JOURNAL OF CULTURAL ANALYSIS AND SOCIAL CHANGE

Journal of Cultural Analysis and Social Change,
2026, 11(1), 2369-2384
ISSN: 2589-1316

The Influence of Information and Communication Technologies on Knowledge Exchange Among Higher Education Students

Oluwayemi IbukunOluwa Odularu[1*]

[1] *Library and Information Science Unit, Faculty of Humanities, Social Science and Law, Walter Sisulu University, Nelson Mandela Drive, Mthatha Campus, 5100, South Africa; oodularu@wsu.ac.za, ORCID: 0000-0003-2089-7970*

*Corresponding Author: oodularu@wsu.ac.za

Citation: Odularu, O. I. (2026). The Influence of Information and Communication Technologies on Knowledge Exchange Among Higher Education Students, *Journal of Cultural Analysis and Social Change*, 11(1), 2369-2384. https://doi.org/10.64753/jcasc.v11i1.4352

Published: January 26, 2026

ABSTRACT

Information and Communication Technologies (ICTs) have transformed knowledge exchange dynamics in higher education, fostering collaborative learning and improved academic performance. However, disparities in access, digital literacy, and institutional support continue to impede equitable participation among students, particularly in developing contexts. The aim of this study is to examine the influence of Information and Communication Technologies (ICTs) on knowledge exchange among higher education students. The review focused on higher education institutions globally, with implications for developing contexts such as South Africa, where ICT integration remains uneven across institutions. A systematic literature review of 85 peer-reviewed studies was conducted using major databases, including Scopus, Web of Science, and ERIC. The analysis was guided by the Technology Acceptance Model (TAM) and Theory of Reasoned Action (TRA), focusing on perceived usefulness, ease of use, and behavioural intention to adopt ICTs for knowledge sharing. Findings reveal that ICTs significantly enhance students' knowledge exchange, promoting interactive and collaborative learning. However, barriers such as, limited user training, inadequate institutional infrastructure, and unreliable technical support persist, hindering effective adoption. The study concludes that while higher education students generally display positive attitudes towards ICT integration, sustained progress depends on the establishment of robust, theory-driven institutional policies that promote equitable and sustainable use of technology. The study contributes to Sustainable Development Goal 4 (Quality Education) by promoting inclusive and equitable access to digital learning opportunities. It also aligns with SDG 9 (Industry, Innovation, and Infrastructure) through its emphasis on developing resilient ICT infrastructure and enhancing innovation capacity within higher education institutions. Recommendations include implementing mandatory computer literacy workshops, integrating ICTs strategically into curricula, and providing continuous professional development for staff.

Keywords: Information and Communications Technology, Knowledge Exchange, Higher Education, E-Resources, TAM, TRA.

INTRODUCTION

The growing integration of Information and Communication Technologies (ICTs) into higher education has transformed the landscape of teaching, learning, and information exchange globally (Ahmed & Rana, 2011). This study aims to review the influence of ICTs on knowledge exchange among higher education students. While knowledge exchange may be affected by various socio-economic and institutional factors, this study focuses specifically on how ICTs facilitate or hinder students' ability to share and acquire knowledge in academic settings. Globally, the 21st century has witnessed a surge in the use of ICTs across all sectors, including education. Higher

education institutions (HEIs) are under increasing pressure to integrate ICTs into their teaching and learning processes to remain competitive and enhance student engagement (Lawrence, 2019). The effectiveness of ICT in promoting academic development lies in its ability to improve communication, streamline access to information, and foster interactive learning environments (Petrides & Nodine, 2003). According to Boyd & Ellison (2008), ICT tools such as social media platforms and collaborative applications encourage interactive peer-to-peer learning among students. These tools enable greater autonomy in learning, allowing students to discuss, share ideas, and access educational resources asynchronously. Eid & Al-Jabri (2016) add that the paradigm shifts from teacher-centered to student-centered learning is largely supported by the increased availability and use of ICT tools such as Learning Management Systems (LMS), discussion forums, and real-time messaging applications. ICT supports both synchronous and asynchronous knowledge exchange, enabling a continuous flow of information among students and between students and faculty (Hooff et al., 2003). Furthermore, ICT facilitates learning environments that extend beyond traditional classroom boundaries, enhancing collaboration through platforms such as Google Drive, WhatsApp, blogs, wikis, and e-learning portals (Kwahk & Park, 2016; Young, 2012). However, implementing ICT in higher education institutions, particularly in resource-constrained environments, poses significant challenges. Limited access to ICT infrastructure, inadequate training, and low institutional support can significantly hinder effective integration (Opeke & Onuorah, 2013; Okon et al., 2005). Ahmed & Rana (2011) emphasize that despite these challenges, ICTs eliminate spatial and temporal boundaries, enhancing accessibility and flexibility for students engaged in academic collaboration. Moreover, the absence of proper orientation and support for both students and lecturers regarding ICT tools often leads to underutilization and resistance (Gasaymeh, 2018). Universities may also invest in costly ICT solutions without adequately assessing their suitability or providing adequate user training (Tochukwu, 2015). Thus, while the potential for ICT to support knowledge exchange is immense, its success depends on policy alignment, institutional commitment, and user competence. ICTs provide higher education students with numerous opportunities for academic knowledge exchange, but these opportunities must be matched by strategic planning, adequate infrastructure, and capacity-building initiatives (Appiah et al., 2022; Fu, 2013). The study will provide insights into the effectiveness, challenges, and perceptions surrounding the use of ICTs for knowledge exchange in higher education.

Aim of the Study

The aim of this study is to review the influence of Information and Communication Technologies (ICTs) on knowledge exchange among higher education students.

Research Problem

In the 21st century, the integration of Information and Communication Technologies (ICTs) into higher education has transformed how students access, generate, and share knowledge. ICTs have created diverse digital environments that allow for flexible learning, real-time collaboration, and virtual knowledge exchange beyond the physical classroom (Castro and Alemán, 2011; Fu, 2013). Despite this growing importance, students in many higher education institutions, particularly in developing contexts, continue to face multiple barriers that hinder the effective use of ICTs for academic knowledge exchange (Al-Ruz & Khasawneh, 2011). A prominent challenge is the lack of adequate ICT training, particularly among first-year students, who often enter university with limited prior exposure to educational technologies (Riege, 2005). Although many of these students are digitally native in their use of social media and smartphones, they often lack the academic digital literacy needed to navigate learning management systems, access e-resources, and participate meaningfully in online forums and collaborative tools (Bock & Kim, 2002; Opeke & Onuorah, 2013). This digital divide results in uneven participation in ICT-supported knowledge exchange processes. Furthermore, technical barriers such as system downtime, limited bandwidth, poor access to devices, and the absence of ICT support staff compound the problem. In many cases, students encounter frustrating experiences when attempting to access online platforms or submit assignments electronically due to server crashes, login failures, or outdated software (Kwahk & Park, 2016; Lawrence, 2019). Without proper support structures, such as trained lab technicians or IT help desks, students become demotivated, and the potential of ICT to enhance knowledge sharing is diminished. Another pressing issue is the institutional and infrastructural limitations. Many universities adopt ICT tools without conducting needs assessments or providing adequate induction for students and lecturers. According to Tochukwu (2015), the introduction of complex, poorly contextualized ICT systems often results in underutilization and wasted resources. Moreover, a lack of clear institutional ICT policies, funding constraints, and administrative buy-in further hinder sustainable implementation and use of ICTs (Okon, Esin, & Nkoyo, 2005). This study, therefore, seeks to explore how ICTs influence knowledge exchange among higher education students, with a specific focus on identifying enabling factors and barriers. By investigating students' usage patterns, attitudes, and challenges, the study aims to provide insights that can guide higher education institutions in designing effective ICT integration strategies. Such findings are crucial

for informing the development of inclusive policies, capacity-building programs, and infrastructure improvements that foster equitable and meaningful participation in the digital academic ecosystem.

LITERATURE REVIEW

The purpose of conducting a literature review is to systematically explore existing empirical studies and theoretical contributions that inform the current research topic while identifying gaps that this study seeks to fill. The focus of this research is to examine the influence of Information and Communication Technologies (ICTs) on knowledge exchange among higher education students. A literature review plays a critical role in identifying what is already known, the methods previously employed, and what remains underexplored regarding a phenomenon (Boswell & Cannon, 2014). This section critically reviews the relevant literature on the role of ICTs in facilitating knowledge exchange among university students. Through this review, the study aims to contextualize the topic, justify its significance, and establish a framework for analysis. ICTs have become essential tools in higher education, enhancing how students create, share, and access knowledge. The growth of e-learning, learning management systems (LMS), mobile communication, and social networking platforms has dramatically changed how students engage with academic content and collaborate with peers (Echenique, Molias, & Bullen, 2015). Despite this evolution, the extent and nature of ICT use among students, especially in knowledge exchange, remain uneven due to factors such as digital literacy, infrastructure availability, and institutional policies (Lawrence, 2019). Numerous studies have examined the integration of ICTs in education across various countries and institutions. For instance, Kennedy et al. (2008) conducted a cross-sectional survey involving 2,120 first-year university students in Australia. The findings highlighted that although students generally had access to digital tools such as mobile phones, desktop computers, and internet services, their preferences and actual usage varied considerably. Similarly, Gosper et al. (2014) investigated students' ICT use in 2010 and 2013, revealing that laptops, smartphones, and digital platforms such as LMSs, social media, and search engines were frequently used for academic purposes. In North America, Smith et al. (2010) undertook a large-scale study involving over 36,000 students across the U.S. and Canada to assess the use of information technologies. The study found that more than 50% of respondents owned laptops and smartphones, and a significant proportion used web-based tools like word processors, wikis, and social networking sites (SNS) for academic work. Gender differences were also noted, with male students more likely to identify as early adopters of ICT. In the United Kingdom, Selwyn (2008) explored undergraduates' internet use for academic purposes. His findings showed that over half of the surveyed students regularly used the internet for educational activities, including accessing newsgroups, participating in online discussions, and downloading academic resources. Female students were found to use the internet more frequently for academic tasks than their male counterparts. From an African perspective, Lawrence (2019) examined ICT usage among Library and Information Science students at Delta State University in Nigeria. The study showed high engagement with ICT tools for academic knowledge sharing, including emails, SMS, social networking sites, and online databases. These technologies facilitated time efficiency, simultaneous knowledge sharing, and reduced the cost and barriers associated with traditional learning methods.

However, studies also indicate significant challenges. These include a lack of digital literacy, poor infrastructure, and insufficient institutional support. For example, Oketunji (2000) highlighted electricity access as a major constraint. Kamba (2008), Oyesika & Oduwole (2004) noted that poor infrastructure and lack of student training hampered effective ICT use. Aino (2004) added that negative attitudes from students and faculty further limited ICT integration in university libraries. These constraints underline the need for institutional reforms, including digital skills training and improved infrastructure. Echenique et al. (2015) employed a qualitative approach to study Spanish university students' ICT use for academic and social purposes. Their findings confirmed widespread use of Facebook, Twitter, WhatsApp, and email, with students appreciating the flexibility these tools provided. ICTs allowed them to collaborate on assignments, form study groups, and access academic materials with ease. Despite the widespread use of ICT in education, Gasaymeh (2018) emphasizes that students still face obstacles, including inadequate institutional support, limited ICT training, and restricted access to necessary tools. These findings reinforce the importance of understanding not only the availability of ICT tools but also how effectively students can use them to facilitate meaningful knowledge exchange. This literature demonstrates the potential and prevalence of ICT in knowledge exchange among higher education students and reveals persistent gaps, particularly regarding first-year students and the contextual challenges they face. This study builds upon these foundations to explore how ICTs influence knowledge exchange within a specific South African university context, contributing to a more nuanced understanding of digital learning environments.

The Influence of Information and Communication Technologies on Knowledge Exchange Among Higher Education Students

Information and communication technologies (ICTs) have become pivotal in shaping the 21st-century global economy, driving rapid societal transformations. Over the past decade, advancements in ICT tools have revolutionized communication, business, and education (UNESCO, 2023). In higher education, ICTs have dramatically altered teaching and learning methodologies, enabling more interactive, flexible, and collaborative knowledge exchange (Delacey & Leonard, 2002; Bayindir & Inan, 2009; Albino et al., 2004). UNESCO (2023) emphasizes that ICTs can fundamentally transform education by redefining where, when, and how learning occurs, as well as the roles of educators and students in the process. The integration of ICTs in universities creates diverse learning environments that enhance student and instructor engagement and foster motivation (Kara & Yakar, 2008). Higher education institutions face mounting pressure to adopt these technologies to equip students with 21st-century competencies and align with evolving societal demands (Geoffrey, 2010). ICTs mitigate disparities in educational quality by reducing reliance on variable teacher expertise and enabling round-the-clock access to learning resources (Mbwesa, 2002).

In the knowledge economy, ICTs serve as critical facilitators of knowledge-sharing practices. They minimize barriers to information exchange, optimize time efficiency, and promote collaborative learning among undergraduates (Casimir et al., 2012). Studies indicate that ICT-mediated knowledge sharing enhances cooperation among student groups, enabling real-time interaction regardless of geographical constraints (Lawrence, 2019; Grace, as cited in Mohd & Zawiyah, 2015).According to Mbwesa (2002, there are Key benefits of ICTs in knowledge exchange, including: Enhanced Knowledge Transfer: ICTs improve the efficacy and reach of knowledge dissemination while reducing temporal and spatial costs (Albino et al., 2004; Osman, 2015). Collaborative Tools: Platforms such as online discussion forums, intranets, and email facilitate problem-solving and collective decision-making (Toro & Joshi, 2013; Gyensare & Asare, 2012). Digital Repositories: Technologies such as social media, blogs, and search engines streamline knowledge creation, storage, and retrieval (Chikono, 2018; Rasmus, 2003). Despite these advantages, challenges persist. African higher education institutions (HEIs), for instance, lag in digital infrastructure and information literacy programs, limiting student access to epistemic resources (Albino et al., 2004; Osman, 2015). A PRISMA-based review underscores the need to examine technological, cultural, and behavioral factors influencing knowledge-sharing practices in HEIs (Fadilah, 2013). Fadilah (2013) found that systematic ICT use narrows knowledge gaps among undergraduates, granting them a competitive edge (Raab et al., 2014). King (2009) highlights collaborative workspaces as accelerators of collective learning, while Kumaresan (2010) identifies Microsoft Office suites and mobile technologies as pivotal knowledge management tools. Emerging ICTs such as video conferencing, SMS, and online databases further enrich knowledge-sharing ecosystems (Riege, 2005; Gartner, 2006). However, student self-efficacy in ICT adoption remains influenced by infrastructural and pedagogical support (Delacey & Leonard, 2002)

Antecedents of Information and Communication Technologies on Knowledge Exchange among Higher Education Students

Information and Communication Technologies (ICTs) have become fundamental components of contemporary higher education systems. As noted by Harrell & Bynum (2018), today's university students are typically "digital natives" who have grown up surrounded by digital technologies and are naturally inclined toward technology-mediated learning environments. This technological immersion has created new expectations and opportunities for pedagogical innovation in higher education institutions. The integration of ICTs into university curricula is no longer optional but a necessity for preparing students for the demands of 21st-century careers (Luterbach & Brown, 2011; Cakir, 2012). However, as Harrell & Bynum (2018) emphasize, implementing these technologies faces significant challenges that can be categorized into three primary dimensions: infrastructural limitations, institutional barriers, and individual-level factors.

Barriers to ICT Implementation

Infrastructural Deficits: The successful adoption of ICTs in higher education is heavily dependent on reliable physical infrastructure. Research by Oketunji (2000) & Kamba (2008) has demonstrated that many universities, particularly those in rural areas, struggle with inconsistent electricity supply and inadequate ICT facilities. These challenges are compounded by insufficient hardware resources and slow internet connectivity, which Bisht (2013) and Pittman & Gaines (2015) identify as major obstacles to effective technology integration in academic settings.

Technical and Human Resource Gaps: Effective ICT implementation requires more than just physical resources; it demands adequate human capital. Harrell & Bynum (2018) highlight the critical shortage of qualified IT support staff across many institutions, leading to poor system maintenance and limited technical assistance. Furthermore, Oyesika & Oduwole's (2004) research reveals that many students lack fundamental ICT competencies due to inadequate training opportunities, creating a significant barrier to technology adoption.

Behavioral & Psychological Factors: The human dimension of technology adoption cannot be overlooked. Hatlevik et al. (2018) emphasize that low self-efficacy among both students and faculty members often leads to resistance against new technologies. This psychological barrier is closely tied to the concept of perceived usefulness, which Hung et al. (2011) identify as a crucial determinant of technology acceptance in educational contexts.

ICT Enablers of Knowledge Exchange

ICT Tools: Modern educational technology offers numerous tools that facilitate knowledge exchange. Toro and Joshi (2013) demonstrate how web-based platforms, such as intranets and discussion forums, enhance collaborative learning by enabling asynchronous communication and resource sharing. Similarly, Ofori-Dwumfuo & Kommey (2013) highlight the importance of digital repositories in preserving institutional knowledge for future generations. In crisis situations, Yates & Paquette (2011) found that social communities served as vital platforms for rapid knowledge dissemination and problem-solving.

ICT Infrastructure: The foundation for effective knowledge exchange lies in robust ICT infrastructure. Bwalya's (2009) research indicates that universities with high-speed internet connectivity experience up to 40% more knowledge-sharing activities among students and faculty. Furthermore, Cheng et al. (2009) document how cloud computing solutions can reduce knowledge retrieval times by 50%, significantly enhancing research efficiency and collaborative potential.

ICT Skills: The human capacity to utilize available technologies effectively remains paramount. Olatoye (2019) argues that digital literacy, ranging from basic computer skills to advanced data analysis capabilities, is essential for meaningful participation in modern knowledge economies. This perspective is supported by Susana et al. (2009), who found that students with strong ICT skills contribute up to 60% more content to institutional knowledge bases than their less-skilled peers.

Students' Perspectives towards ICT for Knowledge Sharing

In institutions of higher learning, technology serves as a key driver for enhancing teaching, learning, and knowledge-sharing practices. The integration of Information and Communication Technologies (ICTs) has revolutionized how students access information, collaborate, and disseminate knowledge. Successful implementation and meaningful use of ICTs in education are influenced by several factors, including the availability and accessibility of technology, as well as the presence of adequate technical and administrative support (Al-Ruz & Khasawneh, 2011; Fu, 2013; Lin et al., 2012; Srivastava et al., 2014). Furthermore, users' attitudes and perceptions toward technology play a critical role in determining the extent of ICT use in academic settings (Abedalaziz et al., 2013; Pelgrum, 2001). The Technology Acceptance Model (TAM), developed by Davis et al. (1989), is one of the most widely used frameworks in explaining user behavior and attitudes towards ICTs. TAM posits that an individual's intention to use a technology is primarily influenced by two key beliefs: perceived usefulness and perceived ease of use. Perceived usefulness is defined as the degree to which an individual believes that using a particular system would enhance their performance, while perceived ease of use refers to the degree to which a person believes that using the system would be free of effort (Olatoye, 2021; Wong et al., 2013). Attitudes towards ICT, shaped by these perceptions, determine how students engage with digital tools for knowledge sharing and collaborative learning (Edmunds et al., 2012). Although many studies have employed quantitative methods to investigate user acceptance of ICT, there is growing recognition of the value of mixed-method approaches. For instance, Smarkola (2011) argues that integrating qualitative insights with quantitative data provides a more holistic understanding of users' experiences. Similarly, Silin & Kwok (2017) emphasize that qualitative findings can help explain inconsistencies in quantitative results, thus enhancing the depth and validity of research conclusions.

Siragusa & Dixon (2008) examined undergraduate students' attitudes towards ICT use and found contrasting experiences. While survey data suggested students found ICT interaction helpful and easy, interviews revealed that some students experienced anxiety and intimidation when using technology (Silin & Kwok, 2017). These findings indicate that perceptions of ICT are not uniform and are influenced by individual confidence, experience, and support systems. Moreover, research shows that students' perceived usefulness and ease of use significantly impact their willingness to engage with ICT tools for academic purposes. When students find ICTs user-friendly and beneficial for learning, they are more likely to use them for collaborative tasks, self-directed learning, and knowledge sharing (Wong et al., 2013). Nevertheless, several barriers remain, including ICT competency, unstable internet connectivity, and lack of technical support, all of which can hinder effective ICT adoption (Silin & Kwok, 2017). Self-efficacy theory is another important lens for understanding students' engagement with ICT. Self-efficacy refers to an individual's belief in their ability to successfully execute tasks. For first-year university students with limited exposure to academic technologies, high levels of ICT self-efficacy can positively influence their attitudes and increase their likelihood of using ICT for academic collaboration and knowledge sharing (Bandura, 1997). However, limited confidence and lack of prior experience may negatively impact students' engagement with

digital platforms. While much of the existing research on ICT use in higher education generalizes findings across all undergraduates, there is a notable lack of studies focusing specifically on first-year students, especially within African institutions. This gap is significant because first-year students often face unique transitional challenges and may require more targeted digital support. Locally, few studies have explored the role of ICT in promoting knowledge exchange among this cohort. Empirical evidence from Sub-Saharan Africa underscores the potential of ICTs in promoting student engagement. For example, a study at the University of Ghana reported that 99% of health sciences students demonstrated ICT literacy, and 93% reported using digital tools for academic study, highlighting a strong correlation between digital confidence and ICT engagement (Appiah et al., 2022). Similarly, in Ethiopia, undergraduate students who had undergone formal ICT training or enrolled in IT-related courses demonstrated significantly higher usage of digital tools for research, information-seeking, and collaborative learning (Mekonnen et al., 2022). These findings emphasize the importance of institutional strategies that support ICT readiness and digital confidence, particularly among first-year students. Efforts to improve ICT infrastructure, provide access to digital learning platforms, and offer tailored training programs will not only enhance students' technological skills but also promote a culture of academic collaboration and open knowledge exchange.

THEORETICAL FRAMEWORKS ON ICT-MEDIATED KNOWLEDGE EXCHANGE

Technology Acceptance Model (TAM) and Theory of Reasoned Action (TRA)

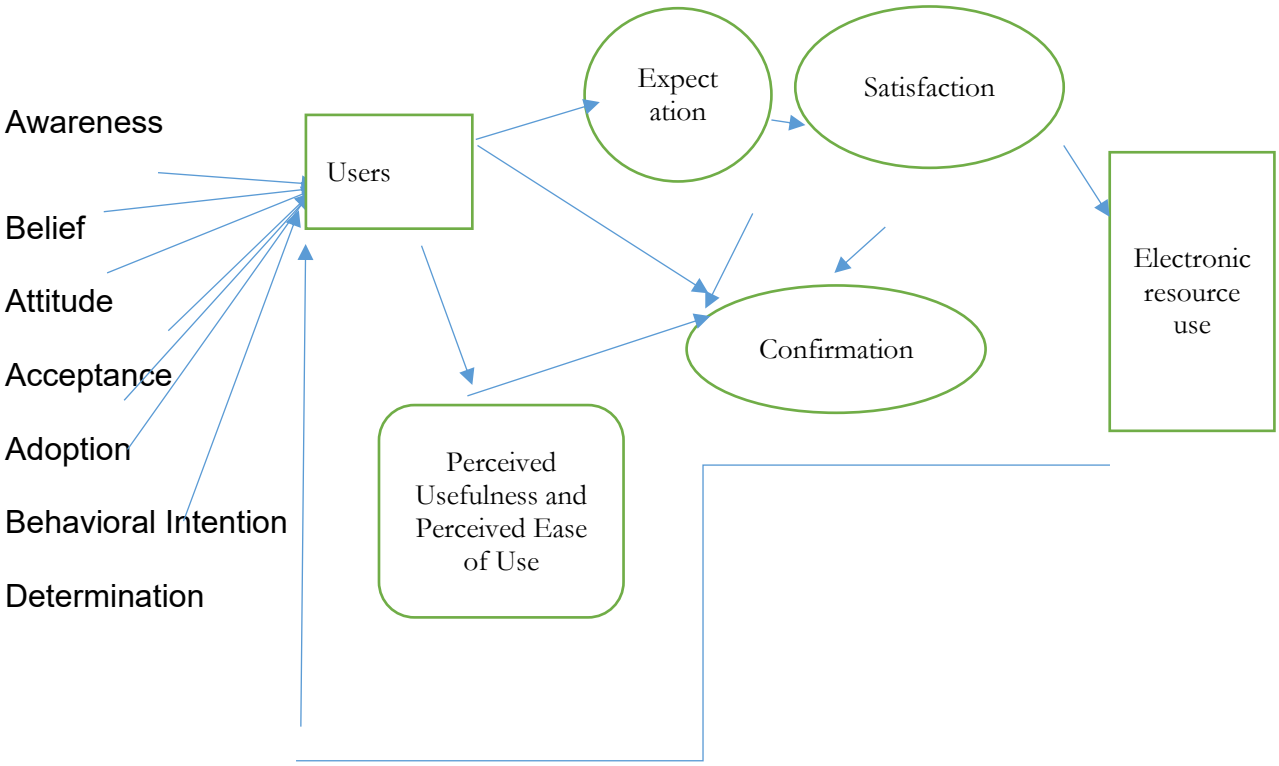
The Technology Acceptance Model (TAM), grounded in the Theory of Reasoned Action (TRA), provides a foundational framework for understanding how higher education students adopt and use ICT tools for knowledge exchange. TAM posits that two core constructs, perceived usefulness (PU) and perceived ease of use (PEOU), significantly influence users' attitudes and intentions toward technology adoption (Davis, 1989; Venkatesh et al., 2003). In higher education, these constructs help explain how students view ICT tools such as learning management systems (LMS), institutional repositories, and social platforms as vehicles for co-creating and distributing knowledge. According to Olatoye (2020), A study conducted in selected South African universities investigated students' ICT competencies, access, and attitudes, finding that awareness of digital resources shaped perceptions of usefulness, which strongly influenced intentions to use ICTs for academic purposes (Determinants of Undergraduate Students' Attitude). Similarly, TAM was employed to assess students' readiness for online learning in Open and Distance e-Learning (ODeL), where PU and PEOU were significant predictors of technology adoption (Makhitha & Mbedzi, 2024). At historically disadvantaged universities, TAM also explained faculty members' ICT adoption behavior. Results showed that positive attitudes toward ICTs substantially influenced the intention to integrate technology into teaching, thereby enhancing students' access to shared learning materials (Technology Acceptance) (Ahmed et al, 2021). It is germane to conclude that undergraduate students need to develop their ICT literacy skills and incorporate their values in their use of electronic resources. Furthermore, although the universities surveyed have provided the required e-resources for undergraduate students, the respondents have yet to fully utilize them due to hindrances posed by demographic factors and a lack of ICT literacy. Hence, students did not seek to optimize their use of e-information resources to fulfill their academic and other information needs, which negates the assumption of the theories that users of technology should embrace and adopt e-information resources. However, the theories used in this study met the psychological, academic, social, and interpersonal needs of the respondents to build their capacity, which the electronic resource infrastructure is primarily designed to provide. Hence, to achieve the postulated goals of the theories, it is recommended that the management of the surveyed universities create avenues for mass enlightenment campaigns on the use and benefits of E-resources among undergraduate students through training and retraining, seminars, and workshops. To do justice to the implementation of the theories adopted for this study, a new interactive model on e-resources use is proposed. It also constitutes a contribution to theory. The use of these theories in this review is remarkable in studies on the use of electronic resources to enhance users' productivity and professional output. The new model (Figure 1) outlines the procedure for adopting and using e-information resources among respondents.

Proposed Interactive Model of E-Resource Use in Enhancing Knowledge Exchange

In the context of The Influence of Information and Communication Technologies on Knowledge Exchange Among Higher Education Students, this model proposes an Interactive Model of E-Resource Use to capture the dynamic interplay between technological, individual, and contextual factors that facilitate or hinder knowledge sharing in higher education institutions. Building on TAM, Olatoye (2019) developed an Interactive Model that acknowledges the complex, bidirectional relationships among awareness, belief, attitude, acceptance, and behavioral intention. Unlike linear models, this approach recognizes that once students begin using e-resources,

positive feedback loops strengthen their attitudes and likelihood of continued use. Figure 1: Proposed new interactive model on electronic resources use.

Figure 1:



Source: Olatoye, 2019

The proposed model is an interactive framework that explains the adoption, acceptance, and use of e-resources. Interactive means consenting or relating to a continuous two-way transfer of information between a user and a central point of a two-way communication system. (Webster dictionary). This model explains the conditions influencing users' information needs by showing how structural attributes interact and affect one another in a reciprocal manner. The elements in the model are explained below, and their interactive nature is elucidated. The non-recursive model is typified by causal connections flowing in more than one direction. In non-recursive models, not all endogenous variables need to be fully non-recursive. The main proposition is that, because recursive models are unidirectional, they are not appropriately used in the social sciences because they lack feedback between factors or variables. It is on this premise, therefore, as stated by Paxton (2011), that there is either a direct or indirect relationship between the endogenous variables in the models. The proposed model of users' utilization of electronic information resources is assumed to be a function of several factors or variables, including awareness, belief, attitude, acceptance, adoption, behavioral intention, determination, perceived usefulness, and perceived ease of use. The main strength of the proposed non-recursive model is that once users adopt a particular information resource, it generates a feedback loop among the independent and intervening variables. For example, it was observed in this research that the respondents preferred some e-resources to others (e.g. E-journals, E-books, CD-ROMs, etc.), due to the fact that these respondents derived optimum satisfaction from the use of these e-resources, and the resources are more important for the performance of their academic work and other purposes, and this has consequentially resulted in a positive attitude towards the preferred e-resources. The following are attributes of the new proposed non-recursive interactive model of e-resources use.

Awareness: This is defined as knowledge or perception of a situation or fact. The process of utilization of e-resources begins with awareness of the resource. In this study, therefore, awareness of ICT was acquired through the following means: personal development, student group discussion, formal teaching, and friends and colleagues. As a result of acquiring ICT skills, the respondents have greatly improved their proficiency and gained experience in using e-resources. Olatoye (2019) stated that, for example, the findings revealed that most undergraduate students, i.e., 121 (53.1%), developed themselves through email, while 71 (33.3%) developed their file transfer skills through formal teaching. Also, 72 (35.6%) of the surveyed students learnt Audio and video communication

through friends, while 35 (16.9%) learnt online database management through colleagues. Also, during the in-depth research interview, 60% of the interviewees learnt to use email through personal development, and 40% learnt audio and video communication through friends and colleagues.

Belief: The acceptance that something exists or is true, especially without proof. Scholars and researchers alike have used the TRA and TAM models to explain users' beliefs about accepting technology (Hu, Chau, Sheng, & Yan, 1999; Taylor & Todd, 1995). Also, beliefs influence attitudes, which, in turn, shape intentions, which guide or dictate behaviour (Chau&Hu, 2001).

Attitudes: According to Taiwo (1998), attitudes are inclinations and feelings, prejudices or bias, preconceived notions, ideas, fears, and convictions about any specific topic. He then cited Allport (1935), who states that an attitude is a mental and neutral state of readiness organized through experience, exerting a directive or dynamic influence upon an individual's response to all objects or situations with which it is associated. (Olatoye, 2019) The attitudes and perceptions of undergraduate students towards the use of e-resources were analyzed. The result indicates that 89 (41.4%) of the surveyed undergraduate students believe that E-Resources are readily available for use.

Acceptance: The action of consenting to receive or undertake something offered. In this study, acceptance is supported by TAM theory, which focuses on individual acceptance of technology and uses intention or usage as the dependent variable (Venkatesh et al.,2003).

Adoption: The action or fact of choosing to take up, follow, or use something. From the foregoing, the application of adoption in this thesis was exemplified by the DOI theory, which describes the pattern of adoption, explains the mechanism, and predicts whether an invention (in this case, information technology) will be successful. Adoption entails "full use of an innovation as the best course of action available" (Rogers, 1983). Rogers (1983) and (1995).

Behavioral Intention: This is defined as a person's perceived likelihood or subjective probability of engaging in a given behavior. In this study, TAM postulates that behavioral intention determines the actual use of information technology and has been empirically proven to have high validity.

Determination: the process of establishing something exactly by calculation or research. This article found that users (students) are one of the factors that determine e-resource use. Other empirical studies that support the findings of this research include Adomi (2000), who found that more male students than females used electronic resources. This is because male respondents demonstrate greater determination in using e-resources than their female colleagues.

Perceived Usefulness & Perceived Ease of Use: This is defined as the degree to which a person believes that using a particular system would enhance his or her performance (Davis 1989). From the foregoing, academics in universities and elsewhere will adopt, accept, or use an information system vis-à-vis electronic instructional media based on two beliefs: (1) perceived usefulness (PU) (Davis et al., 1989; Davis,1986), and (2) perceived ease of use (PEOU). Oye, (2014) opined that attitude towards technology becomes more positive when an individual sees the usefulness and ease associated with using electronic instructional media. Empirical evidence suggests that students prefer resources such as e-books, discussion forums, and digital libraries when these tools are perceived as accessible and academically relevant. These preferences reinforce their satisfaction and perceived usefulness, which enhances sustained use of ICTs for collaborative learning (Olatoye, 2019).

This model builds upon the Technology Acceptance Model (TAM), the Unified Theory of Acceptance and Use of Technology (UTAUT), and elements from Connectivism and Learning Organization Theory, and introduces context-specific dimensions relevant to Sub-Saharan African higher education environments (Abedalaziz et al., 2013).

Interactive Model Implications for Higher Education

This interactive model provides a scaffold for policymakers, educators, and ICT administrators to design targeted interventions that address barriers while amplifying enablers of e-resource usage. Further, highlighting sociotechnical integration, the model shifts attention from mere access to purposeful and sustained engagement with ICT tools for academic growth. It can serve as a diagnostic framework in future empirical studies to evaluate readiness, adoption patterns, and long-term impacts of ICT on knowledge exchange.

Extensions of TAM in Sub-Saharan Africa: A Higher Education Perspective

In Sub-Saharan African higher education contexts, the Technology Acceptance Model (TAM) has been extended to reflect socio-technical and infrastructural realities. Ujakpa (2020) proposed an Expanded TAM that includes constructs such as perceived performance, perceived benefits, and external support factors. These additions recognize the relevance of institutional capacity, reliable infrastructure, and localized training in influencing students' acceptance of ICT tools for learning and knowledge sharing. Particularly in higher education,

these constructs help explain why some students adopt digital tools for peer collaboration and academic engagement, while others resist them due to perceived institutional inadequacies (Ujakpa, 2020). In Somalia, a study by Ahmed & Khalif (2021) integrated constructs such as ICT self-efficacy, learning autonomy, and infrastructure availability into a localized TAM framework, and the findings indicated that students' confidence in using digital tools, combined with their ability to manage independent learning tasks, significantly predicted ICT acceptance in university settings. Interestingly, economic barriers such as data costs and device access were not the strongest predictors, suggesting that psychological readiness and institutional support systems (e.g., digital libraries and e-learning units) play a greater role in shaping ICT behavior (Ahmed & Khalif, 2021; Ndebele & Mbodila, 2022).

Integrated Interactive ICT Acceptance Framework for Higher Education

This synthesis points to the need for a more comprehensive and context-sensitive model to explain how ICTs facilitate knowledge exchange in African higher education. Key takeaways include:

Core TAM constructs (Perceived Usefulness and Perceived Ease of Use) remain essential predictors of ICT adoption among students.

Interactive learning models, where feedback and real-time collaboration (e.g., discussion forums, peer assessment tools) are embedded, enhance motivation and knowledge co-construction (Ujakpa, 2020).

Contextualized TAM frameworks acknowledge the influence of infrastructure reliability, administrative support, and cultural learning orientations.

Unified Theory of Acceptance and Use of Technology (UTAUT) extensions incorporate this model's motivational (e.g., effort expectancy) and structural (e.g., facilitating conditions) enablers, which are vital for sustained use. Ajibade et al. (2023) validated the UTAUT model among undergraduate students in Nigeria and found that performance expectancy, effort expectancy, and facilitating conditions were strong predictors of students' intention to use ICTs for academic purposes. Furthermore, constructs such as self-efficacy, attitude, and social influence served as mediators, enhancing sustained engagement with tools such as Learning Management Systems (LMS), institutional repositories, and collaborative platforms (Ajibade et al., 2023).

Thus, this Integrated Interactive ICT Acceptance Framework provides a robust theoretical lens through which higher education institutions in Sub-Saharan Africa can design, implement, and assess technology-enabled knowledge-sharing environments. It underscores the importance of aligning digital infrastructure development with pedagogical strategies, institutional leadership, and student-centered support systems.

METHODOLOGY

This study employs a systematic literature review (SLR) methodology, guided by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework, to examine the influence of Information and Communication Technologies (ICTs) on knowledge exchange among higher education students. The research integrates three key theoretical models: the Proposed Interactive Model of E-Resource Use in Enhancing Knowledge Exchange which provides a framework for understanding how digital resources facilitate collaborative learning and information sharing among students and Technology Acceptance Model (TAM) and Theory of Reasoned Action (TRA) – These theories help assess students' behavioral intentions and actual usage of ICT tools in academic settings. The SLR follows a structured, replicable process to identify, evaluate, and synthesize relevant empirical studies, ensuring methodological rigor and minimizing bias.

Search Strategy and Database Selection

A metadata-informed search strategy was adopted, combining Boolean logic, keyword mapping, and indexed metadata to optimize precision and recall. The following databases were selected for their interdisciplinary coverage of education, ICT, and knowledge management: Scopus, Web of Science, ERIC (Education Resources Information Center), JSTOR, and Google Scholar.

Keyword Construction

Search strings were developed using terms such as: ICT in higher education, Knowledge exchange among students, E-resources and collaborative learning, TAM and TRA in education, Digital literacy and student engagement.

Boolean operators (AND/OR) and truncation (e.g., *"learn*" OR *"exchange*"*) refined the search queries to ensure comprehensive retrieval of relevant literature.

Inclusion and Exclusion Criteria

Identification

- A comprehensive and systematic literature search was conducted across five major electronic databases: Scopus, Web of Science, ERIC, PubMed, and the ACM Digital Library. The search strategy was developed using predefined keywords and Boolean operators related to information and communication technologies, knowledge exchange, and higher education students.
- This initial search yielded 1,845 records. In addition, 27 records were identified through manual searching of reference lists from relevant review articles and seminal studies. This resulted in a total of 1,872 records identified for further screening.

Screening

- Following identification, 325 duplicate records were removed, leaving 1,547 unique records. These records underwent title and abstract screening based on predefined inclusion and exclusion criteria.
- During this stage, 1,329 records were excluded. The primary reasons for exclusion included:

    - Studies conducted outside higher education contexts (e.g., corporate training, primary or secondary education),
    - Studies that discussed ICT in general terms without a direct focus on student learning, collaboration, or knowledge exchange processes.

Eligibility

- The full texts of 218 articles were sought for eligibility assessment. Due to access limitations, 8 full-text articles could not be retrieved. Consequently, 210 full-text articles were assessed in detail against the eligibility criteria.

Exclusion

- Of the 210 full-text articles assessed, 125 reports were excluded for the following specific reasons:

    - Wrong Outcome (n = 58): Studies examined general ICT usage, technology acceptance, or digital literacy without explicitly addressing knowledge sharing, collaboration, or knowledge exchange as a core outcome.
    - Wrong Population (n = 41): Studies focused exclusively on academic staff, administrators, librarians, or K–12 learners, with no disaggregated data relating specifically to higher education students.
    - Wrong Study Design (n = 22): Publications were conceptual papers, narrative reviews, book chapters, or opinion pieces that did not present original empirical findings.
    - Duplicate Publications (n = 4): Multiple reports of the same study were identified, and only the most complete and relevant version was retained.

Inclusion

- Following the rigorous screening and eligibility assessment process, 85 empirical studies met all predefined inclusion criteria and were included in the final synthesis. These 85 studies constitute the evidence base for this systematic review and were subjected to qualitative and theoretical analysis.

Quality Assessment and Ethical Considerations

- To ensure methodological rigor and credibility, several quality assurance measures were applied:

    - Bias mitigation: Only peer-reviewed empirical studies were included, and transparent search and screening protocols were strictly followed.
    - Geographical coverage: Studies from diverse global regions were included to capture variations in ICT adoption and knowledge exchange practices across higher education systems.
    - Ethical compliance: As this study involved secondary data analysis, all procedures adhered to principles of academic integrity, proper citation, and responsible reporting.

Analytical and Theoretical Framework

- The analysis was guided by established technology adoption and learning theories, primarily the Technology Acceptance Model (TAM) and the Theory of Reasoned Action (TRA). These frameworks were used to examine:

1. Perceived Usefulness (PU): The extent to which students perceive ICT tools as enhancing knowledge sharing and academic collaboration.
2. Perceived Ease of Use (PEOU): The degree to which digital platforms are considered user-friendly and accessible.
3. Behavioural Intention (BI): How students' attitudes and perceptions influence their intention to adopt ICT for knowledge exchange.

In addition, the Interactive Model of Electronic Resource Use was employed to explore:

- Patterns of collaborative engagement in digital learning environments,
- Institutional, infrastructural, and pedagogical factors influencing knowledge dissemination and exchange.

Key Findings and Implications

- Synthesis of the 85 high-quality studies revealed several consistent findings:

- ICT significantly enhances knowledge exchange among higher education students through interactive digital platforms such as learning management systems (LMS), MOOCs, and collaborative online tools.
- Core TAM constructs, particularly Perceived Usefulness and Perceived Ease of Use, are strong predictors of students' adoption of digital resources for academic knowledge sharing.
- Persistent barriers include inadequate digital infrastructure, unequal access to technology, and resistance to digitally mediated pedagogical approaches.

PRISMA 2020 Flow Diagram: Figure 2

Identification Records identified from databases (n = 1,845) Records identified from other sources (n = 27) Total records identified (n = 1,872)
Duplicates removed before screening (n = 325)
Screening Records screened (n = 1,547)
Records excluded after title and abstract screening (n = 1,329)
Eligibility Full-text articles sought for retrieval (n = 218)
Full-text articles not retrieved (n = 8)
Full-text articles excluded with reasons (n = 125)
Included Studies included in the systematic review (n = 85)

Conclusion

This study set out to examine the influence of Information and Communication Technologies (ICTs) on knowledge exchange among higher education students through a systematic review of 85 peer-reviewed studies drawn from major academic databases. The findings confirm that ICTs have fundamentally transformed knowledge exchange processes in higher education by enabling interactive, collaborative, and student-centred learning environments. Digital platforms such as learning management systems, social media tools, and e-resources facilitate both synchronous and asynchronous knowledge sharing, thereby enhancing students' academic engagement and learning outcomes. Guided by the Technology Acceptance Model (TAM) and the Theory of Reasoned Action (TRA), the review demonstrates that perceived usefulness, perceived ease of use, and behavioural intention are central determinants of students' adoption and effective use of ICTs for knowledge exchange. Positive student attitudes toward ICT integration were consistently associated with increased collaboration, information sharing, and peer-to-peer learning. However, the review also reveals persistent barriers that undermine the full potential of ICTs, particularly in developing and resource-constrained contexts. These barriers include unequal access to digital infrastructure, limited user training, inadequate institutional support, and unreliable technical systems, all of which contribute to uneven participation in digital knowledge exchange. Importantly, the study highlights that successful and sustainable ICT integration in higher education extends beyond technology availability. Institutional readiness, supportive policies, continuous capacity building, and strategic alignment of ICTs with teaching and learning objectives are critical for maximizing impact. Without these enabling conditions, investments in digital technologies risk underutilization and resistance from both students and academic staff. Adopting a PRISMA-guided approach, this review provides a rigorous and theory-driven synthesis of empirical evidence on ICT-enabled knowledge exchange. The study contributes to Sustainable Development Goal 4 (Quality Education) by advocating for inclusive, equitable access to digital learning opportunities, and aligns with Sustainable Development Goal 9 (Industry, Innovation, and Infrastructure) through its emphasis on resilient ICT infrastructure and innovation capacity within higher education institutions. he findings offer actionable insights for educators, institutional leaders, policymakers, and digital learning designers seeking to strengthen collaborative learning environments and foster sustainable knowledge-sharing cultures in higher education.

Recommendations and Policy Implications Aligned to African Union Agenda 2063

African Union Agenda 2063 envisions *"An Africa whose development is people-driven, relying on the potential of African people, especially its youth, and caring for children."* In this context, higher education and digital transformation are central to building a knowledge-based, innovative, and inclusive continent. The findings of this study directly align with Aspiration 1 (A Prosperous Africa based on Inclusive Growth and Sustainable Development) and Aspiration 6 (An Africa whose development is people-driven, especially youth and women).

Policy-Aligned Recommendations

1. **Strengthening Digital Infrastructure for Inclusive Growth (Aspiration 1)** Higher education institutions should invest in resilient, equitable ICT infrastructure to support student knowledge exchange. This includes expanding broadband connectivity, ensuring access to learning management systems, and providing affordable digital devices. Such investments contribute to inclusive growth by reducing digital divides within and across African higher education institutions.
2. **Institutionalising Digital Literacy and Skills Development (Aspiration 6)** Consistent with Agenda 2063's emphasis on youth empowerment, universities should implement mandatory digital and information literacy programmes for students. These programmes should focus on developing competencies required for academic collaboration, knowledge sharing, and digital innovation, thereby enhancing students' participation in the knowledge economy.
3. **Embedding ICTs into Curriculum and Pedagogy (Aspiration 1 & Aspiration 6)** ICT integration should be strategically embedded within curricula to promote collaborative learning, critical thinking, and innovation. Policy frameworks should encourage curriculum reform that positions ICTs as enablers of student-centred learning and knowledge exchange rather than as peripheral tools.
4. **Capacity Building for Academic Staff (Aspiration 6)** Agenda 2063 underscores the importance of human capital development. Universities should prioritise continuous professional development for academic staff in digital pedagogy and ICT-enhanced teaching.

This will strengthen institutional capacity to support effective knowledge exchange and reduce resistance to technology adoption.

5. **Promoting Knowledge Sharing Ecosystems (Aspiration 1)**
   Higher education policies should encourage the use of collaborative digital platforms that support peer-to-peer learning, interdisciplinary collaboration, and cross-institutional knowledge exchange across African universities. This supports the development of regional knowledge networks aligned with Agenda 2063's vision of continental integration.

Policy Implications for Higher Education Governance

1. **Theory-Driven ICT Policy Design**
   National and institutional ICT policies should be informed by established technology adoption frameworks such as the Technology Acceptance Model (TAM) and the Theory of Reasoned Action (TRA). Policies that enhance perceived usefulness, ease of use, and positive attitudes towards ICTs are more likely to achieve sustained adoption among students.
2. **Equitable Access and Social Inclusion**
   In alignment with Agenda 2063's commitment to social justice and inclusion, ICT policies should explicitly address inequalities in access to digital resources. Special consideration should be given to historically disadvantaged institutions and students from rural or low-income backgrounds.
3. **Sustainable and Coordinated Funding Models**
   Governments and higher education authorities should adopt long-term funding strategies to sustain ICT infrastructure and digital learning initiatives. Fragmented or short-term investments undermine Agenda 2063's goal of sustainable development and institutional resilience.
4. **Monitoring and Evaluation for Impact**
   Policy frameworks should include mechanisms to monitor and evaluate the impact of ICT integration on student knowledge exchange, collaboration, and learning outcomes. Evidence-based policy adjustments will ensure alignment with Agenda 2063's results-oriented approach.
5. **Positioning Higher Education as a Driver of Africa's Knowledge Economy**
   By strengthening ICT-enabled knowledge exchange, higher education institutions can contribute directly to Agenda 2063's vision of an innovation-driven Africa. Policymakers should recognise universities as strategic hubs for digital knowledge production, dissemination, and regional collaboration.

Concluding Policy Alignment State

This study demonstrates that effective ICT integration in higher education is critical to advancing the African Union Agenda 2063's aspirations for inclusive growth, youth empowerment, and sustainable development. Adopting theory-driven, equity-focused, and institutionally supported ICT policies, African higher education institutions can strengthen knowledge exchange ecosystems and contribute meaningfully to Africa's long-term socio-economic transformation.

Acknowledgments: Not Applicable
Statements and declarations: Not Applicable
Ethical considerations: Not Applicable
Declaration of conflicting interest: Not Applicable
Funding statement: Not Applicable

References

Abedalaziz, N., Jamaluddin, S., & Leng, C. H. (2013). Measuring attitudes toward computer and Internet usage among postgraduate students in Malaysia. The Turkish Online Journal of Educational Technology, 12(2), 200–216.

Ahmed, K., & Rana, M. M. (2011). ICTs and knowledge sharing: An overview. International Journal of Computer Applications, 16(5), 1-5.

Ahmed, S. A., & Khalif, A. M. (2021). Understanding student ICT acceptance through self-efficacy and institutional support: A Somali higher education study. arXiv. https://doi.org/10.48550/arXiv.2106.09987

Ahmed, Y. A., Mohamed, M. M., Ali, A. F., Alasso, M. M., & Ahmad, A. D. S. M. N. (2021). Evaluating Students Perspectives on ICT Readiness in Somali Higher Education towards Teaching--Learning Acceptance. arXiv preprint arXiv:2108.11455.

Ajibade, P., Lawal, A., & Ojo, T. (2023). Applying the Unified Theory of Acceptance and Use of Technology (UTAUT) in Nigerian universities. Journal of Educational Technology & Society, 26(2), 102–114.

Ajibade, P., Odunayo, I., & Osei-Bryson, K. M. (2023). Technology adoption among university students in Africa: A UTAUT approach. African Journal of Information Systems, 10(3), Article 1.

Albino, V., Garavelli, A. C., & Schiuma, G. (2004). Knowledge transfer and inter-firm relationships in industrial districts. The Role of Knowledge Transfer, 12(1), 77–90.

Al-Ruz, J. A., & Khasawneh, S. (2011). Jordanian pre-service teachers' and technology integration: A human resource development approach. Educational Technology & Society, 14(4), 77–87.

Appiah, M., Laryea, E. D., & Nyarko, S. H. (2022). Digital literacy and ICT usage among health sciences students at the University of Ghana. BMC Medical Education, 22(1), 144. https://doi.org/10.1186/s12909-022-03296-9

Bandura, A. (1997). Self-efficacy: The exercise of control. Freeman

Bayindir, N., & Inan, H. Z. (2009). ICT use in early childhood education: A review of the literature. Educational Technology & Society, 12(3), 146–153.

Bisht, R. K. (2013). Barriers to ICT implementation in higher education. Journal of Educational Technology Systems, 41(3), 221-238. https://doi.org/10.2190/ET.41.3.c

Boswell, C., & Cannon, S. (2014). Introduction to nursing research: Incorporating evidence-based practice. Jones & Bartlett Learning.

Boyd, D. M., & Ellison, N. B. (2008). Social network sites: Definition, history, and scholarship. *Journal of Computer-Mediated Communication, 13*(1), 210–230. https://doi.org/10.1111/j.1083-6101.2007.00393.x.

Bwalya, K. J. (2009). Digital knowledge infrastructure in developing nations. International Journal of Information Management, 29(1), 33-41. https://doi.org/10.1016/j.ijinfomgt.2008.05.003

Cakir, R. (2012). Technology integration in Turkish higher education. Computers & Education, 58(1), 242-254. https://doi.org/10.1016/j.compedu.2011.08.005

Casimir, G., Lee, K., & Loon, M. (2012). Knowledge sharing: Influences of trust, commitment, and cost. Journal of Knowledge Management, 16(5), 740–753.

Castro, M., & Alemán, E. (2011). The role of ICT in improving teaching and learning in higher education. International Journal of Educational Technology, 2(1), 32–47.

Cheng, M.-Y., Ho, J. S.-Y., & Lau, P. M. (2009). Knowledge sharing in virtual teams. Journal of Computer Information Systems, 50(1), 143-152.

Chikono, T. (2018). ICTs and knowledge sharing in higher education. Journal of Educational Technology, 15(2), 45–60.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319–340. https://doi.org/10.2307/249008

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. Management Science, 35(8), 982–1003.

Delacey, B. J., & Leonard, D. A. (2002). Case study on technology and distance in education at the Harvard Business School. Educational Technology & Society, 5(2), 1–126.

Echenique, E., Molias, L., & Bullen, M. (2015). Students in higher education: Social and academic uses of digital technology. International Journal of Educational Technology in Higher Education, 12(1), 25–37.

Edmunds, R., Thorpe, M., & Conole, G. (2012). Student attitudes towards and use of ICT in course study, work and social activity: A technology acceptance model approach. British Journal of Educational Technology, 43(1), 71–84.

Eid, M. I. M., & Al-Jabri, I. M. (2016). Social networking, knowledge sharing, and student learning: The case of university students. Computers & Education, 99, 14–27. https://doi.org/10.1016/j.compedu.2016.04.007

Fadilah, S. (2013). Bridging knowledge gaps through ICTs. International Journal of Educational Development, 33(4), 512–520.

Fu, J. (2013). ICT in education: A critical literature review and its implications. International Journal of Education and Development using ICT, 9(1), 112–125.

Gasaymeh, A. M. (2018). A review of literature: The use of ICT in higher education. International Journal of Educational Technology, 13(2), 110–129.

Geoffrey, L. (2010). Digital transformation in higher education. Journal of Higher Education Policy, 22(1), 34–50.

Gosper, M., McKenzie, J., Pizzica, J., Malfroy, J., & Ashford-Rowe, K. (2014). Student use of technologies for learning: What has changed since 2010? Australasian Journal of Educational Technology, 30(1), 1–13.

Gyensare, M., & Asare, K. (2012). Intranet use and organizational problem-solving. African Journal of Management, 8(3), 112–125.

Harrell, S., & Bynum, Y. (2018). Factors influencing technology adoption in higher education. Alabama Journal of Educational Leadership, 5, 12-18.

Hatlevik, O. E., Throndsen, I., Loi, M., & Gudmundsdottir, G. B. (2018). Students' ICT self-efficacy. Computers & Education, 122, 103-115. https://doi.org/10.1016/j.compedu.2018.04.006

Hooff, B. V. D., Elving, W. J. L., Meeuwsen, J. M., & Dumoulin, C. (2003). Knowledge sharing in knowledge communities. Journal of Communications Management, 7(3), 75–86.

Hung, M.-L., Chou, C., Chen, C.-H., & Own, Z.-Y. (2011). Learner readiness for online learning. Computers & Education, 57(1), 1184-1192. https://doi.org/10.1016/j.compedu.2011.01.007

Kamba, M. A. (2008). Problems of ICT in Nigerian universities. Journal of Information Technology Impact, 8(2), 69-76.

Kara, A., & Yakar, B. (2008). ICT motivation in higher education. Turkish Online Journal of Educational Technology, 7(4), 12–20.

Kennedy, G., Judd, T., Churchward, A., Gray, K., & Krause, K. L. (2008). First year students' experiences with technology: Are they really digital natives? Australasian Journal of Educational Technology, 24(1), 108–122.

King, W. R. (2009). Collaborative workspaces and learning. Knowledge Management Research, 11(2), 89–102.

Kumaresan, S. (2010). Digital tools for knowledge management. Journal of Library Sciences, 5(1), 30–45.

Kwahk, K. Y., & Park, D. H. (2016). The effects of network sharing on knowledge sharing and innovation performance in university–industry collaboration. Technological Forecasting and Social Change, 113, 69–84. https://doi.org/10.1016/j.techfore.2016.06.007

Lawrence, A. (2019). Impact of information and communication technologies on knowledge sharing among undergraduate students in Delta State University. Library Philosophy and Practice, 2019(1), 1–18.

Lawrence, D. (2019). Digital transformation and the role of ICT in higher education. Journal of Education and Practice, 10(21), 45–56.

Lawrence, T. (2019). ICTs and student cooperation. Journal of Educational Technology Systems, 47(3), 345–360.

Lin, C. S., Wang, C. H., & Lin, C. H. (2012). Investigating the critical factors influencing students' acceptance of mobile learning. Computers & Education, 56(3), 817–827.

Luterbach, K. J., & Brown, C. (2011). Education for the 21st century. TechTrends, 55(2), 27-37. https://doi.org/10.1007/s11528-011-0479-7

Makhitha, K. M., & Mbedzi, T. (2024). The application of the technology acceptance model to determine students' intention to adopt online teaching and learning in South Africa. International Journal of Education Economics and Development, 462–477.

Mbwesa, J. (2002). ICTs and educational access. African Journal of Education, 3(2), 56–70.

Mekonnen, B. G., Tadesse, T., & Mulualem, G. (2022). Predictors of ICT usage among undergraduate students in Ethiopian universities. Education and Information Technologies, 27(1), 561–578. https://doi.org/10.1007/s10639-021-10720-w

Mohd, N., & Zawiyah, M. (2015). Knowledge sharing in HEIs. Malaysian Journal of Learning, 12(1), 78–95.

Ndebele, C., & Mbodila, M. (2022). Examining technology acceptance in learning and teaching at a historically disadvantaged university in South Africa through the technology acceptance model. Education Sciences, 12(1), 54.

Ofori-Dwumfuo, G. O., & Kommey, B. (2013). Digital repositories in Ghanaian universities. Journal of Library Innovation, 4(1), 45-60.

Oketunji, I. (2000). ICT infrastructure in African universities. African Journal of Library, Archives and Information Science, 10(2), 123-135.

Okon, M., Esin, J. I., & Nkoyo, A. A. (2005). The challenges of ICT integration in African universities. Nigerian Journal of Library and Information Science, 6(1), 55–63.

Olatoye, O. I. (2019). Ict literacy skills and demographic factors as determinants of electronic resources use among the undergraduate students in the selected universities the Eastern Cape, South Africa (Doctoral dissertation).

Olatoye, O. I. (2020). Determinants of undergraduate students' attitude and perception towards the use of electronic information resources (EIRs) among undergraduate students in selected universities in Eastern Cape, South Africa. Open Access Library Journal, 7(02), 1.

Olatoye, O. I., Nekhwevha, F., & Muchaonyerwa, N. (2021). ICT literacy skills proficiency and experience on the use of electronic resources amongst undergraduate students in selected Eastern Cape Universities, South Africa. Library Management, 42(6/7), 471-479.

Opeke, R. O., & Onuorah, E. (2013). Staff ICT training in Nigerian university libraries. Library Philosophy and Practice, 2013, 1–15.

Osman, S. (2015). ICTs and spatial barriers in education. Journal of Information Technology Education, 14, 203–220.
Oyesika, O. O., & Oduwole, A. A. (2004). Library technology use in Nigerian universities. Library Review, 53(4), 223-228. https://doi.org/10.1108/00242530410531805
Pelgrum, W. J. (2001). Obstacles to the integration of ICT in education: Results from a worldwide educational assessment. Computers & Education, 37(2), 163–178.
Petrides, L. A., & Nodine, T. (2003). Knowledge management in education: Defining the landscape. The Institute for the Study of Knowledge Management in Education.
Pittman, J., & Gaines, T. (2015). Technology integration in higher education. Journal of Research on Technology in Education, 47(4), 297-315. https://doi.org/10.1080/15391523.2015.1075861
Raab, R. T., Ellis, L., & Abdon, B. R. (2014). ICTs and competitive advantage. International Journal of Educational Technology, 11(2), 134–150.
Rasmus, D. (2003). Knowledge sharing technologies. Harvard Business Review, 81(5), 23–30.
Riege, A. (2005). Three-dozen knowledge-sharing barriers managers must consider. Journal of Knowledge Management, 9(3), 18–35.
Selwyn, N. (2008). An investigation of students' internet use for academic purposes. The Internet and Higher Education, 11(1), 17–27.
Silin, H., & Kwok, L. (2017). Blending quantitative and qualitative data in ICT adoption research. Journal of Educational Technology Research and Development, 65(3), 591–613.
Siragusa, L., & Dixon, K. C. (2008). A preliminary investigation into student experiences of learning technologies. Australasian Journal of Educational Technology, 24(1), 27–44.
Smarkola, C. (2011). The effectiveness of a hybrid technology course in pre-service teacher education. Contemporary Issues in Technology and Teacher Education, 11(2), 1–20.
Smith, S. D., Caruso, J. B., & Kim, J. (2010). The ECAR study of undergraduate students and information technology. EDUCAUSE Center for Applied Research.
Srivastava, S. C., Chandra, S., & Theng, Y. L. (2014). Evaluating the role of ICTs in enhancing knowledge sharing in higher education. Computers in Human Behavior, 39, 84–97.
Susana, M., Peón, J. M. M., & Ordás, C. J. V. (2009). IT competency and knowledge sharing. Journal of Knowledge Management, 13(3), 45-61. https://doi.org/10.1108/13673270910962832
Tochukwu, M. C. (2015). Challenges of implementing ICT in Nigerian universities. International Journal of Modern Education Research, 2(1), 1–5.
Toro, U., & Joshi, M. (2013). Knowledge management systems. *Journal of Computer-Mediated Communication, 18*(4), 450-466. https://doi.org/10.1111/jcc4.12020..
Ujakpa, M. M. (2020). Digital literacy and technology acceptance among university students in Africa: A modified TAM approach. African Journal of Information Systems, 12(3), 201–217.
UNESCO. (2023). Digital learning and transformation of education. https://www.unesco.org/en/digital-education
Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly, 27(3), 425–478. https://doi.org/10.2307/30036540
Wong, K. T., Osman, R., Choo, S. S., & Rahmat, M. K. (2013). Understanding student teachers' behavioral intention to use technology: Technology acceptance model (TAM) validation and testing. International Journal of Instruction, 6(1), 89–104.
Yates, D., & Paquette, S. (2011). Emergency knowledge management. Journal of Knowledge Management, 15(1), 156-168. https://doi.org/10.1108/13673271111108780
Young, P. (2012). Information and communication technology (ICT): Overview and key applications. Journal of Communication and Technology, 10(2), 99–110.

