Journal of Global Education and Research
ISSN 2577-509X (online) ISSN 2577-5081 (print)

Volume 10 | Issue 2 Article 5

July 2026

Broadband diffusion and digital preparedness in Tanzania: Harnessing the role of technology in formal education

George Matto
Moshi Co-operative University, mattogeorge@gmail.com

John J. Iwata
Moshi Co-operative University, iwata2j@gmail.com

Recommended Citation

Matto, G., & Iwata, J. J. (2026). Broadband diffusion and digital preparedness in Tanzania: Harnessing the role of technology in formal education. *Journal of Global Education and Research, 10*(2), 167-181. https://www.doi.org/10.5038/2577-509X.10.2.1424

Broadband diffusion and digital preparedness in Tanzania: Harnessing the role of technology in formal education

Authors

Corresponding Author

John Jackson Iwata, Department of Knowledge Management, Moshi Co-operative University,, Sokoine Road, P. O. Box 474, Moshi-Kilimanjaro, Tanzania

Abstract

Broadband, as a high-speed Internet connectivity, is an essential enabler for digital preparedness. However, little is known, in the case of Tanzania, about the nexus between broadband diffusion and digital preparedness, particularly in the facilitation of the teaching and learning process. This study, therefore, aimed at investigating the nexus between broadband diffusion and digital preparedness in Tanzania by focusing on the country's readiness to leverage the same for formal education. The study employed a systematic review, guided by the PRISMA framework, to obtain the empirical evidence from existing literature. Thematic analysis was used to identify themes, analyze, and interpret qualitative data from the reviewed literature. Findings show that, although Tanzania instituted several policies and initiatives regarding broadband diffusion, it still missed a few key policy documents that would help to foster the rollout of broadband. In addition, legal instruments tailored to promote and support broadband diffusion were still lacking. Furthermore, more infrastructural improvements and support for digital literacy were needed. Based on the study's findings, a conclusion has been made that Tanzania still faces considerable work ahead to effectively leverage digital technologies in formal education. Among other suggestions, the study recommended that relevant policies on broadband diffusion should be established and operationalized throughout the country.

Keywords

broadband, Internet, digital preparedness, formal education, Tanzania

Revisions

Submission date: Oct. 23, 2024; 1st Revision: Apr. 25, 2025; 2nd Revision: Aug. 21, 2025; 3rd Revision: Oct. 24, 2025; 4th Revision: Mar. 31, 2026; Acceptance: Apr. 15, 2026

Broadband Diffusion and Digital Preparedness in Tanzania: Harnessing the Role of Technology in Formal Education

George Matto[1] and John J. Iwata[2]

Department of Information and Communication Technology
Moshi Co-operative University, Tanzania
[1]george.matto@mocu.ac.tz

Department of Knowledge Management
Moshi Co-operative University, Tanzania
[2]iwata2j@gmail.com

Abstract

Broadband, as a high-speed Internet connectivity, is an essential enabler for digital preparedness. However, little is known, in the case of Tanzania, about the nexus between broadband diffusion and digital preparedness, particularly in the facilitation of the teaching and learning process. This study, therefore, aimed at investigating the nexus between broadband diffusion and digital preparedness in Tanzania by focusing on the country's readiness to leverage the same for formal education. The study employed a systematic review, guided by the PRISMA framework, to obtain the empirical evidence from existing literature. Thematic analysis was used to identify themes, analyze, and interpret qualitative data from the reviewed literature. Findings show that, although Tanzania instituted several policies and initiatives regarding broadband diffusion, it still missed a few key policy documents that would help to foster the rollout of broadband. In addition, legal instruments tailored to promote and support broadband diffusion were still lacking. Furthermore, more infrastructural improvements and support for digital literacy were needed. Based on the study's findings, a conclusion has been made that Tanzania still faces considerable work ahead to effectively leverage digital technologies in formal education. Among other suggestions, the study recommended that relevant policies on broadband diffusion should be established and operationalized throughout the country.

Keywords: broadband, Internet, digital preparedness, formal education, Tanzania

Introduction

While the Internet has become an indispensable resource tool in the contemporary world that changes the way people live and interact with each other, little is known in Tanzania about the nexus between broadband diffusion and digital preparedness, particularly in the context of formal education. Studies indicate that internet usage has changed the way people think and feel about the world around them. In the world over, most of the daily activities in various fields, including education, business, agriculture, health, and several others, are now driven by the Internet (Bihu, 2022; Tomer et al., 2020). To ensure Internet accessibility and usage, different technologies have been used to offer a wide range of data signaling speeds. While in the 1990s, Internet access

became popular through dial-up connections (Biswas, 2017), by the first decade of the 21st century, there was a move to shift from dial-up to broadband Internet access technologies (Downes, 2007). Currently, all over the world, broadband offers improved speed of Internet connectivity. It provides high-speed Internet access through multiple types of technologies, including fiber optic cable, wireless technologies, advanced digital subscriber line, broadband over powerline, and satellite (Byanyuma et al., 2017).

Although there is no universally accepted definition of broadband, in this study, it refers to a high-speed Internet connectivity that is always available, and it is faster than a dial-up connection. This definition is in accordance with Chen et al. (2020). Tomer et al. (2020) assert that broadband connectivity is a bedrock of modern society, providing numerous social and economic advantages. Consequently, Byanyuma et al. (2017) emphasize that people, irrespective of their geographic location or demographic traits, require access to affordable and reliable broadband services to improve their livelihoods. Similarly, broadband is essential for enhancing educational development. This means reliable and high-speed Internet connectivity is needed to enable both students and instructors to not only access a wide range of online resources, but also participate in virtual learning environments (Danchikov et al., 2021). According to Aligo and Prudente (2025) and Chen et al. (2020), broadband enables students to access online courses and undertake assessments through online learning platforms. Further, according to Shaykina and Minin (2018) and Rajasekaran et al. (2024), broadband facilitates integration of technology into classrooms while allowing for innovative teaching methods and personalized learning experiences. This is the reason behind the suggestion by Begičević Ređep (2021) that broadband – along with other digital technologies – affects every level of education, from primary and secondary schools to universities. Hence, ensuring equitable access to broadband can help to bridge the digital divide and consequently enhance educational equity, thereby fostering a more knowledgeable and skilled society (Kelley & Sisneros, 2020).

On the other hand, Oughton et al. (2023) contend that, despite its significance, broadband is still far from ubiquitous. This is in line with the view by Tomer et al. (2020) that millions of individuals and households do not have access to broadband, and many others lack digital skills or income to use online services. In Tanzania, a significant proportion of the population still does not have access to broadband, as noted by the Ministry of Information, Communication and Information Technology (2023) and Pazi (2019). This aligns with the findings by Mwananziche et al. (2023) that while Tanzania is among the developing Sub-Saharan countries that have achieved significant progress with respect to information and communications technology (ICT) indicators, it still lags several neighboring countries, including Kenya, Uganda, and Rwanda, on the proportion of the population accessing and using the Internet. While broadband access gaps persist across different areas of the country, Bahia et al. (2021) found that rural communities, poorer and less educated, are the most affected. A study by Pazi (2019) highlights that, despite the nationwide efforts to distribute broadband, there are various factors that impede the population's ability to fully harness and leverage its role in several aspects of living, which include formal education. This translates to the country's digital preparedness.

According to Pingali et al. (2023), digital preparedness refers to the level of readiness of an individual or organization to leverage digital technology for the purpose of achieving anticipated objectives. It involves ensuring that digital infrastructure, data, and systems are secure, resilient, and accessible when needed. With regard to students, a study by Van de Werfhorst et al. (2020)

suggests four digital preparedness indicators: ICT use, ICT skills, ICT infrastructure, and ICT competencies. In their study, Van de Werfhorst et al. (2020) argue that all four dimensions are essential as they enhance students' readiness for digital learning. These indicators can be categorized into three key areas: availability, physical access, and the skills necessary to effectively use the digital infrastructure.

Ollerenshaw et al. (2021) observe that broadband is an essential enabler for digital preparedness as it acts as the core infrastructure that empowers societies, organizations, and individuals to efficiently address and navigate digital challenges and opportunities, especially in times of crisis. As suggested by Begičević Rađep (2021), digital preparedness is also important in formal education for the purpose of ensuring that learning and other administrative operations in educational institutions are maintained and continue even during disruptions like pandemics and natural disasters. It plays a crucial role in supporting remote education by providing access to various online platforms such as Zoom, Microsoft Teams, and Google Classroom (Rajasekaran et al., 2024).

The formal education, which refers to a structured and systematic form of education provided by institutions such as schools, colleges, and universities, involves having predetermined curricula and attending regular classes in person or through online channels, leading to certification (Yahl, 2015). In Tanzania, little is known about the nexus between broadband diffusion and digital preparedness, particularly in the context of formal education. Some previous studies attempted to undertake similar research; however, the majority of them, including Byanyuma et al. (2017) and Simba et al. (2012), focused on the broader impacts of broadband on national development. While studies by Shao et al. (2022), Henseler et al. (2022), and Mpapalika and Katera (2023) examined the use of digital technologies in formal education during the COVID-19 pandemic, they lacked analysis on how well Tanzania is digitally prepared. In this regard, the present study was conducted to investigate the nexus between broadband diffusion and digital preparedness in Tanzania, reflecting on the country's readiness to leverage the same in formal education. Two research questions guided this study. First, what factors affect the diffusion of broadband in fostering digital preparedness in Tanzania? And second, what implications does the prevailing digital preparedness have on formal education in Tanzania?

This research enhances existing literature by delivering a thorough evaluation of the effects of broadband diffusion on formal education in Tanzania. The study also provides actionable insights for policymakers to institute proper strategies that not only enhance broadband infrastructure but also foster an environment conducive to digital learning and literacy. In addition, the study enhances the theoretical framework regarding digital readiness in formal education settings in developing nations.

Literature Review

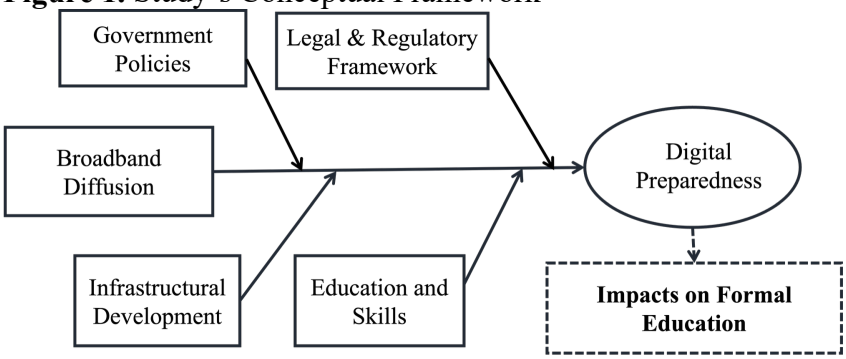
Theoretical Review

The study employed the Network Readiness Index (NRI) developed by the World Economic Forum and INSEAD (Dutta & Lanvin, 2019) to explain the impact of broadband diffusion on digital preparedness. As noted by Begum (2021), the NRI assesses a nation's ability to leverage digital technologies based on three fundamental components: Infrastructure and access, digital

skills and usage, and institutional support. The infrastructure and access component includes aspects such as physical broadband networks, affordability, and coverage. The digital skills and usage component pertains to an individual's ability to use the Internet for education, among other applications. Lastly, the institutional support component addresses matters such as government policies. A thorough analysis of these components of the NRI facilitated an in-depth exploration of the connection between broadband access and individuals' ability to efficiently access and leverage digital resources for educational purposes.

The components in the NRI align with the observation by Nguyen et al. (2019) that digital preparedness involves three key factors. These are digital assets (NRI's infrastructure and access), digital capabilities (NRI's digital skills and usage), and digital commitment (NRI's institutional support). These factors were adopted in this study with some modifications to enhance their relevance and applicability within the research framework. Digital assets were regarded as the readiness in terms of infrastructural development, while digital capabilities were associated with an individual's digital education and skills. Additionally, digital commitment was linked to government policies and the legal and regulatory framework. These factors are considered to continuously pose effects on the role of broadband in enhancing digital preparedness, and ultimately, have consequences on the country's digital preparedness. In turn, they pose effects on the country's formal education as summarized in the study's conceptual framework in Figure 1.

Figure 1. Study's Conceptual Framework



Empirical Review

Similar studies were conducted in several other African countries. A study by Mbah and Ankah (2023) established the impact of broadband Internet on labor market productivity across 34 African countries. The research provided strong evidence of a positive and substantial impact of broadband Internet on education, along with other aspects of labor productivity. In the related context, research conducted by Kouladoum (2024) examined the impact of Internet penetration on human capital development across 48 African nations. The findings indicated that advancements in broadband Internet access positively influence the development of human capital, particularly in the education and health sectors. Research conducted in specific African countries, including Nigeria (Bahia et al., 2024), Senegal (Masaki et al., 2020), and Ghana (Osondu et al., 2024; Siaw et al., 2020), has demonstrated the beneficial effects of broadband diffusion.

Although many scholars, such as Mbah and Ankah (2023), Kouladoum (2024), and Siaw et al. (2020), highlight the importance of enhancing broadband connectivity as a catalyst for economic development, most of them admit that many African countries continue to face obstacles necessary

to effectively use the Internet. Some of these obstacles include high Internet costs, limited accessibility, and a lack of skills necessary to effectively use the Internet (Mbah & Ankah, 2023). Others are Internet infrastructural expansion, regulatory framework, and the capacity to implement those regulations effectively (Chemjor, 2023; Welde, 2021). Despite relatively high broadband coverage in certain African countries, challenges remain. For example, Caldarola et al. (2023) report that Rwanda has achieved universal mobile broadband coverage, a claim supported by Mugabe et al. (2021), who noted that Rwanda attained some of the highest 3G and 4G network coverage rates on the continent, enabling mobile broadband access for nearly all its citizens. Nevertheless, Caldarola et al. (2023) indicated that digital literacy remains a significant barrier to digital access in Rwanda.

While numerous studies have highlighted the present circumstances surrounding the implementation of broadband services in various African countries, they have overlooked the critical link between the expansion of broadband access and digital preparedness. This oversight is particularly significant when considering the implications for formal education. The relationship between broadband connectivity and the preparedness of individuals and institutions to effectively utilize digital resources in educational settings remains inadequately explored. Understanding this connection is essential for developing strategies that not only enhance broadband infrastructure but also foster an environment conducive to digital learning and literacy.

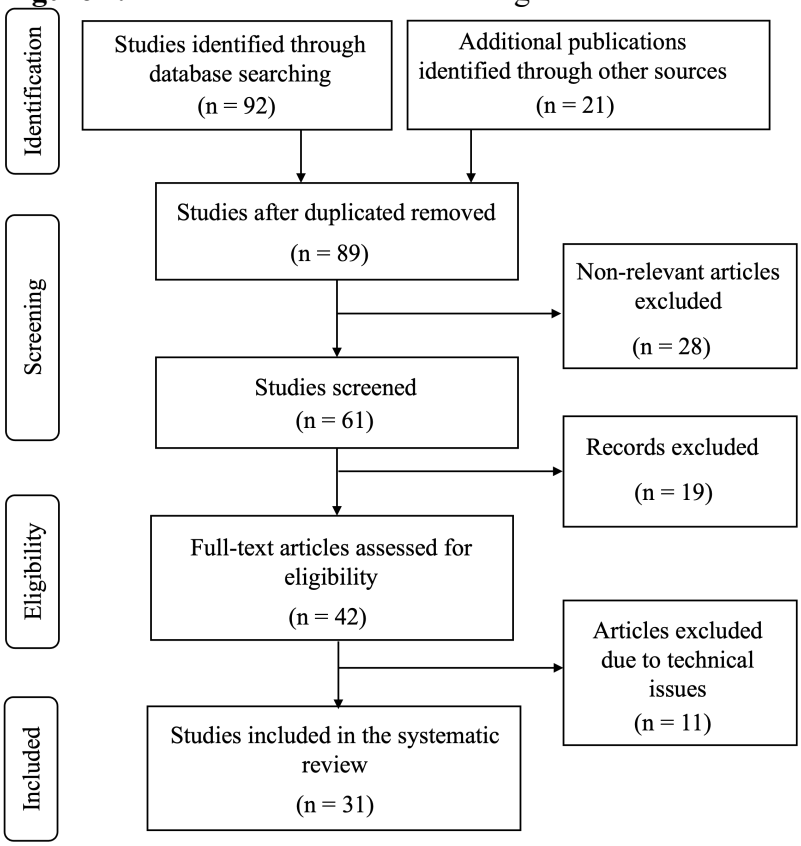
Method

The qualitative research approach was adopted in undertaking this study, in which the process was underpinned by an interpretivist research paradigm. The paradigm focused on the ways people create meaning towards social phenomena through their experiences, cultures, and interactions. This enabled researchers to gain descriptive insights by analyzing empirical evidence derived from existing literature regarding the study's focus. A detailed desk review of available literature on the status of broadband diffusion, factors affecting the diffusion, and their implications in the digital preparedness based on their relevance to the study's objectives and contextual relevance was undertaken. A review involved a systematic searching, retrieval, and thematic analysis of literature relevant to the research objectives.

The systematic qualitative review design was used in reviewing literature accessed from digital repositories, online databases, and institutional archives, comprising academic journal articles, conference proceedings, books, institutional reports, and policy documents published between 2010 and 2025. The search was performed using phrases related to the broadband diffusion and the digital preparedness within the formal education context. The phrases included *broadband* OR *internet connectivity* AND *digital preparedness* AND *formal education* AND *Tanzania*. The study employed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework to accomplish the identification and inclusion of literature in the review. A comprehensive search was performed across multiple databases, including DOAJ, AJOL, Google Scholar, JSTOR, EBSCO, Web of Science, and other pertinent sources, resulting in the identification of 113 studies; 92 from databases and 21 from additional sources. After eliminating duplicates, 89 studies remained. Of these, 28 were deemed irrelevant and excluded. A thorough review of the remaining articles resulted in the exclusion of 19 due to inaccessible full texts. Ultimately, 42 full-text articles were eligible for analysis; however, 11 were excluded due to

technical difficulties. Thus, the final number of studies included in the review was 31, as depicted in the PRISMA framework in Figure 2.

Figure 2. PRISMA Framework Showing Inclusions and Exclusions of Reviewed Literature



Thematic analysis was employed as a core analytical method to identify, analyze, and interpret patterns of the qualitative data obtained from the studies included in the review. The Braun and Clarke's (2006) six-step framework was employed as follows:

i. Familiarization with data by engaging deeply with data through repeated reading of literature for the purpose of identifying ideas of diffusion patterns, such as digital preparedness indicators like infrastructure, training, and policies
ii. Generating initial codes was also done by systematic coding of interesting features across the dataset, like the perceived usefulness of the broadband and Internet technology in formal education.
iii. Searching and reviewing themes was performed by grouping codes into broader themes such as institutional preparedness, drivers of broadband diffusion, and barriers to adoption, while checking if they do say something meaningful about the coded extracts.
iv. Reviewing themes involved checking whether the themes work in relation to the coded extracts. In this study, the review was conducted to identify whether drivers of broadband diffusion encompassed all relevant codes, or if some needed to be fragmented into sub-themes as external influence or external partnerships.
v. Defining and naming themes in this study was also carried out by refining each theme and writing a concise definition. For example, the *institutional preparedness* in this context referred to the extent to which infrastructure, human capacity, and policy

environments support the adoption of broadband and Internet usage in formal educational institutions.

vi. Producing the report, which in this context was based on using vivid data extracts and analytic commentary to illustrate themes in relation to research questions, was done. In this study, it entails coming out with the write-up showing how preparedness levels of the country in using the Internet for teaching-learning correlated with the speed or success of broadband diffusion, using literature insights to support points.

Results and Discussions

This section provides the results along with an in-depth discussion of the findings. The analysis is grounded in the current literature and theoretical framework, emphasizing their significance in the context of Tanzania.

Broadband Connectivity in Tanzania

Broadband connectivity in Tanzania covers mobile, fixed (wired), and satellite technologies. Studies such as Byanyuma et al. (2017) and Nieminen (2020) show that the country's broadband connectivity is mostly accelerated by mobile network operators, whose coverage is almost all over the country. From time to time, mobile network operators have been offering Internet service through special price Internet bundles, leading to Tanzania being renowned for offering some of the most affordable data rates in the region (Mmari, 2023). Report by the Tanzania Telecommunications Regulatory Authority shows that by September 2023, the average coverage of 3G mobile broadband network signal was 83% of the population, while 4G coverage was 74%. Regarding geographical coverage, 67% and 55% of the geographical areas of the country were covered by 3G and 4G mobile broadband network signals, respectively.

Concerning the quality of network regarding download and upload speeds, there was an average of 6.86Mbps and 10.81Mbps upload and download speeds, respectively, for mobile broadband, and 23.07Mbps and 24.29Mbps upload and download speeds, respectively, for fixed (wired) broadband (Ministry of Information, Communication and Information Technology, 2023). In addition to Internet broadband offered through mobile network operators, there have been several other initiatives by the government to develop broadband infrastructure. The most prominent initiative, as described by Simba et al. (2012), is the laying down of the countywide backbone cable known as the National ICT Broadband Cable (NICTBB). The NICTBB is aimed at providing Internet connectivity to all of Tanzania's regions, districts, and border areas of neighboring countries through a fiber optic cable technology. It is not surprising, therefore, that there are studies such as Byanyuma et al. (2017) arguing that broadband connectivity in Tanzania is no longer a challenge, especially in areas where NICTBB is laid, alongside the existing growth in mobile broadband coverage. However, research shows that most Tanzanians still do not have access to broadband connectivity and related services (Bahia et al., 2021; Maghori & Lubawa, 2025; Pazi, 2019).

Furthermore, the country still misses key elements necessary for the distribution of 5G network (Makaro, 2023). Similarly, Alikhan and Alikhan (2025) and Mmari (2023) assert that while data may be affordable, a significant digital divide persists in Tanzania, making Internet access prohibitive for a considerable segment of the population. UNESCO (2021) reports that although

86% of men and 77% of women in Tanzania own a mobile phone, only 35% and 17% of men and women, respectively, have mobile Internet access. These facts suggest that, regardless of the efforts made, the general status of broadband connectivity to the general population is still low.

Factors Affecting Broadband Diffusion

The broadband diffusion is a critical driver for, among others, educational advancement in the country. Despite its potential, the study found that adoption of broadband in a wider community in Tanzania remains uneven, due to inadequate government policies, unsupportive legal and regulatory frameworks, insufficient infrastructure, and limited digital literacy. These factors are essential in addressing the gaps in broadband access and fostering a more inclusive digital environment. More details on these factors are provided in the following sub-sections.

Government Policies

In the planning and deployment of broadband infrastructure in the country, government policies are an essential factor in setting out a strategic direction. As Majid Gilani and Faccia (2022) suggest, government policies in the context of this study involve key government documents, including policies, programmes, and projects that involve broadband connectivity and diffusion in the country. In 2016, the government of Tanzania formulated and operationalized the National ICT Policy and its implementation strategy (United Republic of Tanzania, 2016). Such a policy provides a framework for the development and growth of Tanzania's ICT industry for social change and economic growth. The policy has put in place measures and mechanisms to accelerate broadband penetration and access by individuals and organizations (Ministry of Information, Communication and Information Technology, 2024). During the period of this study, such a policy document was under review, and a draft document of the new policy was published online to solicit stakeholders' inputs (Ministry of Information, Communication and Information Technology, 2023). However, the study could not find an independent national policy document that set forth a strategic framework regarding broadband diffusion in the country. Additionally, Tanzania is still implementing the National Telecommunication Policy of 1997 (Ministry of Communications and Transport, 1997). The policy, nonetheless, lacks a statement on both Internet connectivity and broadband diffusion. As far as national broadband plan in the management and development of ICTs is concerned, Katz and Jung (2021) are of the view that the development of a national broadband plan in any country is expected to increase mobile investment by 15%, network coverage by 14%, price reduction by 8%, and mobile penetration by close to 3% after only two years.

Furthermore, the study found that Tanzania was implementing a five-year (2021-2026) World Bank-funded project named Digital Tanzania Project (DTP). The DTP is structured around four components including: (i) digital ecosystem which aimed at strengthening the laws, policies, regulations, institutional and human capacities for promoting ICT infrastructure investment, among others, (ii) digital connectivity with the aim of ensuring access to affordable, high-quality Internet services for all citizens, including those in rural areas, and for critical government institutions, (iii) digital platforms and services which aimed at building the core infrastructure and capacity necessary to support digital public service delivery, and (iv) supporting management of the project (United Republic of Tanzania, 2023). A successful implementation of DTP is expected to boost, among others, broadband connectivity. Additionally, the government launched the

Tanzania Digital Economy Strategic Framework 2024 – 2034 (Ministry of Information, Communication and Information Technology, 2024). The framework describes digital infrastructure, which includes reliable, accessible, and affordable Internet connectivity as one of the pillars of the country's digital economy. Furthermore, in 2020, Tanzania's cabinet was restructured, and subsequently, a new Ministry for ICT was established. The newly established Ministry was mandated to oversee, formulate, coordinate, and monitor the implementation of various policies pertaining to the management and development of ICTs (broadband included) in the country (Ministry of Information, Communication and Information Technology, 2023).

From analyzing the existing government policies in Tanzania, a twofold reality was revealed. First, the government missed some key policy documents, such as the national broadband plan. These are very necessary documents that need to be in place for the purpose of fostering broadband diffusion, and ultimately, digital preparedness. And second, some of the initiatives, including review of the ICT policy and implementation of DTP, were still in progress; thus, during this study, their impacts could not have been measured or realized.

Legal and Regulatory Framework

The legal and regulatory environment is among the important aspects in raising ICT usage, and broadband diffusion. As the developments and use of ICTs in various areas pose some social, economic, and technological challenges, there is equally a need to establish legal and regulatory instruments to address those challenges. The study found that the government of Tanzania enacted several Acts regarding issues pertaining to consumer protection, cybersecurity, and promotion of electronic communications (United Republic of Tanzania, 2016). Among Tanzania's legal instruments on this matter that were found to be available and accessible include: the Electronic and Postal Communications Act of 2010, Universal Communications Service Access Act of 2006, and the Cybercrime Act of 2015. Others were the Electronic Transactions Act of 2015, the Access to Information Act of 2016, and the Personal Data Protection Act of 2022. Table 1 provides a summary of each of these instruments.

Table 1. Related Legal Instruments Available

Legal Instrument	Description	Source
Electronic and Postal Communications Act of 2010	The Electronic and Postal Communications Act institutes the law with regard to electronic communications in the country.	United Republic of Tanzania, 2010
Universal Communications Service Access Act of 2006	This Act sets and defines minimum set of quality and affordable communication services to all users regardless of their physical places.	Parliament of the United Republic of Tanzania, 2006
Cybercrime Act of 2015	The aim of this Act is to specify penal sanctions to protect privacy and prevent data protection abuses and violations.	Parliament of the United Republic of Tanzania, 2015a
Electronic Transactions Act of 2015	Provides for the legal recognition of electronic transactions, e-Government services, and other electronic undertakings.	Parliament of the United Republic of Tanzania, 2015b
Access to Information Act of 2016	The Access to information Act stipulates the constitutional right of access to information. It also describes the scope of information which the public has the right to access, among other related matters.	Parliament of the United Republic of Tanzania, 2016
Personal Data Protection Act of 2022	This Act stipulates principles related to the protection of personal data and other related matters.	Parliament of the United Republic of Tanzania, 2023

As it is with the policy environment, the legal and regulatory environment was introduced in order to play an important role in facilitating investment, innovation, and access to digitalization, as well as in stimulating competitiveness by easing market entry and emphasizing consumer protection (Ministry of Information, Communication and Information Technology, 2023). Additionally, the presence of legal instruments was expected to set the underlying foundation for an environment that fosters the responsible use of ICT services in the country. All these imply the creation of an environment conducive to the diffusion and utilization of broadband services. However, as detailed in Table 1, none of the listed legal instruments was tailored specifically for promoting and supporting broadband diffusion in the country. This may be the reason why Shao et al. (2022) opine that there is a need for the government to lower regulatory constraints and barriers that hinder the adoption of ICT-based interventions and increase those that do the opposite.

Information and Communications Technology Infrastructural Development

Tanzania has made considerable investments in the development and support of ICT infrastructures, some of which foster broadband connectivity in the country. In 2021, Tanzania rolled out its NICTBB for broadband Internet access. The NICTBB is a national fiber optic cable network aimed at achieving the vision of extending opportunities for Internet access inland. More than 13,000 kilometers of NICTBB have been laid (Ministry of Information, Communication and Information Technology, 2023). The Government has also formed a consortium with Mobile Network Operators (comprising Airtel, Tigo -currently known as Yas Tanzania-, Vodacom, and Zantel) to support the construction of metro and last-mile broadband infrastructure that covers 27,912 kilometers of fiber optic cable countrywide (United Republic of Tanzania, 2023). The construction of fiber networks is crucial for high-speed and reliable Internet connectivity. As part of infrastructure development, a fiber optical cable manufacturing company, including the Raddy Fiber Manufacturing Limited, has been established in the Pwani Region with a capacity of producing 24,000 kilometers of fiber per year. The company is a major boost to the fiber cable industry, providing an opportunity for cost reduction in the investment in fiber network infrastructure. The country has also established the Government Communication Network, an online gateway to all government information and services. Government Communication Network aims to allow the public to perform online transactions with the government and to obtain information on how and where to access government services.

Despite the indicated availability of infrastructural development initiatives in Tanzania, more needs to be done. For example, in rural areas where most of the Tanzanian population resides, the Internet penetration is still at an infant stage as compared to urban areas where it is largely concentrated (Bahia et al., 2021; Matto, 2022). Kemp (2021) reports that only 35.6% of Tanzania's population resides in urban areas, while the majority (64.4%) live in rural areas. This suggests that Internet usage remains low in the country because most people are located in places where ICT infrastructure is still poorly developed. Within the East African context, Kemp (2021) indicates further that as of February 2021, Tanzania had 25% Internet penetration, which was higher than South Sudan (8%) and Burundi (13.3%), yet still behind Uganda (26.2%), Kenya (40%), and Rwanda (31.4%). On the global scale, the Portulans Institute (2020) ranks Tanzania 112th out of 134 countries for Internet usage and 117th for Internet access. Furthermore, the high cost of ICT equipment, including computers, makes it difficult for many Tanzanians to acquire such tools (Mwantimwa, 2019).

Education and Skills

The proper leveraging of broadband connectivity hinges on having adequate digital literacy. As defined by Law et al. (2018), digital literacy encompasses the ability to access, manage, understand, integrate, communicate, evaluate, and create information safely and appropriately through digital devices and networked technologies, to participate fully in social and economic life. However, research indicates that digital literacy levels in Tanzania remain low. For example, in 2020, the Portulans Institute ranked Tanzania 85th out of 134 countries for ICT skills and 82nd for adult literacy. These outcomes align with findings by Matto and Ponera (2025), Nieminen (2020), and Matto et al. (2025) that digital literacy is still very limited in Tanzania. The low level of digital literacy suggests that even if broadband were widely available, many Tanzanians would not be in a position to make full use of it. Thus, the country can be considered digitally unprepared with regard to this aspect.

Implications for Formal Education

Digital preparedness presents a significant opportunity to transform the formal education sector by reducing inequalities, enhancing learning outcomes, and preparing students for an increasingly digital world. However, the findings of this study reveal that broadband rollout in Tanzanian communities remains uneven, largely due to insufficient government policies, unsupportive legal and regulatory frameworks, inadequate infrastructure, and limited digital literacy. It is fair to say, therefore, that the country has considerable work ahead to effectively leverage digital technologies in formal education. Further, as found in the study, the distribution of some of the supporting factors for broadband diffusion (such as ICT infrastructures) is uneven. This creates a possibility of a scattered ability to infuse online learning among learners in the country. As a result, some learners may enjoy better access to digital educational resources, while others continue to encounter significant limitations, thereby deepening the existing digital divide in formal education.

The lack of digital preparedness became particularly evident during the COVID-19 pandemic when schools and universities were forced to suspend physical operations and traditional classroom settings (Masubo, 2020). As highlighted by Mpapalika and Katera (2023), this suspension affected over 14.5 million students across the country, necessitating the exploration of alternative methods for teaching and learning beyond conventional classroom environments. While several other countries employed digital technologies to sustain the teaching and learning processes during the pandemic, in Tanzania, teaching stopped and was only done in a few circumstances, and was done through broadcasting channels, mainly radio and television channels (Mtebe et al., 2021). The channels were the only option available because of the lack of digital preparedness that could have facilitated the use of the virtual classroom services (Bihu, 2022). Mpapalika and Katera (2023) add that radio and television were used to deliver teaching and learning because there was limited access to alternative learning resources, and varying availability of technological tools like Internet connectivity, computers, and tablets. Lack of utilization of electronic learning platforms for teaching and learning during events where physical meetings were not allowed was primarily influenced by four key challenges: lack of digital literacy, insufficient ICT infrastructure, the Internet connectivity challenges, and ineffectiveness of governmental initiatives and policies on educational dissemination through electronic means, as illustrated in the study's conceptual framework in Figure 1. These observations align with the findings of other researchers, including Mpapalika and Katera (2023) and Nieminen (2020).

Conclusion and Recommendations

This study examined the broadband diffusion in Tanzania and its connection to the digital preparedness, reflecting on the country's readiness to leverage broadband for formal education. An in-depth analysis of four critical dimensions that affect broadband diffusion: government policies, regulatory framework, infrastructural readiness, as well as education and skills, was conducted. Findings show that, although Tanzania instituted several policies and initiatives regarding broadband diffusion, it still lacks some key policy documents, such as the national broadband plan. In addition, critical legal instruments tailored to promote and support broadband diffusion in the country are still lacking. Furthermore, despite several countries' initiatives to support the development of ICT infrastructure, more still needs to be done. Internet penetration is also at an infant stage and is largely concentrated in urban areas, where there is a small population compared to rural areas. Regarding digital education and skills, Tanzania is still ranked very low. Taking these factors into account, it is evident that Tanzania's level of digital preparedness remains low while considerable work, demanding a multistakeholder approach, is needed to improve the rollout of broadband.

Based on the findings of this study, it is recommended that the Tanzanian government, through the Ministry of Communication and Information Technology, should ensure that relevant policies and documents related to the broadband diffusion are established and operationalized. In achieving that, the country can benchmark with some successful models like Rwanda. It is also important to enact legal instruments that promote and do not obstruct the broadband diffusion in the country. In addition, more efforts should be exerted to keep improving the ICT infrastructure and boost digital literacy. In addressing the digital inequalities, the government could establish digital preparedness policies. In addition, educational institutions in collaboration with the Ministry of Education, Science and Technology should develop curricula that allow and not only support the digital learning but also enforce digital skills in both students and instructors.

This study, while successful in its objectives, had some limitations. First, it relied exclusively on a review of existing documents. Future research that involves primary data from key informants, including academic faculty and librarians, would help to triangulate this study's findings. Second, the research was based only on the preparedness side, specifically assessing whether the environments are suitable for supporting digitalization as far as broadband diffusion is concerned. However, this aspect does not address the actual incorporation of digital technologies into the teaching and learning processes. Future research might explore the integration of these technologies and their effects on learning outcomes. And third, this study was limited to formal education. Subsequent studies could expand their scope to include informal education, where digital tools also play a significant role.

References

Aligo, B. L., & Prudente, M. S. (2025). Effectiveness of digital learning materials on students' achievement in science: A meta-analysis. *Journal of Global Education and Research, 9*(1), 55-69. https://www.doi.org/10.5038/2577-509X.9.1.1427

Alikhan, S., & Alikhan, M. M. (2025). Assessing telecentres as a strategy for bridging the digital divide in rural communities of developing countries: A narrative review. *Journal of the University Librarians Association of Sri Lanka*, *28*(2), 118-156. https://doi.org/10.4038/jula.v28i2.8113

Bahia, K., Castells, P., Cruz, G., Masaki, T., Pedrós, X., Pfutze, T., Rodríguez-Castelán, C., & Winkler, H. (2024). The welfare effects of mobile broadband internet: Evidence from Nigeria. *Journal of Development Economics*, *170*, Article 103314. https://doi.org/10.1016/j.jdeveco.2024.103314

Bahia, K., Castells, P., Cruz, G., Masaki, T., Rodríguez-Castelán, C., & Sanfelice, V. (2021). *Mobile broadband Internet, poverty and labor outcomes in Tanzania* (IZA DP No. 14720). IZA Institute of Labor Economics. https://docs.iza.org/dp14720.pdf

Begičević Ređep, N. (2021). *Comparative overview of the digital preparedness of education systems in selected CEE countries* (CPS Working Paper). Center for Policy Studies, Central European University. https://cps.ceu.edu/sites/cps.ceu.edu/files/attachment/publication/3316/cps-working-paper-educ-digital-preparedness-2021.pdf

Begum, S. (2021). Accelerating digital transformation: An analysis of network readiness index 2020 post COVID-19. *Eurasian Journal of Management & Social Sciences*, *2*(2), 29-42. https://doi.org/10.23918/ejmss.V2i2p29

Bihu, R. (2022). Implications of the COVID-19 pandemic on higher education in Tanzania: A roadmap for developing an EPRRM contingency plan. In M. B. Garcia (Ed.), *Socioeconomic inclusion during an era of online education* (pp. 68-91). IGI Global. https://doi.org/10.4018/978-1-6684-4364-4.ch004

Biswas, P. (2017). Emerging internet services: An overview. *International Journal of Information Science and Computing*, *4*(1), 7-16. http://dx.doi.org/10.5958/2454-9533.2017.00002.3

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Byanyuma, M., Yonah, Z. O., Simba, F., & Trojer, L. (2017). Overview of broadband connectivity for rural areas: Tanzania as a case study. *International Journal of Computer Science and Information Security*, *15*(4), 312-320.

Caldarola, B., Grazzi, M., Occelli, M., & Sanfilippo, M. (2023). Mobile Internet, skills and structural transformation in Rwanda. *Research Policy*, *52*(10), Article 104871. https://doi.org/10.1016/j.respol.2023.104871

Chemjor, T. K. (2023). *Effects of internet broadband access on service delivery: Case of health care sector in Elgeyo-Marakwet County, Kenya* [Master's thesis, Kenyatta University, Kenya]. Kenyatta University Repository. https://ir-library.ku.ac.ke/server/api/core/bitstreams/b15dbfca-344b-4ea3-9079-9c9c474c979f/content

Chen, S., Liu, W., & Song, H. (2020). Broadband internet, firm performance, and worker welfare: Evidence and mechanism. *Economic Inquiry*, *58*(3), 1146-1166. https://doi.org/10.1111/ecin.12854

Danchikov, E. A., Prodanova, N. A., Kovalenko, Y. N., & Bondarenko, T. G. (2021). The potential of online learning in modern conditions and its use at different levels of education. *Linguistics and Culture Review*, *5*(S1), 578-586. https://doi.org/10.21744/lingcure.v5nS1.1442

Downes, P. K. (2007). Connecting to the internet. *British Dental Journal*, *202*, 317-322. https://doi.org/10.1038/bdj.2007.225

Dutta, S., & Lanvin, B. (Eds). (2019). *The network readiness index 2019: Towards a future-ready society*. Portulans Institute. https://download.networkreadinessindex.org/reports/data/2019/nri-2019.pdf

Henseler, M., Maisonnave, H., & Maskaeva, A. (2022). Economic impacts of COVID-19 on the tourism sector in Tanzania. *Annals of Tourism Research Empirical Insights*, *3*(1), Article 100042. https://doi.org/10.1016/j.annale.2022.100042

Katz, R., & Jung, J. (2021). *The impact of policies, regulation, and institutions on ICT sector performance.* International Telecommunication Union. https://www.itu.int/en/ITU-D/Regulatory-Market/Documents/Events2021/Impact_policies_regulation_and_Institutions_on_ICT_Sector_performance.pdf

Kelley, B., & Sisneros, L. (2020). *Broadband access and the digital divides: Policy brief*. Education Commission of the States. https://www.thepattersonfoundation.org/images/Broadband-Access-and-the-Digital-Divides.pdf

Kemp, S. (2021). *Digital 2021: Tanzania.* DataReportal. https://datareportal.com/reports/digital-2021-tanzania

Kouladoum, J. C. (2024). Internet penetration and human capital development in Africa. *Journal of the Knowledge Economy*, *16*(2), 10195-10221. https://doi.org/10.1007/s13132-024-02234-y

Law, N., Woo, D., de la Torre, J., & Wong, G. (2018). *A global framework of reference on digital literacy skills for indicator 4.4.2* 9 (Information Paper No. 51). UNESCO Institute for Statistics. https://unesdoc.unesco.org/ark:/48223/pf0000265403

Maghori, J. M., & Lubawa, G. G. (2025). Assessing e-government services for sustainable rural entrepreneurship in Tanzania. In D. Ç. Yıldırım, S. Yıldırım & V. Kandpal (Eds.), *Sustainable digitalization strategies in business and healthcare* (pp. 65-92). IGI Global. https://doi.org/10.4018/979-8-3373-5087-5.ch003

Majid Gilani, S. A., & Faccia, A. (2022). Broadband connectivity, government policies, and open innovation: The crucial IT infrastructure contribution in Scotland. *Journal of Open Innovation: Technology, Market, and Complexity*, *8*(1), Article 1. https://doi.org/10.3390/joitmc8010001

Makaro, M. (2023, February 10). 5G technology: Transforming Tanzania's digital landscape—What more to expect? *Tanzania Digest*. https://tanzaniadigest.com/5g-technology-transforming-tanzanias-digital-landscape-what-more-to-expect/

Masaki, T., Ochoa, R. G., & Rodríguez-Castelán, C. (2020). *Broadband Internet and household welfare in Senegal* (IZA DP No. 13658). IZA Institute of Labor Economics. https://docs.iza.org/dp13658.pdf

Masubo, V. (2020, July 2). *COVID-19 in Tanzania: Is business as usual response enough?* International Growth Centre. https://www.theigc.org/blogs/covid-19-tanzania-business-usual-response-enough

Matto, G. (2022). Big data analytics framework for effective higher education institutions. *Tanzania Journal of Engineering and Technology*, *41*(1), 10-18.

Matto, G., & Ponera, J. (2025). Artificial intelligence in higher education institutions in Tanzania: Analysis of policy perspectives. *Interdisciplinary Journal of Education Research*, *7*(1), Article 13. https://doi.org/10.38140/ijer-2025.vol7.1.13

Matto, G., Ponera, J. M., & Kyumana, V. (2025). GenAI and effective reading among university students: Prospects, challenges, and future directions. *Indonesian Journal of Informatics Education*, *8*(2), 123-134. https://doi.org/10.20961/ijie.v8i2.97595

Mbah, L., & Ankah, E. (2023). *The impact of broadband Internet on labor productivity in African countries.* [Unpublished master's thesis]. University of Stavanger, Norway.

Ministry of Communications and Transport. (1997). *National telecommunications policy*. United Republic of Tanzania. https://www.mawasiliano.go.tz/uploads/documents/sw-1687598675-National%20Telecommunications%20Policy%20of%201997.pdf

Ministry of Information, Communication and Information Technology. (2023). *Drafted national ICT policy, 2023*. The United Republic of Tanzania. https://www.mawasiliano.go.tz/uploads/documents/sw-1693455522-DOCUMENT%20TO%20UPLOAD%20DRAFT%20AUGUST%20NICTP.pdf

Ministry of Information, Communication and Information Technology. (2024). *Tanzania digital economy strategic framework 2024-2034*. The United Republic of Tanzania. https://ictc.go.tz/storage/44/01J5TJNDHDVTA3AHVQN9CR6BV7.pdf

Mmari, K. (2023, November 28). Tanzania's digital paradox: Affordable data, unaffordable connectivity. *The Chanzo*. https://thechanzo.com/2023/11/28/tanzanias-digital-paradox-affordable-data-unaffordable-connectivity/

Mpapalika, J., & Katera, L. (2023). *The impact of the COVID-19 pandemic on educational inequalities in Tanzania* (Occasional Paper No. 85). Southern Voice. https://southernvoice.org/wp-content/uploads/2023/09/COVID-19-pandemic-Education-Tanzania-Mpapalika-and-Katera-2023.pdf

Mtebe, J. S., Fulgence, K., & Gallagher, M. S. (2021). COVID-19 and technology enhanced teaching in higher education in sub-Saharan Africa: A case of the University of Dar es Salaam, Tanzania. *Journal of Learning for Development*, *8*(2), 383-397. https://doi.org/10.56059/jl4d.v8i2.483

Mugabe, R., Liu, S., & Enock, B. (2021). The impact of ICT investment and diffusion on economic growth: Empirical evidence from Rwanda. *International Journal of Innovation and Economic Development, 7*(4), 23-36. https://doi.org/10.18775/ijied.1849-7551-7020.2015.74.2002

Mwananziche, J., Myovella, G., Karacuka, M., Haucap, J., & Moshi, G. (2023). Is digitalization a booster for economic growth in Africa? Short run and long run evidence from Tanzania. *Telecommunications Policy*, *47*(10), Article 102679. https://doi.org/10.1016/j.telpol.2023.102679

Mwantimwa, K. (2019). ICT usage to enhance firms' business processes in Tanzania. *Journal of Global Entrepreneurship Research*, 9(1), 1-23. https://www.econstor.eu/bitstream/10419/261974/1/1689835443.pdf

Nguyen, D. K., Broekhuizen, T., Dong, J. Q., & Verhoef, P. C. (2019, December 15-18). Digital readiness: Construct development and empirical validation [Conference presentation]. International Conference on Information Systems, Munich, Germany.

Nieminen, J. (2020). *Landscape report: Digital education in Tanzania*. Fingo Powerbank. https://fingo.fi/en/fingo-powerbank/learning-material/landscape-report-digital-education-in-tanzania/

Ollerenshaw, A., Corbett, J., & Thompson, H. (2021). Increasing the digital literacy skills of regional SMEs through high-speed broadband access. *Small Enterprise Research*, *28*(2), 115-133. https://doi.org/10.1080/13215906.2021.1919913

Osondu, J., Jean Francois, E., & Strycker, J. (2024). Artificial intelligence as a policy response to teaching and learning issues in education in Ghana. *Journal of Global Education and Research*, 8(3), 236-253. https://www.doi.org/10.5038/2577-509X.8.3.1361.

Oughton, E. J., Amaglobeli, D., & Moszoro, M. (2023). What would it cost to connect the unconnected? Estimating global universal broadband infrastructure investment. *Telecommunications Policy*, *47*(10), Article 102670. https://doi.org/10.1016/j.telpol.2023.102670

Parliament of the United Republic of Tanzania. (2006). *The Universal Communications Service Access Act, 2006* (Act No. 11 of 2006). https://www.mawasiliano.go.tz/uploads/documents/en-1687758221-The%20Universal%20Communications%20Service%20Access%20Act%20of%202006.pdf

Parliament of the United Republic of Tanzania. (2015a). *The Cybercrimes Act, 2015* (Act No. 14 of 2015). https://www.mawasiliano.go.tz/uploads/documents/en-1687499190-The%20Cybercrimes%20Act,%202015.pdf

Parliament of the United Republic of Tanzania. (2015b). *The Electronic Transactions Act*, 2015 (Act No. 13 of 2015). https://www.mawasiliano.go.tz/uploads/documents/en-1687499369-The%20Electronic%20Transactions%20Act,%202015.pdf

Parliament of the United Republic of Tanzania. (2016). *The Access to Information Act, 2016* (Act No. 6 of 2016). https://www.mawasiliano.go.tz/uploads/documents/en-1687500936-THE%20ACCESS%20TO%20INFORMATION%20ACT,%202016.pdf

Parliament of the United Republic of Tanzania. (2023). *The Personal Data Protection Act, 2023* (Act No. 11 of 2022). https://www.mawasiliano.go.tz/uploads/documents/en-1691158828-The%20Personal%20Data%20Protection%20Act%202022_English.pdf

Pazi, S. M. (2019). Assessment of broadband access technologies in Tanzanian rural areas. *International Journal of Internet of Things*. *8*(1), 1-9.

Pingali, S. R., Singha, S., Arunachalam, S., & Pedada, K. (2023). Digital readiness of small and medium enterprises in emerging markets: The construct, propositions, measurement, and implications. *Journal of Business Research*, *164*, Article 113973. https://doi.org/10.1016/j.jbusres.2023.113973

Portulans Institute. (2021). *The network readiness index: Accelerating digital transformation in a post-COVID global economy*. https://networkreadinessindex.org/wp-content/uploads/2020/11/NRI-2020-V8_28-11-2020.pdf

Rajasekaran, S., Adam, T., & Tilmes, K. (2024). *Digital pathways for education: Enabling greater impact for all*. World Bank. https://doi.org/10.1596/42386

Shao, D., Mwangakala, H., Ishengoma, F., Mongi, H., Mambile, C., & Chali, F. (2022). Sustenance of the digital transformations induced by the COVID-19 pandemic response: Lessons from Tanzanian public sector. *Global Knowledge, Memory and Communication*, *72*(6-7), 700-713. https://doi.org/10.1108/GKMC-11-2021-0186

Shaykina, O. I., & Minin, M. G. (2018). Adaptive internet technology as a tool for flipping the classroom to develop communicative foreign language skills. *International Journal of Emerging Technologies in Learning*, *13*(7), 243-249. https://doi.org/10.3991/ijet.v13i07.8092

Siaw, A., Jiang, Y., Twumasi, M. A., & Agbenyo, W. (2020). The impact of internet use on income: The case of rural Ghana. *Sustainability 12*(8), Article 3255. https://doi.org/10.3390/su12083255

Simba, F., Trojer, L., & Yonah, Z. O. (2012). Sustainable broadband connectivity model for rural areas of Tanzania. *African Journal of Science, Technology, Innovation and Development*, *4*(2), 150-172.

Tomer, A., Fishbane, L., Siefer, A., & Callahan, B. (2020, February 27). *Digital prosperity: How broadband can deliver health and equity to all communities*. Brookings. https://www.brookings.edu/articles/digital-prosperity-how-broadband-can-deliver-health-and-equity-to-all-communities/

UNESCO. (2021, October 5). *Adolescent girls and young women in Tanzania expand digital literacy and skills*. https://www.unesco.org/en/articles/adolescent-girls-and-young-women-tanzania-expand-digital-literacy-and-skills

United Republic of Tanzania. (2010). *The electronic and postal communications act, 2010*. Office of the Solicitor General. https://elibrary.osg.go.tz/items/4b042d10-d0e3-406c-a21a-a5989be15c39http://parliament.go.tz/polis/uploads/bills/acts/1452072364-ActNo-3-2010.pdf

United Republic of Tanzania. (2016). *National information and communications technology policy*. Government Printer. https://www.modans.go.tz/uploads/publications/sw1479372814-national%20ict%20policy%202016.pdf?utm_source=chatgpt.com

United Republic of Tanzania. (2023). *Digital Tanzania project*. Ministry of Information, Communication and Information Technology. https://dtp.mawasiliano.go.tz/home

van de Werfhorst, H. G., Kessenich, E., & Geven, S. (2020). *The digital divide in online education: Inequality in digital preparedness of students and schools before the start of the COVID-19 pandemic* [Preprint]. SocArXiv. https://osf.io/preprints/socarxiv/58d6p_v1

Welde, A. A. (2021, July 23–24). *Digital divide in Sub-Saharan Africa: A panel analysis of Internet diffusion* [Conference presentation]. Eighteenth International Conference of the Ethiopian Economy, Addis Ababa, Ethiopia.

Yahl, M. (2015). Education in Tanzania. *Harvard Education Review, 55*(1), 45-52. https://pages.nyu.edu/keefer/waoe/webbj.pdf

Acknowledgements

The authors are grateful to their employer, Moshi Co-operative University, for giving them the opportunity to undertake this study. They declare no conflict of interest associated with this study.