

E-Learning as a Catalyst for Change in Tanzania's Higher Education System

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Abstract

Original Research Article

E-learning, defined as the use of electronic technologies to deliver, manage, and enhance education, has increasingly become a transformative force in education systems worldwide. In Tanzania, the higher education system has faced several challenges, including limited access to quality education, inadequate infrastructure, and resource constraints. This study examined e-learning adoption as a catalyst for change in Tanzania's higher education system, focusing on the availability of e-learning platforms, the usage of digital tools, and institutional support for e-learning. It also explored the potential benefits and future prospects of e-learning, including improvements in learning outcomes, expanded access to higher education, and enhanced teaching methods. Furthermore, the study analysed the challenges and barriers affecting the effective implementation of e-learning, such as technological and infrastructure limitations, financial and institutional constraints, and digital literacy issues. A mixed-methods approach was employed, utilizing surveys and interviews to gather data from a sample of 304 respondents, including students, faculty members, and institutional administrators. The findings revealed that while e-learning platforms were available in most institutions, their accessibility and effectiveness varied significantly due to limited infrastructure and inconsistent institutional support. Digital tools were widely used, though engagement levels differed based on faculty preparedness and student readiness. The study further found that e-learning contributed to improved learning outcomes and increased higher education accessibility, particularly for students in remote areas. However, financial constraints, poor internet connectivity, and inadequate training programs remained major obstacles to effective implementation. The study recommends enhancing institutional investment in digital infrastructure, expanding training initiatives for educators and students, and fostering collaborations between the government and private sector to support sustainable e-learning development. These findings underline the transformative potential of e-learning in Tanzania's higher education sector while highlighting the need for strategic interventions to address existing challenges.

Keywords: E-Learning Adoption, Digital Tools, Learning Management Systems (LMS), Institutional Support, Technological Barriers, Digital Literacy, Online Learning, Student Engagement, Internet Connectivity.

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1. INTRODUCTION AND BACKGROUND

E-learning, defined as the use of electronic technologies to deliver, manage, and enhance education, has increasingly become a transformative force in education systems worldwide. In Tanzania, the higher education system has faced several challenges, including limited access to quality education, inadequate infrastructure, and resource constraints. However, the integration of e-learning in Tanzania's higher education institutions offers a promising avenue for addressing these challenges and creating a more inclusive and accessible

education system. E-learning has the potential to catalyse significant changes in the way education is delivered, accessed, and experienced by students and educators alike. This study explored the role of e-learning as a catalyst for change in Tanzania's higher education system, examining how its adoption can enhance teaching, improve learning outcomes, and address barriers related to access and affordability. By investigating the current state of e-learning in Tanzanian higher education, the study aimed to provide insights into how this educational technology can contribute to the development of a more equitable and effective system for higher learning.

The global higher education system faces significant challenges, particularly in rural areas, including inadequate infrastructure, teacher shortages, and limited access to quality education (Mustafa et al., 2024, Saha et al., 2021). The COVID-19 pandemic has exacerbated these issues, exposing the unpreparedness of many institutions to shift to online learning (Bhagat and Kim, 2020, Saha et al., 2021). Other concerns affecting higher education quality include outdated curricula, memory-based examinations, lack of research environments, and inconsistent government policies (Ariff et al., 2007). To address these challenges, institutions need to improve infrastructure, train teachers, develop appropriate content, and build collaborations (Saha et al., 2021). Additionally, focusing on faculty quality, technological infrastructure, accreditation, and good governance can enhance overall higher education quality (Ariff et al., 2007). In rural areas, specific strategies such as infrastructure improvements, financial assistance, digital literacy programs, and customized curricula are needed to effectively integrate ICT and bridge the digital divide (Mustafa et al., 2024).

Tanzania's higher education system faces significant challenges in delivering quality education, particularly in rural areas. Limited physical infrastructure, inadequate learning resources, and poor access to technology hinder effective learning (Mahai, 2023, Mahundu). The COVID-19 pandemic worsened these issues, forcing a rapid shift to e-learning that exposed inequalities in digital access and skills (Mahundu, Msigwa, 2020). Rural women, in particular, face socio-cultural and financial barriers to participation in higher education (Mahai, 2023). Despite investments in technology-enhanced learning, many institutions struggle to realize its benefits due to insufficient IT infrastructure, lack of faculty training, and limited student support (Mahundu, Oroma and Mduma, 2013). To address these challenges, recommendations include improving rural infrastructure, investing in low-tech solutions, focusing on vulnerable populations, and developing comprehensive e-learning ecosystems (Mahundu, Msigwa, 2020). These efforts are key for building a resilient education system capable of adapting to future disruptions.

E-Learning, leveraging digital technologies for remote education, offers a viable solution to educational challenges in developing countries. It provides flexible, scalable, and cost-effective learning opportunities, bridging the gap between urban and rural students (Siddiqui and Masud, 2012, Kumar, 2007). E-Learning can enhance education quality through interactive and personalized experiences, utilizing technologies like satellites, internet, and mobile devices (Siddiqui and Masud, 2012). However, implementing eLearning in developing countries faces challenges such as poor network infrastructure, lack of ICT knowledge, and weak content development (Aung and Khaing, 2016). Success factors include financial support from governments, student motivation, and well-trained tutors (Naresh and Reddy, 2015). Despite these challenges, eLearning has significant potential to address educational disparities and meet the growing demand for education in developing nations, particularly in rural areas (Naresh and Reddy,

2015, Kumar, 2007).

E-Learning in Tanzania's higher education institutions offers potential solutions to challenges like limited resources and staff shortages (Oroma and Mduma, 2013). However, implementation faces significant hurdles including management support, technology access, and cultural attitudes (Ndume et al., 2008). Content delivery is hindered by distributed learning environments, large data volumes, and bandwidth limitations (Mahenge and Msungu, 2021). Research trends show growing interest in E-Learning, with students as the primary focus and quantitative methods dominating (Mtebe and Raphael, 2018a). Internet access and lack of support remain major obstacles (Mahenge and Msungu, 2021). While E-Learning is increasingly accepted in higher education, doubts persist about online course certificates (Ndume et al., 2008). To address these challenges, a cost-effective strategy leveraging mobile edge computing and cloud computing has been proposed (Mahenge and Msungu, 2021). This approach capitalizes on the high ownership of mobile devices among students, with over 75% possessing multiple devices capable of supporting M-learning (Mahenge and Msungu, 2021).

E-learning has emerged as a transformative force in education, offering personalized and interactive learning experiences (Ayu, 2020). Artificial Intelligence (AI) plays a crucial role in tailoring educational content to individual learners' needs and preferences (Imran et al., 2024, Jian, 2023). Adaptive Intelligent Tutoring Systems (ITS) integrate AI and data analytics to enhance learning outcomes by adjusting content based on learners' cognitive abilities and learning styles (Phobun and Vicheanpanya, 2010). These systems leverage extended reality technologies like VR, AR, and MR to create immersive learning environments (Imran et al., 2024). While e-learning cannot replace traditional teaching methods, it complements them by improving quality and efficiency (Ayu, 2020). However, challenges remain, including implementation costs and the need for personalized, interactive learning environments (Phobun and Vicheanpanya, 2010). As AI continues to evolve, it promises to revolutionize education by providing increasingly tailored and engaging learning experiences (Jian, 2023).

Recent studies have assessed the integration of e-learning technologies in higher education institutions. While universities are increasingly adopting e-learning platforms to enhance teaching and learning processes (Asad et al., 2021, Ayu, 2020), challenges persist. Many institutions lack adequate e-learning infrastructure and resources (Mtebe and Raphael, 2018b, ADELABU et al., 2014). Although students and faculty often possess personal devices, their utilization for educational purposes remains limited (ADELABU et al., 2014). Barriers to effective implementation include insufficient institutional support, limited resources, and lack of teacher competencies (Mtebe and Raphael, 2018b, ADELABU et al., 2014, Asad et al., 2021). However, e-learning technologies have shown potential to improve student engagement, provide interactive materials, and facilitate access to information (Ayu, 2020). To address these challenges,

recommendations include organizing training for faculty on ICT use, increasing government funding for infrastructure development, and encouraging integration of e-learning technologies into course curricula (Mtebe and Raphael, 2018b, ADELABU et al., 2014, Asad et al., 2021).

The adoption of e-learning in developing countries faces numerous challenges. Key obstacles include insufficient internet connectivity and inadequate ICT infrastructure (Mwakyusa and Mwalyagile, 2016, Mutisya and Makokha, 2016, Aldowah et al., 2015). Limited digital literacy among students and faculty is another significant barrier (Mwakyusa and Mwalyagile, 2016, Mutisya and Makokha, 2016, Aldowah et al., 2015). Financial constraints, such as lack of computers and laptops, hinder e-learning implementation (Mutisya and Makokha, 2016, Aldowah et al., 2015). Institutional policies, including the absence of e-learning policies and lack of technical and managerial support, impede adoption (Mwakyusa and Mwalyagile, 2016, Aldowah et al., 2015). Other challenges include heavy workloads for lecturers, copyright issues, and cultural barriers (Mutisya and Makokha, 2016, Aldowah et al., 2015). To overcome these obstacles, universities must invest in infrastructure, content development, capacity building, and awareness enhancement (Mutisya and Makokha, 2016).

E-learning has emerged as a powerful tool to enhance learning outcomes and promote inclusive education. It offers cost-effective, self-paced, and consistent learning experiences (Arunachalam, 2014). Effective e-learning strategies include pedagogical design, technology integration, collaboration, and continuous assessment (Wagino et al., 2024). E-learning can support inclusive education by providing equal opportunities and addressing diverse educational needs (Radović and Bodroški, 2010). In developing countries like Pakistan, e-learning has the potential to promote inclusion in rural areas, although challenges such as limited technological knowledge exist (Muhammad et al., 2024). The implementation of e-learning requires good policy and financial support to ensure successful interaction with inclusive education (Radović and Bodroški, 2010). As education continues to embrace digital transformation, e-learning serves as a valuable resource for educators and stakeholders, fostering improved learning outcomes in diverse educational settings (Wagino et al., 2024).

Tanzania's higher education system faces several challenges, including limited access to quality education, inadequate infrastructure, and a shortage of teaching resources. Many students, particularly those in rural and underserved areas, struggle to access higher education due to financial constraints and geographical barriers. Additionally, traditional face-to-face learning methods often fail to meet the increasing demand for higher education, leading to overcrowded classrooms and limited student engagement. E-learning has emerged as a potential solution to these challenges, offering flexible and cost-effective ways to deliver education. The adoption of digital learning platforms, online courses, and virtual classrooms can enhance accessibility and improve learning outcomes. However, despite its potential, the implementation of e-

learning in Tanzania remains slow and faces several obstacles, such as limited internet connectivity, inadequate technological infrastructure, lack of digital literacy among students and educators, and insufficient institutional support. Given these challenges, there is a need to investigate the current state of e-learning in Tanzania's higher education institutions and assess its potential as a catalyst for change. This study sought to identify the key barriers to e-learning adoption and explore strategies to enhance its effectiveness in transforming the higher education system. Understanding these factors would help in developing policies and frameworks to facilitate the successful integration of e-learning and ensure that it contributes to a more inclusive and efficient education system in Tanzania.

The main objective of this study was to examine the role of e-learning as a catalyst for change in Tanzania's higher education system. Specifically, the study evaluated the current state of e-learning adoption in Tanzania's higher education institutions by assessing the availability of digital learning platforms, resources, and infrastructure. It also explored the potential benefits and future prospects of e-learning in transforming higher education by improving learning outcomes, increasing accessibility, and enhancing teaching methodologies. Moreover, the study analysed the challenges and barriers that affected the effective implementation of e-learning, including issues related to internet connectivity, digital literacy, financial constraints, and institutional policies.

The study made several significant contributions to the understanding of e-learning in Tanzania's higher education landscape. It provided a comprehensive evaluation of the current adoption levels of e-learning across Tanzanian universities, identifying key implementation gaps and institutional readiness. The research uncovered valuable insights into the transformative potential of e-learning, particularly in enhancing accessibility and quality of education, while also revealing critical barriers such as technological infrastructure limitations and digital literacy challenges. Furthermore, the study developed evidence-based recommendations that could guide policymakers and educational institutions in formulating effective strategies for sustainable e-learning integration, ultimately contributing to the ongoing discourse on digital transformation in African higher education systems.

2. METHODOLOGY

This study employed a mixed method research design to examine the role of e-learning as a catalyst for change in Tanzania's higher education system. A mixed-methods approach was used, combining both quantitative and qualitative data collection techniques to ensure a comprehensive analysis of e-learning adoption, challenges, and potential benefits.

The target population consisted of students, lecturers, and administrators from various higher education institutions in Tanzania. A sample size of 304 respondents was selected using stratified random sampling to ensure representation from different institutions and stakeholder groups. Data were collected through structured questionnaires, which were used to gather quantitative

data, and semi-structured interviews, which provided qualitative insights into the challenges and future prospects of e-learning.

The collected data were analysed using statistical methods for quantitative responses, including descriptive statistics such as frequencies and percentages. Qualitative data were analysed using thematic analysis to identify key patterns and themes related to e-learning adoption and challenges. Ethical considerations, including informed consent and confidentiality, were upheld throughout the study to ensure the credibility and integrity of the research findings.

3. RESULTS AND DISCUSSIONS

This section presents and discusses the findings of the study based on data collected from a sample of 304 respondents, including students, lecturers, and administrators from various higher education institutions in Tanzania. The analysis focuses on the current state of e-learning adoption, the challenges hindering its effective implementation, and its potential benefits in transforming higher education. The results provide valuable insights into the extent to which e-learning has been integrated into academic institutions, the obstacles faced by stakeholders, and the opportunities it presents for improving accessibility, quality, and efficiency in higher education. The discussion further interprets these findings in relation to existing literature and theoretical perspectives, highlighting key trends and implications for policy and practice.

3.1 E-learning Adoption in Tanzania's Higher Education Institutions

The study examined the adoption of e-learning in Tanzania's higher education institutions by assessing the availability of e-learning platforms, the usage of digital tools, and the level of institutional support for e-learning. It was found that various institutions had implemented learning management systems and online course materials, though their accessibility and effectiveness varied. The usage of digital tools among students and lecturers differed, with some actively engaging in online learning while others faced challenges due to limited resources or skills. In addition, institutional support, including policies, funding, and training programs, played a crucial role in determining the success and sustainability of e-learning adoption.

3.1.1 Availability of E-learning Platforms

The study as in figure 1, explored the availability of e-learning platforms in Tanzanian higher education institutions, focusing on Learning Management Systems (LMS), online course materials, and virtual classrooms. The findings revealed a mixed picture regarding the accessibility and usage of these platforms. A majority of the respondents, 120, reported that e-learning platforms were fully available in their institutions. Respondents from institutions where LMS and online course materials were widely accessible emphasized how these tools had enhanced their learning experiences. One respondent from

the University of Dar es Salaam stated:

"...the introduction of the Learning Management System has revolutionized how we access course materials. We no longer have to wait for physical handouts, as everything is readily available online. This system has also made interaction with lecturers more efficient, allowing us to submit assignments and receive feedback much faster than before..."

Many respondents highlighted the use of virtual classrooms that facilitated real-time learning. A lecturer at the Open University of Tanzania remarked:

"...virtual classrooms have significantly improved our teaching methods. Not only can we engage with students in real-time, but we can also provide instant feedback and encourage more participation, even from students in remote areas..."

However, a substantial proportion of respondents, 145, reported that e-learning platforms were partially available at their institutions. This category included institutions where LMS and online resources were not consistently implemented or were limited in scope. A student from the University of Dodoma noted:

"...we have access to online course materials, but not all professors use the platform regularly. Some still rely heavily on traditional face-to-face teaching methods, which can be challenging for those of us who prefer or need online access..."

Another respondent added:

"...while we have a basic LMS, it's not as interactive or comprehensive as we would like. Sometimes, we have to rely on external platforms or social media to access learning materials..."

In contrast, a smaller group of respondents, 39, indicated that e-learning platforms were not available at their institutions. These institutions faced significant barriers, including poor infrastructure, lack of technical support, and limited funding. A respondent from the Ruaha Catholic University shared:

"...unfortunately, our institution has not yet fully adopted e-learning platforms. We have some basic online tools, but they are not used extensively, and many students and staff lack the necessary training to engage with them effectively..."

Another respondent expressed frustration, saying:

"...the lack of e-learning platforms in our institution is a major setback. We are far behind compared to other universities, and it limits our opportunities for flexible learning..."

The availability of e-learning platforms varied significantly across institutions. Many institutions were

still in the early stages of adoption or struggling with limited resources. This inconsistency in the availability of e-learning platforms posed a challenge for both students

and educators, impacting the effectiveness and accessibility of e-learning in Tanzania's higher education system.

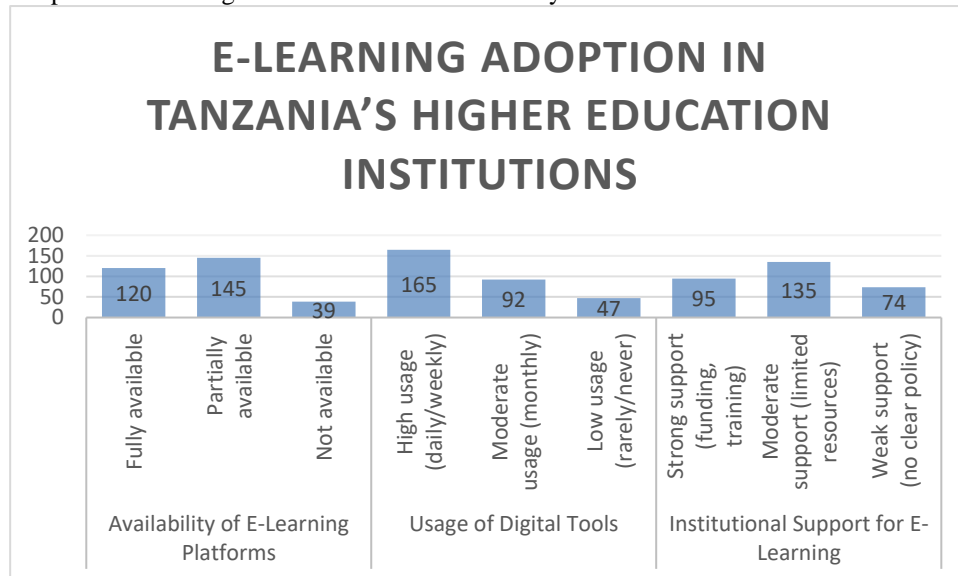


Figure 1: Showing the adoption of e-learning in Tanzania's higher education institutions

3.1.2 Usage of Digital Tools

The study also examined the usage of digital tools in Tanzanian higher education institutions, specifically focusing on the frequency of online learning and the level of student and faculty engagement with e-learning resources. As per figure 1, the findings showed varied usage patterns across institutions. A majority of the respondents, 165, reported high usage of digital tools, engaging with online learning on a daily or weekly basis. These respondents often highlighted the critical role that digital tools, such as LMS, video conferencing platforms, and digital libraries, played in enhancing their educational experience. A student from the University of Dar es Salaam shared:

"...I engage with online learning almost every day. The university has integrated the LMS into all our courses, and I find it really convenient. I can access my lecture notes, participate in discussions, and submit assignments all in one place. This has made my learning experience more interactive and flexible, especially when I need to balance my studies with part-time work..."

Another respondent, a faculty member from the University of Dodoma, mentioned:

"...as a lecturer, I use various digital tools to engage with students regularly. We use Zoom for lectures, and the LMS for distributing materials and assignments. This frequent interaction keeps students involved, even when they are unable to attend in person. It has become an essential part of our teaching practice..."

However, 92 respondents reported moderate usage of digital tools, with engagement occurring on a monthly

basis. These respondents often indicated that while digital tools were available, they were not used as extensively as in other institutions. A lecturer from the Catholic University of Mbeya noted:

"...we have access to digital tools like the LMS and video conferencing software, but we don't use them as often as we should. I typically use the LMS to upload course materials and share updates, but live sessions or interactive activities are infrequent. This can limit the potential of these tools to enhance student engagement and learning..."

A student from the same institution echoed these concerns, saying:

"...I use the LMS to check for new materials and sometimes participate in forum discussions, but it doesn't feel as interactive as I would like it to be. I wish the professors would use more digital tools to make learning more engaging, but it feels like they are still relying on traditional methods for most of the teaching..."

The smallest group of respondents, 47, indicated low usage of digital tools, with some engaging rarely or never. For these respondents, several barriers hindered the effective use of e-learning resources. These included lack of access to reliable internet, insufficient training in using digital tools, and resistance to change from both students and faculty. A respondent from the State University of Zanzibar explained:

"...I rarely use the online learning platforms. The internet connection is poor, and most of the time, the platforms are either down or difficult to access."

Additionally, some of the professors don't use these platforms effectively, so I don't feel the need to check them regularly..."

A faculty member at the same institution shared a similar statement, saying:

"...while we have the tools available, I find it challenging to engage with them effectively. The lack of infrastructure and support, both in terms of training and technical assistance, makes it difficult to fully embrace digital tools in our teaching..."

The usage of digital tools in Tanzanian higher education institutions highlighted a clear divide between high, moderate, and low engagement levels. Those who reported high usage seemed to benefit significantly from digital tools, suggesting that frequent interaction with e-learning resources could foster more dynamic and flexible learning environments. However, the moderate and low usage categories pointed to barriers that hindered the effective implementation of e-learning, such as limited access to technology, insufficient faculty training, and inconsistent institutional support. This disparity in usage reflected the challenges facing the higher education sector in Tanzania as it attempted to integrate digital tools into its teaching and learning practices.

3.1.3 Institutional Support for E-learning

The study also explored the level of institutional support for e-learning in Tanzanian higher education institutions, focusing on policies, funding, and training programs for both educators and students. The findings as illustrated in figure 1, revealed varying levels of support, which significantly impacted the adoption and effectiveness of e-learning platforms. A total of 95 respondents indicated that their institutions provided strong support, characterized by sufficient funding, comprehensive policies, and well-structured training programs for both students and faculty. These institutions had a clear commitment to integrating e-learning into their academic offerings. A faculty member from the University of Dar es Salaam explained:

"...our institution has been very supportive of e-learning. They provide consistent funding for the development and maintenance of the LMS and other digital tools. We also receive regular training on how to use these platforms effectively, which has been crucial in enhancing the quality of our teaching..."

A student from the same institution added:

"...I've benefited a lot from the training sessions provided for us. There are workshops available to help students learn how to use the e-learning platforms, and it has made a huge difference in how efficiently I can complete my assignments and engage with the course materials..."

Respondents from these institutions frequently emphasized how strong institutional support had created

an environment conducive to the effective use of digital tools, contributing to a more engaging and accessible learning experience.

In contrast, 135 respondents reported moderate support, where institutions offered some level of support but faced limitations, particularly in resources and training. These institutions were in the process of integrating e-learning but often lacked the comprehensive policies, consistent funding, or extensive training programs necessary for widespread success. A lecturer from the University of Bagamoyo shared:

"...the institution has begun to embrace e-learning, but the support is not always sufficient. There are occasional training sessions, but they are not regular, and many faculty members are still unfamiliar with how to use digital tools effectively. While funding has been allocated to improve infrastructure, it is often not enough to cover all the needs of the department..."

A student at the same university commented:

"...the university provided us with an online learning platform, but the training on how to use it effectively was minimal. We were mostly left to figure things out on our own. While there is some institutional backing, it feels like more could be done to integrate e-learning into our courses in a more meaningful way..."

The moderate support indicated that these institutions were making strides towards embracing e-learning, but without consistent, well-funded, and systematic support, the full potential of digital learning tools could not be realized.

On the other hand, 74 respondents reported weak support for e-learning in their institutions. These respondents described a lack of clear policies, minimal funding, and insufficient training programs for both students and educators. In these institutions, the implementation of e-learning was either inconsistent or non-existent, creating significant barriers to successful adoption. A respondent from the State University of Zanzibar remarked:

"...there is no clear policy on e-learning at our institution. While we have access to some digital tools, there is very little guidance on how to use them, and there are no dedicated funds to support e-learning initiatives. As a result, e-learning is not fully integrated into our courses, and many of us struggle to make the most of the limited resources available..."

A faculty member at the same institution explained:

"...training for staff is rare, and when it is offered, it is often not comprehensive enough to prepare us for the demands of e-learning. There is no formal strategy in place for incorporating digital tools into our teaching, which leaves a lot of room for uncertainty and inefficiency..."

The lack of institutional support in these cases hindered the ability to effectively use e-learning platforms, limiting the

educational opportunities for both students and faculty. The varying levels of institutional support highlighted the crucial role that funding, training, and policy development play in the successful integration of e-learning in Tanzanian higher education institutions. Institutions that provided strong support were able to create more effective and engaging e-learning environments, while those with moderate or weak support struggled to meet the needs of their students and educators. The absence of a clear, systematic approach to e-learning in many institutions revealed significant challenges in fully realizing the potential of digital education in Tanzania's higher education system.

3.2 Potential Benefits and Future Prospects of E-learning in Higher Education

The study explored the potential benefits and future prospects of e-learning in Tanzanian higher education institutions, focusing on three key sub-indicators: improvement in learning outcomes, expansion of access to higher education, and enhancement of teaching methods. The findings revealed how e-learning had the potential to significantly enhance student performance and engagement, broaden educational opportunities for remote and underserved populations, and transform traditional teaching approaches by incorporating more interactive and flexible learning strategies. Respondents shared insights on how these benefits were perceived to shape the future of higher education in Tanzania.

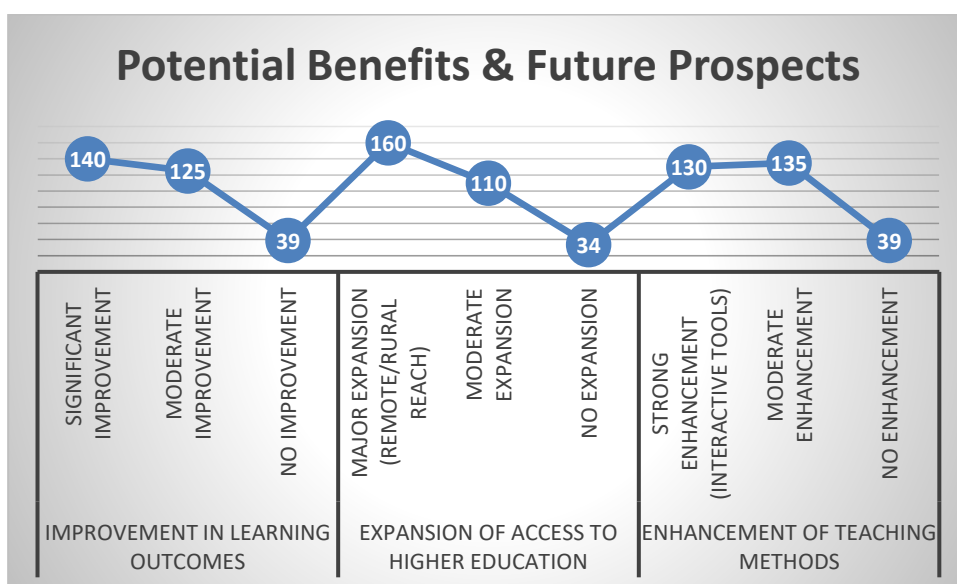


Figure 2: Showing the potential benefits and future prospects of e-learning in Tanzanian

3.2.1 Improvement in Learning Outcomes

The study revealed varying perceptions regarding the improvement in learning outcomes as a result of e-learning adoption in Tanzanian higher education institutions. As in figure 2, a majority of the respondents, 140, reported significant improvement in student performance, engagement, and access to diverse learning resources. Many students and faculty members highlighted how the shift to e-learning platforms, such as LMS, online discussion forums, and virtual classrooms, had enhanced their academic experience. A student from the University of Dar es Salaam commented:

"...since the introduction of the LMS, I have noticed a huge improvement in my learning. I can access lecture notes, readings, and even recorded lessons at any time, which makes studying much more flexible. It has helped me stay on top of my work and boosted my

performance in exams..."

Another student from the Mount Meru University shared:

"...the ability to engage in online discussions and interact with peers and lecturers has greatly increased my involvement in courses. I feel more motivated to participate because it's easier to reach out to others for support, and I can review materials as many times as I need..."

These responses reflect how e-learning provided students with enhanced access to educational materials, increased their engagement with the course content, and ultimately contributed to better academic outcomes.

In contrast, 125 respondents indicated moderate improvement in learning outcomes, where the adoption of e-learning had led to some positive changes, but these improvements were not as pronounced. For these respondents, while digital tools helped enhance learning,

traditional teaching methods still played a dominant role, and the benefits of e-learning were not fully realized. A faculty member from the University of Dodoma remarked:

"...there has been some improvement in learning outcomes, especially in terms of access to course materials. However, not all students engage with the digital tools regularly, and some prefer face-to-face interactions. E-learning has improved flexibility, but we still face challenges in terms of consistent engagement and participation..."

A student from the same institution commented:

"...while e-learning has helped me access more resources, I still find it difficult to concentrate and learn effectively through online platforms. Sometimes I feel like I need more face-to-face interactions to really grasp the concepts..."

These responses highlight that although e-learning had a positive impact on learning outcomes, its full potential had not been reached in these institutions due to factors such as limited engagement and mixed teaching approaches.

Finally, 39 respondents reported no improvement in learning outcomes despite the introduction of e-learning. For these respondents, barriers such as lack of infrastructure, insufficient digital literacy, and limited access to devices or the internet undermined the effectiveness of e-learning. A respondent from the State University of Zanzibar (SUZA) shared:

"...we have some e-learning tools available, but they don't really make a difference in my learning. The internet is too slow to stream videos or access some of the online materials, and many of my peers don't have access to computers. It feels like e-learning is just an additional burden rather than a benefit..."

Another student added:

"...there was an attempt to introduce e-learning platforms, but the materials were often outdated, and not all lecturers used them consistently. I haven't noticed any improvement in my grades, and I feel like the lack of interaction with lecturers and classmates limits my ability to learn..."

These responses indicate that in institutions with poor infrastructure and limited support, e-learning was not able to bring about significant improvements in student performance or engagement.

The varying perceptions about the improvement in learning outcomes underlined the fact that while e-learning had the potential to enhance student performance, engagement, and access to diverse resources, the extent of its impact depended heavily on the institution's readiness to support its full integration. Institutions that offered strong e-learning platforms, along with appropriate training and resources, saw more significant improvements in learning outcomes, while those facing infrastructural

and engagement challenges struggled to realize the potential benefits of e-learning.

3.2.2 Expansion of Access to Higher Education

The study also explored the potential for e-learning to expand access to higher education in Tanzania, particularly for remote and underserved populations. The findings as in figure 2, revealed that 160 respondents perceived major expansion in access to education, particularly for students from rural and remote areas who had previously faced significant barriers to enrolment. E-learning allowed these students to access courses and programs that they might not have been able to attend in person due to geographical or financial constraints. A student from a remote village in the Shinyanga region expressed:

"...I never thought I could attend university because the nearest institution was too far, and I couldn't afford to live there. But with e-learning, I can access my courses online from home. It's a life-changing opportunity for me, and many others in my village..."

Another student from the same area added:

"...the ability to study online has opened doors for many students like me who would have never had the chance to pursue higher education. It feels empowering to know that distance is no longer an obstacle..."

These quotes highlight how e-learning enabled access to higher education for students who were previously excluded due to geographic and economic barriers, providing them with opportunities they had not imagined before.

In contrast, 110 respondents reported moderate expansion in access to higher education, where e-learning had increased opportunities for some students but not to the extent that it reached all underserved populations. These respondents indicated that while e-learning had helped improve access, certain groups still faced challenges, such as limited internet connectivity or inadequate digital literacy. A lecturer from the University of Dodoma explained:

"...E-learning has certainly made it easier for students in certain areas to access courses. However, students from rural regions still face significant challenges with unreliable internet connections, which makes it difficult for them to fully engage with online learning. Even though many students are enrolled, the number who can actively participate is limited..."

A student from a semi-urban area echoed this sentiment, saying:

"...I can access my courses online, but many of my peers in villages struggle to even get a reliable internet connection. Some students have to travel to town to

use internet cafes, which is not only costly but also time-consuming..."

These responses suggest that while e-learning had the potential to expand access, the effectiveness of this expansion was still constrained by infrastructure issues that prevented full engagement, especially in more remote areas.

On the other hand, 34 respondents indicated no expansion in access to higher education, as they felt that e-learning had not contributed to widening educational opportunities for underserved students. These respondents highlighted a lack of infrastructure, such as poor internet access and limited access to devices, as significant barriers that prevented e-learning from reaching a broader population.

A respondent from the University of Tanga shared:

"...while e-learning is offered, it hasn't made a real difference for most students in my community. Many do not have access to computers or smartphones, and the internet connection is either too slow or unavailable in rural areas. E-learning hasn't done much to change the situation for those who are most in need of access to education..."

Another respondent from a different rural area noted:

"...I enrolled in an online course, but I couldn't keep up with the lessons because I lacked a stable internet connection at home. I had to drop out, which was disappointing because I thought e-learning would be the answer to my education struggles..."

These responses emphasized that for some institutions and regions, the lack of sufficient infrastructure and resources meant that e-learning could not effectively expand access to higher education, leaving many students still excluded from the benefits of digital education.

The findings clearly illustrated that e-learning had the potential to greatly expand access to higher education, particularly for students from rural, remote, and underserved areas. While the most significant expansion was observed in institutions that provided robust digital infrastructure and support, challenges such as poor internet connectivity and inadequate access to devices remained major barriers. While some students benefited from the opportunity to study remotely, others still faced significant challenges that hindered their ability to participate fully in online education. These results suggest that further investments in infrastructure and support are necessary to ensure that e-learning can reach all students, particularly those in the most marginalized communities.

3.2.3 Enhancement of Teaching Methods

The study examined the extent to which e-learning had enhanced teaching methods in Tanzanian higher education institutions. The findings as in figure 2, revealed varied perceptions of how e-learning had contributed to the enhancement of teaching, with 130 respondents reporting strong enhancement in teaching methods through the use of interactive tools, flexibility in lesson delivery, and blended learning approaches. These respondents

highlighted how e-learning platforms enabled instructors to integrate diverse teaching strategies, making lessons more engaging and effective. A lecturer from the University of Dar es Salaam expressed:

"...E-learning has allowed me to incorporate various interactive tools into my lessons, such as quizzes, discussion boards, and videos. This has made learning more engaging for students and has helped them grasp complex concepts better. The ability to blend traditional teaching with online resources has made my teaching more dynamic and responsive to students' needs..."

Another faculty member from Kampala International University (KIU) shared:

"...with the introduction of e-learning, I have been able to use multimedia content like podcasts, videos, and interactive simulations to explain difficult topics. These tools have significantly improved student engagement, and I have noticed better retention of information during exams. The flexibility e-learning provides in lesson delivery, where I can offer materials online for students to access at their convenience, has also made teaching much more effective..."

These quotes illustrate how e-learning facilitated the incorporation of various interactive tools and flexible teaching methods, which contributed to a more dynamic and engaging learning experience.

In contrast, 135 respondents reported moderate enhancement in teaching methods, indicating that while e-learning had improved teaching in some ways, its full potential had not been fully realized. Many of these respondents acknowledged the use of online resources but pointed out challenges related to the integration of interactive content and the balancing of online and face-to-face instruction. A lecturer from the Mbeya University of Science and Technology stated:

"...E-learning has made some improvements in teaching, especially with the use of online materials and resources. However, I still find it challenging to incorporate fully interactive tools, as not all students have the same level of access to technology. We still rely on face-to-face instruction for the most part, and many lecturers are not fully trained in how to effectively use e-learning tools..."

A student from the same institution mentioned:

"...the lectures have become more flexible, and I appreciate the ability to access materials online. However, sometimes the online content isn't as interactive as I would like it to be. It's often just recorded lectures or PowerPoint presentations, and I feel that more interactive methods, like quizzes or group discussions, could improve my learning experience..."

These responses highlight that while e-learning brought some enhancements, the integration of more interactive tools and effective blended learning approaches was still limited by factors such as unequal access to technology and a lack of training for educators.

On the other hand, 39 respondents reported no enhancement in teaching methods due to e-learning. These respondents expressed disappointment with the use of e-learning, as they felt that teaching methods had not changed significantly, and the introduction of digital tools did not lead to improvements in teaching quality. A faculty member from the St. Augustine University of Tanzania remarked:

"...the transition to e-learning has been slow, and the use of digital tools has not really changed the way we teach. In most cases, it's just been about uploading lecture slides to an online platform, without any real engagement with students. It hasn't made much difference in terms of how we deliver lessons, and students still expect traditional face-to-face teaching..."

A student from the same institution added:

"...I haven't noticed any real changes in the way lessons are taught. The online platform just provides access to course materials, but the teaching itself hasn't changed. I still prefer the direct interaction with the lecturer in the classroom, as the online content feels impersonal and disconnected..."

These responses underscore that for some respondents, the adoption of e-learning had not significantly enhanced teaching methods, as the transition to more interactive or

flexible teaching approaches had not been fully embraced. The findings from the study indicate that e-learning had a substantial potential to enhance teaching methods, particularly through the integration of interactive content, flexibility in lesson delivery, and the use of blended learning approaches. Institutions that fully embraced these tools reported significant improvements in teaching, with students finding lessons more engaging and interactive. However, in institutions with limited access to technology, inadequate training for educators, or a reluctance to adopt new teaching methods, the enhancements were moderate or non-existent. The results suggest that while e-learning has the potential to revolutionize teaching methods in Tanzanian higher education, its full impact depends on the institution's infrastructure, the training provided to faculty, and the willingness of both students and lecturers to engage with new educational tools.

3.3 Challenges and Barriers to E-learning Implementation

The study also investigated the challenges and barriers faced by Tanzanian higher education institutions in implementing e-learning, focusing on three key areas: technological and infrastructure barriers, financial and institutional constraints, and digital literacy and user readiness. These factors played a significant role in limiting the effectiveness and widespread adoption of e-learning, as many institutions struggled with inadequate technology, limited funding, and varying levels of digital competence among students and staff. The following sections provide a detailed exploration of these challenges based on the responses gathered from participants.

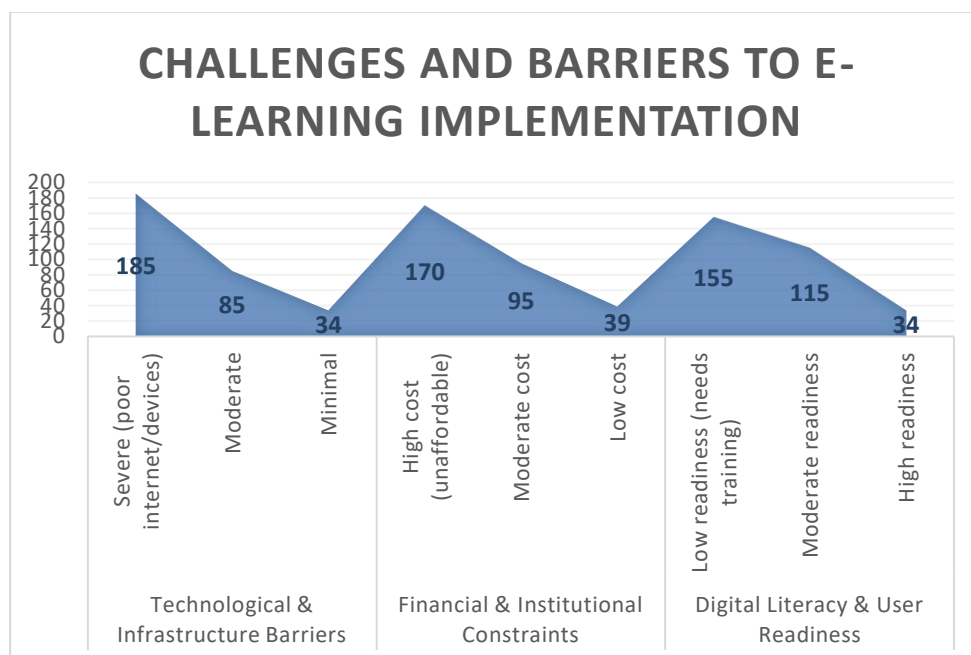


Figure 3: Showing the challenges and barriers faced by Tanzanian higher education institutions in implementing e-learning

3.3.1 Technological & Infrastructure Barriers

The study as in figure 3, identified significant

technological and infrastructure barriers as one of the major challenges in the implementation of e-learning within Tanzanian higher education institutions. These barriers, including poor internet connectivity, limited availability of digital devices, and insufficient IT support, hindered the full adoption and effective use of e-learning tools. Among the respondents, 185 reported severe barriers, highlighting that poor internet access and inadequate infrastructure were major obstacles to the success of e-learning initiatives. A lecturer from the University of Dar es Salaam stated:

"...the internet connectivity here is a huge problem. We are supposed to deliver online lessons, but most students cannot access the materials because the network is unreliable. In many cases, they are forced to download lectures or assignments when they go to town, but this is not sustainable for long-term learning..."

Another faculty member from the University of Dodoma shared:

"...students face frequent disruptions during online learning sessions. We try to use interactive tools and video conferencing for lectures, but the internet cuts off at crucial moments, which wastes everyone's time. It's incredibly frustrating, especially when the technology fails in the middle of an important lesson..."

These responses reflect the widespread issues faced by institutions where poor internet infrastructure made it difficult to deliver consistent and effective e-learning experiences.

In addition to connectivity issues, the lack of adequate digital devices also posed a severe challenge. Many students were unable to access e-learning platforms because they did not have reliable devices such as laptops, tablets, or smartphones. A student from a rural area in the Arusha region explained:

"...I have a smartphone, but it is not powerful enough to access online courses properly. Sometimes, I have to borrow a better phone from a friend or go to a cyber café. However, this is not always possible, especially during exam periods when I need constant access to materials..."

Another student from the same region noted:

"...my university encouraged online learning, but I couldn't participate fully because I didn't have a laptop or a tablet. I often have to rely on my phone, which is not ideal for learning long texts or participating in discussions..."

These challenges regarding device availability were particularly prevalent among students in remote or underserved areas, where digital poverty was a significant barrier to educational participation.

Furthermore, 85 respondents reported moderate technological and infrastructure barriers, recognizing that while some improvements had been made, challenges still existed. These respondents noted that their institutions had

taken steps to improve internet access and provide devices to students, but issues persisted due to inconsistent support and unequal distribution of resources. A lecturer from the State University of Zanzibar remarked:

"...our university has made efforts to improve infrastructure, such as installing Wi-Fi in some buildings and providing laptops for students on loan. However, there are still many areas on campus with poor signal reception, and many students still don't have access to the devices they need. There is also insufficient IT support to address technical problems when they arise..."

A student from a semi-urban area added:

"...I've noticed that e-learning resources are becoming more accessible in some parts of the university. However, not all students benefit equally, as many still face issues with connectivity and devices. The problem lies in the fact that the resources are often centralized in one area, making it hard for students who are far away from that area to access them..."

These comments illustrate that while there were some efforts to address the infrastructure and device gaps, these challenges were still prevalent to a moderate degree.

Lastly, 34 respondents reported minimal technological and infrastructure barriers, suggesting that these respondents were from institutions where e-learning infrastructure was more robust. These respondents noted that, in comparison to other institutions, their universities had relatively reliable internet access and adequate resources for online learning. A faculty member from the University of Iringa explained:

"...we have relatively good internet connectivity in our institution, and many students own laptops or smartphones. The university has been proactive in providing the necessary support for e-learning, such as technical workshops and online learning platforms. However, there are still occasional challenges, like power outages, but they are not as frequent as in other regions..."

Another student from the same institution shared:

"...I've had fewer problems with online learning because the university has invested in good infrastructure, and the internet speed is fast. I can access courses and participate in discussions without much trouble, and there are dedicated support staff available to assist with any technical issues..."

These responses highlight the positive impact of institutions that had made more substantial investments in infrastructure, which led to fewer barriers in terms of connectivity and access.

The study underlines the critical role that technological and infrastructure barriers play in the implementation of e-learning. While some institutions had managed to address these challenges through investments in technology and improvements in IT support, many others were still

struggling with poor internet connectivity, limited access to digital devices, and inadequate infrastructure. For e-learning to be truly effective and accessible in Tanzania's higher education institutions, it is essential that these technological barriers be addressed comprehensively, ensuring that all students, regardless of their location or socio-economic status, have equal access to the tools and resources needed for successful learning.

3.3.2 Financial & Institutional Constraints

The study as in figure 3, identified financial and institutional constraints as another significant barrier to the effective implementation of e-learning in Tanzanian higher education institutions. A substantial number of respondents, 170 in total, reported experiencing high costs related to the implementation of e-learning. These costs included expenses for purchasing digital devices, maintaining online learning platforms, and providing technical support. The financial burden of these initiatives often made it difficult for institutions to fully embrace e-learning. A respondent from the University of Dar es Salaam explained:

"...the cost of implementing e-learning in our institution is extremely high. We have to invest in software, hardware, and online platforms, but our budget is limited. Many students also cannot afford the necessary devices, so they miss out on online classes. This financial strain affects the quality of learning we can provide..."

Another lecturer from the Mbeya University of Science and Technology remarked:

"...although the university has started adopting e-learning, we are limited by the financial constraints. There is not enough funding for the necessary infrastructure, and even when we manage to get some funding, it is not sustainable. The cost of maintaining an online learning platform, providing devices to students, and ensuring continuous internet connectivity remains a huge challenge..."

These responses reflect how high costs related to e-learning implementation prevented many institutions from fully integrating e-learning into their teaching and learning processes.

In addition to the direct costs of e-learning, many institutions faced moderate financial constraints, as 95 respondents reported. While these institutions had made some progress in implementing e-learning, funding remained a limiting factor, preventing the comprehensive implementation of necessary e-learning tools. A faculty member from Mzumbe University (MU) explained:

"...our institution has tried to support e-learning by investing in some online platforms and offering training programs for faculty. However, the funds we have are not enough to reach all students or to sustain these projects over the long term. Many departments still rely heavily on traditional teaching methods because we simply cannot

afford to upgrade our technology..."

A student from the same institution expressed similar concerns, stating:

"...E-learning could be a great tool, but the funding for it is limited. The university is trying, but some of the tools we need, like laptops and fast internet, are just too expensive. Sometimes, I wonder if the university will be able to continue providing these resources in the long run..."

These responses highlight the difficulties faced by institutions with moderate financial support, where the implementation of e-learning was somewhat constrained by the limited availability of funds and resources.

Lastly, 39 respondents reported low financial constraints, suggesting that their institutions were able to provide more support for e-learning, either through external funding, partnerships, or a more robust internal budget. These institutions were able to implement e-learning tools with fewer financial limitations. A lecturer from the University of Iringa noted:

"...our university has managed to secure funding through various partnerships and government support. This has allowed us to implement e-learning with fewer financial constraints. We have provided devices to students in need, and there is a dedicated budget for upgrading our online platforms. It hasn't been without challenges, but we are in a better position than many other institutions..."

A student from the same institution added:

"...I appreciate the efforts made by the university to provide the necessary technology and infrastructure for online learning. I have access to all the materials, and the university has made sure that no student is left behind due to financial constraints..."

These replies suggest that when institutions are able to secure adequate funding, either through external sources or internal allocation, they can overcome many of the financial challenges associated with e-learning implementation.

However, many respondents across the board noted the institutional resistance to change as a key barrier that exacerbated financial constraints. This resistance often came from both staff and administrators who were reluctant to embrace new technologies due to a lack of understanding, fear of disruption to traditional teaching methods, or concerns about the costs involved. A faculty member from the Ardhi University remarked:

"...some of my colleagues are resistant to using e-learning tools. They feel that it's an unnecessary expense, and they don't see the value in shifting from traditional methods. It's a challenge to convince them that e-learning is not just a trend, but a necessary evolution in education..."

A university administrator from the same institution shared:

"...we understand the potential of e-learning, but the financial investment required makes it a hard sell to the board. There's a lot of hesitance, especially from those who have been working with traditional systems for decades. They see e-learning as an additional cost rather than an opportunity..."

These responses underline that institutional resistance to change, coupled with financial constraints, was a significant barrier to the successful adoption of e-learning in many Tanzanian higher education institutions.

The financial and institutional constraints posed serious challenges to the adoption of e-learning in Tanzanian higher education. While some institutions managed to overcome these constraints through external funding or internal allocation, many others struggled with high costs and limited resources. The reluctance to change among staff and administrators further compounded these financial challenges. For e-learning to become a sustainable and widespread tool in Tanzanian higher education, institutions must secure adequate funding, embrace a more proactive approach to integrating technology, and foster a culture of innovation and change.

3.3.3 Digital Literacy and User Readiness

Digital Literacy and User Readiness as in figure 3, emerged as a significant challenge in the adoption and effective implementation of e-learning in Tanzanian higher education institutions. The study revealed that low readiness, as reported by 155 respondents, was a predominant issue, with both students and faculty lacking adequate ICT skills. Many respondents emphasized that, despite the availability of e-learning platforms, a lack of digital literacy hindered the effective use of these resources. A student from the University of Dodoma noted:

"...I have struggled with accessing course materials online because I don't have the skills to navigate the e-learning platform. It's frustrating when I try to use the system, and I can't find what I need. I know the tools are there, but I don't know how to use them effectively..."

Similarly, a lecturer from the Catholic University of Mbeya explained:

"...many of my colleagues are not comfortable using digital tools for teaching. Some are unfamiliar with the basic functions of the online platforms we are expected to use, which creates a significant barrier to delivering e-learning content effectively. Without proper training, it's hard to engage students in meaningful ways..."

These responses highlight the gap in digital literacy among both students and faculty, making it difficult for them to fully participate in or deliver e-learning programs.

Respondents also pointed out that this low readiness was closely tied to the lack of formal training programs. A faculty member from the University of Dar es Salaam shared:

"...there have been no structured training programs for teachers to help us adapt to digital teaching methods. We are expected to use online tools, but there's very little guidance on how to integrate them into our teaching practices effectively. Some of us feel overwhelmed, as we are expected to become experts in these tools without receiving any professional development..."

A student from the same institution added:

"...I've heard that there are some training opportunities, but they are not enough. I need more guidance on how to use the e-learning systems effectively. There's a lot of trial and error, and sometimes it feels like the responsibility for learning these skills falls on us rather than the institution providing proper support..."

The lack of training, as expressed by the respondents, was a key factor contributing to the low readiness for e-learning implementation.

In contrast, 115 respondents reported moderate readiness, indicating that while digital literacy was not a major barrier, there were still significant challenges in using e-learning tools effectively. These respondents highlighted that although they were somewhat familiar with digital tools, they required additional training to optimize their use in academic contexts. A lecturer from the University of Iringa commented:

"...I've used basic online tools for my lectures, like email and PowerPoint, but using a full-fledged Learning Management System (LMS) is a different challenge. I am somewhat familiar with these tools, but I still need more comprehensive training to use them more effectively for student engagement..."

Similarly, a student from the University of Iringa shared:

"...I can manage basic online tasks like downloading materials and attending video lectures, but I feel there is a lot more I could do with these platforms if I had the right skills. Some of my peers and I have learned through trial and error, but it's not enough. We need more structured guidance..."

These comments indicate that while moderate readiness was an improvement, there were still gaps in training and digital skills that hindered the efficient use of e-learning tools.

On the other hand, high readiness, reported by 34 respondents, reflected a more confident and capable user group. These respondents were generally well-versed in using digital tools for both learning and teaching purposes. They often had access to additional resources and training, allowing them to integrate technology seamlessly into their academic routines. A faculty member from the Mwenge University described:

"...I've had training on e-learning tools for several years, and I actively engage with students through online platforms. I use interactive content, discussion forums, and

other digital tools that enhance the learning experience. My students also come prepared to engage with digital content, as they are familiar with the tools and have the necessary devices..."

A student from the same university elaborated:

"...I feel confident using the e-learning platforms here. I have all the necessary tools and resources, and the university provides regular workshops to improve our skills. I can easily access all my materials, participate in discussions, and even collaborate on group projects online..."

These respondents demonstrated that when students and faculty members have adequate access to digital training and support, they are able to use e-learning tools to their full potential, enhancing the overall learning experience.

In summary, the findings suggest that digital literacy and user readiness were major barriers to the effective implementation of e-learning. A large portion of respondents indicated that low readiness, characterized by inadequate ICT skills and a lack of training, was a significant challenge. However, institutions that offered moderate levels of training or provided resources for digital tool usage saw more engagement and better outcomes. Those with high readiness were able to use e-learning tools effectively, indicating that with proper preparation, e-learning can be fully integrated into higher education in Tanzania. The need for comprehensive training programs for both students and faculty members became evident, as these programs were crucial for overcoming digital literacy challenges and ensuring the smooth implementation of e-learning.

4. CONCLUSION AND RECOMMENDATIONS

The study provided valuable insights into the adoption and implementation of e-learning in Tanzanian higher education institutions. It highlighted both the progress and challenges encountered in integrating digital tools and platforms into the educational system. The findings revealed that while there was significant progress in the availability of e-learning platforms and a growing usage of digital tools, there were still notable challenges related to infrastructure, digital literacy, and institutional support. Many institutions struggled with inadequate funding, limited access to digital devices, and poor internet connectivity, which impeded the widespread adoption of e-learning. Moreover, the study revealed that the potential benefits of e-learning, such as improving learning outcomes, expanding access to higher education, and enhancing teaching methods, were recognized by many respondents. However, these benefits were often tempered by the challenges in implementation, particularly in remote and underserved areas. The lack of digital literacy among students and faculty, combined with insufficient training programs, further complicated the effective utilization of e-learning tools. Despite these challenges, the study demonstrated a growing awareness of the importance of e-learning in the transformation of higher education in

Tanzania. It highlighted the need for improved institutional support, including policies, funding, and training programs, to ensure the sustainability and effectiveness of e-learning initiatives. The overall findings emphasize that while progress has been made, there is still much work to be done to fully realize the potential of e-learning in Tanzanian higher education institutions.

The study recommends that Tanzanian higher education institutions strengthen their e-learning infrastructure by improving internet connectivity, ensuring the availability of digital devices, and expanding access to well-functioning learning management systems. Institutional support should be enhanced through clear policies, increased funding, and comprehensive training programs for both students and faculty to improve digital literacy and user readiness. Universities should implement structured capacity-building initiatives to equip educators with the necessary skills to effectively integrate digital tools into their teaching methods. Moreover, collaborations between the government, private sector, and educational institutions should be encouraged to address financial and technological barriers, ensuring that e-learning is accessible and sustainable across all regions, including remote and underserved areas.

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