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Students' Prior ICT Knowledge and its Relationship with Online Learning Implementation in Public Universities in Kenya

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Abstract

This study examined the relationship between students' prior ICT knowledge and online learning implementation in public universities in Kenya. The study was motivated by persistent disparities in students' digital competencies despite substantial institutional investments in online learning platforms. Although universities have increasingly adopted technology-driven education, variations remain in students' ability to effectively engage with digital learning systems. The study sought to determine the level of students' ICT knowledge, assess institutional preparedness, and examine the relationship between ICT competencies and the effectiveness of online learning implementation. The study was conducted in seven purposively selected public universities and targeted both students and institutional staff. A quantitative cross-sectional research design was adopted, and data were collected from 153 respondents (118 students and 35 staff members, comprising 19 registrars and 16 ICT staff) using structured questionnaires, supplemented by key informant interviews. Instrument reliability was confirmed through Cronbach's alpha coefficients ranging from 0.762 to 0.778, while validity was established through expert review and exploratory factor analysis. Data were analyzed using SPSS through descriptive statistics. Guided by the Technology Acceptance Model and Constructivist Learning Theory, the findings indicate that students generally possess basic ICT skills such as computer literacy, internet use, and learning management system navigation, with variation observed in more advanced competencies. The study concludes that students' prior ICT knowledge and institutional support structures are important factors in online learning implementation and recommends strengthening student-focused digital literacy initiatives and institutional capacity-building strategies in Kenya's public universities.

Keys words: *Digital Literacy, E-Learning, ICT Competence, Online Learning Implementation, Public Universities, Students' Readiness.*

1. Introduction

The rapid expansion of digital technologies, accelerated by the COVID-19 pandemic, triggered a global shift from traditional face-to-face instruction toward online and blended learning modalities. This shift went beyond the mere adoption of digital platforms and represented a broader transformation of learning processes, including changes in instructional delivery, student engagement, assessment practices, and access to educational resources. However, the transition also exposed significant disparities in digital readiness across education systems. Globally, emergency remote learning coincided with increased learning inequalities, with learning poverty rising markedly after 2020 (World Bank, 2022). In response, post-pandemic recovery strategies now emphasize strengthening digital infrastructure, access to devices, quality digital content, and human capacity development to support effective and sustainable online learning (World Bank, 2024).



UNICEF similarly highlights that prolonged school closures and unequal access to remote learning tools have underscored the need for inclusive and skills-oriented digital education strategies (UNICEF, 2021).

In sub-Saharan Africa, the transformation of online learning has been constrained by persistent structural and capacity-related challenges. Limited household access to digital devices, high costs of internet connectivity, and uneven network coverage continue to restrict students' ability to participate fully in online learning environments (Mo Ibrahim Foundation, 2021). These constraints have affected not only access but also the quality and effectiveness of online learning in higher education institutions. Although many universities adopted learning management systems (LMS) and videoconferencing technologies, the extent to which these tools translated into meaningful learning experiences has varied considerably, largely due to differences in digital skills among both students and academic staff.

In Kenya, public universities rapidly implemented online learning platforms to sustain teaching, assessment, and academic continuity during and after the COVID-19 disruptions. Despite these efforts, evidence indicates uneven levels of e-readiness across institutions. Studies report gaps in infrastructure, inconsistent access to devices and internet services, and limited systematic capacity building for both staff and students (Omito, 2024). Faculty-level analyses further reveal variations in digital pedagogy skills and confidence in using e-learning tools, suggesting that institutional investments alone are insufficient to guarantee effective online learning (Shisakha, 2024).

Within this context, online learning transformation in Kenyan public universities can be understood as the extent to which digital technologies are not only adopted but also effectively utilized to enhance learning delivery, student engagement, and academic outcomes. A critical yet underexplored factor in this transformation is students' prior ICT knowledge, including basic computer literacy, internet and email use, learning management system navigation, and troubleshooting skills. These competencies shape students' ability to interact with digital platforms, participate actively in online learning activities, and derive educational value from technology-mediated instruction. Strengthening students' foundational ICT skills, alongside institutional support mechanisms, is therefore central to achieving effective, equitable, and sustainable online learning transformation in Kenya's public universities.

1.1 Statement of the Problem

The rapid expansion of online learning in higher education has been widely promoted as a transformative solution for improving access, flexibility, and continuity of instruction. However, in many contexts, the shift to digital learning has not consistently translated into effective or sustainable learning experiences. A key challenge underlying this gap is the uneven level of students' ICT competencies, which directly affects their ability to meaningfully engage with online learning platforms. Despite substantial investments in digital infrastructure and supportive policy frameworks, universities continue to report disparities in students' digital readiness, undermining the effectiveness of educational technology adoption (UNESCO, 2022; OECD, 2023).



In sub-Saharan Africa, higher education institutions have increasingly adopted learning management systems and online delivery tools, yet student participation, engagement, and learning outcomes in online environments remain inconsistent. This inconsistency is largely attributed to limited access to devices, unstable internet connectivity, and, critically, inadequate digital skills among students (Agyemang et al., 2022). While infrastructural constraints are well documented, less attention has been paid to how students' prior ICT knowledge influences the extent to which online learning initiatives achieve their intended transformative outcomes.

In Kenya, public universities rapidly transitioned to online teaching during and after the COVID-19 pandemic. Although this transition ensured instructional continuity, it also exposed persistent gaps in students' digital preparedness, particularly in basic computer literacy, learning management system navigation, and troubleshooting skills (Omito, 2024). Institutional investments in connectivity and digital platforms have therefore not uniformly resulted in effective online learning, as many students continue to experience difficulties in interacting with digital systems and fully benefiting from online instruction (Shisakha, 2024).

The core problem, therefore, is the limited empirical understanding of how students' prior ICT knowledge shapes the effectiveness and sustainability of online learning transformation in Kenya's public universities. Existing studies have largely focused on infrastructural and institutional readiness, leaving a gap in evidence on learner-level digital competence as a determinant of online learning success. This lack of context-specific empirical evidence constrains the development of targeted interventions and policies aimed at strengthening online learning outcomes. Consequently, this study seeks to examine the influence of students' ICT competencies on online learning transformation in Kenyan public universities.

1.3 Research Objectives

The study was guided by the following specific objectives:

1. To determine the level of students' prior ICT knowledge and digital literacy skills in public universities in Kenya.
2. To assess the preparedness of institutional ICT staff and registrars in supporting the adoption and sustainability of online learning platforms in public universities in Kenya.
3. To examine the relationship between students' prior ICT competencies and the effectiveness of online learning implementation in public universities in Kenya.

1.4 Scope of the Study

This study focused on examining the influence of students' prior ICT knowledge on online learning transformation in public universities in Kenya. It was conducted in seven purposively selected chartered public universities to capture variations in institutional contexts and levels of digital adoption. The study targeted students, ICT staff, and registrars as key stakeholders involved in the implementation and support of online learning systems. Core variables examined included students' computer literacy, internet and email use, learning management system proficiency, and basic troubleshooting skills, alongside

institutional preparedness indicators related to ICT support. The scope was limited to public universities because of their large student enrolments, national representation, and strategic role in advancing Kenya's digital higher education agenda.

1.5 Limitations of the Study

The study was subject to several limitations. First, data were collected primarily through self-reported questionnaires, which may have resulted in response bias or overestimation of ICT competencies among participants. Second, the cross-sectional research design limited the ability to establish causal relationships between students' ICT knowledge and online learning effectiveness. Third, inconsistent internet connectivity in some participating universities affected the timeliness of questionnaire completion and submission. Additionally, financial and logistical constraints restricted the inclusion of all chartered public universities in Kenya. Nevertheless, the use of multiple respondent categories and limited triangulation through interviews and document review enhanced the credibility and reliability of the findings.

1.6 Significance of the Study

This study provides empirical evidence on the role of students' prior ICT knowledge in shaping the effectiveness of online learning in Kenya's public universities. The findings are valuable to policymakers, university administrators, and educators in designing targeted digital literacy interventions and strengthening institutional support structures for online learning. The study contributes to the growing body of literature on educational technology adoption in African higher education by foregrounding learner-level digital competence as a critical factor in online learning transformation. Additionally, the findings can inform national higher education policies and capacity-building initiatives aimed at promoting equitable, sustainable, and technology-enhanced learning in line with Kenya's digital education goals.

2. Literature Review

2.1 Theoretical Review

This study is grounded in two key theories: The Technology Acceptance Model (TAM) and the Constructivist Learning Theory. The Technology Acceptance Model (TAM), developed by Davis (1989), serves as the anchor theory for this study. TAM posits that users' acceptance and use of technology are influenced by two major factors perceived usefulness (PU) and perceived ease of use (PEOU). These perceptions shape users' behavioral intentions toward adopting new technologies (Venkatesh & Davis, 2020). In the context of online learning in public universities, students with higher ICT competence are more likely to find digital platforms useful and easy to use, thereby enhancing adoption and sustained engagement (Nura et al., 2023). Empirical studies in Africa and Asia support TAM's applicability in educational contexts, showing that students' prior ICT knowledge significantly affects their perceptions and intentions to use learning management systems (Alamri, 2022). Therefore, TAM provides a robust framework for understanding how ICT literacy influences students' acceptance of online learning technologies in Kenyan universities.



Complementing TAM, the Constructivist Learning Theory emphasizes that learning occurs actively as learners construct knowledge through experiences and interactions (Piaget, 1972; Fosnot, 2013). In online environments, constructivism underscores the need for students to possess adequate ICT skills to engage in self-directed and collaborative digital learning (Lemay et al., 2021). Students with higher digital competence can effectively navigate virtual tools, engage in interactive content, and build knowledge through peer collaboration, which enhances learning outcomes (Mwangi & Wanyoike, 2023). This theory thus reinforces the importance of ICT readiness as a foundation for active, meaningful, and autonomous learning in online settings.

Together, TAM and Constructivist Learning Theory provide a dual lens one focusing on technology adoption behavior and the other on learner-centered engagement essential for understanding the transformative potential of ICT in higher education.

2.2 Empirical Review

The integration of Information and Communication Technology (ICT) into higher education has fundamentally reshaped instructional delivery, learning access, and modes of student engagement worldwide. While digital technologies offer increased flexibility and collaboration opportunities, empirical evidence consistently shows that their effectiveness is highly contingent on students' ICT literacy and readiness. For instance, OECD (2023) and UNESCO (2022) both report that students with stronger digital competencies exhibit higher engagement, autonomy, and learning outcomes in online environments. However, whereas UNESCO emphasizes digital skills as a matter of educational equity, OECD highlights their role in sustaining quality and continuity of learning, suggesting that ICT competence functions both as an access enabler and a performance determinant. In response to post-pandemic disruptions, universities globally have increasingly embedded digital competence development into institutional strategies, focusing on capacity-building for students and faculty alike (World Bank, 2024).

In sub-Saharan Africa, the literature presents a more constrained picture of online learning implementation. Agyemang, Boateng, and Anane (2022) demonstrate that digital readiness across African universities remains uneven, with many students lacking the foundational ICT skills required for effective participation in virtual learning. Similarly, Muganda and Otieno (2023) report that limited ICT proficiency among students reduces their ability to navigate learning management systems, complete online assessments, and engage in interactive learning activities. While both studies attribute these challenges partly to infrastructural constraints, Oketch and Mukhongo (2021) argue that institutional capacity alone does not guarantee effective online learning. Their findings indicate that even in universities with adequate technical infrastructure, learning outcomes remain suboptimal when students lack sufficient ICT competencies. This comparison suggests that learner-level digital skills are as critical as institutional readiness in sustaining online learning initiatives.

Kenyan studies mirror these regional trends while revealing context-specific challenges. Omito (2024) observes that although public universities in Kenya rapidly adopted e-learning platforms during the COVID-19 pandemic, significant disparities persist in students' ICT competencies, particularly in computer literacy, LMS navigation, and troubleshooting skills.



Shisakha (2024) further notes that inconsistent access to training opportunities and digital resources undermines effective integration of online learning tools, even where platforms are available. Collectively, these studies highlight that prior ICT knowledge including basic computer operations, internet use, resource sharing, and problem-solving skills is a critical determinant of students' ability to engage meaningfully in online learning environments.

Despite this growing body of research, much of the existing literature in Kenya and the broader African context has emphasized institutional and infrastructural readiness, often treating student ICT competence as a secondary or assumed factor. There remains limited empirical evidence that explicitly examines how students' prior ICT knowledge influences the effectiveness of online learning transformation, particularly within public universities. This gap constrains the development of learner-centered digital capacity-building strategies. The present study addresses this gap by systematically examining the relationship between students' ICT competencies and online learning implementation in Kenyan public universities.

3. Methodology

This study adopted a quantitative cross-sectional research design to examine students' ICT readiness and its relationship with online learning transformation in Kenya's public universities. The design enabled the collection of standardized data at a single point in time and supported both descriptive analysis of ICT competence levels and inferential examination of relationships among key variables (Saunders et al., 2019). The study was guided by a pragmatist research philosophy and a deductive approach, drawing on established technology adoption theories to empirically test relationships within the higher education context (Venkatesh et al., 2022).

The target population comprised students and institutional staff from the 39 chartered public universities in Kenya. Seven universities were purposively selected to reflect diversity in size, geographic location, and levels of ICT adoption. 153 respondents participated in the study, comprising 118 students and 35 institutional staff, including 19 registrars and 16 ICT staff. Respondents were selected using stratified sampling to distinguish between students and staff categories, followed by simple random sampling within each stratum to enhance representativeness (Nikolopoulou, 2022).

Primary data were collected using structured questionnaires administered to students and staff. Key informant interviews with selected ICT staff and registrars were conducted solely to clarify institutional support mechanisms and contextualize survey findings; interview data were not subjected to statistical analysis and therefore did not alter the study's quantitative orientation. Secondary data were obtained from institutional ICT reports and policy documents to support contextual interpretation.

A pilot study involving 20 respondents was conducted to refine the research instruments. Instrument reliability was assessed using Cronbach's alpha coefficients, which ranged from 0.762 to 0.778, indicating acceptable internal consistency. Content and construct validity were established through expert review and exploratory factor analysis, ensuring that questionnaire items adequately measured the intended constructs.



Data analysis was conducted using SPSS. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize respondents' demographic characteristics and levels of ICT competence. Statistical significance was evaluated at the 0.05 level.

Ethical approval for the study was obtained from the National Commission for Science, Technology and Innovation (NACOSTI). Participation was voluntary, informed consent was secured from all respondents, and confidentiality and anonymity were maintained throughout the research process.

4. Findings and Discussion

4.1 Gender of the Respondents

The findings are illustrated in Table 1

Table 1: Gender of the Respondents

Gender	Frequency	Percent
Male	105	68.6
Female	48	31.4
Totals	153	100

Of the 153 respondents, 68.6% were male while 31.4% were female. This table presents the gender composition of the respondents who participated in the study.

4.2 Age of the Respondents

To enhance clarity, the age distribution of respondents is presented separately by category.

Table 2: Age Distribution of Registrars (n = 19)

Age Group (Years)	Frequency	Percent
31-40	9	47.4
41-50	3	15.8
51-60	6	31.6
61-70	1	5.3
Total	19	100.0

Most registrars were aged 31–40 years (47.4%), followed by those aged 51–60 years (31.6%).

Table 3: Age Distribution of ICT Staff (n = 16)

Age Group (Years)	Frequency	Percent
20-30	3	18.8
31-40	9	56.3
41-50	3	18.3
51-60	1	6.3
Total	16	100.0

More than half of the ICT staff respondents (56.3%) were aged 31–40 years.



Table 4: Age Distribution of Students (n = 118)

Age Group (Years)	Frequency	Percent
15-19	12	10.2
20-25	101	85.6
26-30	4	3.4
31-35	1	0.8
Total	118	100.0

The majority of students (85.6%) were aged 20–25 years, reflecting the typical age range of undergraduate enrolment in public universities.

4.3 Level of Education of Registrars and ICT Staff

Table 5: Highest Level of Education of Registrars and ICT Staff (n = 35)

Qualification	Frequency	Percent
Certificate	5	14.3
Diploma	3	8.6
Degree	15	42.9
Master`s	8	22.9
PhD`s	4	11.4
Total	35	100.0

Most registrars and ICT staff held at least a **bachelor's degree (42.9%)**, while **34.3%** had postgraduate qualifications.

4.4 Level of Course Pursued by Students

Table 6: Level of Course Pursued (n = 118)

Course level	Frequency	Percent
Certificate	1	0.8
Diploma	7	5.9
Degree	110	93.2
Total	118	100.0

The majority of student respondents (93.2%) were enrolled in degree programmes, with a smaller proportion pursuing diploma and certificate courses.

4.5 Position of Registrars and ICT Staff

Table 7: Positions Held by Registrars (n = 19)

Position	Frequency	Percent
Lecturer	6	31.6
ICT staff	7	36.8
Registrar	2	10.5
Administrator	4	21.1
Total	19	100.0

Table 8: Positions Held by ICT Staff (n = 16)

Position	Frequency	Percent
ICT staff	14	87.5
Lecturer	2	12.5
Total	16	100.0

Most ICT staff respondents (87.5%) were directly involved in ICT-related roles within their institutions.

4.6 Number of Years at the University (Staff)

Table 9: Years of Service at the University (n = 35)

Years	Frequency	Percent
Less than 5	8	22.9
5-10	14	40.0
11-15	10	28.6
16-20	3	8.6
Total	35	100.0

A majority of staff respondents (68.6%) had worked at their institutions for more than five years.

4.7 Students' Prior ICT Knowledge

Table 10: Students' Prior ICT Knowledge (n = 118)

Statement	Mean	Std. Dev
Possess computer literacy skills	1.466	0.623
Ability to share resource on LMS	1.754	0.826
Ability to upload/download LMS content	1.653	0.744
Ability to use internet and email	1.297	0.495
Ability to troubleshoot computers	1.831	0.972

Lower mean scores indicate stronger agreement.

The results indicate that students strongly agreed that they could use the internet and email (M = 1.297) and possessed basic computer literacy skills (M = 1.466). They also agreed that they could upload and download learning materials, share resources on LMS platforms, and perform basic troubleshooting tasks.

4.8 Relationship between Students' Prior ICT Competencies and the Effectiveness of Online Learning Implementation

The third goal of research aimed to explore the connection between the previous ICT skills

of learners and the success of implementing online learning at public universities in Kenya. The results of the study imply that the initial knowledge of ICT plays a vital role in the success in learning online. According to Table 10, learners performed well in basic computer literacy, internet and email applications, sharing learning resources through learning management system (LMS) and uploading and downloading learning materials. The lowest mean was for online communication with the internet and email ($M = 1.297$), while the computer skills got $M = 1.466$, uploading and downloading materials – $M = 1.653$, and using the learning management systems (LMS) for exchange of materials using LMS – $M = 1.754$. The higher mean for computer troubleshooting ($M = 1.831$) signifies more variation in the indicated competence about the ICT skill level. Since lower means are connected with more certainty, the results denote that learners received sufficient basic knowledge of ICT skills.

The study results point out that competencies mentioned are tightly related to students' capability to access online learning platforms, and the process of digital learning. Those students who have Internet and e-mail access, manage the functions of an LMS (Learning Management System) platform, upload, and/or download learning materials, and share learning materials are much better equipped to participate in learning. Hence, the results mentioned suggest that even basic ICT know-how forms a basis for the successful implementation of online learning.

The results around the role of institutional support confirm this connection, since ICT staff and registrars were the main parties engaged in the process of promoting and sustaining online learning implementations. Saliently, in terms of methodology, institutional staff were included as the source of information concerning ICT support mechanisms, and the conclusion of the study acknowledges the support role of ICT staff and registrars in online learning implementation. Thus, it can be concluded that successful online learning implementation is dependent on ICT competences of learners and institutional support facilities.

Moreover, the results show that the students' previous ICT skills and support provided by the institution are key elements of successful online learning in public universities in Kenya. Good basic competencies of using the internet, knowledge about computers, and using LMSs help students to be more efficient in online learning, while studying institutions offer ICT support helping to utilize the digital learning systems. Thus, the results confirm the hypothesis of the research that online learning process depends on both the presence of modern technologies and ability of the students to use them effectively. Nonetheless, since this paper does not provide any statistical data on the correlation or regression analysis as

described in the methodology section, the results achieved in this paper establish the evidence-based correlation rather than a statistically proven causal connection.

5. Conclusion and Recommendations

5.1 Conclusions

The study established that students in Kenya's public universities generally possess basic ICT competencies, including computer literacy, internet use, and learning management system navigation. These skills are essential for participation in online learning environments. However, the findings also indicate variation in more advanced competencies, such as troubleshooting, suggesting areas where further skills development may be beneficial. In addition, the study found that institutional ICT staff and registrars play an important supportive role in the implementation of online learning systems. Overall, the findings suggest that online learning transformation in public universities depends not only on institutional infrastructure but also on the level of students' prior ICT knowledge.

5.2 Recommendations

Based on the study findings, public universities in Kenya should strengthen student-focused digital literacy initiatives, particularly targeting areas beyond basic ICT use, such as troubleshooting and effective use of learning management systems. ICT skill development may be integrated into student orientation programmes and embedded within academic curricula. Universities should also continue to support ICT staff and academic personnel through ongoing professional development to enhance online learning support. Further research is recommended to examine how different levels of ICT competence relate to specific online learning outcomes using longitudinal or experimental designs.

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