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Research Article

UNLOCKING THE TRANSFORMATIVE POWER OF ARTIFICIAL INTELLIGENCE FOR SUSTAINABLE DEVELOPMENT IN HIGHER EDUCATION

TIJJANI MUHAMMAD[1]*, MARY DAVID[2]

[1]Department of Islamic Banking and Finance, Federal University, Gashua, Yobe State, Nigeria. [2]Department of Educational Foundation, Nasarawa State University, Sociology of Education, Keffi, Nasarawa State. Email: hajiteee@fugashua.edu.ng

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ABSTRACT

The rapid transformative power advancement of artificial intelligence (AI) is revolutionizing various aspects of higher education (HE), offering a transformative potential to reshape the way HE teachers and students learn, teach, and interact as the global HE sector strives to achieve sustainable development. AI has become a current phenomenon that everyone needs to tap into to promote inclusive and equitable access and drive innovation in teaching and learning environments through staff and students' perceptions. The study approach employed structural equation modeling and gathered staff and students' perceptions of the potential AI sustainability in HE. Two hundred and fifty samples were gathered using cluster and multi-stage sampling methods based on the study population. The researcher disseminated surveys through face-to-face and social media platforms, including WhatsApp. The data were analyzed using two different software, AMOS and Statistical Package for the Social Sciences, and the outcome of the data collected based on the relationship of variables toward adaptation of AI in higher institutions of learning for a better educational system and enhancing qualities of education based on a set of descriptive and testing the relationship between four different variables. The findings revealed that AI adoption in HE enhances and transform the educational system. The study identified that awareness, attitude, and performance expectancy play significant roles in influencing AI adaptation in HE. The study recommends that policymakers, educators, and institutions harness the transformative potential of AI for sustainable higher educational development, emphasizing the importance of collaboration, professional development, and ethical standards in enhancing HE to become more effective, efficient, and inclusive, and ultimately contributing to a more sustainable future for individuals and society.

Keywords: Transformation, Artificial intelligence, Sustainable, Higher education.

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INTRODUCTION

Twenty-first-century higher education (HE) is changing quickly due to globalization, technological advancements, and shifting student demographics. Universities are increasingly providing courses and degree programs that can be completed totally online due to the broad availability of online learning technologies (Imran *et al*., 2023). This approach gives students more flexibility in their learning process and increases access to HE (Luzano, 2023).

With students enrolling and learning from a wider range of environments, educational sectors are obviously becoming more diverse, which results in a higher emphasis on global citizenship and cross-cultural understanding. HE and universities are becoming more crucial in promoting innovation and research as the rate of technological development quickens (Manchanda and Arora, 2023). This results in increased emphasis on entrepreneurship and commercialization, as well as increased collaborations between academia and business. Employers are willing to choose graduates with particular talents and competencies above those with a broad education in the current hiring frenzy. As a result, prestigious universities are shifting to more skills-based curricula that provide students with useful, career-focused knowledge, and abilities (Braxton, 2023). In order to improve the quality of HE, the educational sector is finding numerous approaches to satisfy stakeholder requirements (Bloch *et al*., 2023). Using artificial intelligence (AI) to improve education is one of the most promising ideas (Chiu *et al*., 2023). Given how rapidly technology is advancing and changing how we learn and teach, AI in education has a bright future (Imran *et al*., 2023).

In many respects, AI is improving HE and is becoming increasingly important (Al Ka'bi, 2023). AI-powered learning strategies have been used to assess students' performance histories, identify their areas of strength and weakness, and create individualized learning programs for each student. With the use of this method, students can acquire knowledge more successfully and produce useful results (Manchanda and Arora, 2023). Chatbots, virtual assistants, and adaptive learning systems are a few examples of AI-based technologies that provide immersive and interesting learning experiences which let students learn complicated ideas and solutions in a more participatory and meaningful way (Braxton, 2023).

These services include resolving basic inquiries, supplying information on course enrollment, and responding to inquiries concerning course materials. With the use of this filter, educators and support personnel may more quickly identify and assist students who are at risk of failing their classes and give them the assistance. HE research has been found to benefit from the use of a variety of AI applications, such as Bit.ai, Mendeley, Turnitin, elinik.io, and Coursera tools and platforms. These applications analyze large data sets, produce insights and predictions, and spot patterns that may be challenging for human researchers to find (Crompton and Burke, 2023). Therefore, the study is unlocking the transformative power of AI for sustainable development in HE in Nigeria.

The paper is designed in the following sequences: Section 2 reviews the literature and research model development and hypotheses. Section 3 covers the research approach of the studies. Section 4 discusses the measurement model of the assessment for model fit and meeting the required threshold and discusses the results that contain theoretical and practical implications.

LITERATURE REVIEW

AIs is a rapidly growing field in HE, with numerous studies defining the opportunities, potential benefits, and challenges. Huang *et al*. (2023) found that AI enhances students' capacity by providing defined personalized learning experiences to enable quality adaptive teaching efficiency. The study reviewed 24 articles based on AI and found that the system significantly enhances the student's intelligence in HE (Chen and See, 2020). One of the most significant areas, AI, is highly needed and applied in HE is natural language processing (NLP), which enables the system to communicate with the machine and generate human language for efficient communication between the computer and human (Kaswan *et al*., 2024). Thus, it is essential for online learning; virtual assistants affect the AI platform and other support to guide and provide support to students in different angles of the studies (Vashishth *et al*., 2024). Another area concerned the intelligent tutoring system (ITS), which leverages technology to support and personalize students (Liu *et al*., 2022). Intelligent tutoring support offers firm support with high real-time feedback that individually adapts to learning styles and customizes students' guidance. A study by (Phillips, 2021) indicates that intelligence tutoring systems improve students' science performance by almost 20%. Information-driven decision or data-driven decision-making is also a crucial area that AI has, unlocking the potential to transform the area to stimulate the impact on HE using a big datasets algorithm based on AI, which can identify trends and patterns that are hidden from humans educators (Thomas *et al*., 2024) such can scrutinize them and inform decision-making process on the related areas such as curriculum development, course design, and student retention.

SCHOLARS CRITICISM ON AI

Fergus *et al*. (2023) examined the functionality of Chat Generative Pre-Trained Transformer (ChatGPT) in responding to chemistry evaluation questions, which required additional analysis to determine its potential influence on learning. The integration of technology has become a priority for most of us in recent years. They concluded that ChatGPT produced responses to questions that focused on knowledge and comprehension, using verbs like "describe" and "discuss," utilizing two modules that were centered on chemistry in the 1st and 2nd years of a pharmaceutical science program. They found that ChatGPT only provided a restricted set of answers to questions that focused on using knowledge and interpreting non-textual data. Furthermore, ChatGPT was a potential catalyst for educating people about academic integrity rather than a high-risk tool that may be used to enable cheating.

Dergaa *et al*. (2023) investigate the potential benefits and drawbacks of ChatGPT and other NLP technologies in research and academic publishing. They emphasize the ethical issues raised by these technologies' use and take into account how they might affect the validity and authenticity of academic works. They discovered that ChatGPT and other NLP technologies can improve academic writing and research efficacy. However, the concerns about the effects on the academic work's authenticity and credibility were also voiced, emphasizing the importance of human intelligence and critical thinking in research. Farrokhnia *et al*. (2024) used a SWOT analysis to investigate ChatGPT's possible advantages and hazards for education, as well as its benefits and drawbacks. They emphasized the capacity to generate believable, customized, and instantaneous responses. Their results indicate that ChatGPT can ease individualized learning, lessen instructional overload, and make the material more accessible. One of their criticisms was that they did not wholly grasp the context, which could have compromised academic integrity and encouraged plagiarism.

With the use of a systematic review, Ouyang *et al*. (2022) provided an overview of empirical studies concentrating on the application of AI in online HE. More specifically, they look into the functions of AI in empirical studies, the algorithms used, and the outcomes. Using WOS, Scopus, ACM, IEEE, Taylor and Francis, Wiley, and Ebscohost, 434 articles (published between 2011 and 2020) were found for screening; only 32 papers were chosen for the in-depth analysis. The following were the conclusions: Although more advanced techniques (such as deep learning or genetic algorithms) are becoming more common, classic AI technologies are still widely employed. These techniques include automatic assessment, resource recommendation, learning status and user satisfaction prediction, and automatic assessment, as well as improving the educational experience became standard practice, with the ultimate goal of raising students' participation in online courses and, ultimately, their general academic achievement.

Cotton *et al*. (2024) examined the advantages and potential risks of ChatGPT use in HE. The paper discussed the difficulties in recognizing and deterring unethical behavior and offered rules for academic institutions to ensure the responsible use of these resources. Dwivedi *et al*. (2023) highlight the views of forty-three professionals in various fields—including computer science, marketing, IT, education, policy, hospitality and tourism, management, publishing, and nursing. Although the experts acknowledged ChatGPT's potential to boost productivity, they also highlighted certain disadvantages, such as privacy and security issues. Experts disagree on whether ChatGPT use needs to be controlled or limited.

Chen and See (2020) concentrate on AI applications and their effects on administration, learning, and teaching. Using a qualitative approach and a thorough review of the literature, they conclude that AI has been widely used in education, particularly by educational institutions. AI started as computers and eventually progressed to web-based and online education systems, chatbots, and humanoid robots that could teach. A thorough analysis is carried out by Zawacki-Richter *et al*. (2019) to provide a comprehensive picture of AI's application in HE. One hundred and forty-six publications out of 2656 published between 2007 and 2018 were included in the final summary. The majority of the research was quantitative and was conducted in the STEM fields, including computer science. The four domains of AI applications in education were identified the ITSs, adaptive systems and personalization, assessment and evaluation, and profiling and prediction. The results brought to light the need for more research on dangers and difficulties, as well as the necessity for a deeper examination of the pedagogical and ethical aspects of AI application in HE. In their analysis of how AI varies from related concepts such as the Internet of Things and big data, Haenlein *et al*. (2019) recommended viewing AI more nuancedly, either by focusing on different types of AI systems (such as analytical AI, human-inspired AI, and humanized AI), or by viewing them through the lens of evolutionary stages (narrow, general, and artificial superintelligence). They illustrated the potential hazards of AI using case studies involving universities, corporations, and governments. Furthermore, they introduced the Three C Model, which stands for confidence, change, and consistency. This framework can help stakeholders think through the implications of AI in the context of education.

Zhang *et al*. (2022) employed automatic evaluation to enhance the academic writing abilities of Chinese students from the Uyghur ethnic group. Many cultural quirks are associated with writing, and in this study, the students interacted behaviorally, intellectually, and emotionally with the automated evaluation system. As a result, the pupils could learn independently and improve their writing. The term "feedback" was frequently utilized in the research since students received textual and visual feedback as part of a formative assessment.

Mousavi and Beroza (2020) created a system to give 1st-year biology students automatic, personalized feedback based on their individual characteristics, academic standing, and traits. AI was employed to evaluate and offer comments on students' group work because of AI toward education (AIEd's) unique ability to examine numerous datasets involving various students (Muhammad and Salisu, 2019; Ouatik *et al*., 2021). AIEd was frequently employed in HE for prediction; 21 studies on AI's application to data trend forecasting were conducted. The application of AI to anticipate various issues led to the development of

ten axial codes, nine centered around student predictions and one on the future of HE.

Ai *et al*. (2022) expounded on how creating an AI-powered talent cultivation teaching system and using digital affordances to set up a practical teaching quality assurance system offer novel approaches to university education system design. Zhang discovered that in creating such a system, the instructional design's stability outweighed the shortcomings of the manual subjectivity that was previously presented. The studies revealed that using AI to handle large student data to enhance learning was another trend.

Chu *et al*. (2022) did not include the application of AIEd for student data management among the top uses of AIEd HE in their analysis of the top 50 most referenced AIEd articles. More research in this field seems necessary to fully explore AI's potential.

However, with such unlocking potential benefits of AI in HE, there are issues regarding the impact of Jobs on educators' development of new knowledge skills. Mühlroth and Grottke, (2020) indicates that more than 46% of human resources leaders revealed that AI could lead to job displacement in the nearest years. It has become crucial for learners and educators to be equipped with various skills to work with AI effectively. Therefore, the overall literature shows that AI has the potential to unlock potential and improve HE outcomes and teacher effectiveness through equitable access to education.

FACTOR INFLUENCE ADAPTATION OF AI IN HE IN NIGERIA

Awareness

Employing technological awareness has a significant impact on the attitude of adopting AI based on effectiveness HE. Porter and Graham (2016) show how awareness supports higher institutions to adopt and explore the affected way to a blended approach to learning in HE. In line with the above study, Soellner and Koenigstorfer (2021) indicate that systematic awareness and training programs will enhance the establishment of flipped classrooms in universities and support the design of programmes. Similarly, Maslov *et al*. (2021) conducted a study showing that the significant position of awareness in implementing e-learning effectiveness in HE learning during the COVID-19 pandemic has a strong connection with invention in near future which AI would be part of it. Awareness was crucial in implementing integrated technologies, including AI courses, in HE worldwide. This result corroborates earlier research alerting academic institutions to offer staff and students chances for professional development and training to achieve notable success while integrating new technologies into their work environments (Muhammad and Khalil, 2021; Sun *et al*., 2022;). Awareness's ability to affect a person's perspective and attitude toward unknown things is one of its most important contributions (Kang *et al*., 2023; Muhammad *et al*., 2022). The current study found a substantial association between awareness and attitude toward AI and that the intern's contributions to improving faculty work engagement were favorable.

AWARENESS SIGNIFICANTLY INFLUENCES OF ADOPTING AI TOWARD HE IN NORTHERN NIGERIA

Attitude

Attitude is one of the significant aspects that contribute to the adoption of technology, which many considered. Al Darayseh (2023) discussed the impact of AI on the attitude of learners in HE. It was found that allied infrastructure support and conducive technical advancement support the system implementation affect the attitude of people adopting the usage of AI in HE on both staff and students. Van Twillert *et al.* (2020) indicated that the facilities' role in infrastructure influenced the attitude of faculty members toward adopting 2.0 web technologies in HE learning. Such attitudes led to the position of facilities' infrastructure as significant toward faculty member adoption. The findings indicate that the stress effectiveness condition of facilities encourages the adoption of new technology in HE.

ATTITUDE ENHANCES THE ADOPTION OF AI IN HE IN NORTHERN NIGERIA

Performance expectancy

It interprets users' perceptions and adopts an attainment system to attract productivity. Cao *et al*. (2023) used the UTAUT framework to indicate students' performance in accepting cloud computing in HE and further explored how techno complexity impacts students' performance and expectancy.

PERFORMANCE EXPECTANCY AI ENHANCE ADAPTATION IN HE

Adopting AI HE

Ouyang *et al*. (2022) reviewed the literature on AI applications from 2011 to 2020 and performed a comprehensive review of AIEd in online HE. The results demonstrate the four primary purposes of AI applications in online HE: prediction of performance, referral of resources, automated evaluation, and enhancement of learning experiences. Salas-Pilco *et al*. (2022) researched centered on the use of AI in HE in Latin America. The findings showed that the following are the most common uses of AI in Latin American HE: (1) Intelligent analytics, (2) predictive modeling, (3) assistive technology, (4) automatic content analysis, and (5) image analytics has significant impact toward HE. These studies offer a partial analysis of AIEd in HE; however, they do offer insightful data for the online and Latin American settings.

According to Chu *et al*. (2022) analysis of the top 50 AI-related HE articles cited between 1996 and 2020, the most often discussed issues about students' learning system. At a time, AI was used in engineering courses, and it was mainly used for prediction and profiling. In order to compare the interactions between the Intelligent Tutoring Robot, students, and experimental groups to characterize the synergy between students and teachers, Sun *et al*. (2024) employed Robotic Process Automation on a sample of 123 students as a control group. Regarding academic achievement, they discovered a slight difference between the experimental and control groups.

Therefore, the research is assessing the perceptions of HE staff and students toward AI and its adoption in the HE system through awareness, attitude, adoption, and performance expectancy toward the adoption of HE.

METHODOLOGY

The information was gathered from academic staff members with various titles and specialties who work for universities and other HE. Two hundred and fifty samples were gathered using cluster and multi-stage sampling methods based on the study population. The researcher disseminated surveys through social media platforms, including WhatsApp. The acquired data were coded and analyzed using the statistical program AMOS and Statistical Package for the Social Sciences (SPSS) 29 to create the exact sampling distribution, which was then utilized to develop structural equation modeling to investigate the connections between the latent and observable variables.

Data collection of the survey administered to HE institutions (HEIs) to gather information on their current perception of use and adoption of AI toward HE which perceived benefits and challenges, and perceived impact on teaching and learning. In-depth case studies will be conducted at three HEIs that have successfully implemented AI-based solutions in teaching and learning. These case studies will explore the specific applications of AI, the challenges faced, and the benefits realized.

Data analysis

Survey data were analyzed using statistical software SPSS to identify trends, patterns, and correlations.

Table 1 describes the questionnaires used in the research. The selected questions were selected based on relevance to the defined sections. Each section consists of a description of each. Section 1 of Awareness

Table 1: Description of constructs

Construct	Item (s)	Description	Loading factor
Awareness	AW1	Awareness leads to AI adoption using tools for routine academic activities	0.860
	AW2	Learn AI for the future need of higher education is significant	0.979
	AW3	AI is easy to learn by starter or beginner and beneficial to higher education	0.734
	AW4	Staff and students of higher institutions are aware that AI is used for answering query and other purpose	0.697
	AW5	Stakeholders in higher education are aware of the use and explore AI tools for better education in society	0.887
	AW6	AI should be use by higher education to solve issues and gathered information	0.726
Attitude	AT1	Individual behavior attitude influence the attitude toward the use of new AI in promoting higher education	0.789
	AT2	In higher education will make the individual students or staff teaching-learning activity more interesting and educative	0.833
	AT3	Adoption of AI in higher education will make education more interactive and professional	0.841
	AT4	Adoption of AI technology and tool fostered the attitude of students engagement in learning	0.950
	AT5	Smart educational content can be positively changed attitude using AI technology	0.681
Performance Expectancy	PE1	It is hard to come-up with perfect AI covering the need for high education	0.785
	PE2	If I know the basic AI technology, enhance the efficiency of higher education	0.699
	PE3	I can have my query answered quickly using AI-chatbot technology as efficient and effective	0.924
	PE4	Learning powered activities of AI enhance the efficiency of higher education system	0.768
	PE5	The content covered and prepared by AI is efficient and useful	0.872
	PE6	My institute encourages its staff to use modern technology based on effectiveness and efficiencies	0.780
Adopting higher education	AHE1	People should learn AI technology for the future need of the higher education sector	0.846
	AHE2	Application of AI in higher education will make education more interactive	0.940
	AHE3	Application of AI is highly encouraged in making the teaching-learning activity easier	0.747
	AHE4	Technology created learning and teaching experience more interactive in society	0.656
	AHE5	Adoption of higher education explore the effectiveness AI in higher education	0.549

AI: Artificial intelligence

consists of six questions that discuss the level of awareness, while the questions related to attitude indicate a clear description of five (5) items. The performance expectancy questionnaire also consists of six (6) items that are directly related to research, and the adopting HE section has five (5) questions that were discussed, each contributing to the approach of the section.

The results of the normalcy assessment are presented in Table 2. This provides skewness and Kurtosis for each item, with items unbounded between ±2 on the graph by Byrne's (2013) recommendation. A normal distribution for each item construct well represents the data set. On the other hand, −0.072–1.706 is for kurtosis, and −0.627 to −1.404 belongs to skewness in their related values of the exact lattice point at the origins and were all loaded perfectly.

Data analysis and interpretation

In analyzing the data, two different software were used, SPSS and AMOS, to generate the outcome of the data collected based on the relationship of variables toward adaptation of AI in higher institutions of learning for a better educational system and enhancing qualities of education based on a set of descriptive and testing the relationship between four different factors.

Sample characteristics

The research sample was restricted to academic staff working in different Nigerian HE in Northern Nigeria. The sample comprised 68% male and 42% female respondents.

The survey respondents are distributed across various regions. However, the majority of participants in this survey come from HEIs in Nigeria. Two hundred and fifty respondents responded, and the university got 60% of the respondents. On the other hand, colleges and polytechnics represent only 20%, while the remaining 20% are from research institutions.

Table 3 consists of factor loadings, average variance extracted (AVE), composite reliability, and Cronbach alpha. The factor loading indicates the absolute loadings of the threshold of 0.5 above each item. The AVE

Table 2: Normality for measurement model

Construct	Item	Skewness	CR	Kurtosis	CR
AW	AW1	−1.295	−8.074	1.358	4.537
	AW2	−0.627	−6.530	−0.278	−0.674
	AW3	−0.791	−5.829	0.516	1.579
	AW4	−0.828	−6.121	0.345	0.928
	AW5	−1.044	−6.921	0.654	2.864
	AW6	−0.854	−7.171	0.197	0.368
AT	AT1	−0.894	−8.022	0.201	0.382
	AT2	−0.918	−5.206	0.362	1.745
	AT3	−0.871	−6.363	0.816	2.721
	AT4	−0.731	−3.783	−0.072	−0.272
	AT5	−0.791	−4.773	0.425	1.237
PE	PE1	−0.852	−6.240	0.762	2.540
	PE1	−1.009	−5.656	1.121	4.259
	PE2	−1.001	−6.613	0.392	1.515
	PE3	−0.851	−7.234	0.382	1.074
	PE4	−1.327	−8.326	0.682	2.975
	PE5	−1.404	−10.426	1.706	6.858
	PE6	−1.134	−6.850	0.257	1.361
AHE	AHE1	−1.109	−5.276	0.301	1.265
	AHE2	−1.219	−4.306	0.402	1.367
	AHE3	−1.108	−3.008	0.802	1.238
	AHE4	−1.127	−2.102	0.701	1.330
	AHE5	−1.029	−1.326	0.407	1.400

AW: Awareness, AHE: Adoption of higher education, PE: Performance expectancy, AT: Attitude, CR: Composite reliability

was above 0.5 as recommended by Byrne (2013) Cronbach's alpha test to assess the instrument's reliability, and none of the variables was <0.7. The instruments were updated following the reliability test and adopted from several studies. The research Cronbach's alpha value indicates that every value exceeds the threshold of 0.7 (Taber, 2018). Therefore, the composite reliability, (AVE, and Cronbach alpha were perfectly loaded and met the threshold of above 0.7).

Table 4 conducted discriminant validity tests using the square root of the AVE. The findings prove convergent validity since the AVE is

more than 0.5 (Olapade *et al*., 2023). Similarly, the Fornell and Larcker criterion has been applied to discriminant validity. There is currently a stronger association between the square root of AVE and other variables; as Roemer *et al*. (2021) indicated, the threshold should be below 0.85, and every requirement is met.

Table 6 displays the fit and the model measurements. As suggested by, CMIN/DF threshold 1.932 (Byrne, 2013). While RMSEA is advised to be <0.08, as proposed by Rakhimov *et al*. (2023), GFI, AGFI, IFI, CFI, and TLI are recommended to be more than 0.9, satisfying the assumptions (Byrne, 2013; Roemer *et al*., 2021; Olapade *et al*., 2023; Roemer *et al*., 2021). On the other hand, the dependent variable matches the specifications given in the measurement model, pointing to a suitable and approved study model.

Table 6 discusses three hypotheses listed for analysis, as shown in Fig. 1 and Table 6. The hypotheses support the claim based on the analysis and outcomes. This can be attributed to the lack of significance in the association between awareness and adopting AI in HE with a p-value of (p>0.003, SE=0.081). The results support the claim that people are aware of AI and are inclined to consider it in HE. The attitudes toward the adoption of AI (Hypothesis 2 and 3) were found to be significant (p<0.000 and SE=0.064). In a similar vein, performance expectation and attitude of adopting HE were also found to be significant (p<0.001 and β=0.071).

Table 3: Demographic analysis

Demographic	Frequency	Percentage
Gender		
Male	170	68
Female	105	42
Education		
University	150	60
College	50	20
Polytechnic	50	20

Table 4: Factor loadings

Variables	Items	Factor loading (s)	AVE	CR	Cronbach alpha
AW	AW1	0.860	0.813	0.881	0.871
	AW2	0.979			
	AW3	0.734			
	AW4	0.697			
	AW5	0.887			
	AW6	0.726			
AT	AT1	0.789	0.819	0.873	0.875
	AT2	0.833			
	AT3	0.841			
	AT4	0.950			
	AT5	0.681			
PE	PE1	0.785	0.804	0.851	0.861
	PE2	0.699			
	PE3	0.924			
	PE4	0.768			
	PE5	0.872			
	PE6	0.780			
AHE	AHE1	0.846	0.877	0.800	0.811
	AHE2	0.840			
	AHE3	0.747			
	AHE4	0.656			
	AHE5	0.549			

CR: Composite reliability, AVE: Average variance extracted, AW: Awareness, AHE: Adoption of higher education, PE: Performance expectancy, AT: Attitude

Table 5: Discriminant validity

Variables	(1)	(2)	(3)	(4)
AW	0.514			
AT	0.700	0.501		
PE	0.674	0.672	0.789	
AHE	0.554	0.634	0.640	0.630

AW: Awareness, AHE: Adoption of higher education, PE: Performance expectancy, AT: Attitude

DISCUSSION

The adoption of AI in HE is vast, promising a future of enhanced learning and teaching. However, this complex process requires careful planning and implementation to ensure its effectiveness and ethical considerations. The research findings illustrate the use of AI in HE by discussing examples and experiences from various Northern Nigerian HEIs. The adoption of AI technology in HE enhances the acceptability of AI in Nigerian HE (Sohn and Kwon, 2020). The UTAUT model, which stands for Unified Theory of Acceptance and Use of Technology, was crafted with three relationships (hypotheses) between the variables: awareness, attitude, performance expectancy, and adoption of HE. This model provides a structured approach to understanding AI adoption in HE.

Based on a previous study by Chen and See (2020), the research generally considered teaching staff as respondents in HE to investigate their attitudes and behavior as antecedents for understanding AI adoption in HE. Second, it investigated under what circumstances these predictors affected work engagement. This study is distinct from all previous research in the district, as it focuses on the unique context of Northern Nigerian HEIs. These institutions, with their limited resources, diverse student populations, and unique awareness, attitude, and performance expectancy factors, present a unique challenge and opportunity for the adoption of AI in HE. The results are interpreted using the lens of these factors to provide a greater perspective on AI for HE.

The findings further indicate attitudes and behaviors shaping the landscape of AI adoption in HE. This study highlights several important issues, one of which influences staff and students' attitudes toward using AI in HE. The study's conclusions show that the attitude of the HE teaching staff was highly impacted by their awareness of how AI-based technology was used in their academic operations. Consequently, this aided in the incorporation of AI into HE.

Table 6: Goodness of fit indices

Fit index	Modified model	Recommendable value	Acceptable value	Source
p	0.000	>0.05	>0.000	Roemer *et al.* (2021)
χ^2/df	1.932	<2.0	>5.0	Olapade *et al*., 2023
GFI	0.921	>0.92	>0.9	Byrne, 2013
AGFI	0.911	>0.93	>0.9	Byrne, 2013
CFI	0.931	>0.91	>0.9	Olapade *et al*., 2023
TLI	0.912	>0.94	>0.9	Roemer *et al.* (2021)
RMSEA	0.031	<0.08	<0.1	Rakhimov *et al.* (2023)

Table 7: Hypothesis testing

Path	Estimate	SE	CR	p-value	Decision
AW→AHE	0.260	0.081	3.456	0.001	Supported (H1)
AT→AHE	0.236	0.064	3.593	0.000	Supported (H2)
PE→AHE	0.116	0.040	2.900	0.02	Supported (H3)

CR: Composite reliability, SE: Standard error, AW: Awareness, AHE: Adoption of higher education, PE: Performance expectancy, AT: Attitude

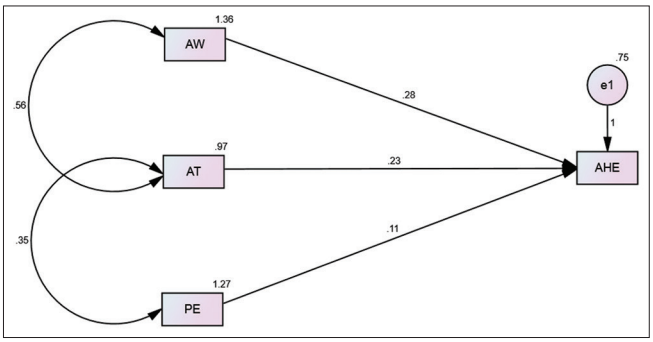

Fig. 1: Measurement of the model
Source: Designed by authors

The research further highlights the critical role of institutions in implementing awareness, training, and learning programs to incorporate new technologies into their operations successfully. Moreover, it corroborates earlier research by Beerkens (2022), which found that access to cutting-edge technology and well-functioning facilities can change HE by increasing student outcomes, personalizing learning, and streamlining administrative procedures. This underscores the importance of education and training in AI adoption, as it not only enhances awareness but also aids in the successful incorporation of AI into HE. Such unlock the transformative power of AI for sustainable development in HE.

Implications

A collaborative and multifaceted approach is suggested, involving all stakeholders, including legislators, educators, learners, and technology providers. Policymakers should provide financial aid and support for HE, while institutions should establish clear guidelines for AI-powered tools that address privacy, security, and ethical concerns through awareness, attitude, and performance expectancy for better usage. HE should also allocate budgets for training and support for educators to effectively use AI-powered tools, ensuring that everyone is part of this collective effort.

In order to use AI in HE, it is crucial that governments prioritize the ongoing advancement of technology and infrastructure in educational institutions. HE must place a high priority on creating intellectual capital and the means to manage AI tools and technologies in order to meet these demands. Similarly, HE must create AI-based curricula and courses by conducting a thorough market assessment to provide staff and students with the knowledge and abilities necessary to thrive in an AI-driven society.

CONCLUSION

As we stand on the technological revolution, integrating Artificial Intelligence (AI) in higher education presents a profound opportunity to advance sustainable development. This journey toward harnessing AI's transformative capabilities and improving educational outcomes. AI can streamline administrative processes to enhance personalized learning experiences and facilitate access to academic resources. Moreover, it equips institutions with the tools to analyze complex data patterns, enabling them to innovate solutions to pressing global challenges in all fields of study and economic disparities. Implementing AI in higher education requires a concerted effort among stakeholders. Policymakers, educators, technologists, and students must collaborate to create an ethical framework that prioritizes inclusivity, accountability and transparency. This requires training and resources to ensure that all users can leverage AI effectively and responsibly.

Furthermore, AI is used in educational paradigms, so fostering a culture of lifelong learning and adaptability is crucial. Critical thinking and creativity should be encouraged; higher education institutions can prepare students to navigate an increasingly complex world, ensuring they are not only consumers of technology but also innovators and ethical leaders in their respective fields. In conclusion, the path to unlocking AI's transformative power for sustainable development in higher education hinges on a holistic approach that values collaboration, ethics, and innovation. AI is a catalyst for change, ultimately contributing to a more equitable, sustainable, and resilient future.

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