important ways of improving learning at universities where there are large classes and few academic materials.

In terms of research, GenAI may help scholars in literature review, data analysis, academic writing, and knowledge synthesis, and help the researchers become more productive and interact with other scholars from across the globe. Through AI-based solutions, interdisciplinary research and innovation could be enabled through information processing and ideas generation (Dwivedi et al., 2023). In terms of administrative tasks, GenAI could increase the efficiency of the institutions by automating some tasks related to student services, admissions, documentation, and decision-making systems. This would alleviate the pressure on workload and enable institutions to work on strategic matters. With the responsible use of GenAI, the technology could help in improving the quality of education in Nigeria (UNESCO, 2023).

ii) Challenges and barriers affecting the adoption and effective utilization of generative artificial intelligence in Nigeria’s higher education sector

Though there are many benefits attached to the use of generative artificial intelligence, the uptake of the technology in Nigeria's higher education system is not without barriers. First, there is the inadequacy of

technological infrastructure, especially power outages and limited internet access. Nigerian universities are facing challenges in connectivity and ICT infrastructure, which limits the effective use of artificial intelligence (Okunola et al., 2022). The problem of inadequate digital literacy among academics and students is a barrier to implementing the technology.

Secondly, ethical and academic issues arise with the application of generative AI in education. The AI may result in inaccurate facts, biased results, or fictitious references (Kasneci et al., 2023). There is a need to formulate a policy concerning issues of plagiarism, academic dishonesty, privacy, and copyright infringement. Inadequacy of funding can be viewed as another barrier to the implementation of AI. Moreover, the resistance of some members of the academic faculty and management towards new technology could pose an obstacle. The lack of proper professional training and strategic planning will ensure that the application of GenAI remains superficial without changing any teaching practices. The above issues can only be handled through infrastructure development, capacity building, ethics, and policy-making at a national level (UNESCO, 2023).

iii) Implications of generative artificial intelligence adoption for the future development, quality improvement, and sustainable transformation of higher education in Nigeria

The integration of generative artificial intelligence will have significant impacts on the future development and sustainable transformation of Nigeria's higher education system. This technology can aid in improving the quality of higher education through innovation in teaching methodologies, enhanced research capabilities, and increased efficiency of institutions. Universities that effectively utilize the power of AI technologies can deliver more flexible, learner-oriented education, thus increasing their competitiveness in the global knowledge-based economy (Schleicher, 2020). With its support of personalized learning and access to educational materials, GenAI may reduce inequalities in educational access.

However, the future impact of GenAI will depend on the governance and ethical implementation of the technology. The universities in Nigeria will have to come up with policies that promote transparency, responsibility, academic integrity, and accessibility to AI technology. The universities will have to allocate resources in terms of infrastructures and training of their faculty members and students so that they can use GenAI effectively (UNESCO, 2023).

Moreover, GenAI can help shift the focus of the educational sector from the traditional models of knowledge dissemination to technologically advanced learning ecosystems. The innovation may help to improve cooperation between the universities, industries, and research centers thus boosting innovation and development. Hence, GenAI should not be considered only as an innovation but also as a tool of sustainable transformation of the higher education system in Nigeria (Dwivedi et al., 2023).

DISCUSSION OF FINDINGS

i) The above results demonstrate that Generative artificial intelligence (GenAI) is full of promising opportunities for the improvement of teaching and learning practices in Nigeria's higher education institutions, in research, GenAI can aid academics in the process of literature review, data analysis, writing and synthesis of information, helping researchers to increase their productivity and participate actively in the global scholarly discourse. AI-based applications can also facilitate interdisciplinary research and innovations by increasing the speed of information processing and generation of ideas. The above result is consistent with the results of the study by Kasneci et al. (2023) "ChatGPT for Good? On Opportunities and Challenges of Large Language Models for Education" The results showed that there were numerous opportunities for improving education using generative AI through personalized learning, automated feedback, tutoring, content creation, and improved accessibility to learning materials. The study also demonstrated that AI tools can help teachers with preparation of lessons and development of tests while researchers can benefit from AI-supported writing, idea generation and information synthesis.

ii) From the analysis of results, it is evident that the main barrier faced in Nigeria is the lack of proper technological infrastructure, such as unstable power supply, little internet connection, and minimal digital information. Some Nigerian universities face the challenge of connectivity and ICT capacity, and that might be

an impediment in the application of AI systems as observed in the research conducted by Dwivedi et al. (2023) “So what if ChatGPT Wrote It? Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice, and policy”. The research found out various problems with the use of generative AI, which includes issues with academic honesty, mis-information, privacy concerns, copyright infringement, lack of transparency, and ethical challenges. Lack of digital skills and proper knowledge of AI technology among the users is one of the key barriers. iii) Finally, from the result obtained above, the adoption of generative artificial intelligence has significant implications in the future development of the Nigerian higher education sector. This is because genAI will be useful in improving the quality through innovative teaching, research activities, and efficient administration in the institutions as stated by OECD (2023), *Generative Artificial Intelligence in Education: Opportunities and Challenges*. The findings revealed that generative AI can assist in improving educational quality, research productivity, administrative efficiency, and innovations in higher education institutions.

CONCLUSION

The use of Generative Artificial Intelligence (AI) in the education system of Nigeria offers various opportunities for the advancement of teaching, learning, research, and administration. According to the literature review provided in this study, there is a need to emphasize the benefits associated with the use of Generative AI, which may be helpful for personalizing learning, improving the productivity of academics, facilitating research activities, as well as promoting innovative ways of knowledge generation and institutional management. However, in order to benefit from the discussed technology, it is essential to overcome the challenges associated with its implementation, which are inherent in higher education institutions of Nigeria.

According to the findings of the study, the adoption of Generative AI technology in the higher education sector in Nigeria will need a deliberate strategy in order for it to yield positive results. While the technology presents several opportunities in the enhancement of educational quality and global competitiveness of the education system in the country, it can only be fully leveraged if institutions have the necessary technological capabilities, skill set, and responsible use framework for AI technology. Thus, development of infrastructure, training of academics and students, and establishment of ethical guidelines on the application of AI are necessary steps towards successful implementation of the technology. Consequently, Generative AI technology should be seen as an innovation meant to support academic activities and not as a substitute for the expertise of human beings.

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