

ICT Tools and Their Associations with Research Activities, Students' Assessment Practices, and Administrative Decision-Making in Private Universities in North-Central Nigeria

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ABSTRACT

This study examined the statistical associations between Information and Communication Technology (ICT) tools and research activities, students' assessment practices, and administrative decision-making in private universities in North-Central Nigeria. A cross-sectional correlational design was adopted. The population comprised 62,950 undergraduate students and academic staff from 32 private universities, with 700 respondents (500 students and 200 academic staff) selected from eight universities using stratified sampling. Data were collected using the researcher-designed ITETORADQ questionnaire, validated by experts (CVI = 0.73), with a pilot reliability coefficient of 0.77. Pearson's Product-Moment Correlation and simple linear regression were used at the 0.05 significance level. Findings showed strong positive associations with research activities ($r = .865$), assessment practices ($r = .830$), and administrative decision-making ($r = .848$).

Keywords: academic evaluation, administrative decision-making, digital transformation, education management information systems (EMIS), higher education management, information and communication technology (ICT), private universities, research productivity

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INTRODUCTION

Information and Communication Technology (ICT) has transformed the governance, teaching, research, and administrative operations of higher education institutions worldwide. Beyond supporting classroom instruction, ICT has become an indispensable institutional resource for enhancing research productivity, streamlining students' assessment practices, facilitating evidence-based decision-making, and improving overall university effectiveness. Consequently, the strategic integration of ICT into university management has become an important factor associated with institutional sustainability and performance.

Across developed and developing countries alike, universities continue to invest substantially in digital infrastructure to improve institutional management and service delivery. The increasing adoption of learning management systems, electronic assessment platforms, institutional repositories, research databases, education management information systems (EMIS), cloud computing technologies, and learning analytics has fundamentally changed how universities coordinate research activities, monitor students' academic progress, and make administrative decisions. These technological developments have enhanced transparency, accountability, collaboration, and data-driven governance within higher education institutions (Mabotha & Ngcamu, 2026).

Recent evidence further indicates that effective technology integration depends not only on digital infrastructure but also on organisational support and users' technological competence, both of which are essential for achieving sustainable educational improvement in the digital era (Khotimah et al., 2026). Furthermore, Teoh and Tan (2026) argue that sustainable digital transformation in higher education requires coherent institutional governance frameworks and policy alignment to ensure that technological innovations contribute meaningfully to evidence-based institutional management and long-term organisational development.

The rapid digital transformation of higher education was further accelerated by the COVID-19 pandemic, which compelled universities across the world to adopt technology-mediated approaches to teaching, learning, assessment, research collaboration, and institutional administration. During the early stages of the pandemic, COVID-19-related educational closures affected approximately 90% of the world's student population, prompting an unprecedented expansion of distance and technology-supported learning approaches (UNESCO, 2020). Although emergency remote teaching has largely ended, the pandemic demonstrated that ICT integration is no longer merely a temporary response to crisis situations but has become an important feature of contemporary higher education systems (Adedoyin & Soykan, 2020).

Consequently, universities are increasingly recognising ICT not merely as an instructional tool but as a strategic resource for improving institutional governance and organisational effectiveness. Within the Nigerian higher education system, private universities have continued to expand investments in ICT infrastructure to improve academic and administrative functions. These institutions increasingly utilise digital technologies to support research coordination, academic evaluation, institutional communication, academic record management, and strategic planning. Despite these developments, considerable differences remain in the extent to which ICT tools are effectively integrated into institutional management processes across universities (Bolaji & Ajape, 2022). Variations in technological infrastructure, institutional capacity, digital competence, and management commitment continue to influence the effectiveness of ICT utilisation within university environments.

Existing literature has consistently reported positive associations between ICT adoption and specific aspects of university operations, including teaching effectiveness, research productivity, online learning, assessment, and administrative efficiency. However, much of the existing evidence has examined these outcomes independently, with limited attention to how ICT utilisation is associated simultaneously with research activities, students' assessment practices, and administrative decision-making within a unified institutional management framework. This limitation is particularly evident in the context of private universities in North-Central Nigeria, where empirical evidence on the integrated role of ICT in university management remains limited.

This gap is important because research activities, students' assessment practices, and administrative decision-making are interconnected components of effective higher education management. Understanding their relationships with ICT utilisation can provide a more comprehensive picture of digital transformation beyond its traditional focus on teaching and learning. The present study therefore examines the statistical relationships between ICT tools and these three dimensions of university management and further determines the extent to which ICT statistically accounts for variations in each outcome. Against this background, the present study examines the relationship between ICT tools and research activities, students' assessment practices, and administrative decision-making in private universities in North-Central Nigeria.

By examining these dimensions within a single analytical framework, the study provides contextual empirical evidence on ICT-enabled university management and contributes to the broader discussion of digital transformation and evidence-informed governance in higher education.

Objectives of the Study

The main objective of this study is to examine the relationships between Information and Communication Technology (ICT) tools and research activities, students' assessment practices, and administrative decision-making in private universities in North-Central Nigeria. Specifically, the study sought to achieve the following objectives:

1. To examine the relationship between the use of Information and Communication Technology (ICT) tools and research activities in private universities in North-Central Nigeria.
2. To determine the relationship between the use of Information and Communication Technology (ICT) tools and students' assessment practices in private universities in North-Central Nigeria.
3. To examine the relationship between the use of Information and Communication Technology (ICT) tools and administrative decision-making in private universities in North-Central Nigeria.

Research Questions

The following research questions were answered in the course of the study:

1. What is the relationship between the use of information and communication technology (ICT) tools and research activities in the private universities in North- Central, Nigeria?
2. What is the relationship between the use of Information and Communication Technology (ICT) tools and students' assessment practices in private universities in North-Central Nigeria?
3. What is the relationship between the use of Information and Communication Technology (ICT) tools and administrative decision-making in private universities in North-Central Nigeria?

Research Hypotheses

The following null hypotheses were tested at the 0.05 level of significance:

- H₀₁: There is no significant relationship between the use of Information and Communication Technology (ICT) tools and research activities in private universities in North-Central Nigeria.
- H₀₂: There is no significant relationship between the use of ICT tools and students' assessment practices in private universities in North-Central Nigeria.
- H₀₃: There is no significant relationship between the use of ICT tools and administrative decision-making in private universities in North-Central Nigeria.

LITERATURE REVIEW

The increasing digitalisation of higher education has generated substantial scholarly interest in the role of Information and Communication Technology (ICT) in enhancing institutional effectiveness. Across diverse higher education systems, ICT has evolved beyond its traditional instructional role to become a strategic resource supporting research productivity, assessment management, institutional planning, and evidence-based governance. Consequently, contemporary scholarship increasingly conceptualises ICT integration as a multidimensional organisational process that influences both academic and administrative performance.

ICT in Educational Management

Information and Communication Technology (ICT) encompasses digital technologies used for the creation, storage, processing, transmission, and utilisation of information to support organisational activities. Within higher education, ICT facilitates academic administration, research coordination, student information management, communication, assessment, and institutional planning. Ratheeswari (2018) describes ICT as an essential driver of educational transformation because it enables institutions to improve efficiency, accessibility, and knowledge sharing across academic environments. Recent studies suggest that universities implementing comprehensive ICT systems experience greater organisational responsiveness, improved communication among stakeholders, enhanced documentation, and more efficient institutional management (Bond et al., 2018; Alenezi, 2021). These improvements have become increasingly important as universities operate within data-intensive environments requiring timely access to reliable information for decision-making.

Beyond administrative efficiency, ICT contributes to institutional innovation by strengthening collaboration among academic staff or lecturers, improving access to global research resources, and facilitating digital knowledge exchange through online repositories and collaborative platforms (Tondeur et al., 2017). Similarly, Attuquayefio (2022) argues that sustained ICT integration promotes institutional accountability, transparency, and governance effectiveness, particularly within developing-country higher education systems. Notably, whereas Bond et al. (2018) and Alenezi (2021) do not specify the institutional context of their findings, Attuquayefio's (2022) evidence from a developing-country setting lends more direct contextual relevance to private universities operating under resource constraints similar to those in North-Central Nigeria.

Recent evidence from higher education also indicates that the effectiveness of digital technology integration depends on users' digital competence, institutional support, and appropriate pedagogical and organisational strategies (Inayati et al., 2026). This perspective reinforces the view that the availability of ICT infrastructure alone may not guarantee effective institutional outcomes; rather, the benefits of ICT depend on the capacity of university stakeholders to use digital technologies effectively within supportive organisational environments. Collectively, recent studies suggest that comprehensive ICT integration enhances organisational responsiveness, institutional communication, documentation, and governance effectiveness (Alenezi, 2021; Attuquayefio, 2022; Bond et al., 2018). Beyond improving administrative efficiency, these technologies also facilitate collaboration, knowledge sharing, and institutional innovation, thereby strengthening universities' capacity to respond to increasingly data-intensive environments.

Taken together, the literature indicates that ICT contributes to improved communication, information management, collaboration, and organisational responsiveness in higher education. However, the evidence remains fragmented across specific institutional functions. While some studies emphasise teaching and learning, others focus on administrative efficiency, research productivity, or digital governance. This fragmentation makes it difficult to determine whether ICT utilisation is associated simultaneously with multiple dimensions of institutional management. The present study addresses this limitation by examining research activities, students' assessment practices, and administrative decision-making within a single empirical framework.

ICT Tools and Research Activities

Research productivity is widely recognised as a key indicator of university quality, institutional reputation, innovation capacity, and global competitiveness. Universities increasingly depend on ICT tools, including digital libraries, institutional repositories, statistical software, reference-management applications, virtual collaboration platforms, and online research databases, to improve the quality and efficiency of scholarly activities. Previous studies consistently report that digital technologies enhance literature retrieval, facilitate interdisciplinary collaboration, improve citation management, and increase

research visibility within international academic communities (UNESCO, 2021b; OECD, 2021). Likewise, García-Peñalvo et al. (2021) observed that virtual collaboration technologies have expanded opportunities for international research partnerships while reducing geographical barriers to scholarly engagement.

Institutional investment in research management systems has also strengthened universities' ability to monitor publication output, research funding, and academic performance indicators, thereby supporting evidence-based planning for research development (Doneva et al., 2021). Within African higher education, Ng'ambi et al. (2016) similarly found that access to electronic journals and digital repositories significantly improves research productivity and scholarly collaboration. Notably, while García-Peñalvo et al. (2021) examined collaboration primarily among internationally networked, well-resourced institutions, Ng'ambi et al.'s (2016) findings from an African setting suggest that comparable research benefits are attainable even where digital infrastructure is less extensive, reinforcing the relevance of examining ICT-research linkages within the resource context of Nigerian private universities.

Despite this growing body of evidence, previous investigations have largely examined research productivity as an isolated outcome of ICT adoption. Comparatively little empirical attention has been given to understanding how ICT is simultaneously associated with research alongside other critical management functions, such as student assessment and institutional decision-making. Addressing this gap provides a more holistic understanding of ICT's contribution to university effectiveness. The reviewed evidence therefore establishes a positive role for ICT in supporting research-related activities, but it also reveals an important limitation. Much of the existing research focuses on access to digital resources, scholarly communication, or research productivity as individual outcomes. Less attention has been given to how ICT utilisation relates to research activities alongside other institutional management functions. The present study extends this literature by examining research activities, together with assessment and administrative decision-making within private universities in North-Central Nigeria.

ICT Tools and Students' Assessment Practices

Assessment is central to educational quality assurance because it provides evidence of students' learning outcomes while informing institutional planning and academic improvement initiatives. The integration of ICT into assessment has transformed traditional evaluation methods by improving efficiency, accuracy, transparency, and accessibility. Computer-based testing, learning management systems, electronic grading platforms, and automated feedback technologies enable universities to administer assessments more effectively while reducing administrative workload (Redecker & Johannessen, 2013). Furthermore, learning management systems such as Moodle and Blackboard facilitate continuous assessment through quizzes, assignments, discussion forums, and electronic submission of coursework, thereby supporting more flexible and learner-centred assessment practices (Al-Fraihat et al., 2020).

ICT-supported assessment systems have also strengthened institutional quality assurance by improving monitoring of students' academic progress and reducing delays associated with manual processing of examination results (Bond et al., 2020). Dawson (2021) further argues that digital assessment platforms enhance academic integrity through plagiarism detection and secure examination environments. Within Nigerian universities, Ibrahim et al. (2023) similarly reported improvements in examination administration resulting from ICT-enabled assessment systems. It is worth noting that Dawson's (2021) findings emphasise academic integrity safeguards, whereas Ibrahim et al.'s (2023) Nigerian-context evidence centres more directly on administrative efficiency, suggesting that the institutional value of ICT-enabled assessment may vary depending on which management priority, integrity or efficiency, is emphasised.

Although existing studies consistently demonstrate the advantages of digital assessment technologies, most focus primarily on instructional outcomes rather than their broader contribution to institutional management effectiveness. The present study extends this literature by positioning assessment practices within a wider framework of university governance. Overall, existing studies demonstrate that

ICT can support more efficient and transparent assessment processes. Nevertheless, much of this literature concentrates on instructional delivery, student learning outcomes, or the technical effectiveness of digital assessment platforms. The broader relationship between ICT-supported assessment and institutional management remains comparatively underexplored. The present study addresses this gap by considering students' assessment practices as one component of a broader ICT-enabled university management framework.

ICT Tools and Administrative Decision-Making

Effective university governance depends upon timely access to reliable institutional information capable of supporting planning, policy implementation, resource allocation, and performance monitoring. ICT tools increasingly facilitate these functions through Education Management Information Systems (EMIS), institutional databases, learning analytics, cloud-based information systems, and digital governance platforms. UNESCO (2025) identifies EMIS as a critical mechanism for generating reliable educational data that supports strategic planning and evidence-based policy decisions.

Similarly, Ifenthaler and Yau (2020) demonstrated that learning analytics enables institutional leaders to identify performance trends, predict student outcomes, and implement early interventions that improve institutional effectiveness. The increasing availability of institutional big data and predictive analytics has further strengthened the strategic importance of ICT-enabled decision support systems within higher education governance. Cloud-based information systems further improve coordination across university departments by facilitating communication, enhancing transparency, and supporting collaborative decision-making processes (Selwyn, 2017; Alharbi & Drew, 2014). Attuquayefio (2022) also reported that ICT-supported governance systems improve accountability and resource allocation within African higher education institutions.

Taken together, the reviewed literature demonstrates the growing strategic importance of ICT in higher education management while also revealing a significant empirical gap regarding its simultaneous association with research activities, students' assessment practices, and administrative decision-making. The present study addresses this gap by examining these three dimensions within a unified analytical framework among private universities in North-Central Nigeria.

Theoretical Framework

This study is anchored primarily in three theoretical perspectives namely Technology Acceptance Model (TAM), the Unified Theory of Acceptance and Use of Technology (UTAUT), and Systems Theory, while Education Management Information Systems (EMIS) is used as an institutional application/conceptual framework. These complementary perspectives collectively explain how Information and Communication Technology (ICT) tools are associated with research activities, students' assessment practices, and administrative decision-making within higher education institutions. Rather than functioning independently, the theories provide interconnected explanations of technology adoption, utilisation, organisational interaction, and evidence-based institutional management.

Technology Acceptance Model (TAM)

The Technology Acceptance Model (Davis, 1989) explains that users' acceptance of technology depends primarily on two perceptions: perceived usefulness and perceived ease of use. Individuals are more likely to adopt technological innovations when they believe such technologies improve job performance while requiring minimal effort to operate. Within private universities, lecturers, researchers, and administrators are more likely to utilise ICT tools when they perceive those digital platforms enhance research productivity, simplify students' assessment processes, and improve administrative efficiency.

TAM therefore provides the behavioural explanation for individual acceptance and utilisation of ICT within university management.

Unified Theory of Acceptance and Use of Technology (UTAUT)

While TAM explains individual acceptance, the Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003) expands the explanation by incorporating organisational and social influences. UTAUT proposes that technology utilisation is determined by performance expectancy, effort expectancy, social influence, and facilitating conditions. This perspective is particularly relevant within higher education institutions where organisational support, including ICT infrastructure, technical assistance, staff training, leadership commitment, and institutional policies, plays an essential role in determining the successful implementation of digital technologies. Consequently, UTAUT explains why some universities achieve greater benefits from ICT integration than others, despite having access to similar technologies.

Systems Theory

Systems Theory (von Bertalanffy, 1968) conceptualises universities as interconnected systems whose academic and administrative units continuously interact to achieve institutional goals. Research management, students' assessment, teaching, administration, finance, and quality assurance operate as interdependent subsystems rather than isolated organisational functions. Within this framework, ICT serves as an integrating mechanism that facilitates communication, information exchange, coordination, and collaboration among institutional units. Improvements in digital infrastructure therefore strengthen organisational effectiveness by enhancing the interaction among university subsystems responsible for research, assessment, and decision-making.

Education Management Information Systems (EMIS) Framework

The Education Management Information Systems (EMIS) framework explains how institutional data systems support educational planning, monitoring, evaluation, and evidence-based governance. EMIS integrates information relating to student enrolment, academic performance, staff management, financial administration, research output, and institutional performance into a unified information system that supports strategic decision-making (UNESCO, 2021a; UNESCO, 2025). Within contemporary universities, EMIS enables administrators to access reliable, real-time institutional data that support planning, resource allocation, policy implementation, and continuous institutional improvement. Consequently, the framework provides the direct conceptual link between ICT utilisation and evidence-based university governance.

Integrated Theoretical Perspective

The study draws primarily on the Technology Acceptance Model (TAM), the Unified Theory of Acceptance and Use of Technology (UTAUT), and Systems Theory. These perspectives were selected because they address complementary dimensions of ICT utilisation within higher education institutions. TAM explains users' acceptance of ICT based on perceived usefulness and perceived ease of use, while UTAUT extends this explanation by emphasising performance expectancy, effort expectancy, social influence, and facilitating conditions. Systems Theory provides the organisational perspective by conceptualising the university as an interconnected system in which research, assessment, administration, and other institutional functions interact continuously.

Together, these perspectives provide a coherent explanation of how ICT utilisation may be associated with institutional management outcomes. TAM explains why individual users adopt and use

ICT; UTAUT explains how organisational and environmental conditions support such utilisation; and Systems Theory explains how ICT-supported information flows can connect different institutional units. Within this framework, ICT tools are conceptualised as an institutional resource whose utilisation is statistically associated with research activities, students' assessment practices, and administrative decision-making. The Education Management Information Systems (EMIS) concept is retained as an institutional application of ICT rather than as a separate theoretical perspective. EMIS illustrates how ICT-generated institutional data can support planning, monitoring, resource allocation, and evidence-informed administrative decision-making.

RESEARCH METHOD

Research Design

This study adopted a cross-sectional correlational research design to examine the relationships between Information and Communication Technology (ICT) tools and three dimensions of institutional management effectiveness, research activities, students' assessment practices, and administrative decision-making in private universities in North-Central Nigeria. A correlational design was considered appropriate because the study sought to determine the magnitude and direction of relationships among naturally occurring variables without manipulating the independent variable. In addition to examining associations, the design permitted the use of regression analysis to determine the extent to which ICT tools statistically accounted for variations in the selected institutional management outcomes. Correlational designs are widely recommended for educational management research where the objective is to explain relationships among organisational variables under real-life conditions (Creswell & Creswell, 2017).

Population of the Study

The study population comprised 62,950 respondents, consisting of undergraduate and academic staff drawn from the 32 registered private universities in North-Central Nigeria. These categories of respondents were considered appropriate because they represent the principal users of institutional ICT systems. The lecturers utilise ICT for research, teaching, assessment, and institutional reporting, while students engage with learning management systems, digital assessment platforms, institutional portals, and other academic technologies. Their combined perspectives therefore provide a comprehensive assessment of ICT utilisation within the participating universities.

Sample Size and Sampling Technique

A multistage stratified random sampling procedure was employed to select 700 respondents from eight private universities in North-Central Nigeria. Stratified sampling was considered appropriate because the study involved distinct respondent categories requiring representation within the sample (Taherdoost, 2016). The sampling design was structured to ensure adequate representation of both the participating universities and the two categories of respondents targeted by the study, namely undergraduate and academic staff.

At the first level of stratification, the eight participating private universities constituted the institutional strata. A sampling frame was established for each university, containing the number of eligible undergraduate and academic staff who met the inclusion criteria for participation in the study. The population of undergraduate and academic staff was subsequently aggregated across the eight universities to establish the respective sampling populations. At the second level of stratification, the target population was divided into two mutually exclusive respondent strata: undergraduate and academic staff. A total sample of 700 respondents was predetermined, comprising 500 undergraduate and 200 academic staff.

Thus, undergraduate constituted 71.43% of the sample, while academic staff constituted 28.57%. The final sample provided adequate observations for the correlation and simple linear regression analyses conducted.

Instrument for Data Collection

Data were collected using a researcher-designed structured questionnaire titled Information Technology Tools for Research, Assessment and Decision-Making Questionnaire (ITETORADQ). The instrument comprised items measuring ICT utilisation as the predictor variable and three outcome constructs: research activities, students' assessment practices, and administrative decision-making. The questionnaire consisted of 15 items distributed across the study constructs and organised into the following sections:

- ICT Utilisation
- ICT Tools for Research Activities
- ICT Tools for Students' Assessment Practices
- ICT Tools for Administrative Decision-Making

Responses were measured using a four-point Likert scale: Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1).

The absence of a neutral response category was intended to encourage respondents to indicate clear perceptions regarding ICT utilisation within their institutions. Four-point Likert scales have been widely recommended for measuring organisational perceptions because they reduce central tendency bias while maintaining satisfactory reliability (Joshi et al., 2015).

Operationalisation of the Constructs

The study operationalised ICT utilisation as the independent construct, measured through items assessing respondents' utilisation of digital technologies for institutional research, assessment, communication, information management, and administrative functions. The three dependent constructs were research activities, students' assessment practices, and administrative decision-making. ICT utilisation served as the independent (predictor) variable, whereas research activities, students' assessment practices, and administrative decision-making constituted the dependent (outcome) variables.

Research activities were assessed in terms of ICT-supported access to research resources, scholarly communication, collaboration, and research-related activities. Students' assessment practices were operationalised through ICT-supported assessment administration, electronic submission, grading, feedback, and monitoring of students' academic performance. Administrative decision-making was operationalised through the use of ICT-generated information for planning, monitoring, resource allocation, coordination, and administrative decision-making. Responses to the ICT-related items were summed to obtain a composite ICT utilisation score, which was treated as the independent (predictor) variable in all subsequent correlation and regression analyses. The questionnaire contained 15 items distributed across the study constructs and was measured using a four-point Likert scale ranging from Strongly Agree (4) to Strongly Disagree (1).

Validity of the Instrument

To ensure adequate content validity, the instrument was evaluated by two experts in Educational Management and one expert in Measurement and Evaluation. The experts assessed the relevance, clarity, appropriateness, and comprehensiveness of each questionnaire item in relation to the study objectives and research variables. Their observations informed the modification of ambiguous statements and improvement of item wording prior to the final administration of the instrument. The validation process

produced a Content Validity Index (CVI) of 0.73, following which the experts' recommendations were incorporated into the final instrument.

Reliability of the Instrument

A pilot study involving 50 respondents from private universities outside the study area but with characteristics comparable to those of the study population was conducted to determine the internal consistency of the instrument. Responses obtained during the pilot study were analysed using Cronbach's Alpha coefficient. The overall reliability coefficient obtained was 0.77, while reliability estimates for individual subscales ranged from 0.72 to 0.88, indicating satisfactory internal consistency for educational and behavioural research (Taber, 2018). The reliability coefficients therefore confirmed that the instrument was suitable for the main study.

Procedure for Data Collection

Following institutional approval, copies of the questionnaire were administered with the assistance of trained research assistants across the selected universities. Respondents received explanations regarding the objectives of the study and were assured that participation was entirely voluntary. Informed consent was obtained from all respondents prior to data collection. Completed questionnaires were retrieved immediately where possible to minimise non-response and incomplete responses. A total of 720 questionnaires were distributed, of which 700 were completed and returned, representing a response rate of 97.2%. The high response rate reduced the likelihood of substantial non-response among the distributed questionnaires; however, response rate alone does not establish representativeness, which also depends on the sampling procedure and characteristics of the participating respondents.

Method of Data Analysis

Data were analysed using both descriptive and inferential statistical techniques with the aid of the Statistical Package for the Social Sciences (SPSS). Pearson product-moment correlation (PPMC) was used to examine the strength and direction of the relationships between ICT tools and each dependent variable, while simple linear regression analysis was employed to determine the statistical contribution of ICT tools to research activities, students' assessment practices, and administrative decision-making at the 0.05 level of significance. The regression analyses complemented the correlation analysis by quantifying the proportion of variance in each outcome statistically accounted for by ICT tools. The combination of correlation and regression analyses enabled the study to examine both the existence of relationships and the statistical contribution of ICT tools to institutional management effectiveness.

Assumptions of Regression Analysis

Prior to conducting regression analysis, the assumptions underlying parametric statistical analysis were examined. Specifically, the study assessed:

- linearity of relationships between variables,
- independence of observations,
- normality of residual distributions,
- and homoscedasticity

As each regression model involved a single predictor, multicollinearity was not applicable. Preliminary diagnostic procedures indicated that linearity, independence, normality of residuals, and homoscedasticity were considered satisfactory for the regression analyses (Field, 2018; Hair et al., 2019).

Potential Common Method Bias

Because ICT tools and the three outcome variables were measured through the same self-reported questionnaire and collected from the same respondents at the same time, common method variance is a potential source of inflation in the observed associations. Procedural safeguards included respondent anonymity, voluntary participation, and clearly separated questionnaire sections. No independent marker-variable or confirmatory-factor statistical test of common method bias was conducted in the present analysis; therefore, the possibility of common method bias cannot be ruled out and is considered explicitly in interpreting the findings and limitations.

Ethical Considerations

The study complied with established ethical principles governing educational research. Participation was voluntary, informed consent was obtained from all respondents, and confidentiality and anonymity were maintained throughout the study. Respondents were also informed of their right to withdraw from the study at any stage without penalty. Data obtained were used solely for academic purposes and stored securely throughout the research process. The study complied with recognised ethical standards for educational research involving human participants (BERA, 2018).

RESULTS

These findings are presented in accordance with the research questions and hypotheses that guided the study. Pearson Product-Moment Correlation (PPMC) was employed to determine the strength and direction of the relationships between ICT tools and the dependent variables, while simple linear regression analysis was used to examine the statistical contribution of ICT tools to research activities, students' assessment practices, and administrative decision-making. All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS), and the hypotheses were tested at the 0.05 level of significance.

Table 1
Correlation and Regression Results for ICT Tools and Institutional Outcomes

Outcome Variable	N	r	R ²	Adj. R ²	B	95% CI	β	t	F	P
Research Activities	700	.865	.747	.747	1.968	[1.883, 2.053]	.865	45.45	2065.671	< .001
Students' Assessment Practices	700	.830	.689	.688	1.864	[1.770, 1.957]	.830	39.66	1572.916	< .001
Administrative Decision-Making	700	.848	.719	.718	0.369	[-.351, .388]	.848	41.00	1681.00	< .001

Note. r = Pearson correlation coefficient; R^2 = coefficient of determination; B = unstandardised regression coefficient; β = standardised regression coefficient; CI = confidence interval.

Hypothesis 1: ICT Tools and Research Activities

As shown in Table 1, ICT tools exhibited a strong positive relationship with research activities ($r = .865$, $p < .001$). The regression model was statistically significant, $F(1, 698) = 2065.671$, $p < .001$,

explaining 74.7% of the variance in research activities ($R^2 = .747$). Therefore, the null hypothesis was rejected. This finding indicates that increased utilisation of ICT tools is associated with higher levels of research engagement among staff in private universities. The strength of the association suggests that ICT constitutes an important institutional resource for enhancing research productivity within private universities.

Hypothesis 2: ICT Tools and Students' Assessment Practices

Table 1 further shows a strong positive relationship between ICT tools and students' assessment practices ($r = .830, p < .001$). The regression model was statistically significant, $F(1, 698) = 1572.916, p < .001$, accounting for 68.9% of the variance in students' assessment practices ($R^2 = .689$). Consequently, the null hypothesis was rejected. This finding suggests that increased integration of ICT into university operations is associated with more efficient administration, monitoring, and management of students' assessment processes.

Hypothesis 3: ICT Tools and Administrative Decision-Making

As presented in Table 1, ICT tools were strongly and positively related to administrative decision-making ($r = .848, p < .001$). The regression model was statistically significant, $F(1, 698) = 1681.00, p < .001$, accounting for 71.9% of the variance in administrative decision-making ($R^2 = .719$). Consequently, the null hypothesis was rejected. This shows that respondents reporting higher levels of ICT utilisation also tended to report stronger ICT-supported administrative decision-making. This result is interpreted as a statistical association rather than evidence of a causal effect.

DISCUSSION AND CONCLUSIONS

The findings of this study demonstrate that Information and Communication Technology (ICT) has evolved beyond its traditional instructional role to become a strategic resource for enhancing institutional management effectiveness within private universities in North-Central Nigeria. Significant positive relationships were established between ICT tools and research activities, students' assessment practices, and administrative decision-making, indicating that ICT utilisation is positively associated with both academic and administrative functions of higher education institutions. These findings reinforce the growing international consensus that digital transformation is fundamental to institutional efficiency, accountability, and sustainable university governance.

The study found a strong positive relationship between ICT tools and research activities. This outcome suggests that universities with well-developed digital infrastructure, including online scholarly databases, institutional repositories, statistical software, collaborative research platforms, and electronic communication systems, are better positioned to strengthen research productivity, promote scholarly collaboration, and increase the visibility of institutional research outputs. The result corroborates previous studies (OECD, 2021; García-Peñalvo et al., 2021; Ng'ambi et al., 2016), which reported that ICT enhances knowledge creation by facilitating access to research resources, improving collaboration among scholars, and increasing the visibility of research outputs. From a theoretical perspective, the evidence supports the Technology Acceptance Model, which suggests that perceived usefulness and perceived ease of use influence technology acceptance and utilisation of technological innovations. From a practical perspective, the result implies that sustained investment in digital research infrastructure may support institutional research performance, innovation capacity, and global scholarly competitiveness.

The present study also revealed a significant positive relationship between ICT tools and students' assessment practices. This association may reflect the role of ICT-supported assessment platforms in facilitating efficient, transparent, and reliable academic assessment processes within private universities.

This relationship may be explained by the ability of ICT platforms to automate assessment processes, minimise human error, facilitate timely feedback, and provide administrators with comprehensive assessment data for quality assurance. The result aligns with earlier studies by Redecker and Johannessen (2013), Spector et al. (2016), Bond et al. (2020), and Ibrahim et al. (2023), which have highlighted the role of ICT in strengthening assessment processes, facilitating timely feedback, and supporting more flexible and effective approaches to educational assessment.

The finding further supports the Unified Theory of Acceptance and Use of Technology, which emphasises that facilitating conditions and organisational support influence effective technology utilisation. This finding is further supported by Khotimah et al. (2026), whose meta-analysis demonstrated that educational technology integration and organisational support are significant drivers of effective technology utilisation and improved educational outcomes in the digital era. As universities increasingly adopt computer-based testing and learning management systems, ICT has become an increasingly important component of effective assessment administration and institutional quality management.

Similarly, the study established that ICT tools were significantly associated with administrative decision-making within private universities. This outcome suggests that institutional leaders increasingly depend on ICT-enabled information systems to generate timely, accurate, and comprehensive data for strategic planning, resource allocation, programme evaluation, and policy implementation. The result agrees with Ifenthaler and Yau (2020), Selwyn (2017), Attuquayefio (2022), and UNESCO (2025), who reported that ICT-supported governance systems improve organisational transparency, accountability, and evidence-based decision-making.

The present finding is further reinforced by Teoh and Tan (2026), who argued that effective digital transformation in higher education depends on aligning technological innovation with institutional governance structures, organisational accountability, and policy frameworks that support trustworthy and evidence-informed decision-making. This suggests that the benefits of ICT are maximised when technological investments are accompanied by coherent governance mechanisms capable of supporting sustainable institutional improvement. The evidence is also consistent with Systems Theory and the Education Management Information Systems framework, both of which emphasise that organisational effectiveness depends on efficient information flow among interconnected institutional units. Consequently, ICT-enabled management systems provide university administrators with the information required for strategic governance and continuous institutional improvement.

It is important, however, to interpret the strength of these associations with some caution. Because ICT utilisation, research activities, students' assessment practices, and administrative decision-making were all measured through the same self-reported questionnaire completed by the same respondents, part of the strong statistical relationships observed may reflect common method variance rather than a purely substantive relationship. This possibility does not invalidate the findings but suggests that the true strength of the associations between ICT and institutional outcomes may be somewhat more modest than the reported coefficients imply. Future studies that combine self-report data with institutional records or independent usage metrics would help clarify the extent to which shared-method variance contributes to these results. In addition, while the present findings align with international evidence from both well-resourced and developing higher education systems, the extent to which they generalise to private university systems outside North-Central Nigeria, or to public universities within the same region, remains an open question that future comparative research could usefully address.

Taken together, these findings provide empirical evidence that ICT functions not merely as an instructional technology but as a strategic institutional resource capable of being associated with multiple dimensions of university management simultaneously. Unlike many previous studies that examined research productivity, students' assessment, or administrative decision-making as separate outcomes, this study examines these three outcomes within a unified ICT-enabled institutional management framework. Consequently, the study advances current understanding of digital transformation in higher education by highlighting the potential role of ICT in supporting organisational effectiveness, evidence-based

governance, and institutional sustainability. These findings underscore the need for university administrators and policymakers to prioritise continuous investment in digital infrastructure, staff capacity development, and data-driven management systems capable of supporting long-term institutional excellence.

Collectively, the findings are consistent with the Technology Acceptance Model, Unified Theory of Acceptance and Use of Technology, and Systems Theory, while the EMIS framework provides an institutional application for understanding ICT-supported information management and evidence-informed decision-making. Overall, the study indicates that ICT integration is not simply a technological innovation but a strategic organisational capability that enables private universities to improve research productivity, strengthen students' assessment systems, and enhance evidence-based administrative decision-making in an increasingly digital higher education environment.

Contribution to Knowledge

This study contributes empirical and contextual evidence to the growing body of knowledge on Information and Communication Technology (ICT) integration in higher education management. Specifically, it provides evidence on the statistical associations between ICT tools and research activities, students' assessment practices, and administrative decision-making within private universities in North-Central Nigeria. Unlike studies that examine these institutional functions separately, the present study considers the three outcomes within a single analytical framework, thereby providing a broader understanding of ICT-supported university management.

First, the study contributes empirically by demonstrating strong positive relationships between ICT tools and research activities, students' assessment practices, and administrative decision-making. The regression analyses further showed that ICT tools statistically accounted for substantial proportions of the observed variance in the three outcomes, with R^2 values of .747, .689 and .719, respectively. These findings provide contextual evidence on the extent to which ICT utilisation is statistically associated with multiple dimensions of university management within private universities in North-Central Nigeria.

Second, the study contributes contextually by extending evidence on ICT-supported higher education management to private universities in North-Central Nigeria. While previous studies have examined ICT in areas such as teaching, learning, research, assessment or institutional administration, the present study brings these three management-related functions together within one study. This provides a more integrated view of ICT utilisation across academic and administrative processes in the Nigerian private university context.

Third, the study contributes conceptually by examining ICT utilisation through the complementary perspectives of the Technology Acceptance Model, the Unified Theory of Acceptance and Use of Technology, and Systems Theory, with the Education Management Information Systems (EMIS) framework providing an institutional application for understanding information flow and ICT-supported decision-making. Together, these perspectives provide a basis for interpreting how technology acceptance, facilitating conditions, organisational interdependence, and institutional information systems relate to ICT utilisation in university management.

Finally, the study has practical implications for university administrators, policymakers, and regulatory agencies. The observed positive associations suggest the importance of maintaining adequate ICT infrastructure, strengthening digital capacity development, and supporting institutional information systems for research coordination, assessment administration, and evidence-informed decision-making. These implications may assist university managers and policymakers in considering ICT-related investments and capacity-building initiatives within private higher education institutions.

Limitations of the Study

Several limitations should be considered when interpreting the findings of this study. First, the cross-sectional correlational design captures relationships among variables at a single point in time; it cannot establish temporal precedence or causal direction, and the statistically significant associations reported should therefore be interpreted as evidence of association rather than causation. Second, all constructs, ICT tools, research activities, students' assessment practices, and administrative decision-making, were measured using a single self-reported questionnaire completed by the same respondents at the same time. This shared-method, shared-source design raises the possibility of common method bias, which may have artificially inflated the strength of the observed correlations; future studies could reduce this risk by triangulating self-report data with institutional records, administrator interviews, or objective usage metrics. Third, although the study population comprised respondents from 32 private universities in North-Central Nigeria, the sample was drawn from only eight of these institutions; caution should therefore be exercised in generalising the findings to the remaining universities in the population, and to private university systems outside this region. Finally, because the analysis relied on simple linear regression with a single composite ICT predictor for each outcome, the study could not examine the relative contribution of specific ICT tools or subscales, nor control for other institutional or individual-level factors that may also influence research activities, assessment practices, and administrative decision-making.

Conclusion

This study examined the statistical associations between ICT tools and research activities, students' assessment practices, and administrative decision-making in private universities in North-Central Nigeria. The findings demonstrated strong positive relationships between ICT tools and each of the three outcomes, while the regression analyses showed that ICT tools statistically accounted for substantial proportions of observed variance in the outcomes. These findings suggest that ICT utilisation is an important component of contemporary university management. However, given the cross-sectional correlational design, the findings should be interpreted as associations rather than causal effects.

Implications for practice and policy

The findings of this study have important implications for institutional practice and higher education policy development within private universities in North-Central Nigeria. The evidence that ICT tools are significantly associated with research activities, students' assessment practices, and administrative decision-making demonstrates that digital infrastructure is no longer merely a technological convenience but a strategic institutional resource for enhancing university governance, operational efficiency, and academic service delivery.

At the institutional level, university administrators should prioritise sustained investment in ICT infrastructure that supports research coordination, including access to digital databases, institutional repositories, and collaborative communication platforms. Strengthening digital research environments may support staff productivity, increase scholarly visibility, and improve institutional competitiveness within the national and global higher education landscape. In addition, continuous professional development programmes should be organised to strengthen lecturers' and administrators' capacity to effectively utilise ICT tools for academic and management purposes. This recommendation is consistent with recent evidence suggesting that sustained organisational support and continuous professional development are fundamental to successful educational technology integration and long-term institutional improvement (Khotimah et al., 2026). Such investments also promote interdisciplinary collaboration, improve research visibility through digital repositories, and enhance universities' capacity to participate in international research networks.

With respect to students' assessment practices, the findings suggest the need for wider adoption of computer-based testing systems and learning-management platforms across private universities. Digital assessment platforms can support transparency, reduce administrative delays associated with manual result processing, and strengthen monitoring of students' academic progress. Institutional leaders should therefore support the integration of technology-driven assessment systems that enhance reliability, accountability, and efficiency in evaluation processes. Furthermore, digital assessment systems generate valuable learning analytics that can inform curriculum review, student support interventions, and institutional quality assurance initiatives.

The results also highlight the strategic importance of ICT-supported administrative decision-making systems within university management structures. Education Management Information Systems (EMIS) and other institutional data platforms provide administrators with timely and reliable information required for planning academic programmes, monitoring institutional performance indicators, and coordinating organisational resources. The integration of institutional data analytics into decision-making processes may enable university leaders to respond more effectively to emerging challenges through timely, evidence-informed interventions. University proprietors and governing councils should therefore prioritise policies that strengthen digital governance structures capable of supporting evidence-based decision-making processes. This recommendation is consistent with recent evidence indicating that effective digital governance in higher education requires institutional policy alignment, organisational accountability, and governance structures capable of supporting responsible technology adoption and sustainable institutional development (Teoh & Tan, 2026).

At the policy level, regulatory agencies responsible for higher education administration should develop and implement policy frameworks that encourage private universities to strengthen ICT integration through institutional quality-assurance frameworks and accreditation requirements that emphasise digital infrastructure development. Policies that support staff training in digital competence and promote access to reliable institutional data systems will further strengthen the effectiveness of university management processes. Overall, the findings of this study suggest that strengthening ICT infrastructure and digital capacity development across private universities may support research activities, assessment administration, and evidence-informed institutional decision-making within the Nigerian higher education system.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. Private university management should make sustained investment in ICT infrastructure that supports research coordination, scholarly collaboration, and access to international digital research resources.
2. Private universities should expand the adoption of computer-based assessment systems and learning management platforms to improve the efficiency, transparency, and reliability of students' assessment processes.
3. University administrators should institutionalise the effective utilisation of Education Management Information Systems (EMIS) and institutional data analytics to support evidence-based planning, monitoring, and strategic administrative decision-making.
4. Regulatory agencies, including the National Universities Commission (NUC), should strengthen accreditation standards and policy frameworks that encourage sustained ICT integration, digital capacity development, and continuous technological innovation within private universities.

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