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Beyond Technology Adoption: Differential Associations of Technological Planning Tools with Institutional Goal Achievement in Nigerian Public Universities

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ABSTRACT. This study examined the relationship between technological planning tools and the achievement of institutional goals in public universities in Kwara State, Nigeria. Using a cross-sectional correlational survey design, the study involved 182 academic and non-academic staff from two public universities. Data were collected through the validated Technological Planning and Goal Achievement Questionnaire (TPGAQ), which demonstrated a reliability coefficient of 0.73. Descriptive statistics were used to examine the level, integration, challenges, and adoption of technological planning, while Pearson product-moment correlation was employed to determine the relationships between specific technological planning tools and institutional goal achievement at the 0.05 significance level. The findings showed a generally high level of technological planning and institutional integration, although inadequate funding, poor maintenance culture, and limited ICT personnel remained key implementation challenges. Project management software had the highest adoption level, whereas collaboration tools had the lowest. The technological planning tools were significantly and positively associated with institutional goal achievement ($r = .425$, $p < .001$). Among the specific tools, strategic planning software demonstrated the strongest association ($r = .313$), followed by collaboration tools ($r = .252$), project management software ($r = .219$), and learning management systems ($r = .205$). These findings indicate that technological planning is associated with institutional goal achievement, but the extent of technology adoption does not necessarily correspond to the strength of its organizational association. The study highlights the importance of strategic alignment, sustainable funding, technical capacity, maintenance, and continuous evaluation in strengthening technology-enabled institutional planning. Given the correlational design, the findings should be interpreted as associations rather than causal effects.

Keywords: *Goal Achievement; Higher Education; Learning Management Systems; Project Management Software; Strategic Planning Software; Technological Planning*

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INTRODUCTION

Higher education institutions operate in an increasingly complex environment characterized by rapid technological change, evolving stakeholder expectations, rising demands for institutional

accountability, and the need to achieve sustainable academic and organizational outcomes (Benavides et al., 2020; Fernández et al., 2023; Hashim et al., 2022; Nadkarni & Prügl, 2021; Ramadania et al., 2024; Verhoef et al., 2021). Digital transformation is no longer viewed merely as a process of technology adoption, but as a strategic shift that impacts organizational structures, processes, capabilities, and value creation (Vial, 2019; Warner & Wäger, 2019). For higher education institutions, the ability to integrate technology with strategic priorities is becoming increasingly important, as the success of digital transformation depends not only on the availability of technology but also on organizational capacity, strategic alignment, resources, and the institution's ability to manage change sustainably (Chugh et al., 2023; Gkrimpizi et al., 2023; Hashim et al., 2022).

The strategic role of technology in higher education extends beyond mere teaching and learning. Digital technology facilitates information management, communication, strategic decision-making, project execution, performance monitoring, and coordination among academic and administrative stakeholders (Alavi & Leidner, 2001; Chugh et al., 2023; Fernández et al., 2023). Consequently, technology planning is understood as a systematic effort to identify, allocate, implement, and manage technological resources in support of institutional goals. This concept distinguishes technology planning from mere technology adoption, as its primary focus is not simply on the availability or use of technology but on the deliberate alignment of technological resources with organizational priorities and institutional processes (Aral & Weill, 2007; Hashim et al., 2022; Pesce & Neirotti, 2023). Fernández et al. (2023) emphasize that digital transformation in higher education encompasses organizational strategy, processes, information, technology, and human dimensions, while Chugh et al. (2023) demonstrate that the implementation of educational technology is influenced by technological, organizational, stakeholder, and institutional considerations. This perspective aligns with the view that technological capabilities derive organizational value when combined with other organizational resources and capabilities, rather than solely through increased investment in or usage of technology (Bharadwaj, 2000; Wade & Hulland, 2004; Werder & Richter, 2022). Consequently, technology holds strategic value when integrated into broader institutional processes and aligned with organizational priorities, rather than implemented merely as a collection of fragmented digital initiatives (Vial, 2019; Warner & Wäger, 2019).

This issue is critical for public universities operating with limited resources. Technology investment requires resources not only for procurement but also for infrastructure maintenance, system upgrades, technical support, staff development, cybersecurity, and implementation sustainability (Chugh et al., 2023; Fernández et al., 2023; Gkrimpizi et al., 2023). A systematic review by Gkrimpizi et al. (2023) identified various barriers to digital transformation in higher education, including environmental, strategic, organizational, technical, human resource-related, and cultural obstacles. These findings underscore that digital transformation depends not only on the availability of technology but also on an institution's ability to provide resources, build human capacity, develop supportive organizational structures, and manage change sustainably (Gkrimpizi et al., 2023; Hashim et al., 2022). Such barriers indicate that the effectiveness of technology planning relies as much on institutional capacity as on the availability of digital technology itself. From a dynamic capabilities perspective, organizations must continuously develop, combine, and adapt their technological resources in response to changing environments to ensure that digital transformation yields sustainable organizational value (Warner & Wäger, 2019). Consequently, in resource-constrained settings, university leadership must determine which technology investments best align with institutional priorities and how to ensure their long-term sustainability (Hashim et al., 2022; Fernández et al., 2023). This is particularly relevant for public universities in Nigeria, where digital transformation must be understood not merely as a matter of technology adoption but also as one of institutional capacity, infrastructure, human resources, funding, and organizational readiness.

The organizational significance of technological planning can be further understood from a strategic resource perspective. Strategic management perspectives suggest that organizational

resources generate value when they are aligned with institutional objectives and effectively deployed through organizational capabilities. In higher education, this implies that technology should not be viewed simply as an input but as a resource whose organizational value depends on how it is integrated into planning, governance, coordination, and performance management processes. Recent research on higher education strategy similarly argues that digital transformation requires universities to connect technological development with broader strategic change rather than treating digitalization as an isolated technical activity (Hashim et al., 2022). This perspective is complemented by technology acceptance research, which indicates that technology use is shaped by users' perceptions, organizational conditions, and facilitating resources. The combination of these perspectives suggests that the institutional relevance of technology depends not merely on its availability but also on how effectively it is embedded within organizational practices.

Within this technological environment, universities employ various categories of digital tools that serve distinct organizational functions. Strategic planning software can support institutional priority setting, planning, monitoring, and decision-making; learning management systems (LMS) can facilitate teaching, learning, assessment, and academic administration; project management software can support implementation, monitoring, scheduling, and accountability; while collaboration tools can facilitate communication, information sharing, knowledge exchange, and coordination across organizational units. These technologies, therefore, differ in their functional proximity to strategic institutional processes. Chugh et al. (2023) emphasize that implementing educational technology encompasses a diverse range of technologies and organizational functions, while Fernández et al. (2023) demonstrate that digital transformation entails interconnected technological and organizational changes. Accordingly, it cannot be assumed that all technological tools will have equivalent relationships with institutional outcomes.

Despite the growing literature on digital transformation and technology integration in higher education, an important empirical gap remains. A substantial proportion of existing studies examine digital transformation, ICT adoption, or educational technology as broad institutional constructs. Although this literature has established the importance of digital technologies in higher education, an aggregate conceptualization may obscure differences among specific technological tools and their organizational functions. A university may report a high level of technology adoption while deriving different organizational benefits from strategic planning systems, project management platforms, collaboration technologies, and learning management systems. Consequently, examining technology as a single construct provides limited guidance for institutional leaders who must make technology investment decisions under financial and organizational constraints. The need for more differentiated evidence is reinforced by the literature indicating that digital transformation is multidimensional and shaped by diverse organizational, technological, strategic, and human conditions (Fernández et al., 2023; Gkrimpizi et al., 2023).

A second gap concerns the relationship between technological planning and the achievement of institutional goals. Existing research in higher education technology has frequently focused on technology acceptance, digital readiness, online learning, pedagogical effectiveness, or implementation processes. Comparatively little attention has been paid to whether specific technological planning tools are associated with achieving broader institutional goals. This distinction is important because institutional goals extend beyond classroom outcomes to include administrative efficiency, research productivity, organizational coordination, strategic implementation, and overall institutional performance. The systematic review by Ramadania et al. (2024) confirms the growing scholarly interest in the relationship between digital transformation and organizational performance in higher education and highlights the ongoing development of this research area. The present study responds to this need by examining technological planning at the level of specific tools rather than treating digital technology as a homogeneous institutional resource.

A third gap concerns the empirical context. Although research on digital transformation in higher education is expanding internationally, evidence from African public universities remains

comparatively limited in the broader international literature. Institutional conditions surrounding technology planning may vary according to national policy, funding structures, infrastructure, staff capacity, organizational culture, and governance arrangements. Findings generated in highly resourced higher education systems may therefore not necessarily explain the experiences of public universities in resource-constrained environments. Examining public universities in Kwara State provides context-specific evidence that can contribute to the international discussion of technology-enabled institutional management while recognizing the organizational realities in which technological planning occurs.

The present study addresses these gaps by adopting a multidimensional approach to technological planning and examining four specific technological planning tools: strategic planning software, learning management systems, project management software, and collaboration tools. Rather than assuming that technology adoption is a uniform organizational phenomenon, the study investigates whether these technological functions exhibit varying levels of association with institutional goal achievement. This approach provides two potential contributions. First, it extends the higher education digital-transformation literature by examining technological planning at a more granular level. Second, it provides an empirically grounded basis for university leaders to distinguish between the level of technology adoption and the strength of its association with institutional outcomes. Such differentiation is particularly valuable where technology budgets are constrained, and institutions must prioritize investments based on strategic relevance.

Against this background, this study examined technological planning tools and their relationship with goal achievement in public universities in Kwara State, Nigeria. Specifically, the study sought to determine the level of technological planning, examine the major challenges hindering effective technological planning, ascertain the extent to which technological planning is integrated into institutional strategic planning processes, identify the technological planning tools adopted for goal achievement, and examine the relative relationships between strategic planning software, learning management systems, project management software, collaboration tools, and goal achievement. Accordingly, the study was guided by five research questions addressing these dimensions. It tested the null hypothesis that the dimensions of technological planning tools—strategic planning software, learning management systems, project management software, and collaboration tools—are not significantly related to goal achievement in public universities in Kwara State. Because the study employed a cross-sectional correlational design, the analysis focuses on the strength and direction of statistical associations and does not seek to establish causal effects.

METHOD

Research Design

This study employed a quantitative, cross-sectional correlational survey design to examine the relationship between technological planning tools and the achievement of institutional goals in public universities in Kwara State, Nigeria. A correlational design was considered appropriate because the study sought to determine the direction and strength of associations between naturally occurring technological planning practices and perceived achievement of institutional goals, without manipulating the study variables. Accordingly, the findings are interpreted as evidence of statistical association rather than causal effects.

Study Context and Participants

The study was conducted in two public universities in Kwara State, Nigeria: the University of Ilorin and Kwara State University, Malete. The target population comprised 182 staff members, including 112 academic and 70 non-academic staff across the two institutions. Because the accessible population was relatively small and manageable, the study employed a census (total enumeration) approach, including all 182 members of the target population. Thus, the final analytical sample

comprised 182 respondents. This approach eliminated the need for probabilistic sample-size determination and ensured that both academic and non-academic staff perspectives were represented in the study.

Instrument and Measures

Data were collected using a researcher-developed instrument titled the Technological Planning and Goal Achievement Questionnaire (TPGAQ). The questionnaire consisted of two substantive sections in addition to demographic information. Section A measured technological planning and included 24 items covering the level of technological planning, implementation challenges, integration of technology into institutional strategic planning, and four specific technological planning tools: strategic planning software, learning management systems (LMS), project management software, and collaboration tools. Section B comprised five items measuring perceived achievement of institutional goals. All substantive items were assessed using a four-point Likert scale ranging from 1 (Very Low/Strongly Disagree) to 4 (Very High/Strongly Agree). For descriptive interpretation, mean scores of 3.50–4.00 were classified as very high, 2.50–3.49 as high, 1.50–2.49 as low, and 1.00–1.49 as very low. This classification was applied consistently across the descriptive analyses reported in the Results section.

Validity and Reliability

Content and face validity of the TPGAQ were established through expert review. Three experts in educational planning and measurement evaluated the items for clarity, relevance, and alignment with the intended constructs. Items that did not meet the predetermined content validity criterion were revised or removed before administration. A pilot test involving 20 staff members not included in the main study was subsequently conducted to assess the instrument's internal consistency. The overall questionnaire yielded a Cronbach's alpha of 0.73, indicating an acceptable level of internal consistency for this exploratory organizational study.

Data Collection and Ethical Considerations

Prior to data collection, ethical clearance was obtained from the relevant Research Ethics Committee. Participation was voluntary, and respondents were informed of the purpose of the study, their right to decline to participate or withdraw without penalty, and the procedures used to protect the confidentiality of their responses. The questionnaires were administered anonymously, and no personally identifying information was collected. Completed responses were securely stored and used exclusively for research purposes.

Data Analysis

Data were analyzed using descriptive and inferential statistics. The mean and standard deviation were used to address the four descriptive research questions concerning the level of technological planning, implementation challenges, the integration of technological planning into institutional strategic planning, and the adoption of specific technological planning tools. Pearson's product-moment correlation coefficient (r) was used to test the research hypothesis regarding the relationship between technological planning tools and the achievement of institutional goals. For the inferential analysis, Pearson correlations were computed between the overall technological planning tools measure and goal achievement, as well as between each of the four technological planning tool dimensions—strategic planning software, learning management systems, project management software, and collaboration tools—and goal achievement. Statistical significance was evaluated at the 0.05 level. Given the cross-sectional correlational design, statistically significant correlations were interpreted as evidence of association rather than causal influence.

RESULT AND DISCUSSION

Result

Descriptive Findings

A total of 182 academic and non-academic staff participated in the study. The descriptive analysis examined the level of technological planning, the challenges hindering implementation, the integration of technology into institutional strategic planning, and the adoption of specific technological planning tools. The results are presented in Tables 1–4.

Table 1: Level of Technological Planning

Technological planning indicator	Mean (M)	SD	Level
Contribution of technology to teaching and learning outcomes	3.41	0.68	High
Support for administrative efficiency	3.36	0.71	High
Improvement of institutional performance through ICT infrastructure	3.28	0.74	High
Contribution of technology to research productivity	3.22	0.77	High
The extent to which clear digital roadmaps enhance academic goals	2.88	0.65	High

The results in Table 1 indicate that technological planning was generally rated highly (M = 3.23, SD = 0.71). The highest-rated indicator was the contribution of technology to teaching and learning outcomes (M = 3.41, SD = 0.68), whereas the lowest was the extent to which clear digital roadmaps enhance academic goals (M = 2.88, SD = 0.65). Although all indicators were classified as high, the relatively lower score for digital roadmaps suggests that the strategic articulation of technology toward academic goals may require further attention.

Table 2: Challenges Hindering Technological Planning

Challenge	Mean (M)	SD	Level
Inadequate funding	3.55	0.62	Very high
Poor maintenance culture	3.40	0.70	High
Lack of skilled ICT personnel	3.18	0.81	High
Poor internet services	2.98	0.52	High
Resistance to change	2.94	0.88	High

As shown in Table 2, respondents perceived the challenges hindering technological planning as generally high (M = 3.21, SD = 0.71). Inadequate funding was the most prominent challenge (M = 3.55, SD = 0.62) and the only item classified as very high. Poor maintenance culture (M = 3.40, SD = 0.70) and lack of skilled ICT personnel (M = 3.18, SD = 0.81) were also prominent constraints. Resistance to change recorded the lowest mean (M = 2.94, SD = 0.88), although it remained within the high category.

Table 3. Integration of Technological Planning into Institutional Strategic Planning

Integration indicator	Mean (M)	SD	Level
ICT representation in Senate/Council meetings	3.22	0.55	High
Inclusion of technology in institutional strategic plans	3.10	0.82	High
Alignment of ICT goals with institutional vision and mission	3.05	0.79	High
Existence of technology planning committees	2.88	0.91	High
Periodic review of ICT strategic plans	2.76	0.86	High

Table 3 shows that the integration of technological planning into institutional strategic planning was generally high (M = 3.00, SD = 0.79). ICT representation in Senate/Council meetings received the highest rating (M = 3.22, SD = 0.55), while periodic review of ICT strategic plans received the lowest (M = 2.76, SD = 0.86). The findings indicate that technology has been incorporated into institutional governance and strategic planning, although systematic review and institutional mechanisms for technology planning appear comparatively less developed.

Table 4. Adoption of Technological Planning Tools

Technological planning tool	Mean (M)	SD	Level
Project management software	3.56	0.67	Very high
Strategic planning software	3.11	0.42	High
Learning management systems	2.98	0.89	High
Collaboration tools	2.67	0.95	High

Table 4 demonstrates that technological planning tools were generally adopted at a high level (M = 3.08, SD = 0.73). Project management software had the highest adoption (M = 3.56, SD = 0.67), placing it in the very-high category. Strategic planning software (M = 3.11, SD = 0.42) and learning management systems (M = 2.98, SD = 0.89) were highly adopted, while collaboration tools had the lowest mean (M = 2.67, SD = 0.95). The 0.89-point difference between project management software and collaboration tools indicates substantial variation in the adoption of these technologies.

Pearson Correlation Analysis

Pearson product-moment correlation was used to examine the associations between technological planning tools and the achievement of institutional goals. The analysis was conducted with N = 182 respondents, yielding 180 degrees of freedom. As shown in Table 5, all examined relationships were positive and statistically significant at the 0.05 level.

Table 5. Pearson Correlations between Technological Planning Tools and Institutional Goal Achievement

Technological planning variable	N	M	SD	r	p	Decision
Technological planning tools	182	3.08	0.73	.425	< .001	H_0 rejected
Strategic planning software	182	3.11	0.42	.313	< .001	H_{01} rejected
Learning management systems	182	2.98	0.89	.205	< .001	H_{02} rejected
Project management software	182	3.56	0.67	.219	< .001	H_{03} rejected
Collaboration tools	182	2.67	0.95	.252	< .001	H_{04} rejected

Table 5 presents the Pearson product-moment correlations between technological planning tools and institutional goal achievement among the 182 respondents. Overall, technological planning tools showed a moderate and statistically significant positive association with institutional goal achievement (r = .425, p < .001), indicating that higher reported adoption of technological planning tools was associated with higher perceived goal achievement. At the individual-tool level, strategic planning software demonstrated the strongest positive association (r = .313, p < .001), followed by collaboration tools (r = .252, p < .001), project management software (r = .219, p < .001), and learning management systems (r = .205, p < .001). Although project management software recorded the highest mean adoption score (M = 3.56, SD = 0.67), its correlation with goal achievement was weaker than that of strategic planning software and collaboration tools. Conversely, collaboration tools had the lowest mean adoption score (M = 2.67, SD = 0.95), yet showed a stronger association with goal achievement than project management software and learning management systems. All observed relationships were statistically significant at p < .001. Therefore, all corresponding null hypotheses were rejected. These findings suggest that the level of technology adoption does not necessarily reflect the strength of its association with institutional goal achievement, highlighting the importance of considering the strategic role of technological tools rather than adoption intensity alone. Because the study employed a cross-sectional correlational design, these relationships should be interpreted as associations rather than causal effects.

Table 6. Summary of Descriptive and Correlational Findings

Technological planning dimension	M	SD	r	p	Relative strength of association
Technological planning tools	3.08	0.73	.425	< .001	Moderate
Strategic planning software	3.11	0.42	.313	< .001	Weak-to-moderate
Collaboration tools	2.67	0.95	.252	< .001	Weak
Project management software	3.56	0.67	.219	< .001	Weak
Learning management systems	2.98	0.89	.205	< .001	Weak

Table 6 highlights an important pattern in the findings. Project management software had the highest level of adoption (M = 3.56), but strategic planning software demonstrated the strongest association with institutional goal achievement (r = .313). Conversely, collaboration tools had the lowest adoption level (M = 2.67), yet their association with goal achievement (r = .252)

was stronger than that of project management software (r = .219) and learning management systems (r = .205).

Discussion

The present study found a statistically significant positive relationship between technological planning tools and institutional goal achievement in public universities in Kwara State, with a moderate correlation (r = .425, p < .001). This finding indicates that respondents who reported stronger use of technological planning tools also tended to report higher levels of institutional goal achievement. The result provides empirical support for viewing technological planning as an organizational capability rather than merely as a technical support function. This interpretation is consistent with the broader literature on higher education digital transformation, which emphasizes that the institutional value of digital technology depends on how technological initiatives are embedded in organizational processes, strategy, governance, and institutional priorities (Fernández et al., 2023; Hashim et al., 2022). Importantly, however, the magnitude of the correlation indicates that technological planning is associated with, rather than determinative of, institutional goal achievement. Other organizational conditions—including leadership, human capabilities, organizational culture, funding, infrastructure, and institutional governance—are likely to shape goal achievement alongside technological planning.

This study found a positive and statistically significant relationship between technology-based planning tools and the achievement of institutional goals in public universities in Kwara State, with a moderate correlation (r = .425, p < .001). These findings indicate that respondents reporting higher levels of technology-based planning tool usage also tended to report higher levels of institutional goal achievement. The results provide empirical support for viewing technology-based planning as an element of organizational capability rather than merely a technical support function. This perspective aligns with the digital transformation literature in higher education, which emphasizes that the strategic value of technology is determined not primarily by its presence or intensity of use, but by the extent to which it is integrated with strategy, organizational processes, governance, and institutional priorities (Fernández et al., 2023; Hashim et al., 2022). The findings also accord with the IT capability perspective, which views technological resources as sources of organizational value when combined with organizational capabilities and processes that enable institutions to transform those resources into improved performance (Bharadwaj, 2000; Werder & Richter, 2022). However, the magnitude of the correlation coefficient suggests that technology-based planning is only one factor in achieving institutional goals and cannot be viewed as the sole determinant. Other organizational factors—such as leadership, human resource capabilities, organizational culture, funding, infrastructure, and governance—likely play a role in shaping the achievement of institutional goals (Gkrimpizi et al., 2023; Hashim et al., 2022). Thus, these research findings are best interpreted as evidence that technology derives institutional value when situated within a supportive organizational ecosystem, rather than as evidence that increased technology usage automatically leads to greater goal achievement.

The finding is particularly meaningful because the study examined technological planning as a multidimensional organizational construct rather than treating technology adoption as a single homogeneous phenomenon. Previous research has shown that higher education digital transformation encompasses changes in organizational processes, human factors, governance arrangements, and technological infrastructure, rather than technology acquisition alone (Fernández et al., 2023). Similarly, Chugh et al. (2023) emphasize that technology implementation in higher education involves interactions among technological capacity, stakeholder perceptions, organizational structures, and institutional practices. The present finding extends this perspective by demonstrating empirically that the aggregate use of technological planning tools is positively associated with perceived achievement of institutional goals. Thus, the result supports a shift from

a technology-centered view toward a more organizationally embedded understanding of digital transformation.

The descriptive findings provide an important qualification to this relationship. Overall, technological planning was rated high, yet the clarity of digital roadmaps received a comparatively lower rating than several other technological planning indicators. This pattern suggests that relatively widespread technology use does not necessarily imply equivalent maturity in strategic digital planning. Such a distinction is consistent with the literature showing that higher education institutions can undertake multiple digital initiatives without necessarily achieving an integrated institutional transformation. Fernández et al. (2023) identified the need for digital transformation initiatives to be coordinated through organizational strategies rather than implemented as isolated technological projects. Hashim et al. (2022) likewise conceptualize digital transformation as a strategic process through which universities seek to align technology with broader institutional development. The present findings, therefore, suggest that the challenge for public universities may no longer be simply whether technology is being used, but whether its use is sufficiently coordinated and strategically aligned with institutional objectives.

The results concerning implementation challenges reinforce this interpretation. Inadequate funding was the most strongly reported challenge, followed by poor maintenance culture and limited availability of skilled ICT personnel. These findings are consistent with systematic evidence showing that barriers to digital transformation in higher education are multidimensional and include strategic, organizational, technological, people-related, cultural, and environmental factors (Gkrimpizi et al., 2023). The present study adds an important contextual dimension by showing that financial and organizational sustainability remain critical even where technological planning is already perceived as relatively well established. Technology investments, therefore, cannot be evaluated solely in terms of acquisition or initial implementation. Their institutional value depends on universities' capacity to maintain infrastructure, develop human expertise, update systems, and integrate digital initiatives into routine organizational processes.

The finding that periodic review of ICT strategic plans received the lowest rating among the strategic integration indicators is also theoretically significant. Digital technologies, institutional requirements, and external environments change rapidly; consequently, a strategic plan that is not periodically reviewed may become disconnected from emerging institutional priorities. The literature on higher education digital transformation increasingly emphasizes the importance of strategic coordination and organizational integration rather than fragmented technology initiatives (Fernández et al., 2023; Hashim et al., 2022). The present result, therefore, suggests that Nigerian public universities may have progressed toward formal recognition of technology within institutional governance, while still requiring stronger mechanisms for continuous strategic review. In practical terms, technology planning should be treated as an iterative governance process involving planning, implementation, monitoring, evaluation, and periodic strategic adjustment.

A particularly important contribution of this study emerges from comparing the adoption level of each technological tool with the strength of its relationship to the achievement of institutional goals. Project management software had the highest level of adoption (M = 3.56). In contrast, collaboration tools had the lowest. However, strategic planning software demonstrated the strongest correlation with goal achievement (r = .313), followed by collaboration tools (r = .252), project management software (r = .219), and learning management systems (r = .205). This pattern indicates that the extent of a technological tool's adoption is not necessarily equivalent to the strength of its association with the achievement of institutional goals. This is an important contribution because much of the technology literature focuses on adoption, acceptance, or implementation as primary outcomes, whereas the organizational value of different technological functions may vary considerably. The findings therefore support a more differentiated approach to assessing digital transformation in higher education.

The relatively stronger relationship between strategic planning software and goal achievement is particularly noteworthy. Strategic planning software is functionally connected to institutional priority setting, planning, monitoring, performance tracking, and decision support. Its relatively stronger association with goal achievement may therefore reflect greater proximity between the technology's function and the organizational processes through which institutional goals are formulated and monitored. This interpretation is consistent with the strategic orientation of digital transformation identified in higher education research, where technology is increasingly positioned as part of institutional strategy rather than as a separate technical domain (Hashim et al., 2022; Fernández et al., 2023). Nevertheless, the finding should not be interpreted causally. The correlation indicates that stronger reported use of strategic planning software co-occurs with stronger reported goal achievement; it does not demonstrate that the software itself produces improved institutional performance.

The result for collaboration tools offers an equally important insight. Although collaboration tools had the lowest reported adoption among the four technological categories, their association with goal achievement (r = .252) was stronger than that of project management software and learning management systems. One plausible interpretation is that collaboration technologies may provide organizational value through communication, knowledge sharing, cross-unit coordination, and stakeholder interaction. Such functions are particularly relevant in complex university organizations where institutional objectives require coordination among academic departments, administrative units, and governance structures. The finding suggests that relatively low adoption should not automatically be interpreted as low strategic value. Instead, collaboration technologies may represent an underutilized organizational capability whose potential value depends on the extent to which universities embed them into routine coordination and decision-making practices. This interpretation is compatible with evidence that digital transformation in higher education involves organizational and human dimensions in addition to technological infrastructure (Chugh et al., 2023; Fernández et al., 2023).

Project management software presents a contrasting pattern. It recorded the highest adoption level but showed a weaker correlation with goal achievement (r = .219) than strategic planning software and collaboration tools. This divergence suggests that high adoption does not necessarily translate into a correspondingly strong organizational association. One possible explanation is that project management systems may be widely used for operational coordination while remaining insufficiently connected to higher-level strategic planning and institutional performance monitoring. In other words, a tool may be extensively used within individual projects without becoming fully integrated into the institution's strategic management architecture. This interpretation is consistent with the broader literature emphasizing that successful digital transformation requires integration across organizational processes rather than isolated implementation of technological solutions (Fernández et al., 2023). It also highlights why technology investment decisions should consider not only adoption rates but also the organizational processes to which technologies are connected.

The learning management system finding requires a similarly cautious interpretation. LMS adoption was relatively high (M = 2.98), but its relationship with institutional goal achievement was the weakest among the four technological tools (r = .205). This does not imply that LMSs have limited educational value. Rather, the result may reflect the particular outcome examined in this study: institutional goal achievement. LMSs are often designed primarily to facilitate teaching, learning, assessment, and academic interaction, whereas the goal-achievement construct in the present study captures broader institutional performance. Consequently, the relationship between LMS use and institution-wide goal achievement may be less direct than the relationship involving technologies explicitly designed for strategic planning. This interpretation is also consistent with the wider literature, which shows that educational technology serves multiple institutional functions

and that its effects depend on the specific organizational and pedagogical context in which it is implemented (Chugh et al., 2023).

The differentiated pattern among the four technological tools has important theoretical implications. From a resource-based perspective, technological resources do not automatically generate organizational value merely because they are available or widely adopted. Their value depends on how they are deployed and combined with organizational capabilities. Evidence from a large meta-analysis similarly indicates that the relationship between ICT use and performance is heterogeneous and depends on the type of technology and the surrounding technological context (Karim et al., 2022). The present study extends this logic to higher education, showing that different categories of technological planning tools exhibit varying degrees of association with the achievement of institutional goals. The findings therefore support a capability-oriented rather than an acquisition-oriented interpretation of digital transformation: what matters is not simply how much technology an institution possesses, but how strategically the technology is embedded within institutional processes.

These findings can also be interpreted through the lens of technology acceptance literature, even though acceptance was not directly measured in this study. Research in higher education indicates that technology use and acceptance are influenced by perceived usefulness, facilitating conditions, social influence, organizational capabilities, and other contextual factors (Chugh et al., 2023; Lehmann et al., 2023; Xue et al., 2024). The literature on digital transformation further emphasizes that successful organizational technology implementation depends not merely on the availability of technology, but on the alignment among technology, strategy, organizational processes, human resources, and institutional structures (Fernández et al., 2023; Hashim et al., 2022; Vial, 2019). This perspective offers a useful explanation as to why the relationship between technology adoption and institutional outcomes cannot be assumed to be simple or linear. A tool might be widely available yet underutilized strategically, whereas a tool with more limited adoption could hold greater organizational relevance if its use directly supports critical institutional tasks, processes, and priorities (Bharadwaj, 2000; Warner & Wäger, 2019). Such patterns also help explain why a technology's adoption rate does not necessarily reflect the strength of its link to achieving institutional goals. However, because this study did not measure perceived usefulness, facilitating conditions, social influence, or behavioral intention, these mechanisms should be viewed as theoretically plausible explanations rather than as empirically tested pathways in the current study. Future research could directly examine these mechanisms by integrating technology acceptance constructs and organizational factors into the research model.

The findings have several implications for university management. First, public universities should move beyond technology procurement toward strategic technology portfolio management. Decisions about technological investment should consider the functional relationship between each technology and institutional priorities. The relatively stronger association observed for strategic planning software suggests that technologies directly connected to strategic planning and performance monitoring may deserve particular managerial attention. Second, universities should strengthen the integration of collaboration technologies into cross-unit communication, knowledge sharing, and institutional coordination. Third, high adoption of project management software should be accompanied by stronger integration with strategic performance monitoring so that project-level activities remain connected to institutional priorities. Fourth, LMS investments should continue to be evaluated not only in terms of educational delivery but also in relation to broader institutional objectives, while recognizing that their primary benefits may occur at the teaching and learning level.

The implementation challenges identified in this study further indicate that technology investment cannot be separated from organizational capacity. Inadequate funding, maintenance weaknesses, and shortages of skilled ICT personnel may limit the sustainability of otherwise promising technological initiatives. The literature similarly emphasizes that successful digital

transformation requires attention to strategic, organizational, technological, human, and cultural conditions rather than technology alone (Gkrimpizi et al., 2023). Thus, university leaders should allocate resources not only for acquiring technological platforms but also for maintenance, staff development, technical support, system integration, cybersecurity, and periodic evaluation. Such an approach would help transform technological planning from an expenditure-oriented activity into a sustained institutional capability.

The findings contribute to the literature by demonstrating that technological planning tools are positively associated with institutional goal achievement while simultaneously revealing meaningful differences among specific technological functions. The strongest contribution is therefore not simply the confirmation of a positive technology–performance relationship, but the demonstration that different technological planning tools may have different degrees of organizational relevance even when their adoption levels are considered high. This finding extends broad digital-transformation perspectives by bringing greater analytical specificity to the relationship between technology and institutional performance. It also provides evidence from Nigerian public universities, a context that remains less visible in the international higher education digital-transformation literature. The study consequently supports a more context-sensitive and function-specific approach to technology-enabled institutional management.

Several limitations should nevertheless be acknowledged. First, the cross-sectional correlational design does not permit causal conclusions. The observed relationships may reflect reciprocal associations or the influence of unmeasured institutional characteristics. Second, the study relied on self-reported perceptions of technological planning and goal achievement, which may introduce common-method or social-desirability bias. Third, the study focused on two public universities in Kwara State, limiting the generalizability of the findings to other Nigerian states, private universities, or higher education systems with different institutional and technological conditions. Future research should therefore employ longitudinal designs to examine changes in technological planning and institutional performance over time, incorporate objective indicators of technology use and institutional performance, and investigate potential moderating variables such as digital leadership, organizational culture, ICT capability, funding adequacy, and staff digital competence. Comparative studies across Nigerian regions and between public and private universities would also provide stronger evidence regarding the contextual conditions under which technological planning contributes most strongly to institutional goal achievement.

CONCLUSION

This study concludes that technological planning tools are significantly and positively associated with the achievement of institutional goals in public universities in Kwara State, Nigeria. The overall relationship was moderate, while all four technological planning dimensions—strategic planning software, learning management systems, project management software, and collaboration tools—demonstrated significant positive associations with goal achievement, although the strength of these relationships varied across tools. Notably, strategic planning software showed the strongest association, whereas learning management systems demonstrated the weakest, suggesting that the organizational relevance of technological tools may depend on their strategic functions rather than on their level of adoption alone. The findings further indicate that technological planning was generally well established, but inadequate funding, maintenance challenges, shortages of skilled ICT personnel, and limited periodic review of ICT strategic plans remain important constraints. Accordingly, public universities should strengthen strategic alignment, sustainable funding, technical capacity, maintenance systems, and continuous evaluation of digital initiatives. However, because the study employed a cross-sectional correlational design, the findings demonstrate association rather than causation; longitudinal, comparative, or experimental research is therefore

recommended to examine how technological planning may contribute to institutional performance over time.

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