The Impact and Challenges of Artificial Intelligence Technologies on Universities in Southwestern Nigeria

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Abstract
Advancements in Artificial Intelligence (AI) have led to significant changes in the education sector, creating new opportunities and challenges for teaching, research, and learning anytime and anywhere. The purpose of this study is to evaluate the impact and challenges of using artificial intelligence technology on universities in Southwestern Nigeria. A sample size of 120 Lecturers and 30 students were selected at each university using purposive sampling approaches and well-structured questionnaires distributed face-to-face and online. The questionnaire was distributed to six public and private universities in Nigeria's south-western zone, and 752 out of 900 copies were returned, indicating an 83.6% response rate. The data was captured in Microsoft Excel and SPSS packages, and it was analysed using frequency and percentage distributions. The findings revealed that adopting AI technologies for both learning, research, and teaching activities has a significant impact on teacher automated grading, feedback loops for teachers, virtual facilitators, chat campus questioning for students, personalized learning, adaptive learning, AI-powered anti-cheating, and data accumulation and personalization. However, the key barriers to the implementation of artificial intelligence technology are strategy, organizational maturity, data governance, and infrastructure of necessary IT in the campuses. In conclusion, the study recommends the use of many AI-tools for successful teaching, research, and learning in higher education.

Keywords: Artificial Intelligence Technologies, Adoption, Benefits, Obstacles, Nigeria, Universities

Introduction

Artificial intelligence (AI) refers to intelligence demonstrated by machines rather than people, which mimic human intelligence, allowing them to better assist our tasks, and increase efficiency (Khatri, Pandey, Penkar & Ramani, 2020; Owoc, Sawicka & Weichbroth, 2019). When compared to earlier industrial revolutions' linear processes, it's boosting the fourth Industrial revolution's speed and scope at an unprecedented and exponential rate (Chaka, 2023). AI is defined as the study of "intelligent agents": any device that senses its environment and takes actions to maximize its chances of succeeding at some goal. The term "artificial intelligence" is used colloquially when a computer duplicates "cognitive" functions that humans associate with other human minds, such as "learning" and "problem-solving." Medical diagnosis, remote sensing, computer science, scientific discovery, and robot control are all examples of applications for artificial intelligence (Arakpogun, et al., 2021). One exciting aspect of AI is its ability to learn and make judgments on its own without human intervention or control. It uses algorithms that allow it to learn through natural language processing. Today, artificial intelligence has become an integral aspect of the technology industry, providing solutions for many of the most complex problems in computer science (Butcher, 2011). However, many artificial intelligence applications are deeply ingrained in the architecture of every business and educational sector (Lim & Lee, 2024; Jibril, et al., 2018).

Intelligent technology, by definition, is a strategy that employs knowledge to achieve a certain goal efficiently. Currently, intelligent technologies include multi-agent, machine learning, ontology, semantic and knowledge grid, autonomic computing, cognitive informatics, and neural computing (Akinnuwesi, Odumabo & Aribisala, 2020). The rapid breakthroughs in these sectors have already resulted in significant changes in education, creating new opportunities and challenges to teach and learn anytime and anywhere by introducing new techniques and systems that aim to promote innovative teaching and, eventually, improve learning outcomes (Judijanto Atsani & Chadijah 2024; Owoc, Sawicka & Weichbroth, 2019; Kulkarni, 2017).

It is worth emphasizing that private universities now play an important role in higher education (Green, 2024; Popenici & Kerr, 2017), and they must compete fiercely to attract prospective students. Their position is increasingly dependent on the quality of education and the managerial skills of university administration (Ajadi, 2010; Popenici & Kerr, 2017). In both circumstances, implementing intelligent technology seems to be necessary if one considers their competitiveness and progress (Aroyo & Mizoguchi, 2003). Yet, the level of its implementation is still quite low.

On the other hand, there are a few recorded cases that provide insight into the areas where AI approaches have been deployed in higher institutions of learning (Sagenmuller, 2020). In particular, intelligent technologies are gradually being deployed in private universities (Ajadi, 2021). However, to the best of our knowledge, relatively little research has examined the benefits and challenges of implementing AI technologies in university-developed settings (Owoc, M. L., A. Sawicka, & P. Weichbroth, 2019). The purpose of this study is to evaluate the impact and challenges of using artificial intelligence technology on universities in Southwestern Nigeria.

This paper is organized as follows: Section 2 studies a literature review on artificial intelligence (AI) in the education sector, introducing the basic concepts, benefits, and issues

associated with its adoption and use by public and private Universities. Section 3 describes the materials and methods used in this project. Section 4 describes the results and interpretation while finally, Section 5 describes the conclusion, recommendation, and future research work. A questionnaire for the evaluation of the impact and challenges of AI technology adoption and use by public and private Universities in Southwestern, Nigeria is presented in the appendix section.

Literature Review

Artificial intelligence (AI) has altered the way lecturers, teachers, and trainers interact with students in educational environments. Using AI technology, instructors may personalize learning experiences for students based on their specific needs and talents. This level of customization not only increases student engagement but also improves learning results (Popenici & Kerr, 2017). Furthermore, AI can help educators' grade assignments and provide feedback promptly. This enables better utilization of their time. Automation of routine tasks frees up educators to focus on more complex aspects of teaching. In addition, AI can analyse data from student interactions to identify areas where additional assistance is required. It recognizes patterns in student performance and allows educators to intervene early, which may help to avert academic problems. Moreover, AI can facilitate communication between educators and students. In real-time, by giving immediate feedback and answering queries. This feature promotes a collaborative learning environment. It fosters active involvement among students. The incorporation of AI technology into educational environments offers several benefits for lecturers, teachers, and trainers. By employing AI tools efficiently, educators can increase the learning experience for students and boost overall academic performance (Shahzad, Xu, Lim, Yang & Khan, 2024; Odumabo, Asokere & Ogunfeyimi, 2023; Popenici & Kerr, 2017).

AI Tools for and by Lecturers

1. Personalized Learning: AI-powered adaptive learning systems can tailor educational content to the specific needs of students. It makes personalized recommendations and resources based on students' performance and learning styles.

   Benefits: It helps address the varied learning paces and types within a classroom. It improves student engagement and outcomes by delivering tailored content.

2. Automated Grading and Assessment: AI systems can efficiently and accurately grade multiple-choice and fill-in-the-blank assessments. AI can help evaluate essays and written responses by utilizing natural language processing (NLP) techniques.

   Benefits: It reduces educators' time spent grading, allowing them to focus more on interactive teaching. It offers uniform and unbiased grading.

3. Intelligent Tutoring System Role: AI-powered tutoring systems can assist students with supplementary information and explanations on specific topics. Its offers real-time feedback and advice, akin to one-on-one tutoring sessions.

   Benefits: It helps students outside of regular classroom hours. It helps struggling students to keep up with the coursework.

4. Predictive Analytics: Analyse student data to forecast performance and identify individuals who are at risk of falling behind. It aids in early intervention by identifying which students require further assistance.

   Benefits: It increases student retention rates. It encourages proactive rather than reactive teaching practices.

5. Virtual classrooms with AI teaching assistants: AI-powered virtual teaching assistants can handle basic questions and administrative duties. Manages online classrooms and provides quick support to enable remote study.

   Benefits: It increases the efficiency of organizing online and hybrid classes. This allows instructors to devote more time to curriculum development and student interactions.

6. Enhanced Learning Materials: AI can help generate interactive and engaging learning materials like quizzes, flashcards, and simulations. It supports the creation of multimedia content that appeals to a variety of learning styles.

   Benefits: It enhances the dynamic and engaging nature of learning. Visual and interactive aids help to convey complicated subjects.

7. Administrative Support Role: Automate administrative duties like scheduling, enrolment, and attendance tracking. AI chatbots and automated emails help to streamline communication with students and parents.

   Benefits: It reduces administrative burden on instructors. It ensures the timely and efficient management of educational processes.

8. Professional development for educators' role: AI-powered systems can recommend professional development courses and resources based on an educator's profile and preferences. It provides tailored learning paths to help educators improve their skills.

   Benefits: It provides instructors with the most up-to-date instructional methods and technologies. It promotes continued professional development.

9. Improving Collaboration: AI solutions can help students and educators collaborate more effectively by using intelligent matching and project management tools. It encourages group work and peer-to-peer learning by suggesting the best groupings based on student data.

   Benefits: It encourages a collaborative learning atmosphere. It enhances the social learning experience.

10. Content Curation and Creation Role: AI can assist in collecting appropriate educational content from a variety of sources, saving educator's time when developing lesson plans. It helps create quizzes, assignments, and other learning activities depending on the curriculum.

    Benefits: It ensures that the content is current and relevant. It reduces the workload associated with class planning and content development.

Materials and Method

The methodology and approach adopted in this paper are described below. In this section, the research questions are highlighted, and the study area, the sampled population, and the research techniques used are discussed.

Research Questions

To realize the purpose of this research study, three (3) research questions are formulated as follows:

- What is the level of adoption of AI technologies by universities in the study area?
- What are the benefits associated with the adoption of AI technologies by universities in the study area?
- What are the challenges and the constraining features to the successful adoption and use of AI technologies by universities in the study area?

Data Source and Presentation

This study is empirical research that investigates the level of adoption, benefits, and challenges of AI technologies in universities in the Southwestern part of Nigeria. The instrument for data collection was a well-structured questionnaire titled, "The Usage Impact of Artificial Intelligent Technologies Adoption on Universities in Southwestern, Nigeria" with three (3) parts. The first part provides vital bio-data information about each respondent while the second part provides information on the assessment of the adoption of Artificial Intelligent technologies in universities. The third part assesses the impacts of Artificial intelligence technologies on Universities in the Southwestern part of Nigeria while the fourth part investigates the challenges of using Artificial intelligence technologies in the study area.

The questionnaire was validated and tested for reliability using the Pearson Product Moment Correlation. A Cronbach alpha reliability coefficient (α) of 0.89 was obtained, an indication that the instrument was reliable for data collection. In all, 900 copies of the questionnaire were administered to the six (6) public and private universities in the southwest geo-political zone of Nigeria while 752 copies were returned which represents a respondent rate of 83.7%.

A total of hundred and twenty (120) lecturers and fifty (50) students were surveyed in each university. Microsoft Excel and SPSS were used to capture and analyse the data obtained from the duly-filled copies of the questionnaire while frequency, mean and percentage distributions were the descriptive techniques used. The descriptive survey was adopted to obtain the opinion of a representative sample of the target population to be able to infer the perception of the entire population.

Results and Interpretation

The results of the research on the trends of adoption of Artificial Intelligence Technologies and the impacts and challenges associated with the adoption and use of Artificial Intelligence Technologies on Universities in Southwestern Nigeria are presented and discussed in this section.

Trends of Adoption of Artificial Intelligence Technologies by Universities in Southwest Nigeria

The analysis of the findings for research part II question 1 is presented in Figure 1. The responses obtained from 900 respondents in this research study indicated that out of the six (6) universities in the study area, five (5) universities have already fully adopted and one partially adopted the technology and using it which represents a 90% adoption rate. This endorses the report by Owoc, Sawicka, and Weichbroth that many higher education institutions have implemented Artificial Intelligence Technologies in their universities. However, technologies are gradually being deployed in private universities to meet up with the quality of education and the managerial skills of university administration.

The analysis of the findings for research part II question 2 is presented in Figure 2. The responses indicated that six (6) universities used Artificial Intelligence Technologies services such as personalized learning, complete courseware, and automated grading system while only five (5) used virtual assistants.

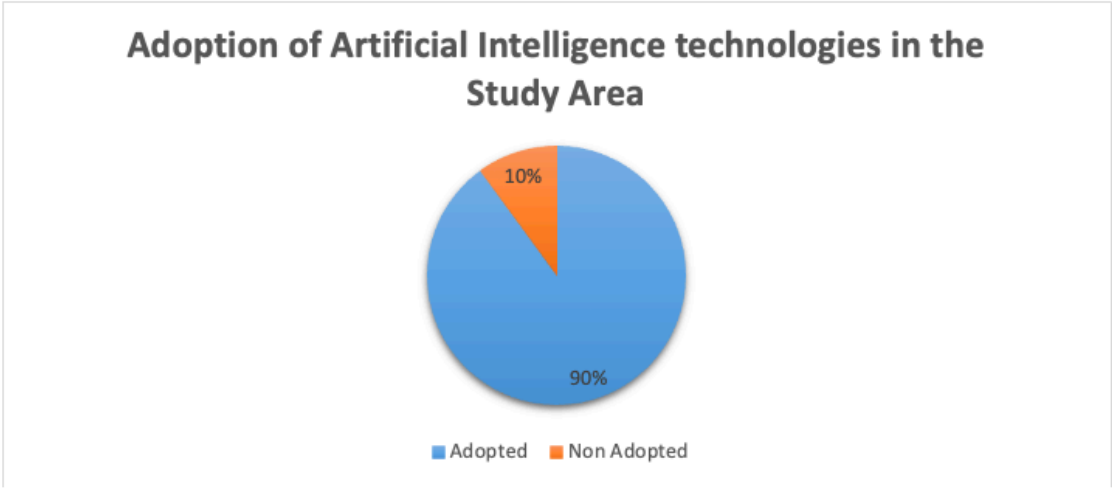

Figure 1: Adoption of Artificial Intelligence Technologies in Nigerian Southwestern Universities

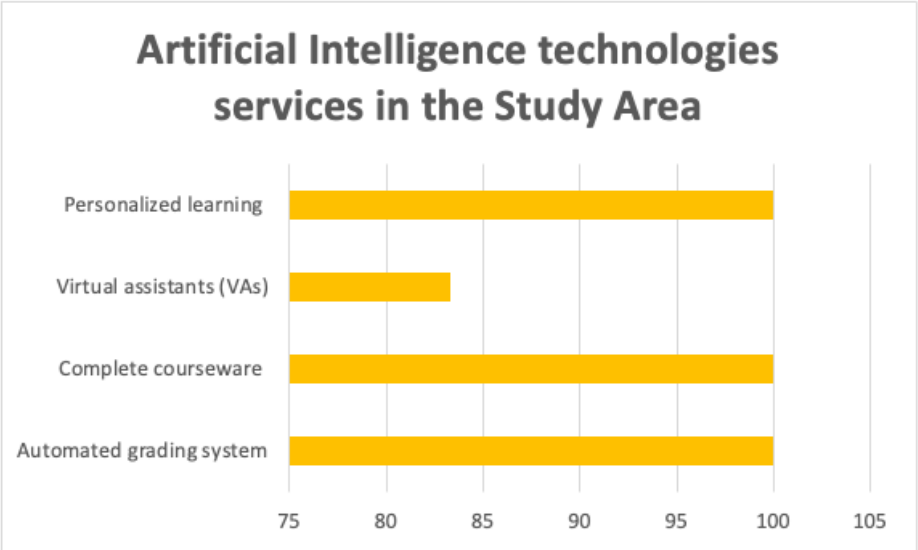

Figure 2: Artificial Intelligence Technologies Services in Nigerian Southwestern Universities

The result of the outcomes obtained from research question part III is presented in Table 1. The foremost benefits resulting from the use of Artificial Intelligence Technologies include Personalized Learning/ computer-assisted tutoring which is the most important factor that drives most Southwestern Universities in Nigeria to adopt AI. The remaining is followed by chat campus questioning for students, teacher automated grading, adaptive learning, AI-powered anti-cheating, virtual facilitators, feedback loops for teachers, and data accumulation and personalization in that order. This result is buttressed by Owoc, Sawicka, and Weichbroth who identified computer-assisted tutoring as the major benefits of adopting Artificial Intelligence Technologies in education higher learning and the high and dynamic student demand of chat campus. UNESCO 2019 support identified computer-assisted tutoring as the major benefits of adopting Artificial Intelligence Technologies in education higher learning and the high and dynamic student demand of chat campus education.

Serial No	Benefits of Artificial Intelligence technologies in the Study Area	% of Respondents
1	Teacher Automated Grading	**97.1**
2	Feedback Loops for Teachers	**76.7**
3	Teacher Virtual Facilitators	**81.5**
4	Chat Campus Questioning For Students	**97.5**
5	Personalized Learning	**97.7**
6	Adaptive Learning	**88.0**
7	AI-Powered Anti-Cheating	**85.0**
8	Data Accumulation and Personalization	**75.3**

Table 1: Benefits of Artificial Intelligence Technologies in Nigeria Southwestern Universities (N = 752)

The analysis of the results obtained for the research question part IV in this study as presented in Table 2, some challenges presently affecting Universities using artificial intelligence technologies in the study area have been recognized. The key barriers to the implementation of artificial intelligence technology are strategy, organizational maturity, data governance, and infrastructure of necessary IT on the campuses. This result is supported by the work of Arakpogun, Elsahn, Olan, and Elsahn who acknowledged these concerns comprise the intensification of current structural inequalities, governance, and regulation, as the key challenges faced by using artificial intelligence technologies in Africa.

Owoc, Sawicka, and Weichbroth who identified content adaptability and flexibility as the major challenges of adopting Artificial Intelligence Technologies in education. UNESCO 2019 report identified strategy as one of the major challenges of using Artificial Intelligence Technologies in education.

Serial No	Challenges of Artificial Intelligence technologies in the Study Area	% of Respondents
1	Strategy	**87.4**
2	Infrastructure	**95.0**
3	Organizational Maturity	**85.8**
4	Data Governance	**84.4**

Table 2: Challenges of Artificial Intelligence Technologies in Nigerian Southwestern Universities (N = 752)

Conclusion, Recommendation and Future Work

Artificial intelligence (AI) has transformed the way lecturers interact with students and do research in the educational sector. With the aid of AI technologies, lecturers can effectively carry out their work well and faster. Hence, AI helps lecturers to better assist our tasks, increase efficiency, and fuel economic progress.

This study recommends the use of many AI tools for successful teaching, research, and learning in higher education. Implementing AI technologies for both learning, research, and teaching activities has a significant impact on lecturers' automated grading, feedback loops for teachers, virtual facilitators, chat campus questioning for students, personalized learning, adaptive learning, AI-powered anti-cheating, and data accumulation and personalization. However, the key barriers to the implementation of artificial intelligence technology are strategy, organizational maturity, data governance, and infrastructure of necessary IT on the campuses.

Based on the results obtained from this research work, the following recommendations are made. The AI technologies can help universities to:

1) Help educators' grade assignments/examinations and provide feedback promptly.
2) Facilitate communication between educators and students. In real-time, by giving immediate feedback and answering queries.
3) Instructors may personalize learning experiences for students based on their specific needs and talents.
4) Analyse data from student interactions to identify areas where additional assistance is required.
5) Educators can increase the learning experience for students and boost overall academic performance.
6) Automation of routine tasks frees educators to focus on more complex aspects of teaching and research.
7) Discourage anti-cheating and copying among the students.
8) Promotes a collaborative learning environment that will foster active involvement among students.
9) It recognizes patterns in student performance and allows educators to intervene early, which may help to avert academic problems.

Future research work can examine how the limiting factors to the efficacious adoption of artificial intelligence technologies in Nigerian universities can be accomplished easily without acquiring additional expenses.

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