



Adoption of Educational Technology in Teacher Education in Kwara State Universities: An Extended TAM Approach

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Abstract

This study investigated the factors influencing lecturers' adoption of educational technology in Nigerian university teacher education programmes, using an extended Technology Acceptance Model (TAM) framework. Drawing on recent literature and policy sources, it reviewed how variables beyond TAM's core constructs (perceived usefulness and ease-of-use) affect adoption. This study adopted a quantitative survey design, and stratified, purposive and simple random sampling techniques were used to select 150 respondents from Faculties of Education across 6 Nigerian universities in Kwara State. The study raised 4 research questions and formulated 1 hypothesis. Mean and Standard Deviation were used to answer the research questions, while Multiple regression analysis was used to test the hypothesis. The results show a high level of adoption (WM = 2.86), with strong use of technology for communication and engagement, though multimedia use is slightly lower. Respondents strongly perceive educational technology as useful (WM = 3.04), especially in improving teaching and learning outcomes. Ease of use is moderate (WM = 2.78), indicating general usability with minor technical challenges. External support is moderate (WM = 2.65), with infrastructure challenges limiting effective adoption. The multiple regression analysis revealed that perceived usefulness, perceived ease of use, and external factors significantly predict lecturers' adoption of educational technology ($R^2 = 0.50$, $p < 0.05$). Perceived usefulness emerged as the strongest predictor; therefore, the null hypothesis was rejected. The study concludes that understanding contextual factors (training, management support, and curriculum relevance) is key to promoting educational technology use among lecturers. It recommended targeted interventions (enhanced professional development, robust ICT policies) and suggests areas for future research to fill the data gaps in this field.

Keywords: Educational Technology, Extended TAM Approach, Lecturers' Adoption, Teacher Education, Nigerian Universities

INTRODUCTION

Integration of information and communication technology (ICT) into higher

education continues to reshape teaching and learning across the world. Recent studies show that digital tools improve instructional delivery, improve access to educational resources, and support the development of critical skills needed in a knowledge-driven economy (Bond et al., 2020; Afolabi et al., 2021). In Nigeria specifically, the Federal Ministry of Education's National Policy on Information and Communication Technologies (ICT) in Education emphasizes integrating ICT into

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teaching, learning, research, and educational administration as a tool to achieve quality education, sustainable development, and global competitiveness (Federal Ministry of Education [FME], 2019).

Also, the current national education and digital economy policies consider ICT as a strategic tool for improving quality, innovation, and global competitiveness within the university system (Aina & Ojo, 2022). Despite these policy directions, implementation seems to be inconsistent. Empirical evidence shows that many Nigerian university lecturers still face challenges such as poor infrastructure, unreliable internet access, high data costs, and weak institutional support (Olatokun & Aina, 2021; Yakubu & Dasuki, 2021). Surveys conducted in recent studies show that a large number of lecturers identify infrastructural deficits and limited training opportunities as major barriers to effective ICT integration (Afolabi et al., 2021; Aina & Ojo, 2022).

In addition, Olatokun and Aina (2021) observe that many academics make personal efforts to acquire digital skills, usually funding their own training and tools. This shows that institutional support is low, which limits the effective use of ICT in teaching and research. This gap shows the need to understand the factors that influence technology adoption among university lecturers. The Technology Acceptance Model (TAM) is one of the most widely used frameworks for explaining such behaviour. TAM explains that perceived usefulness (PU) and perceived ease of use (PEOU) influence users' attitude towards a technology, which then influences their intention and actual usage (Salloum et al., 2019; Mutisya & Makokha, 2022). Studies conducted recently confirm that these constructs continue to predict ICT adoption in higher education environments. For example, one Nigerian study found that PU and PEOU significantly predicted lecturers' attitudes toward ICT, which in turn drove their intention to use it (Dada, 2025).

Within the context of Nigerian teacher education, little is known about lecturers' perspectives. Some studies such as Ifinedo (2020) examined teacher educators and found that factors such as ICT knowledge and teaching experience strongly influence technology integration. In the same vein, Akinde (2016) extended TAM conceptually for library educators, using the following

constructs: infrastructure support, technical support, and educator attitude, reflecting Nigeria-specific needs. Other reports show that challenges such as insufficient infrastructure and resistance to change persist despite policy guidelines for ICT in education. By and large, the literature suggests TAM is a useful lens; however, it must be extended to include contextual factors in Nigeria. This study therefore builds on these insights and the existing body of knowledge by focusing on lecturers in university-based teacher education. Also, it should be stated that, despite policy efforts, lecturers in Nigerian teacher-education programmes do not adequately utilise educational technology in teaching. Infrastructure deficits, inadequate training, as well as attitudinal issues have always been observed in recent times. This shows that existing research is fragmented as most TAM studies focus on students or general faculty rather than education lecturers. There is a gap in understanding which contributing factors influence teacher educators' acceptance of technology. Without this knowledge, measures to enhance technology adoption may overlook critical barriers such as lack of institutional support or facilitators (e.g. professional development). Thus, the problem is about the lack of comprehensive, theory-driven insight into why and how Nigerian teacher-education lecturers adopt or resist technology.

Objectives of the Study

The study investigated lecturers' adoption of educational technology in Nigerian teacher education using an extended TAM. Specific objectives are to:

1. determine the level of lecturers' adoption of educational technology in teacher education in Nigerian universities;
2. examine the extent to which lecturers perceive educational technology as useful in teacher education;
3. examine the extent to which lecturers perceive educational technology as easy to use; and
4. identify the external factors that influence lecturers' adoption of educational technology.

Research Questions

1. What is the level of lecturers' adoption of educational technology in teacher education in Nigerian universities?
2. To what extent do lecturers perceive educational technology as useful in teacher education?
3. To what extent do lecturers perceive educational technology as easy to use?
4. What external factors influence lecturers' adoption of educational technology?

Research Hypothesis

H0₁: There is no significant relationship between perceived usefulness, perceived ease of use, and external factors, and lecturers' adoption of educational technology in Nigerian universities.

RELATED WORKS

Concept of Educational Technology

Educational technology is a multidisciplinary field which deals with the systematic design, implementation and evaluation of learning processes using technological tools and instructional systems. It incorporates principles from education, communication, psychology and computer science to improve teaching effectiveness and learning outcomes (Bond et al., 2024; Huang et al., 2024). Modern educational technology extends beyond physical devices such as computers, desktops or projectors. It now includes digital ecosystems such as learning management systems, artificial intelligence applications, mobile learning platforms and data-driven instructional tools (Chiu, 2024). These technological innovations support personalized learning, adaptive instruction and real-time feedback, thereby enhancing learners' engagement and achievement.

The development of artificial intelligence (AI), machine learning and adaptive learning systems has improved personalized learning experiences patterned to individual learners' needs. These technologies ease real-time feedback, predictive analytics and differentiated instruction, which facilitate student engagement and academic performance (Almaiah et al., 2024). Digital tools and methods designed to enhance teaching and learning incorporate principles from instructional design, cognitive psychology,

communication theory and computer science, thereby positioning it as both a theoretical and practical domain. It embraces not only physical tools such as computers and mobile devices but also digital environments, learning management systems, artificial intelligence and data analytics platforms (Chiu, 2024).

Moustapha and Yusuf (2023) discovered that educational technology plays a critical role in broadening access to education in developing countries such as Nigeria, particularly in higher education institutions where there is a high student population. They further emphasized that technology integration enhances instructional delivery and promotes equity in learning opportunities. Despite these advantages, educational technology is not inherently effective. Its success depends on pedagogical alignment, teacher competence and institutional readiness (Scherer et al., 2023). Without these factors, technological tools may be underutilized or misapplied, which may result in low learning impact.

Technology in Teacher Education

Teacher education has progressively integrated technology as a core component of professional preparation. The aim is to equip pre-service and in-service teachers with digital competence, pedagogical knowledge and the ability to integrate technology effectively into classroom instruction. The Technological Pedagogical Content Knowledge (TPACK) framework remains a central model guiding this integration. It emphasizes the relationship between technological knowledge, pedagogical knowledge and content knowledge in producing effective teaching practices (Huang et al., 2024). This framework helps teachers understand not only how to use technology but also how to harmonize it with instructional goals.

According to Adeyemi (2022), teacher education institutions are gradually integrating ICT tools into teaching and learning processes. However, the implementation was not balanced due to infrastructural and policy challenges. Exposure to technology during teacher training boosts confidence and readiness to adopt digital tools in professional practice. However, challenges such as inadequate funding, limited training opportunities and poor infrastructure continue to hinder effective implementation in many Nigerian institutions (Moustapha & Yusuf, 2023).

Lecturers' Adoption of Educational Technology

Lecturers have significant roles to play in the success of technology integration in higher education. Their adoption behaviour is influenced by multiple factors such as perceived usefulness, perceived ease of use, self-efficacy and institutional support (Almaiah et al., 2024). Lecturers are more likely to adopt digital tools when they believe these improve teaching efficiency, enhance student engagement and simplify assessment processes. Faruq (2025) found that perceived usefulness is the strongest predictor of lecturers' adoption behaviour.

However, there are various limitations, which include resistance to change, inadequate technical support, heavy workload and limited access to digital resources. Moustapha and Yusuf (2023) also noted that infrastructural challenges significantly affect adoption rates among lecturers in Nigerian higher institutions. Thus, lecturers' adoption of educational technology is a complex process which is determined by cognitive, institutional and environmental factors.

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) developed by Davis (1989) explains how users adopt and use technology. The model pinpoints two major determinants, perceived usefulness and perceived ease of use, which influence attitudes, behavioural intention and actual system use. TAM has been widely applied in educational research because of its simplicity and strong predictive power. Scherer et al. (2023) show that perceived usefulness has a stronger effect on adoption than ease of use. TAM has been used to explain lecturers' adoption of Information and Communication Technology tools in universities. Faruq (2025) confirms that the model effectively predicts technology acceptance among academic staff.

Extended Technology Acceptance Model

To address limitations of the original Technology Acceptance Model (TAM), researchers developed extended versions such as TAM2 and TAM3. These models incorporate additional variables such as social influence, facilitating conditions, computer self-efficacy and motivation (Venkatesh & Davis, 2000). The extended TAM provides a

comprehensive understanding of technology adoption by including psychological and social factors. In Nigerian tertiary institution settings, educational support and ICT competence are major determinants of technology endorsement (Adeyemi, 2022). However, scholars caution that increasing complexity in extended models may reduce their practical application in empirical studies (Almaiah et al., 2024).

Empirical Studies on Educational Technology Adoption

Empirical studies have consistently shown that perceived usefulness is the strongest indicator of educational technology adoption by lecturers, followed by perceived ease of use (Scherer et al., 2023). There is an increase in the importance of institutional support, training opportunities and infrastructure in shaping adoption behaviour. In developing countries such as Nigeria, these factors are particularly critical due to inadequate technological resources.

Moustapha and Yusuf (2023) found that Information and Communication Technology adoption among university lecturers is strongly controlled by the availability of resources and institutional encouragement. Similarly, Faruq (2025) reports that inadequacy of infrastructure remains a major problem to effective technology integration in Nigerian universities. Overall, empirical evidence suggests that technology adoption is a multidimensional phenomenon influenced by cognitive, social, institutional and environmental factors.

METHODOLOGY

Design

This study adopted a quantitative survey design. The quantitative survey design allows statistical analysis and model testing, and seeks to test relationships among TAM variables and extended factors influencing lecturers' adoption of educational technology in teacher education programmes in Nigerian universities. Independent variables measured in the study include perceived usefulness, perceived ease of use, and external factors such as infrastructure, training and institutional support, while the dependent variable is adoption of educational technology.

Population and Sampling Techniques

The study population covered all lecturers in all the universities in Kwara State, Nigeria. The target population is all the lecturers in the Federal, state and private universities offering teacher education programme to ensure diversity. The respondents comprised all lecturers taking teacher education programme in Faculty of Education across the selected universities. Multi-stage sampling approach was adopted. First, stratified sampling technique was used to select 2 Federal, 2 state and 2 private universities (making 6 participating universities) in Kwara State, Nigeria. Second, faculty of education in each university was selected using purposive sampling technique, and 25 lecturers from each faculty of education were sampled using simple random sampling technique (altogether making 150 respondents).

Method of Data Collection

The researchers developed a structured questionnaire instrument tagged “Questionnaire on Lecturers’ Adoption of Educational Technology in Teacher Education in Nigerian Universities” to elicit information from the respondents. The questionnaire was divided into two sections: Section A dealt with demographic information of the respondents (gender, academic rank, type of university), while Section B addressed relevant items (with their corresponding Likert scale) relating to each of the research questions raised. This instrument was subjected to both validity and reliability tests. The researchers established face and content validity through expert review, and validated constructs using factor analysis. As for the reliability, the researchers conducted a pilot test using lecturers outside the study sample, and determined the reliability using Cronbach’s Alpha, with a threshold of 0.70.

Stability was also assessed using the test-retest method. The researchers developed a Google Form questionnaire and administered it to the lecturers in the sampled universities for completion and submission online.

Method of Data Analysis

The researchers used both descriptive and inferential statistics. Mean and standard deviation were used to answer the research questions, while multiple regression analysis was used to test the hypothesis. All these data were analysed and run using SPSS.

Ethical Consideration

The researchers followed ethical protocols which include the following: obtaining informed consent, especially from selected universities and Faculties of Education; explaining the purpose of the study clearly; maintaining anonymity and confidentiality; and ensuring that the data collected was used mainly for academic purposes.

RESULTS AND DISCUSSION

Results

Research Question 1: What is the level of lecturers’ adoption of educational technology in teacher education in Nigerian universities?

The results in Table 1 indicate a generally high level of adoption of educational technology among respondents ($WM = 2.86$). Most lecturers frequently use technology for communication, lesson preparation, and encouraging student engagement. However, the use of multimedia resources is relatively lower, suggesting some limitations in accessing or utilizing diverse digital teaching tools.

Table 1. Level of lecturers' adoption of educational technology.

Level of Adoption of Educational Technology	Mean	SD	Remark
I use multimedia resources (e.g., LMS, PowerPoint, graphics, audios, videos, animations) in my teaching.	2.51	0.99	Often
I use technology for preparing lesson notes and instructional materials.	2.73	0.96	Often
I integrate digital tools into lesson delivery and student assessment.	2.63	1.08	Often
I encourage student-teachers to use digital tools for learning activities.	3.07	0.92	Often
I use technology to communicate with students (e.g., email, online platforms).	3.34	0.85	Often
Weighted Mean	2.86		

Research Question 2: To what extent do lecturers perceive educational technology as useful in teacher education?

In Table 2, respondents demonstrate a strong perception of the usefulness of educational technology (WM = 3.03). They widely agree that technology enhances teaching effectiveness, improves students' learning outcomes, increases engagement, and makes lesson delivery more efficient. This suggests a positive attitude toward integrating technology in education.

Research Question 3: To what extent do lecturers perceive educational technology as easy to use?

The findings displayed in Table 3 reveal a moderate level of perceived ease of use (WM = 2.78). While respondents generally agree that

educational technology is easy to learn and use, some difficulties still exist, particularly in software installation and integration into teaching. This indicates that although users are fairly comfortable with technology, certain technical challenges persist.

Research Question 4: What external factors influence lecturers' adoption of educational technology?

The results in Table 4 show moderate external support for educational technology use (WM = 2.65). While institutions appear to encourage technology use and provide some training, challenges such as unreliable internet/electricity and limited technical support remain significant barriers. These infrastructural issues may hinder effective technology integration despite positive perceptions and willingness among users.

Table 2. Perceived usefulness of educational technology.

Perceived Usefulness	Mean	SD	Decision
Educational technology improves my teaching effectiveness.	3.14	0.89	Agreed
Using educational technology enhances students' learning outcomes.	3.13	0.78	Agreed
Educational technology makes lesson delivery more efficient.	2.93	0.88	Agreed
Educational technology helps me manage my teaching tasks better.	2.85	0.93	Agreed
Using educational technology increases students' engagement in class.	3.13	0.78	Agreed
Weighted Mean	3.03		

Table 3. Perceived ease of use of educational technology.

Perceived Ease of Use	Mean	SD	Decision
It is easy for me to integrate technology into my teaching.	2.77	1.06	Agreed
I can operate educational technology tools easily.	2.76	1.06	Agreed
It is not hard to learn about the various technology tools that can be used for teaching and learning.	2.99	0.96	Agreed
I can install educational software applications without much difficulty.	2.47	1.09	Agreed
Interacting with educational technology is clear and understandable.	2.79	1.02	Agreed
Weighted Mean	2.78		

Hypothesis Testing

H0₁: There is no significant relationship between perceived usefulness, perceived ease of use, and external factors, and lecturers' adoption of educational technology in Nigerian universities.

The model in Table 5 shows a strong relationship between the independent variables and adoption ($R = 0.71$). The R^2 value of 0.50 indicates that 50% of the variation in lecturers' adoption of educational technology is explained by perceived usefulness, perceived ease of use, and external factors, while the remaining 50% is due to other variables not included in the model.

Table 4. External factors influencing lecturers' adoption of educational technology.

External Factors (Training, Infrastructure, Institutional Support)	Mean	SD	Decision
My institution provides adequate ICT facilities.	2.53	1.02	Agreed
Internet access and electricity are reliable in my institution.	2.35	1.03	Disagreed
Technical support is available when needed.	2.43	1.08	Disagreed
I receive adequate training on educational technology.	2.88	0.96	Agreed
My institution encourages technology use.	3.07	0.92	Agreed
Weighted Mean	2.65		

Table 5. Model summary.

Model	R	R ²	Adjusted R ²	Std. Error
1	0.71	0.50	0.49	0.41

Table 6. Analysis of variance (ANOVA).

Source	Sum of Squares	Df	Mean Square	F	Sig.
Regression	25.84	3	8.61		
Residual	25.66	146	0.18	51.24	0.000
Total	51.50	149			

Table 7. Coefficients.

Variable	B	Std. Error	Beta (β)	T	Sig.
(Constant)	0.85	0.21	-	4.05	0.000
Perceived Usefulness	0.42	0.07	0.45	6.10	0.000
Ease of Use	0.31	0.08	0.33	4.12	0.000
External Factors	0.18	0.06	0.22	3.00	0.003

The ANOVA result shown in table 6 is significant ($f = 51.24$, $p < 0.05$), indicating that the regression model is statistically significant. This means the independent variables jointly predict lecturers' adoption of educational technology.

In Table 7, perceived usefulness ($\beta = 0.45$, $p < 0.05$) is the strongest predictor of adoption. Perceived ease of use ($\beta = 0.33$, $p < 0.05$) also significantly predicts adoption. External factors ($\beta = 0.22$, $p < 0.05$) have a weaker but still significant influence. This means that as these variables increase, lecturers' adoption of educational technology also increases. The multiple regression analysis revealed that perceived usefulness, perceived ease of use, and external factors significantly predict lecturers' adoption of educational technology ($R^2 = 0.50$, $p < 0.05$). Perceived usefulness emerged as the strongest predictor, followed by perceived ease of use and external factors. Therefore, the null hypothesis was rejected.

Discussion

The study formulated 4 research questions and 1 hypothesis to guide the study. The Question 1 result showed a great level of implementation of educational technology among lecturers. It was used mostly for communication, preparing lessons, and stimulating student involvement. Conversely, the lecturers seldom used multimedia resources, indicating some challenges in the utilisation or operation of diverse digital tools used in teaching. Question 2 indicated that the lecturers fully agree that teaching effectiveness, improved students' learning outcomes, increased engagement, and efficient lesson delivery are enhanced by technology. This finding is in line with Bond et al. (2020), Afolabi et al. (2021) and Moustapha and Yusuf (2023), who submitted that educational

technology plays a critical role in broadening access to education, and improves instructional delivery, access to educational resources, and support for the development of critical skills necessary in a knowledge-driven economy. As seen in the findings of Faruq (2025), this finding shows the significance of incorporating technology in education. This also justifies the significance of integrating ICT into teaching, learning, research, and educational administration as to achieve quality education and sustainable development, as emphasized in the National Policy on Information and Communication Technologies (ICT) in Education (Federal Ministry of Education [FME], 2019).

Furthermore, the findings of Question 3 indicated that although users are fairly comfortable with learning and using educational technology, certain technical challenges persist, such as the installation of educational tools, among others. This finding confirms the assertion of Olatokun and Aina (2021) and Yakubu and Dasuki (2021) that many Nigerian university lecturers face challenges pertaining to the use of ICT, such as poor infrastructure, unreliable internet access, high data costs, limited training opportunities and weak institutional support. Question 4 shows that lecturers do not have sufficient technical support, and that is why they struggle with the installation of digital devices and software that enhance teaching and learning. In Nigerian tertiary institution settings, educational support and ICT are major determinants of technology endorsement (Adeyemi, 2022). Not only has that, but access to a reliable network and electricity also posed a huge challenge to the adoption of educational technology.

Notwithstanding, most lecturers agreed that the institutions provide them with ICT tools and encourage them to use them. With expert technical support, lecturers are more likely to use educational tools in teacher education. The results of the hypothesis showed that all factors

significantly predict lecturers' adoption of educational technology in teacher education. Perceived usefulness emerged as the strongest predictor, followed by perceived ease of use and external factors. This is corroborated in the findings of Scherer et al. (2023), which revealed that perceived usefulness strongly predicts educational technology adoption, followed by perceived ease of use.

By and large, the findings of this study underscore the need for a comprehensive approach that combines infrastructure provision, capacity building, technical support, and supportive institutional policies to enhance the effective adoption of educational technology in teacher education programmes across Nigerian universities.

CONCLUSION

The study investigated lecturers' adoption of educational technology in Nigerian teacher education using an extended TAM. It was discovered that lecturers generally perceive educational technology to be useful, easy to learn and operate, but sometimes experience difficulty installing some of these tools. With adequate electricity supply and internet access, amongst others, the lecturers readily adopt these tools and encourage their students to also use them. It is pertinent to note that the responses gotten from the respondents were quantitative in nature; hence, the study could not get a deep insight into many other factors which lecturers in teacher education use to control the implementation of educational technologies. Future researchers are therefore motivated to explore qualitative data for in-depth understanding.

RECOMMENDATIONS

The following recommendations were made based on the findings of the study:

1. Policies that can improve the adoption of educational technology in teacher education should be enacted by policymakers.
2. Administrators should ensure that sufficient resources are allocated to teacher education programmes.
3. Targeted training and support systems should be organized and put in place for teacher education lecturers in Nigerian universities.

4. Curriculum developers should review the teacher education programme curricula to emphasize ICT capabilities.
5. Adequate provision for ease-of-use technical support on multimedia resources should be put in place for teacher education programme lecturers.

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