Int. J. Educ. Found. 03 (04) 2026. 703-711 DOI: 10.33687/ijef.003.04.0154

Available Online at EScience Press
International Journal of Education Foundations
ISSN: 3078-7866 (Online), 3078-7858 (Print)
https://ijef.esciencepress.net

RESEARCH ARTICLE

# ICT-Enabled Knowledge Management in Selected Higher Education Institutions in Tanzania

**[a]Jacquiline M. Ndanu, [b]Prospery M Mwila**

[a]*Tanzania Institute of Accountancy (TIA), Dar es Salaam, Tanzania*
[b]*Academician, School of Graduate Studies, Saint Augustine University of Tanzania*

**Corresponding Author**
*Jacquiline M. Ndanu, Email: jacquindanu@gmail.com*

***Author's Contributions***
All authors contributed equally to this research

***Article History***
*Received July 12, 2026; Accepted: September 03, 2026; Published: September 15, 2026*

**ABSTRACT**

Digital technologies have expanded how universities create, share, store, and use knowledge, yet their institutional value depends on more than access to devices. This study examined stakeholders' perceptions of ICT-enabled knowledge management in selected higher education institutions in Tanzania, focusing on ICT tools and platforms, perceived barriers, environmental support, and human resource capacity. Guided by the Technology Acceptance Model (TAM) and interpreted through broader socio-technical conditions, the study used a mixed-methods, cross-sectional design. Quantitative data were obtained from 350 valid student questionnaires, while qualitative evidence was generated through interviews, focus group discussions, and documentary review. Frequencies and percentages were used for quantitative analysis, and qualitative data were analysed thematically. Although 82.8% of respondents reported that ICT supported their learning mostly or very much, poor internet connectivity (72%), limited ICT resources (65%), and electricity interruptions (56%) remained prominent barriers. Peer support was widespread (76%), whereas regular ICT training was less common (39%). The findings reveal a gap between extensive everyday use of personal and informal digital tools and the institutionalisation of structured knowledge-management practices. Effective ICT-enabled knowledge management therefore requires reliable infrastructure, accessible and interoperable systems, sustained capacity development, and governance arrangements that address data protection, cybersecurity, and responsible use of emerging technologies.

**Keywords:** ICT-enabled knowledge management; higher education; Technology Acceptance Model; digital transformation; Tanzania

## INTRODUCTION

Information and Communication Technologies (ICTs) are now central to knowledge creation, sharing, storage, and utilisation in higher education institutions (Machado et al., 2022). Universities rely on learning management systems, institutional repositories, cloud services, mobile technologies, and collaboration platforms to support teaching, research, communication, and administration (Guzman et al., 2021; Adhikari & Shrestha, 2022). However, digitisation does not by itself constitute knowledge management (KM). Institutional value emerges when digital tools help transform dispersed information and individual expertise into accessible, reusable, and governed organisational knowledge (Dewah & Sibanda, 2022; Omanyo & Ndiege, 2025). The expansion of digital higher education accelerated during the COVID-19 pandemic and has continued

through hybrid learning, cloud-based collaboration, open repositories, learning analytics, and, increasingly, generative artificial intelligence (Adedoyin & Soykan, 2020; Watermeyer et al., 2021; Holmes & Miao, 2023). These developments can widen access and improve continuity, but they also create new requirements for equity, evidence, privacy, academic integrity, and institutional control of data. Accordingly, contemporary digital transformation should be assessed not only by whether technologies are present, but also by whether they are appropriate, inclusive, sustainable, and capable of supporting meaningful knowledge practices (Global Education Monitoring Report Team, 2023).

These requirements are especially important in resource-constrained settings. In 2024, an estimated 38% of Africa's population used the Internet, compared with 68% globally, underscoring persistent regional inequalities in meaningful connectivity (International Telecommunication Union, 2024). In Tanzania, a World Bank review of higher education similarly identified uneven institutional strategies, costly connectivity, infrastructure constraints, limited staff development, and weak uptake of digitally enhanced learning and teaching (Nfuka et al., 2021). Although universities have invested in digital systems, unreliable connectivity, electricity interruptions, limited technical support, and uneven digital capability can still disrupt their use and encourage dependence on personal devices and informal platforms (Mtebe, 2020; Lubuva et al., 2024).

The Technology Acceptance Model (TAM) provides an individual-level explanation of technology adoption. It proposes that perceived ease of use influences perceived usefulness and that both perceptions shape behavioural intention and subsequent technology use (Davis, 1989). TAM is useful for interpreting why stakeholders prefer familiar, accessible tools; however, it does not fully explain institutional infrastructure, governance, support, or capacity. This study therefore uses TAM as an interpretive lens while examining four contextual dimensions - ICT tools and platforms, perceived barriers, environmental support, and human resource capacity - that can enable or constrain knowledge-management practice (Ajibade, 2018; Na et al., 2022).

Previous studies have examined ICT adoption, e-learning, and KM in higher education, but less empirical attention has been paid to how everyday technology choices, institutional conditions, and human support interact within Tanzanian universities (Mtebe, 2020; Lubuva et al., 2024; Omanyo & Ndiege, 2025). Many studies isolate technology adoption from the broader processes through which universities create, retain, share, and reuse knowledge. This study addresses that gap by examining stakeholders' perceptions of four related dimensions of ICT-enabled KM effectiveness in selected higher education institutions in Tanzania. Specifically, it asks how ICT tools and platforms are used, which barriers are most salient, and how environmental and human resource support shape effective knowledge practices.

## LITERATURE REVIEW

### ICT and Knowledge Management in Higher Education

ICT-enabled KM encompasses the technologies and institutional practices through which universities create, capture, organise, share, preserve, and use knowledge. Learning management systems can distribute course knowledge; institutional repositories can preserve and disseminate research; cloud services can support collaborative work; and mobile platforms can enable rapid communication (Machado et al., 2022; Guzman et al., 2022). When these systems are aligned with organisational processes, they can strengthen institutional memory, reduce duplication, connect dispersed expertise, and improve access to academic resources (Dewah & Sibanda, 2022; Omanyo & Ndiege, 2025).

The post-pandemic literature nevertheless cautions against equating platform adoption with transformation. Digital systems produce value when they are accessible, reliable, pedagogically appropriate, and integrated with institutional workflows. Fragmented platforms, weak interoperability, poor data quality, and low user trust can create isolated information silos rather than shared organisational knowledge. UNESCO therefore recommends that technology decisions be evidence-based, equitable, scalable, and sustainable, with learners' interests at the centre (Global Education Monitoring Report Team, 2023). The rapid adoption of generative AI adds further opportunities for knowledge discovery and content creation, but also raises concerns about accuracy, privacy, intellectual property, bias, and human oversight (Holmes & Miao, 2023).

In Sub-Saharan Africa, these governance questions coexist with basic infrastructure and capacity constraints. Unreliable Internet access, high connectivity costs, unstable electricity, limited equipment, inadequate technical support, and uneven digital skills can restrict participation in formal university systems (Almaiah et al., 2020; Arakpogun et al., 2023). Tanzanian evidence indicates that institutional policy and infrastructure have expanded, but implementation remains uneven across universities and user groups (Charles & Nawe, 2017; Nfuka et al., 2021). When formal systems are difficult to access, stakeholders may turn to WhatsApp, personal email, and privately owned devices. Such tools support immediacy and peer exchange, but they can weaken systematic capture, quality control, security, and long-term preservation of institutional knowledge.

**Theoretical and Conceptual Framework**

TAM, developed by Davis (1989), explains technology acceptance through perceived ease of use and perceived usefulness. Perceived ease of use is the degree to which a person expects a system to require little effort; perceived usefulness is the degree to which the person expects it to improve performance. In the conventional model, perceived ease of use contributes to perceived usefulness, and both shape behavioural intention, which in turn predicts actual use. These relationships provide a useful basis for interpreting stakeholders' preferences for accessible and familiar technologies. TAM's parsimony is also a limitation. By concentrating on individual perceptions, it can understate the institutional and material conditions that make technology usable in practice, including connectivity, power, governance, training, technical assistance, and system quality (Ajibade, 2018; Na et al., 2022). For ICT-enabled KM, acceptance is necessary but insufficient: a widely used tool may still fail to preserve knowledge, ensure quality, protect data, or connect individual contributions to institutional repositories and workflows.

Accordingly, the analytical framework combines TAM with four contextual study dimensions. ICT tools and platforms provide channels for knowledge creation, sharing, storage, and utilisation. Perceived barriers capture obstacles that can reduce access and ease of use. Environmental support reflects infrastructure, policy, governance, and organisational resources. Human resource capacity encompasses digital competence, training, technical assistance, and peer support. These dimensions are treated as analytically related conditions rather than as original TAM constructs (Guzman et al., 2022; Mwombeki et al., 2022).

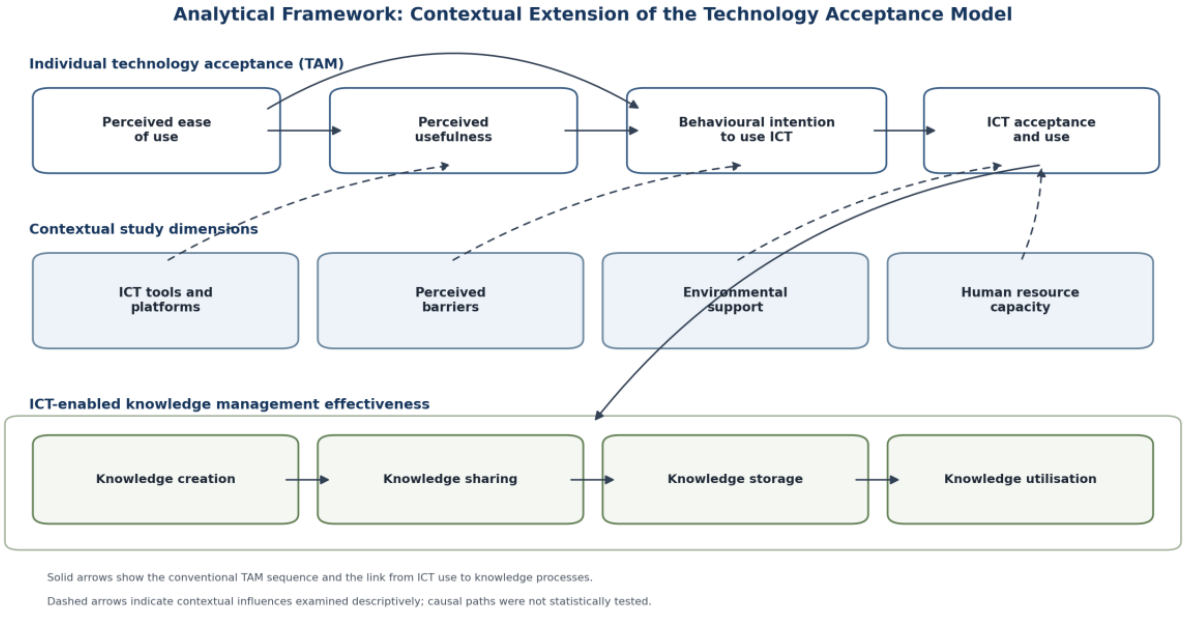


**Figure 1. Analytical framework for ICT-enabled knowledge management effectiveness**

Figure 1 retains TAM's individual-level acceptance sequence while locating technology use within the institutional conditions examined in this study. Because the research is cross-sectional and relies primarily on descriptive analysis, the framework guides interpretation; it does not represent a statistically tested causal model.

**ICT Tools and Platforms for Knowledge Management**

ICT tools support different stages of the university knowledge cycle. Learning management systems organise teaching materials and interaction; institutional repositories preserve research outputs; cloud platforms enable collaborative production; and mobile communication tools support rapid exchange (Machado et al., 2022; Guzman et al., 2022). Their value depends on how well they connect users, content, and institutional processes rather than on the number of technologies available.

Mobile devices are particularly significant where fixed infrastructure is limited. Smartphones and messaging platforms can lower access barriers and sustain communication among students and staff (Omanyo & Ndiege, 2025). Yet the convenience of informal platforms can create a parallel or 'shadow' knowledge system in which useful exchanges are difficult to search, authenticate, preserve, or reuse. Mobile-first design should therefore be combined with pathways that capture appropriate content in formal learning systems and repositories.

The contribution of ICT tools to KM should consequently be assessed through accessibility, reliability, interoperability, usability, security, and fit with users' work (Yang, 2023; Millidonis et al., 2024). This distinction between availability and institutionalisation is central to the present study: high use of personal tools may coexist with weak use of formal knowledge resources.

**Perceived Barriers to ICT Use**

ICT use in higher education may be constrained by unreliable connectivity, high access costs, inadequate equipment, unstable electricity, obsolete software, limited technical support, weak digital skills, and inconsistent policy implementation (Almaiah et al., 2020; Lubuva et al., 2024). These barriers interrupt access and can reduce both the perceived usefulness and ease of use of formal systems. They may also distribute opportunity unevenly across location, income, gender, disability, and device ownership (Global Education Monitoring Report Team, 2023; International Telecommunication Union, 2024).

Tanzanian studies report similar constraints, including connectivity, equipment, staff development, and institutional readiness (Mtebe, 2020; Nfuka et al., 2021). Emerging technologies add a second layer of risk: without clear governance, cloud and generative AI services may expose personal or institutional data, reproduce unreliable information, or weaken accountability for academic work (Holmes & Miao, 2023). Thus, barriers should be understood as both access problems and governance problems.

Perceived barriers are therefore treated as a distinct study dimension because they can limit participation in ICT-enabled KM even when digital tools are nominally available.

**Environmental Support Factors**

Environmental support refers to the institutional conditions that make digital knowledge practices dependable. It includes connectivity, power, hardware and software, accessible system design, technical support, financing, policy, leadership, cybersecurity, data governance, and integration among platforms (Arakpogun et al., 2023; Alghail et al., 2023).

Reliable infrastructure is foundational, but governance determines whether systems can be sustained and trusted. Universities require clear ownership of platforms and data, service standards, backup and recovery arrangements, access controls, records-retention rules, and mechanisms for evaluating system performance. Tanzanian higher education evidence likewise points to the need for coordinated institutional strategies, quality assurance, connectivity, support services, and staff development rather than isolated technology purchases (Nfuka et al., 2021).

A supportive environment therefore enables stakeholders to move from episodic technology use to routine knowledge creation, sharing, storage, and utilisation. In this study, environmental support is examined as an institutional complement to individual technology acceptance.

**Human Resource Factors**

Human resource capacity includes the knowledge, roles, and relationships required to use and sustain institutional technologies. ICT personnel, librarians, instructional designers, lecturers, administrators, and students each contribute different forms of expertise. Their digital competence, confidence, and access to

timely assistance can shape both technology acceptance and KM effectiveness (Na et al., 2022; Nanjundeswaraswamy & Swamy, 2022).

Continuous professional development can strengthen skills, while responsive help desks and peer communities can resolve practical problems close to the point of use (Yang, 2023). Informal peer support is especially valuable, but institutions can improve its reliability by recognising digital champions, developing referral pathways, documenting recurring solutions, and connecting peer networks to librarians and ICT staff. Capacity development should also cover responsible AI use, data protection, cybersecurity, and evaluation of online information (Holmes & Miao, 2023).

Human resource capacity is therefore treated as an enabling dimension alongside tools and platforms, barriers, and environmental support.

## METHODOLOGY

The study adopted a mixed-methods approach to examine stakeholders' perceptions of ICT-enabled KM in selected higher education institutions in Tanzania (Creswell & Creswell, 2018; Saunders et al., 2023). Quantitative evidence described the prevalence of technology use, barriers, and support, while qualitative evidence provided contextual explanations of how these conditions affected academic and knowledge-management practices. The strands were integrated at the interpretation stage through comparison of convergent and divergent patterns.

A cross-sectional design captured experiences and perceptions at one point in time (Setia, 2016). The study was conducted in three selected higher education institutions, referred to as University D in Dar es Salaam, University I in Iringa, and University A in Arusha, representing different geographical areas of Tanzania. The institutions were purposively selected to provide geographical diversity and to include higher education institutions with active use of ICT in teaching, learning, and knowledge-management activities. Data were collected from August to October 2025. The target population comprised students, lecturers, heads of departments, ICT personnel, librarians, and administrative staff involved in ICT-supported academic and knowledge-management activities.

The planned student sample was 374 from a population of 14,271, determined using the Krejcie and Morgan (1970) sample-size determination table. Students were proportionally allocated across the three universities and selected through simple random sampling using student records as the sampling frame. To allow for non-response and incomplete returns, 400 questionnaires were distributed; 360 were returned and 350 valid questionnaires remained after screening. The questionnaire was pilot-tested, and face and content validity were assessed, with content validity evaluated using the Content Validity Index (CVI). Reliability was assessed using Cronbach's alpha, with coefficients ranging from 0.81 to 0.89 across the four content areas for students. Qualitative evidence was collected through 15 key-informant interviews and three focus group discussions. The interviews involved 12 institutional staff members (four from each university) and three student representatives (one from each university), while each focus group comprised eight students representing different academic levels. Participants were purposively selected. Interviews lasted approximately 45–60 minutes and focus group discussions approximately 60 minutes. With participants' consent, the sessions were audio-recorded and transcribed verbatim; where recording was not permitted, detailed interview notes were taken. The emergence of recurring themes across institutions was used to judge thematic saturation. Using multiple methods enabled triangulation across participant groups and evidence types (Creswell & Creswell, 2018; Scheelbeek et al., 2020).

Quantitative data were analysed in SPSS version 26. Frequencies and percentages were used to describe patterns of access, use, barriers, and support; no causal effects were estimated. Qualitative data were transcribed, coded, and analysed thematically. Codes were organised around the four analytical dimensions while allowing additional patterns to emerge from participants' accounts (Turale, 2020; Chand, 2025).

Research clearance was granted by St. Augustine University of Tanzania on behalf of the Government and COSTECH (Ref. No. SAUT/VC/RCP/035/04, dated 6 August 2025). A research permit was subsequently obtained from the Ministry of Education, Science and Technology (Ref. No. CB.153/350/01A/04, dated 3 September 2025), followed by institutional permissions from the three participating universities. Participation was voluntary, informed consent was obtained, and confidentiality and anonymity were maintained. Data were used only for academic purposes.

## RESULTS AND DISCUSSIONS

### ICT Tools and Platforms Supporting Knowledge Management

ICT tools and digital platforms were widely used for academic and knowledge-related activities. Overall, 82.8% of respondents reported that ICT supported their learning mostly or very much, and 66.4% reported using ICT much or very much for academic work. Smartphones were the most frequently used devices (90%), followed by laptops (60%). These results indicate that mobile and personally accessible technologies form the practical entry point to digital knowledge activities in the selected institutions.

Use of formal institutional knowledge resources was much weaker. Only 28% of respondents were aware of their university's Consortium of Tanzania University and Research Libraries (COTUL) membership, and among those aware, only 12% reported using COTUL resources. Qualitative evidence likewise indicated a preference for familiar platforms such as WhatsApp, while some institutional systems were used less frequently.

The contrast between high device use and low engagement with formal resources is analytically important. Consistent with TAM, familiar and convenient tools may be perceived as easier to use and immediately useful (Davis, 1989). However, from a KM perspective, convenience alone is insufficient. Informal exchanges may support rapid knowledge sharing while leaving institutional capture, quality assurance, searchability, and long-term preservation underdeveloped. The finding therefore points to a usability and awareness problem, not simply a shortage of technology.

### Perceived Barriers to ICT Use

Poor Internet connectivity was the most frequently reported barrier (72%), followed by limited ICT resources (65%) and frequent electricity cuts (56%). Respondents also identified outdated or unreliable software and systems (41%), lack of technical support (38%), and inadequate ICT skills or training (34%). The pattern shows that barriers are cumulative: a functional device or platform cannot deliver sustained value when connectivity, power, support, or competence fails.

Qualitative accounts confirmed that unreliable Internet access, inadequate equipment, power interruptions, and limited training disrupted everyday academic activity. When formal systems were unavailable or difficult to use, participants relied on personal devices, informal platforms, and peer assistance. These adaptations improved continuity but shifted costs and risks from institutions to individual users.

The results align with research that identifies connectivity, infrastructure, technical support, and digital competence as persistent constraints in developing-country higher education (Almaiah et al., 2020; Lubuva et al., 2024). They also echo Tanzanian evidence that successful digital expansion requires coordinated attention to strategy, infrastructure, access, quality assurance, and staff development (Nfuka et al., 2021).

### Environmental Support Factors

Perceptions of environmental support were mixed. Communication with lecturers was relatively positive: 55% agreed or strongly agreed that communication was effective. Fifty-two per cent reported that online lessons were easily accessible and shareable, and 49% considered the required software functional. These results suggest that some front-line digital practices are established.

Underlying institutional support was less robust. Only 37% considered Internet connectivity and computer-laboratory access sufficient, fewer than 35% agreed that technical support was readily available, and 49% reported receiving some form of ICT guidance or training. The difference between accessible online activity and weak underlying services suggests that users may be compensating for institutional gaps through personal devices, data, and informal assistance. Environmental support is therefore uneven rather than absent. Sustainable ICT-enabled KM will require universities to convert isolated strengths into dependable institution-wide services, with measurable standards for uptime, access, support response, repository use, data protection, and continuity.

### Human Resource Factors

Human support was similarly uneven. Peer assistance was the strongest mechanism: 76% agreed or strongly agreed that fellow students helped with ICT-related challenges. Administrative support was also comparatively positive, with 56% reporting assistance with ICT-related academic tasks. These findings show that relational resources are already compensating for some technical constraints.

Formal capacity-building mechanisms were weaker. Approximately half of respondents perceived ICT staff as available, but only 39% agreed or strongly agreed that ICT training sessions or workshops were offered regularly. Qualitative evidence also showed that

students relied on peers when formal assistance was delayed or unavailable.

The central implication is not to replace informal support, but to institutionalise its strengths. Peer networks can be linked to trained digital ambassadors, librarians, documented self-help resources, and clear escalation routes to ICT staff. Such arrangements would convert recurring individual solutions into reusable institutional knowledge.

Taken together, the findings reveal a two-speed digital environment. Everyday technology use is extensive and often mobile-first, but formal knowledge resources, technical services, training, and institutional capture mechanisms are less mature. Access to devices therefore coexists with fragmented knowledge practices. This distinction explains why technology availability alone does not guarantee effective KM.

TAM helps explain the preference for technologies perceived as useful and easy to use, particularly smartphones and familiar messaging platforms (Davis, 1989). The broader evidence, however, shows that acceptance is embedded in a socio-technical system. Connectivity, power, governance, support, competence, and institutional workflows determine whether individual use becomes reliable organisational knowledge. The results support UNESCO's wider argument that digital transformation should be judged by relevance, equity, sustainability, and evidence, not adoption alone (Global Education Monitoring Report Team, 2023).

### Implications and Limitations

The findings have practical and theoretical implications. Practically, they show that the highest-value interventions are not isolated technology purchases but coordinated improvements in infrastructure, usability, integration, support, and governance. Theoretically, they demonstrate the value of using TAM as an individual-level lens while explicitly accounting for institutional conditions. The strong role of peer support also suggests that informal communities of practice are an important, but often under-recognised, component of university knowledge systems.

Several limitations qualify the conclusions. The cross-sectional design captures perceptions at one point in time and cannot establish causal relationships. The quantitative evidence is based on student self-reports from selected institutions, which limits generalisability to other universities and stakeholder groups. Frequencies and percentages describe patterns but do not test the relationships proposed in the analytical framework. Future research should use multi-institutional probability samples, include academic and professional staff in the quantitative analysis, combine perceptions with system-usage and service-quality data, and test the framework through longitudinal or multivariate designs.

## CONCLUSION AND RECOMMENDATIONS

This study examined stakeholders' perceptions of ICT-enabled KM in selected Tanzanian higher education institutions. ICT is already integral to learning, communication, collaboration, and access to information, particularly through smartphones, laptops, and familiar communication platforms. However, the findings also expose a persistent gap between individual digital activity and the institutional systems needed to organise, preserve, validate, and reuse knowledge.

Connectivity failures, limited equipment, electricity interruptions, weak technical support, insufficient training, and uneven awareness of formal resources constrain that transition. These conditions reduce the practical ease and usefulness of institutional systems and encourage workarounds that are valuable for continuity but weaker for governance and preservation.

The study therefore concludes that ICT-enabled KM is a socio-technical capability rather than a technology-acquisition project. Sustainable improvement depends on alignment among infrastructure, usable platforms, institutional governance, human capability, and knowledge workflows. TAM remains useful for understanding individual acceptance, but it should be applied alongside analysis of the organisational conditions that make effective use possible.

Four priorities follow. First, institutions should improve reliable connectivity, power resilience, access to devices, and responsive technical support, with mobile-friendly and low-bandwidth options. Second, they should integrate learning systems, repositories, library resources, and communication channels so that useful knowledge shared informally can be captured, searched, secured, and preserved appropriately. Third, continuous role-based training should be institutionalised for students, lecturers, librarians, administrators, leaders, and ICT personnel, with peer-support networks linked to formal help services. Fourth, ICT governance should address data protection, cybersecurity, access control, backup and recovery, digital preservation, responsible generative AI use, and measurable service outcomes (Holmes & Miao, 2023; Nfuka et al., 2021).

Future institutional monitoring should move beyond counting devices or systems. Indicators should include service uptime, active use of learning and repository platforms, support-response time, participation in training, knowledge reuse, user satisfaction, and equity of access across relevant groups. This outcome-oriented approach would better show whether digital investment is producing sustainable knowledge-management value.

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