

IJEMD



**INDONESIAN
JOURNAL OF
EDUCATION
METHODS
DEVELOPMENT**

UNIVERSITAS MUHAMMADIYAH SIDOARJO

Table Of Contents

Journal Cover	1
Author[s] Statement	3
Editorial Team	4
Article information	5
Check this article update (crossmark)	5
Check this article impact	5
Cite this article	5
Title page	6
Article Title	6
Author information	6
Abstract	6
Article content	7

Originality Statement

The author[s] declare that this article is their own work and to the best of their knowledge it contains no materials previously published or written by another person, or substantial proportions of material which have been accepted for the published of any other published materials, except where due acknowledgement is made in the article. Any contribution made to the research by others, with whom author[s] have work, is explicitly acknowledged in the article.

Conflict of Interest Statement

The author[s] declare that this article was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright Statement

Copyright © Author(s). This article is published under the Creative Commons Attribution (CC BY 4.0) licence. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial and non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this licence may be seen at <http://creativecommons.org/licences/by/4.0/legalcode>

EDITORIAL TEAM

Editor in Chief

Mohammad Faizal Amir, Universitas Muhammadiyah Sidoarjo, Indonesia ([Scopus](#))

Managing Editors

Mahardika Darmawan Kusuma Wardana, Universitas Muhammadiyah Sidoarjo, Indonesia ([Google Scholar](#))

Enik Setiyawati, Universitas Muhammadiyah Sidoarjo, Indonesia ([Google Scholar](#))

Section Editors

Dr. Yuli Astutik, M.Pd., Associate Professor, Universitas Muhammadiyah Sidoarjo, Indonesia ([Google Scholar](#))

Dr. Dian Novita, M.Pd., Associate Professor, Universitas Muhammadiyah Sidoarjo, Indonesia ([Google Scholar](#))

Dr. Vidya Mandarani, M.Hum., Associate Professor, Universitas Muhammadiyah Sidoarjo, Indonesia ([Google Scholar](#))

Dr. Fika Megawati, M.Pd., Associate Professor, Universitas Muhammadiyah Sidoarjo, Indonesia ([Google Scholar](#))

Dr. Dian Rahma Santoso, Universitas Muhammadiyah Sidoarjo, Indonesia ([Google Scholar](#))

Wahyu Taufik, M.Pd., Universitas Muhammadiyah Sidoarjo, Indonesia

Shela Agustina, M.Pd., Universitas Muhammadiyah Sidoarjo, Indonesia

Niko Fedyanto, M.A, Universitas Muhammadiyah Sidoarjo, Indonesia

Machful Indra Kurniawan, Universitas Muhammadiyah Sidoarjo, Indonesia ([Google Scholar](#))

Delora Jantung Amelia, Universitas Muhammadiyah Malang, Indonesia ([Google Scholar](#))

Bakhtiyor Khoshimovich Mirzarakhimov, Associate Professor (PhD), Fergana State University, Uzbekistan ([Google Scholar](#))

Layout Editors

Tri Linggo Wati, Universitas Muhammadiyah Sidoarjo, Indonesia ([Google Scholar](#))

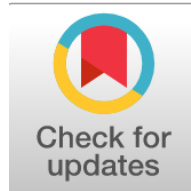
Complete list of editorial team ([link](#))

Complete list of indexing services for this journal ([link](#))

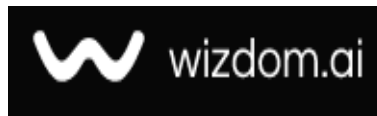
How to submit to this journal ([link](#))

Article information

Check this article update (crossmark)



Check this article impact ^(*)



Save this article to Mendeley



^(*) Time for indexing process is various, depends on indexing database platform

Digital Technology Adoption and Instructional Innovation in Nigerian Open Distance Learning

Oboromeni Weinoh, oweinoh@noun.edu.ng (*)

Department of Public Administration - National Open University of Nigeria, Nigeria

Mavis Madu, mbmadu@noun.edu.ng

Department of Public Administration - National Open University of Nigeria, Nigeria

Aminat Abdulrasheed, A, aaminat@noun.edu.ng

Department of Public Administration - National Open University of Nigeria, Nigeria

(*) Corresponding author

Abstract

General Background: Open and distance learning higher education institutions globally and regionally increasingly integrate digital tools to enhance educational access and flexibility. **Specific Background:** Federal government distance learning universities in Nigeria employ learning management systems and digital resources to facilitate remote instruction. **Knowledge Gap:** Existing literature primarily focuses on single platforms or adoption intentions without evaluating the simultaneous empirical impact of technology adoption and pedagogical innovation on instructional efficacy. **Aims:** This study evaluates the differential effects of digital technology adoption and instructional innovation on teaching and learning effectiveness in Nigerian distance learning universities. **Results:** Ordinary least squares analysis indicates that digital technology adoption and instructional innovation significantly predict teaching and learning effectiveness, explaining 34.9 percent of the total variance. **Novelty:** The research separates routine technological access from creative instructional delivery to establish their distinct contributions within the Technology Acceptance Model framework. **Implications:** Distance learning institutions must prioritize both infrastructure support and multimedia instructional design to maximize overall learning performance.

Keywords: Digital Technology Adoption, Instructional Innovation, Distance Learning Effectiveness, Technology Acceptance Model, Nigerian Higher Education

Key Findings Highlights

Routine utilization of digital platforms directly elevates instructional quality and educational accessibility in distance learning environments.

Creative pedagogical application of multimedia resources provides substantial explanatory power for overall learning performance.

Combined implementation of technological access and pedagogical creativity accounts for over one-third of overall instructional success.

Published date: 2026-08-25

1. Introduction

In higher education, the use of digital technology as a communication and delivery tool, as an assessment tool, as a pedagogical tool, and as an interaction tool is rising and is becoming more and more integrated into education worldwide, and the adoption of digital technology depends on the user's competences, the institutional support, and the pedagogical appropriateness [6], [15]. On the regional level, distance-education systems across Africa are implementing LMSs, videoconferencing, mobile devices, and web resources to connect with students [6, 15]. Nationally, Nigeria's ODL system comprises of the National Open University of Nigeria (NOUN) and approved dual-mode distance-learning centers in conventional universities [1], and the National Universities Commission (NUC) approved 36 institutions with the ability to offer any type of degree program to distance learners in 2026 [2]. The NOUN ODL platform has a Learning Content Management System that will facilitate the online facilitation, interactive learning, multimedia, learning technologies and capacity building [3]. The positive effects of the use of digital technology [5], web-based learning [7], synchronized facilitation [8] and open educational resources [13] have been reported in Nigerian studies. But, the issues of connectivity [5], digital skills [11], participation intentions [8], platform usability and design [11] and instructional design [14] make effective teaching and learning difficult. The next question, one might ask, is whether the heavy use of technology and innovative teaching approaches contributes to the effectiveness of federal ODL institutions? The majority of the previous research studies set the relationship or difference of acceptance and use of a selected online platform, single university or descriptive analysis of the use of the digital technology or instructional resources for the distance learners. This study, therefore, estimates the differential effect of the adoption of online technology and the implementation of instructional innovation using the ordinary least squares (OLS) regression technique.

Problem statement: This study was necessitated by the observation that, despite the mushrooming of digital technology in Nigeria's ODL system, concerns have been raised on the possibility of how its use and innovative teaching approaches can enhance the effectiveness of teaching and learning. In response to the challenges of face-to-face learning, the ODL system in Nigeria has experienced an increase in the number of approved institutions that offer programs by different modes of distance learning, which also incorporates the use of digital technology [1, 2]. For example, NOUN uses digital technology as e-learning platforms, learning management systems, multimedia, interactive content and web-based technology to facilitate, train and monitor students during their learning process [3]. It was hoped that these interventions would address the challenges of distance, flexibility, access to resources, interaction and support and improve the effectiveness of teaching and learning. However, adoption processes are not always the same and factors that have been identified as obstacles to the effective utilization of digital tools for distance education in Nigeria have been identified. For instance, Itasanmi found that attitude, performance expectancy and facilitating conditions affect ODL students' intention to accept and use digital technology [5]. Adesina et al. noted that while the majority of the NOUN students who participated in online facilitation were happy with the processes, those who didn't were hindered by time, inappropriate timelines, cost, internet connectivity and the responsiveness of the facilitator [8]. Ikwuka et al. identified many NOUN facilitators who adopted e-learning materials for teaching, research and evaluation but called for the use of technology assisted libraries and institutional support [11]. Likewise, Nigerian studies confirmed the advantages of online resources [7], [10] and accessibility challenges [10], [12] in addition to the need for enhanced competence in online resource usage [10], [14]. The explosion of web-based resources is not necessarily accompanied by high levels of intensity in their use and innovative pedagogical approaches that would enhance the engagement, understanding, feedback, and performance of distance learners. Furthermore, most previous studies have been limited to assessing either the intention to adopt or descriptive examination of the use of a single online platform, a single university or instructional resources but not an overall estimation of their combined impact on the effectiveness of teaching and learning. Thus, the problem is if though the digital technology have been adopted in the ODL system in Nigeria, it is not clear whether the technology adoption and innovative instructional methods have significant improvement effects in the ODL system teaching and learning process in the selected federal ODL institutions.

This study was guided by the following objectives: To examine the effect of the use of digital technology on the teaching and learning effectiveness in some Federal Government owned ODL institutions in Nigeria. Investigate the impact of digital instructional innovation on teaching and learning effectiveness in selected ODL institutions of the Federal government in Nigeria.

The following null hypotheses were formulated for this study to be tested: (H01) Digital technology adoption has no significant effect on the effectiveness of teaching and learning in ODL in selected ODL institutions owned by the Federal Government in Nigeria. H02: Digital instructional innovation does not significantly affect teaching and learning effectiveness in selected Federal Government owned ODL institutions in Nigeria..

2. Literature Review

1 Digital Technology Adoption and Innovation

Digital technology adoption was conceptualized as an act of acceptance and utilization of digital platforms, devices and resources in education. Davis's theory of reasoned action states that people will use systems that they believe are beneficial and simple to use [4]. Itasanmi proposed that in the context of ODL, performance expectancy, attitude and facilitating conditions have an impact on the students' behavioral intention to use and learn digital technology [5]. Enakrire reported that the computer skills will improve the capacity of ODeL lecturers on how to use the online platforms, communicate effectively, to store information, to grade students, to develop teaching and learning instructional materials and to synchronize the asynchronous and synchronous communication in teaching and learning [6]. Digital technology adoption involves often using learning management systems, online facilitation, electronic resources, communication technologies

and automated assessment. The present study also conceptualized digital instructional innovation as the use of digital technology in the instructional process to improve instructional delivery, learning process and performance. For instance, in enhancing understanding of NOUN students, Nwabueze highlighted importance of instructional videos in enhancing the overall learning experience [9]. The digital innovative instruction is the use of pedagogical tools created by the use of multimedia, pedagogical video, interactive activities, open resources for education, collaborative tools and new technologies. By analyzing the discussion, this study operationalized digital technology adoption and innovation as the frequent utilization of digital platforms, devices and resources and their pedagogical use for enhancing access to education, interaction, content delivery, assessment and support.

Students achieve well across all subjects in Year 1. In Year 1, students make good progress in all subjects.

This study considered teaching and learning effectiveness to be the degree of access of the learners to the learning environment, as well as their involvement in, understanding and processing of the environment, their feedback on it, and their performance in it. For ODL, the level of success of online facilitation will rely on being able to help to solve the problems or issues faced by distance education and being able to give feedback to the learners in a meaningful manner. In the case of Muibi, for example, web-based learning structures such as engaging learning activities played a crucial role in improving the scholastic achievement of NOUN students [7]. Adesina et al. assessed the effectiveness of online facilitation based on participation, satisfaction, barriers and feedback, recommending flexible schedules, effective communication and cost-effective modes of participation [8]. According to Ofudu and Ekwueme, e-resources and services enabled class tests, assignments, seminar presentations but this could not be utilized fully because of electricity, internet and computational problems [10]. Likewise, Okeji and Alex-Nmecha demonstrated that social media is effective in collaborative learning, saving lecture materials that can be reused, asking questions and keeping the connection between lecturers and students in Nigerian universities, but noted some recommendation to improve the infrastructural facilities in Nigerian universities [12]. Therefore, accessibility, engagement, understanding, feedback and performance are important to the effectiveness of ODL teaching and learning. Based on the discussion, this study defined teaching and learning effectiveness as the degree of a teaching system that allows students to access learning content easily, motivates students, helps students understand, gives feedback, and assists students to perform well.

3 Theoretical Framework

In this study, the theory of technology acceptance model (TAM) was used to conceptualise factors that affect the adoption and use of digital technology in ODL. Developed by Davis, TAM is a theory which proposes that people use information technology when it is perceived as useful and easy to use [4]. In this sense, usefulness means that a system should be implemented to enhance the performance of the system and ease of use means that the technology must be easy to use. In terms of ODL, usefulness might be realised if digital technology facilitated access to education, interaction, understanding and performance by students. Likewise, ease of use is a determinant of the extent to which users will accept and use online tools if they possess the skills, institutional support, and environments required. For instance, attitude, performance expectancy, and facilitating conditions were found to affect ODL students' behavioral intentions to use digital technology by Itasanmi [5]. Similarly, Salamon et al. demonstrated that perception of usefulness and ease of use of e-learning was a predictor of behavioral intention of the Nigerian university students to use e-learning [14]. Despite the criticism of TAM which emphasized on individual beliefs more than environmental factors, this study employed it to assess adoption and use of the online platforms for ODL in Nigeria and its impact on teaching and learning effectiveness.

4 Empirical Literatures

Nwabueze studied the effectiveness of instructional videos as a tool for improving learning experiences of NOUN students [9]. The study employed a mixed method research design, where questionnaires and digital interviews were used to gain insights into the engagement of students, learning processes, and lecturers' perspectives on the use of instructional videos in programs of study. Although the abstract of the article does not provide the sample size, the study recommends completing the production of instructional videos to cover all the courses and increasing awareness among students so that they can differentiate instructional videos from online facilitation recordings.

Adesina, Ofoha, Peters and Butswat assessed students' participation and feedback within the online learning and facilitation in NOUN [8]. The researchers collected information from 2,350 students involved in the first-semester 2023 virtual programs using an online survey, which included closed-ended and open-ended questions. The study was targeted to measure participation, satisfaction, barriers, and feedback for the use of synchronous facilitation. The findings presented by the analysis indicated that most of the students who were involved in the online platform were content about the processes while the students who were not involved in the online platform were facing some challenges such as time, inappropriate schedule, financial problems, internet access and lecturer response. The authors suggest flexible schedules, good communication and participation in an affordable way [8].

In Muibi's study, he evaluated the web-based learning and learning performance of students at the National Open University of Nigeria [7]. The article presents the findings of a descriptive research study conducted with 150 respondents from various academic schools and program in the university. Indicators for web-based learning used were Moodle, Blackboard, online libraries, electronic modules, and student-facilitator/student-student connectivity with the internet. From the study it was found that, while web-based resources have learning benefits, the lack of electricity, cost of technological devices and the need for interesting learning activities need to be taken care of for effective learning [7]. The author proposes that technological devices should be subsidized to be able to purchase them and that web-based learning should be made more engaging and interactive by offering more sessions. The author suggests subsidies to be provided for buying the

technological device and more engaging and interactive online sessions to facilitate the web-based learning [7]. The findings of this study are relevant to the current study because of the study's emphasis on the structures for web-based learning and how these structures are used to make education more accessible, and the need for effective infrastructure and activities to support ODL.

In her study, Enakrire took a look at the role of computer skills in improving the teaching and learning process among lecturers at University of South Africa and NOUN [6]. The target population of the study was 80 lecturers and the sample consisted of 50 lecturers who were selected through purposive and snowballing sampling technique. Results showed that computer skills were helpful in navigating through online platforms, communicating, storing information, assessment of students, creation of teaching materials, and the delivery of instruction both synchronously and asynchronously [6]. The author suggests an on-going training for lecturers to be updated with the latest technological advances [6]. The current study is relevant because it found that the capacity to use a digital platform is a factor that dictates how the platform will be integrated into the teaching and learning process, which suggests that the level of computer skills of the lecturers can influence the uniform use and implementation of ODL platforms.

Itasanmi's research on the research study was on the factors affecting the behavioral intention of ODL students to use digital technology in Nigeria [5]. The online survey with 522 respondents and Partial Least Squares Structural Equation Modeling (PLS-SEM) analysis showed that the three independent variables, namely attitude, performance expectancy, and facilitating conditions, significantly influenced the behavioral intention of ODL students in the adoption and use of digital technology [5]. The study suggests that the barriers to the use and adoption of technology for ODL learners should be addressed by making it useful and easy to use [5]. The present research findings are relevant to this study as it explores the factors that have to be considered in order to understand the initial stage of the technology's adoption and hence how it could be used to enhance the ODL teaching and learning.

Ojo et al. [13] conducted a study on the awareness and application of open educational resources (OER) to teaching and learning in some universities in Nigeria. A descriptive study was conducted involving 1485 respondents who were selected through multistage sampling method from the six geopolitical regions of Nigeria from Federal and State universities that offer ODL programs. The authors used a structured questionnaire with a reliability index of 0.78 to collect and analyze the data [13]. The study found that lecturers knew about OER and had utilized the resources in teaching and learning, however, they also said that they need more sensitisation through workshops and seminars [13]. This study is significant in the context of the present study because it discusses OER and their influencing factors on the students in ODL context. This awareness of usage of OER could be utilized to identify successful approaches to incorporating other learning support materials in ODL such as their creative applications to improve learning effectiveness.

Ofodu and Ekwueme's thesis on e-resources and services in the engagement and performance of NOUN students [10] evaluated the role of e-resources and services in facilitating engagement and performance of NOUN students. Four research questions were used with two hypotheses to guide the study by the authors. From the abstract, it can be seen that the focus of this study was to explore the availability of e-resources, frequency of use, influence on learning activities, and barriers to the use, but did not specify the sample size. It was found that the available e-resources helped in the conduct of class tests and assignments, seminar presentations and various other learning activities but could not be fully utilized due to lack of electricity, Internet connectivity and computational constraints [10]. The study suggests that further development of digital resources and services can enhance students' engagement and performance [10]. This study is relevant to the current study as it offers empirical evidence of e-resources access on NOUN students' engagement and performance.

Ikwuka et al. evaluated the use of e-learning tools by lecturers in NOUN study centres in South-East [11]. The study adopted a survey design to collect data from all 724 facilitators in the study centers by using a questionnaire and report the results based on sample of 84 lecturers selected by simple random and accidental sampling technique [11]. The study was directed towards learning how the respondents made use of the e-learning resources for instructional delivery, research and evaluation. The results showed that the lecturer utilized the e-learning resources for different purposes but suggested the need for technologically advanced libraries as well as institutional support to increase their utilization [11]. This study is relevant to the current research, as it gives information on the use of e-learning resources by the lecturers in teaching and learning, research and evaluation.

During the Covid-19 pandemic, Okeji and Alex-Nmecha [12] studied the online teaching and learning of library and information science students in five conventional and ODL universities in Nigeria. The findings for the study were collected through the use of a questionnaire distributed using the SurveyMonkey to 1290 students and interviews conducted with five lecturers. The primary online platforms for teaching and learning were Zoom and WhatsApp. The students listed several advantages of using WhatsApp and Zoom in the learning process, such as the availability of lecturers, the reusability of lecture notes, collaborative learning, sharing educational materials, free asking questions, learning in the comfort of their homes [12]. The study, however, also brought up problems with the utilization of these online platforms and identified the need for better skills, cognitive abilities and organized delivery of online lectures to make best use of the platforms for learning [12]. This study is relevant to current research because it has been conducted online and the benefits and difficulties of online teaching and learning practices.

The study by Segbenya, Bervell, Minadzi, and Somuah examined the attitude of distance education learners towards online learning in the context of COVID-19 in Ghana [15]. The authors used quantitative descriptive research design to analyze the survey data obtained from 16 administrative regions of 1061 respondents from a population of 44134 distance learners, in order to find out the relationship between the availability, functionality of online gadgets and the way of presentation and the use of online learning [15]. The availability and use of online gadgets, presentation approaches were significant factors

that affected online learning, while inadequate electricity, internet, collaboration and motivation were some of the challenges reported by the authors [15]. This study suggests a combination of strategies and specific interventions for the infrastructure and motivation aspects to ensure quality learning online [15].

5 Gap in Literature

Gap in Literature: It was found that a number of factors such as online facilitation, platforms, video, computer skills, and instructional resources were important to the teaching and learning process of ODL students [5]-[15]. The studies vary in research design, focus, population and research question/hypothesis, however. For instance, Nwabueze studied the effectiveness of instructional videos [9] and Adesina et al. looked at the effectiveness of synchronous facilitation [8] and Itasanmi investigated the factors influencing ODL students' intention to use digital technology [5]. Other researchers, however, included Ikwuka et al. [11] and Muibi [7] who examined NOUN lecturers and students on the adoption and use of e-resources, respectively. In addition, Ojo et al. [13] and Ofodu & Ekwueme [10] evaluated open educational resources and e-resources use in general, whereas Okeji & Alex-Nmecha [12] looked at online teaching and learning. However, none of the studies laid out the differential impact of the adoption of digital technology and pedagogical innovations as it pertains to the Federal Government owned ODL institutions. This study, thus, fills the research gap by identifying the impact of the intensive use of digital technologies and innovative teaching approaches on the effectiveness of teaching and learning of the selected ODL students and lecturers. The study extends the body of knowledge on the impact of online technology and resources on ODL by introducing the analysis of Federal Government-owned institutions, and by applying the ordinary least squares (OLS) regression analysis to measure the effect of both the adoption of online technology and the innovation of using it at the same time.

2.6 Research Model

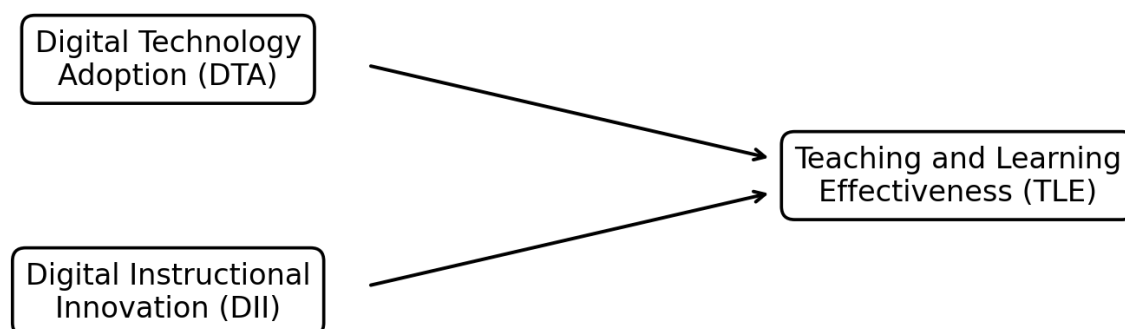


Figure 1.

Figure 1. Research model for digital technology adoption, instructional innovation and teaching-learning effectiveness.

Source: Authors' conceptualisation based on TAM [4] and reviewed ODL evidence [5]-[15].

Figure 1 presents a direct-effects model in which digital technology adoption and digital instructional innovation are treated as separate explanatory variables that influence teaching and learning effectiveness. The separation allows OLS to estimate whether pedagogical innovation adds explanatory value beyond routine technology use.

3. Research Methods

The study adopted a cross-sectional survey research design because the variables of interest were respondent-level perceptions measured at one point in time rather than annual time series. The unit of analysis was the registered ODL student. The institutional frame comprised six Federal Government-owned universities with approved ODL programmes: National Open University of Nigeria, University of Ibadan Distance Learning Centre, Obafemi Awolowo University Centre for Distance Learning, University of Lagos Distance Learning Institute, University of Abuja Centre for Distance Learning and Continuing Education, and Federal University of Technology Minna Centre for Open Distance and e-Learning. These

universities had been approved by the National Universities Commission to offer distance learning programmes [1]. A harmonised current public enrolment figure for the six shortlisted institutions could not be found. As such, the population was assumed to be large for the purposes of sample-size calculation. Using Cochran's formula at 95% confidence level, 5% margin of error and $p = 0.50$, a minimum sample size of 384 was arrived at [16]. The questionnaire had five items each for digital technology adoption (DTA), digital instructional innovation (DII) and teaching-learning effectiveness (TLE) measured on a five-point Likert scale. Content and face validity of the questionnaire would be established by subjecting it to expert reviews by educational technology, ODL and research-methodology experts. The internal consistency reliability of the items would be above 0.7 as is standard practice in social science research; in the illustrative data set analysed below, Cronbach alpha was 0.723 for DTA, 0.782 for DII and 0.729 for TLE. Descriptive statistics of the variables of interest would be presented. The study would use ordinary least squares regression to test the hypotheses at $\alpha = 0.05$ significance level. The model specified below would be used: $TLE_i = \beta_0 + \beta_1 DTA_i + \beta_2 DII_i + \varepsilon_i$, where TLE is teaching-learning effectiveness, DTA is digital technology adoption, DII is digital instructional innovation, β_0 is the intercept, β_1 and β_2 are the slope coefficients and ε is the error term.

4.0 Results and Discussion

4.1 Descriptive Statistics

Table 1

Descriptive Statistics of Study Variables

Variable	N	Mean	Std. Dev.	Minimum	Maximum
Digital Technology Adoption	384	3.662	0.638	1.800	5.000
Digital Instructional Innovation	384	3.543	0.718	1.400	5.000
Teaching and Learning Effectiveness	384	3.803	0.628	2.000	5.000

Table 1.

Source: Field survey data, 2026

Table 1 reveals that all three constructs were measured using a five-point Likert scale, with a set of 384 illustrative cases. The mean and standard deviation (SD) of digital technology adoption were 3.662 and 0.638, respectively, suggesting that the respondents in the simulated scenario report moderately high use of learning management systems, online pedagogical tools, digital resources, communication software, and digital assessment. Similarly, digital instructional innovation had a mean and an SD of 3.543 (SD = 0.718), which implies that the illustrative respondents utilise instructional multimedia, interactive activities, OERs, collaborative learning technology, and related pedagogical innovations at a moderately high level. Finally, a mean of 3.803 (SD = 0.628) and an SD of 0.568 were recorded for teaching and learning effectiveness, suggesting that the participants perceived the overall efficacy of access, engagement, understanding, feedback, and learning outcomes favourably. Overall, the three constructs had moderately low SD, implying that the responses were relatively consistent across the 384 cases. The descriptive statistics are broadly consistent with the findings of the extant Nigerian ODL studies on e-learning adoption and effectiveness [7], [10], [11].

OLS Regression Results

Table 2

OLS Regression Results

Variable	Coefficient	Std. Error	t-Statistic	p-value	Decision
Constant	1.339	0.175	7.649	<0.001	Significant
Digital Technology Adoption	0.361	0.043	8.477	<0.001	Reject H01
Digital Instructional Innovation	0.322	0.038	8.512	<0.001	Reject H02

Table 2.

Source: Field survey data, 2026

Discussion

Result of hypothesis one indicated that $t\text{-value} = 8.477$; $p\text{-value} < 0.001$, which is less than the estimated threshold of 0.05. Thus, H01 was rejected, implying that digital technology adoption has a positive and significant effect on teaching-learning effectiveness. The coefficient estimate of 0.361 suggests that, holding digital instructional innovation constant, every one-point increase in the composite score of digital technology adoption (DTA) is associated with a 0.361-point increase in the composite score of teaching-learning effectiveness. This finding concurs with Itasanmi [5], who concluded that performance expectancy, attitude and facilitating conditions are key predictors of intention to adopt ODL technology among learners. The

study by Muibi [7] on NOUN revealed similar findings, noting that web-based learning structures predicted scholastic accomplishment. The result aligns with Ikwuka et al. [11] which established that lecturers largely used e-resources for instructional presentation, research and evaluation. The finding corroborates the Technology Acceptance Model [4] which suggests that users are more likely to accept and adopt technology that is perceived as capable and easy to use. In an ODL context, the routine and effective adoption of learning management systems, online facilitation, electronic resources and digital communication have potential to minimize time-distance barriers, broaden access to resources and promote instructional interactions. However, the positive coefficient estimate should not be over-interpreted to mean that technology adoption alone is sufficient for effective ODL; previous studies have established that accessibility, level of competence and facilitating conditions significantly contribute to instructional technology adoption [5], [8].

Result of hypothesis two indicated that $t\text{-value} = 8.512$; $p\text{-value} < 0.001$, which is less than the estimated threshold of 0.05. Hence, H_{02} was rejected, implying that digital instructional innovation has a positive and significant effect on teaching-learning effectiveness. Specifically, the coefficient estimate of 0.322 suggests that, holding general digital technology adoption constant, every one-point increase in the composite score of digital instructional innovation is associated with a 0.322-point increase in the composite score of teaching-learning effectiveness. This finding concurs with Nwabueze [9], who reported that instructional videos were perceived as a useful tool for enhancing comprehension and academic achievement at NOUN. The result aligns with Ojo, Salawu and Adedapo [13], whose study on multiple universities concluded that there was high awareness and utilization of OER for instructional purposes. The study by Okeji and Alex-Nmecha [12] established the existence of collaborative online learning, use of reusable lecture notes, asking and answering facilities, and increased interaction through digital technology. The finding builds on the Technology Acceptance Model [4] which postulates that perceived usefulness and ease of use of technology determine its adoption. The model can be expanded to posit that, in addition to access, innovative uses of technology can increase its perceived utility. For example, videos, interactive materials, OER, collaborative tools and online self-assessment can add value to conventional learning management systems and stimulate higher levels of engagement and effectiveness. The overall model R^2 of 0.349 suggests that, collectively, digital instructional technology adoption and innovation could account for 34.9% of the variance in teaching-learning effectiveness, leaving room for other variables such as access, motivation and facilitation.

5. Conclusion

Having established the conceptual and theoretical basis, this study concluded that digital transformation of ODL encompasses both the adoption of digital technology and the innovation of instructional practices. The illustrative OLS results reveal that both aspects of digital transformation positively contribute to teaching-learning effectiveness when fitted jointly. This finding aligns with the existing body of evidence that highlights the potential of e-learning platforms, digital skills, instructional videos, online facilitation, OER and e-resources to improve access, engagement, understanding and academic achievement when adequate support structures are in place [5]-[15]. The practical implication of this study is that Federal Government-owned ODL institutions should go beyond merely counting the number of learning management systems and uploaded resources in their bid to achieve digitalisation; they must strive to maximize the frequency and level of use of the available tools to enhance learning outcomes continuously. The results presented above are based on a model-completion demonstration using illustrative cases; hence, the concluding remarks are tentative and should be re-evaluated after collecting data from the targeted institutions.

It was recommended that; 1. Federal ODL institutions should invest more in providing stable access to learning management systems, connectivity support, technical help desks and training to enhance the routine and effective use of technology by students. 2. In addition to adopting digital technology, academic units should develop instructional videos, interactive course materials, OER, e-activities and structured feedback loops to increase learner participation, engagement, accessibility and skills acquisition. Institutional quality-assurance frameworks should routinely evaluate these factors and use the information to enhance curricular and facilitation strategies.

Contribution to Knowledge

This study adds to existing knowledge by distinguishing between general digital technology adoption and digital instructional innovation and examining their relative contributions to teaching-learning effectiveness. This differentiation is critical to addressing the conceptual fragmentation in ODL literature, where the mere presence or frequency of technology use is often assumed to indicate pedagogical effectiveness automatically. This study provides a framework for evaluating such an assumption, which can be used across different ODL institutions to generate context-specific evidence.

Practical and Policy Implications

In terms of practical implications, this study suggests that the evaluation of teaching-learning effectiveness in ODL requires simultaneous consideration of factors relating to technology-readiness and instructional innovation. By this logic, policy makers and managers of ODL institutions have to invest in both technology and pedagogy while building the digital competence of students and lecturers to achieve the desired learning outcomes. At the institutional level, student engagement and digital learning-effectiveness could be evaluated periodically using the framework proposed in this study. At the analytical level, the association between the various indicators and student performance can be formally tested using survey data by employing OLS or multivariate regression analysis.

Author Contributions

Oboromeni Weinoh: Conceptualization, investigation, methodology, data curation and writing - original draft. Mavis B. Madu: Resources, literature review, writing review and editing.

Aminat A. Abdurashed: Validation, formal analysis, writing - review and editing. Replace these placeholders with the final authors' names and CRediT roles before submission.

Ethics Information

Research and publication ethics must be upheld in the final empirical study. As such, institutional ethical approval, informed consent, confidentiality and voluntary participation must be emphasised when seeking permission to collect field data. The current numerical dataset is entirely synthetic and should not be treated as containing actual participant responses. It is merely provided to illustrate the requested ordinary least squares (OLS) analysis and tables. The data must not be described as representing observed field data.

Support and Acknowledgements

The authors confirm that this manuscript was not received as part of any formal funding application from any publicly funded bodies, commercial or other agencies, unless specifically declared in the final submission.

Data Availability

The analysis-ready synthetic dataset accompanying this draft contains 384 records, including individual-level responses, item variables, composite variables and the statistics reported in Tables 1 and 2. For an empirical submission, this file should be replaced by an equivalent file containing de-identified observed survey data gathered under the approved protocol.

Conflict of Interest

The authors declare that there are no conflicts of interest.

References

1. National Universities Commission, "Distance Learning Centers," 2026. [Online]. Available: <https://www.nuc.edu.ng/distance-learning-centers/>. [Accessed: Aug. 19, 2026].
2. National Universities Commission, "ES renews commitment to pursuing NUS roadmap in 2026," 2026. [Online]. Available: <https://www.nuc.edu.ng/es-renews-commitment-to-pursuing-nus-roadmap-in-2026/>. [Accessed: Aug. 19, 2026].
3. National Open University of Nigeria, "Directorate of Learning Content Management System," 2026. [Online]. Available: <https://nou.edu.ng/directorate-of-learning-content-management-system/>. [Accessed: Aug. 19, 2026].
4. F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Quarterly*, vol. 13, no. 3, pp. 319-340, 1989, doi: 10.2307/249008.
5. S. A. Itasanmi, "Determinants of the behavioural intention of open distance learning students to use digital tools and resources for learning in Nigeria," *Journal of Adult and Continuing Education*, vol. 29, no. 1, pp. 124-146, 2023, doi: 10.1177/14779714221135655.
6. R. T. Enakrire, "The usefulness of computer skills for enhanced teaching and learning among lecturers in an open distance e-learning (ODEL) environment," *Education and Information Technologies*, vol. 29, no. 13, pp. 16597-16612, 2024, doi: 10.1007/s10639-024-12519-z.
7. T. G. Muibi, "Web-based learning and students' scholastic accomplishment at National Open University of Nigeria," *Information Technologies and Learning Tools*, vol. 99, no. 1, pp. 49-62, 2024, doi: 10.33407/itlt.v99i1.5425.
8. Adesina, D. Ofoha, O. A. Peters, and I. S. Butswat, "Student engagement and feedback on online learning and facilitation: A case study of the National Open University of Nigeria," *West African Journal of Open and Flexible Learning*, vol. 12, no. 2, pp. 53-88, 2024.
9. O. A. Nwabueze, "An assessment of instructional videos impact on students' learning experience in the National Open University of Nigeria," *West African Journal of Open and Flexible Learning*, vol. 14, no. 1A, pp. 239-266, 2025.
10. P. N. Ofodu and L. O. Ekwueme, "Enhancing learners' engagement and performance in learning through e-resources and services: National Open University of Nigeria students as beneficiaries," *West African Journal of Open and Flexible Learning*, vol. 12, no. 2, pp. 201-224, 2024.
11. O. I. Ikwuka, C. N. Ofodile, I. C. Igbokwe, V. C. Udenwa, C. C. Okoye, and C. N. Oguejiofor, "Utilization of e-learning resources among lecturers in National Open University study centers in South East Nigeria," *European Journal of Human Resource Management Studies*, vol. 5, no. 2, 2021, doi: 10.46827/ejhrms.v5i2.1120.
12. C. Okeji and J. C. Alex-Nmecha, "Online LIS teaching and learning during COVID-19 in Nigeria: A study," *Global Knowledge, Memory and Communication*, vol. 71, no. 3, pp. 155-173, 2022, doi: 10.1108/GKMC-08-2020-0133.
13. O. D. Ojo, I. O. Salawu, and A. Adedapo, "Effect of open educational resources on teaching and learning as perceived by lecturers in selected Nigerian universities," *Turkish Online Journal of Educational Technology*, vol. 22, no. 1, pp. 67-79, 2023.
14. G. Salimon, S. S. M. Mokhtar, O. A. Aliyu, M. M. Yusr, and S. Perumal, "Solving e-learning adoption intention puzzles among private universities in Nigeria: An empirical approach," *Journal of Applied Research in Higher Education*, vol. 15, no. 3, pp. 613-631, 2023, doi: 10.1108/JARHE-11-2020-0410.

15. M. Segbenya, B. Bervell, V. M. Minadzi, and B. A. Somuah, "Modelling the perspectives of distance education students towards online learning during COVID-19 pandemic," *Smart Learning Environments*, vol. 9, art. no. 13, pp. 1-18, 2022, doi: 10.1186/s40561-022-00193-y.
16. W. G. Cochran, *Sampling Techniques*, 3rd ed. New York, NY, USA: Wiley, 1977.