Gender and Digital Technology Use in Higher Education: A Case Study of Distance Learners in Tanzania

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Abstract: The study examined gender differences and use of digital technology in higher education among distance learners in Tanzania. It sampled 185 respondents from a population of 344 distance learners using a random sampling technique. Questionnaires were used as the primary data collection tool. Data analysis was conducted using SPSS, with both descriptive and inferential statistics employed. Tools such as percentages, mean scores, and independent t-tests were used to analyse and interpret the data. The findings revealed that information and communication technology (ICT) access and use significantly facilitates students' academic progress. Sixty percent of respondents utilised Moodle for assignments, while 30% improved interactions with instructors and peers through online forums and discussions. A significant gender disparity (p <.000) was identified in ICT access and usage, with male students demonstrating a higher mean score (M = 5.71) compared to female students (M = 3.34) in the use of e-learning tools. Additionally, attitude emerged as a significant factor influencing ICT usage, with 98.1% of students indicating active use of ICT facilities in the ODL context. Students with positive attitudes toward ICT were more effective in utilising digital resources for learning. The study recommends targeted ICT training for both lecturers and students to enhance digital literacy. Furthermore, open and distance learning (ODL) institutions should ensure the availability of quality internet infrastructure and technical support services to improve education delivery and bridge gender disparities in the digital age.

Keywords: ICT usage, Digital technologies, Attitudes, Gender, Distance learners

1. Introduction

Higher education plays a pivotal role in national development by driving the diffusion of knowledge into the economy, ultimately contributing to sustainable development (SD). Tanzania's "Development Vision 2025" emphasises the creation of a well-educated and learning society as a cornerstone for achieving sustainable growth. Information and communication technology (ICT) has revolutionised teaching and learning processes,

enabling institutions like the Open University of Tanzania (OUT) to adopt open and online learning systems. Since 2016/2017, OUT has utilised Moodle to provide a platform where lecturers and students can interact and share resources, also fostering flexibility and accessibility of education (OUT, 2023). This study examines how male and female distance learners access and utilise digital technologies in learning to ensure quality education for sustainable development.

The United Nations' 2030 Agenda for Sustainable Development highlights the critical role of education through SDG-4, which seeks to ensure inclusive and equitable quality education for all. ICT investment is seen as a prerequisite for achieving this goal as it creates opportunities for collaboration and continuous learning across the education system (United Nations, 2016; Alenezi, Wardat & Akour, 2023). Digital technologies empower individuals by providing innovative solutions such as interactive websites, online libraries, and virtual classrooms, which support flexible learning (Parveen & Ramzan 2024). Such tools are particularly valuable in open and distance education systems, where learners benefit from self-paced study opportunities, bridging gaps in traditional classroom-based learning environments (Thuy & Qalati, 2020; Wolfram & Kienesberger, 2023).

ICT is reshaping education by enabling access to inclusive and equitable learning opportunities, especially in regions with limited infrastructure. Open and distance learners can make use of digital platforms to enhance their skills and knowledge without physical interaction with instructors (Prosper & Mnyanyi, 2017). However, challenges persist, including limited ICT skills, unreliable internet connectivity, high costs, and inadequate technical support (Dahiya, 2022; Alenezi, Wardat & Akour, 2023). These challenges are more pronounced in developing countries like Tanzania, where socio-economic and cultural factors, particularly gender dynamics, influence the adoption and effective use of ICT in education (Prosper, 2020).

This study focuses on the gendered dimensions of digital technology use among distance learners in Tanzania, exploring ICT-based learning indicators such as access and use as well as determining the relationship between level of attitudes and digital technologies. While global research highlights the transformative potential of ICT in education, there remain significant disparities in its application and impact. For example, studies by Silin and Kwok (2017) and Thuy and Qulati (2020) show that while ICT fosters engagement and collaboration, challenges such as technical issues, internet accessibility, and limited ICT competency hinder its full potential. Understanding these dynamics at the OUT will help develop strategies to improve digital literacy and ensure sustainable development through equitable access to education.

1.1 Problem Statement

Information and communication technology (ICT) plays a crucial role in enhancing open and distance learning (ODL), addressing the growing demand for equitable access to higher education (Rao, 2010). ICT is recognised as an instrument driving the development of higher education systems (Thuy & Qulati, 2020). Recent advancements in digital technology have transformed ODL into a premier platform for delivering electronically accessible courses, thereby expanding educational opportunities for broader communities (Prosper & Mnyanyi, 2017). ICT-based practices in education provide students with professional, supportive, and enabling digital environments that promote learning.

However, the effective integration of digital technologies in ODL institutions often encounters setbacks, such as poor student performance and negative attitudes toward ICT use (Alenezi, Wardat & Akour, 2023). Challenges to implementation include inadequate internet connectivity, high ICT costs, time constraints, frequent power outages, and limited digital literacy (Mumba, 2017; Sithole & Mbukanma, 2024). In Tanzania, social, economic, and cultural factors further exacerbate disparities in ICT use for distance education. Notably, Prosper (2020) highlighted that gender mediates access to and attitudes toward ICT, influencing teaching and learning experiences. Additionally, perceptions of ICTs' usefulness and ease of use are closely linked to students' attitudes toward access and application (Olipas & Leona, 2022).

Given such disparities, this study aims to explore the interplay between students' attitudes, gender, and digital technology usage at the Open University of Tanzania. By examining these relationships, the research intends to inform the technological access and use in distance education and bridge the ICT gender gap for sustainable development.

1.2 Specific Research Objectives

1. To examine the ICT-Based learning indicators (access and use) among distance learners.
2. To assess gender differences in ICT usage among distance learners.
3. To determine the relationship between level of attitudes and digital technologies among distance learners.

1.3 Research Question and hypothesis

The study is guided by one research question and two hypothesis:

Research Question: What are the indicators of ICT access and use among distance learners?

Hypothesis Ho1: There is no significant difference between accessing ICT facilities and gender.

Hypothesis Ho2: There is no significant relationship between level of attitude and the use of digital technologies.

1.4 Theoretical Framework

The Gender and Technology Framework is discussed in relation to gender and digital technology use in Tanzanian higher education. It provides a basis for analyzing how socially constructed gender roles influence access to, use of, and engagement with digital technologies, particularly among distance learners. This discussion synthesizes key perspectives, emphasizing its relevance in addressing gender disparities in ICT use.

Gender and Technology Theory

This study is informed by the Gender and Technology theoretical Framework, which examines the relationship between gender-defined as the socially constructed roles, behaviours, and identities associated with being male or female-and technology, understood as the application of scientific knowledge to practical situations. This framework highlights how gender influences and is influenced by technological design, access, use, and impact. It draws on contributions from scholars such as Kenny & Donnelly, (2020), who argue that the relationship between gender and technology is bidirectional. These scholars assert that gender norms shape the development, adoption, and utilisation of technology, while technology, in turn, can reinforce or challenge existing gender inequalities. Additionally, Kube, Weidlich, Jivet, Kreijns and Drachsler (2022) emphasise that gender plays a critical role in determining access to and use of technology, thus exposing disparities that contribute to digital exclusion. Historically, scholars such as Grint and Gill (1995) and Wolfram and Kienesberger (2023) have documented barriers marginalised groups face in accessing technology, often leading to unequal opportunities and outcomes.

The chosen theory is relevant to this study as it helps to analyse how digital technologies interact with gendered experiences in higher education. By exploring gender-based disparities in access to and attitudes toward use of ICT among distance learners in Tanzania, this framework offers a deeper understanding of how sociocultural and historical factors influence technological engagement. It also helps identify structural inequalities and cultural norms that contribute to differences in ICT adoption and usage among male and female students. The theory is applied to assess attitudes toward ICT-based learning among male and female distance learners and to identify potential gender differences in ICT usage within an open and distance learning (ODL) institution in Tanzania.

2. Empirical Literature Review

This literature review examines gender differences in the use of digital technology within higher education, with a specific focus on distance learners in Tanzania. It synthesises previous research to explore factors contributing to gender disparities in familiarity with digital tools, accessibility, and the effectiveness of technology in supporting learning activities. Literature survey aims to establish a foundation for understanding the underlying factors shaping these differences among male and female distance learners in the Tanzanian context.

2.1 Digital Technologies

Digital technologies involve a broad range of electronic tools, systems, and resources used for generating, storing, or processing data, including social media, online applications, multimedia, and mobile devices (Haleem, Javaid, Qadri & Suman, 2022). These technologies go beyond the traditional notion of "computers" as they include resources like digital audio, video, and internet-based tools, making them integral to modern educational settings (Alenezi *et al.* 2023). While this paper uses "digital technologies" broadly, its focus is not on specific tools but rather on exploring students' attitudes toward ICT-based teaching and learning within open and distance learning (ODL), particularly along gender perspectives.

Parveen & Ramzan (2024) point out the transformative potential of digital technologies in education, from addressing university cost challenges to reshaping teaching and learning practices. These technologies have educational advantages such as fostering collaboration, creativity, and interaction, as well as shifting traditional teaching methods toward innovative, technology-driven approaches. Nevertheless, the role of digital technologies in education is influenced by societal values and aspirations for sustainable development (Mahmoud, 2023). While digital technologies offer opportunities for educational transformation, this review insists that their impacts vary based on usage and accessibility, particularly in the ODL system.

2.2 Attitude and ICT Based learning

The integration of ICT in higher education has significantly transformed teaching and learning processes, shifting from traditional teacher-centred approaches to innovative digital methods encouraging student-centred learning (Thuy & Qalati, 2020). Students now engage with learning materials in distance mode facilitated by digital tools, which enhance flexibility and accessibility (Haleem *et.al* 2022; Parveen & Ramzan, 2024). However, as Alenezi *et al.* (2023)

reiterates, while ICT's potential is unquestionable, students' attitudes toward ICT-based learning remain a critical factor. This is significant in ODL contexts since understanding students' attitudes can illuminate gender-based differences in ICT skills and experiences, contributing to academic development (Dahiya, 2022; Alshuaybat, 2025).

Studies such as Dahiya (2022) and Tarazi (2023) provide insight into user perspectives on e-learning and ICT. For example, Dahiya (2022) examined Libyan university students' and instructors' experiences with ICT, focusing on satisfaction and attitudes. Similarly, Tarazi (2023) explored e-learning preferences in Palestine, finding that blended learning approaches combining traditional and digital methods were more effective and appreciated by students. Both studies highlight the importance of ICT integration into learning strategies to improve engagement and educational outcomes and they also emphasize the need to contextualise findings to local settings, such as distance learning institutions in Tanzania.

Research in gender differences in digital use, particularly in higher education, presents varied findings. A study by (Rawal, 2024) observed that female students had more favourable attitudes toward ICT and cherished its academic benefits. Conversely, Fisher, Thompson & Brookes (2020) noted lower computer confidence among females in Australia. These contrasting findings entail that factors such as cultural and contextual may have influenced the students' gendered attitudes toward ICT (Vimalkumar, Singh & Gouda, 2021). Similarly, studies like Lee Shong (2020) in South Africa revealed distinct perspectives based on language, prior exposure, and learning modes, emphasising more on the complexity of gender and technology interactions in education.

Other studies indicate that gender disparities in ICT usage may be lessening due to increased exposure to technology. Mahmoud (2023) found no significant gender differences in attitudes toward ICT among students in Malaysia and Guam, respectively. They suggest that as technology becomes more accessible, gender-related barriers may also decrease. Islahi (2019) further supports this view, showing that both male and female educators valued ICT equally for improving teaching and learning quality. These findings generally present that attitudes are socially constructed and revolve with increased exposure in digital literacy.

While ICT is increasingly embraced for its educational benefits, gender gaps in access and usage persevere in certain contexts. Studies by Sithole & Mbukanma (2024) and Kenny & Donnelly (2020) attest to the existence of a digital divide among students. Both scholars observed the gender differences, as male students often have greater access to ICT resources than females. However, women report higher perceived empowerment through ICT usage in academic settings, indicating its transformative potential. The presented findings emphasise the role of societal norms and access disparities in shaping gendered attitudes and insist on the importance of promoting equal ICT access and use for all students to enhance learning outcomes.

This literature review presents the complexity of the gender and ICT relationship, emphasising the need for contextualised research, particularly in higher learning institutions, such as ODL, in order to address persistent disparities and thus impact sustainable educational development.

3. Methodology

This section outlines the quantitative research approach and methods employed in this study 'Gender and Digital Technology Use in Higher Education: A Case Study of Distance Learners in Tanzania'. It details the selection of respondents, the instruments used for data collection, and the procedures for data collection and analysis. The chosen methods align with the study's objectives, ensuring a comprehensive exploration of gender dynamics in digital technology use among distance learners.

3.1 Participants in the study

Participants were selected utilising a stratified random sampling method to guarantee representation across gender and other significant demographic characteristics. The sample comprised 185 remote learners from diverse academic programs at the Open University of Tanzania. Stratification was conducted according to gender, academic programmes, and year of study to encompass a diverse array of viewpoints on the utilisation of digital technology in education. Participants were randomly selected from each group following stratification to reduce bias. This approach guaranteed equitable gender representation while showcasing the varied academic backgrounds and degrees of technological involvement among the students. A sample size of 185 was selected to guarantee statistical reliability and enhance the generalisability of findings within the institution's setting.

3.2 Instrument for Data Collection

This descriptive study adopted a quantitative approach for data collection and analysis. The study deployed a structured questionnaire as the primary data collection tool to gather relevant information. Based on the study's objectives, we designed a five-point Likert scale questionnaire that focused on ICT access, usage indicators,

and attitudes toward ICT among male and female students. The questionnaires were distributed to the sample of 185 distance learners studying various programmes at the Mwanza Regional Centre of the Open University of Tanzania. The research participants were informed of the purpose of the study and provided with clear instructions to complete the questionnaire. The administration of questionnaires involved both online and paper-based formats to accommodate participants' varying levels of digital accessibility.

The study achieved a 100% response rate, with all administered questionnaires successfully completed and returned. Analysis of the socio-demographic data revealed that males constituted a larger proportion of the sample, accounting for 67% of respondents, while females comprised 33%, as shown in Table 1. This disparity suggests that male enrollment in higher education institutions is higher than that of females.

Table 1: Socio-demographic characteristics

Variable	Frequency	Percentage (%)
Male	128	69.19
Female	57	30.81
Total	185	100

3.3 Sampling Procedure

The study was conducted at the Mwanza Regional Centre of the Open University of Tanzania (OUT) and employed a random sampling technique to select students under the e-learning study mode. The sampling was based on a population of 344 bachelor's degree students enrolled at the Mwanza Regional Centre. Following the guidelines of Miaoulis and Michener (1976), quantitative sampling considers three essential criteria: the level of precision, the level of confidence or risk, and the degree of variability in the attributes being measured. For this study, a precision level of ±5% was adopted.

The sample size was calculated using Yamane's (1967) simplified formula for determining sample size at a 95% confidence level with a precision level of 0.05:

$$n = \frac{N}{1 + N\ (e^2)}$$

Where:
n = sample size
N = population size (344)
e = level of precision (0.05)
Calculation: $\frac{344}{1 + 344\ (0.05)^2} = 184.95 = 185$
This calculation led to the determination of a sample size of 185 respondents for the study.

3.4 Data Analysis

The collected data were coded and analysed using the Statistical Package for Social Sciences (SPSS, Version 23). Descriptive statistics were employed to examine respondents' demographic characteristics and to measure their attitudes toward ICT-based learning, categorised by gender. Additionally, inferential tests were conducted to assess the association between respondents' attitudes and their use of digital technologies for sustainable teaching and learning. A t-test was performed to evaluate gender differences in ICT usage among the Open and Distance Learning (ODL) students.

4. Results and Discussion

This section presents findings in relation to objectives of the study. Also, the findings are discussed with supports from previous literatures in order to authenticate the findings.

4.1 ICT-Based Learning indicators

Descriptive statistics identified key indicators of ICT-based learning for sustainable development, focusing on access and usage among students. The results showed that ICT significantly improved students' ability to carry out essential learning activities, with 60% reporting enhanced efficiency in completing assignments. Additionally, 30% of students noted that ICT facilitated interactions with instructors and peers, highlighting its role in fostering collaborative learning. Access to Moodle was another important aspect of ICT use, as presented in Table 2. These findings concur with those of Dahiya (2022) and Alshuaybat (2025), who emphasize the positive impact of digital tools on academic performance and interactive learning.

Sustainable educational practices were also evident, with 80% of students relying on computers for learning, compared to 10% using smartphones and tablets, as shown in Table 3. This reinforces (Alenezi *et al*. 2023) observation of computers as a central tool in higher education, although the limited use of mobile devices suggests potential for broader integration. Additionally, the high attainment of e-learning assignments, with a mean score of 70%, supports the transformative role of ICT in enhancing learning outcomes, as noted by (Tarazi, 2023).

These findings underline ICT's contribution to achieving sustainable educational goals, as emphasised by Mahmoud, 2023), while stressing the importance of making technology more inclusive through diversified device usage.

Table 2: ICT Access indicators

Variable	Frequency	Percentage (%)
Carry out assignments	147	80
Interaction with instructors and students	19	10
Access to Moodle learning system	19	10

Table 3: Use of ICT indicators

Variable	Frequency	Percentage (%)
Computers	147	80
Smart phones	19	10
Tablets	19	10

4.2 Gender Differences in ICT Usage

The study identified significant differences in ICT access and usage between male and female students. Male students demonstrated higher access to ICT facilities, including telecentres, cybercafés, Moodle platforms, and personal computers, with a mean score of 6.42 (SD = 0.731), compared to female students, who had a mean score of 4.27 (SD = 0.521). Table 5 reveals that males use e-learning tools more frequently (M = 5.71, SD = 0.854) than females (M = 3.34, SD = 0.541).

Table 4: Independent t-Test of Gender with Access to ICT facilities

	Male		Female				
	M	SD	M	SD	T	Df	p
Access to ICT Facilities	6.42	.731	4.27	.521	12.85	185	0.03

p<.05. N=185. t-test is significant at the 0.05 level (2-tailed).

The findings show a gender disparity in ICT access and usage among distance learners. Male students' higher access to facilities and tools aligns with prior studies suggesting that gendered roles and societal norms may influence technology engagement (Rawal, 2024). This disparity could stem from differences in exposure, resources, or confidence in using digital tools. The greater use of e-learning tools by male students supports earlier observations by Vimalkumar, Singh & Gouda (2021), who noted gender differences in computer-related attitudes and usage patterns. These results call for targeted interventions to enhance female students' access to and use of ICT, thereby promoting equitable participation in technology-driven education.

Table 5: Descriptive Statistics for access and use of ICT based on Gender

	Male		Female	
	M	SD	M	SD
Accessing of ICT facilities	6.42	.731	4.21	.521
Use e-learning tools	5.71	.854	3.34	.541

Globally, the findings correspond with the longitudinal study by Mahmoud (2023), which examined gender differences in ICT usage at the tertiary level in Pakistan. Their study revealed that male students had significantly higher access and usage of ICT facilities (M = 3.71) compared to female students (M = 3.17). Similarly, the results resonate with Gillwald, Milek and Stork (2010), who assessed gender disparities in ICT usage and access across 17 countries in East, West, Central, and Southern Africa. Their study found that women had less access to ICT facilities than men, largely due to factors such as income disparities, educational attainment, and societal roles.

4.3 Level of Attitude and Use of Digital Technologies in ODL

To determine the level of students' attitudes toward digital technology in the Open and Distance Learning (ODL) context, the study revealed that students demonstrated high levels of positivity in terms of subjectivity, understanding, interest, credibility, content, dependency, and communication. Multiple regression was conducted to examine the relationship between these attitudes and the use of digital technologies.

The results, as presented in Table 5, show an $R2=0.981R^2 = 0.981R2=0.981$, indicating that students' attitudes account for 98.1% of the variance in the model. This finding suggests that attitudes are a significant predictor, contributing 98.1% to the students' engagement and use of digital technologies. The strong correlation highlights the critical role of fostering positive attitudes to enhance the adoption and effective use of digital technologies in the ODL context.

Table 6: Regression model results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.995ᵃ	.981	.630	1.57312

To affirm linear relationship between the variables, graph was plotted between attitude and digital technology use as shown on the Figure 1.
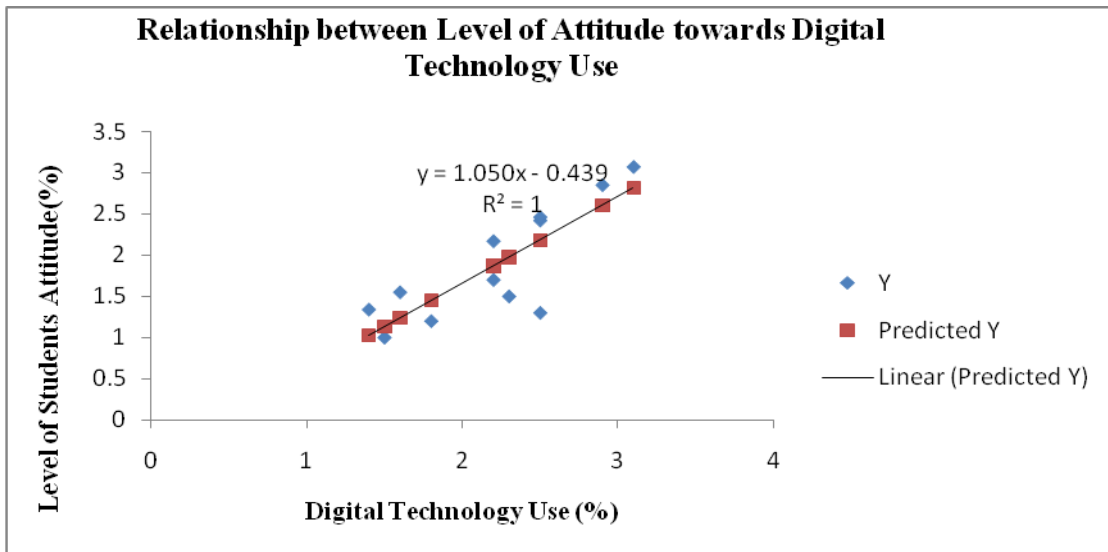

Figure 1: Relationship between Level of Attitude and Digital Technology use at OUT

The findings demonstrate a strong positive linear relationship between students' attitudes toward ICT-based learning and their use of digital technologies, as depicted by the linear regression fit line equation. The observed variation value of $R2=1R2=1$ confirms a perfect correlation between the two variables. This result reveals that students with favorable attitudes toward IT-based learning engage more actively with digital technologies.

The association suggests that as students cultivate positive attitudes, their performance and skills in ICT-based learning improve, promoting sustainable development in education. These findings concur with Alenezi et al. (2023), who emphasised the transformative role of technology in enhancing learning outcomes. Similarly,

Alshuaybat (2025) asserted that positive attitudes toward ICT contribute significantly to skill acquisition and academic performance. This relationship emphasises the importance of promoting positive perceptions of ICT-based learning to maximize its impact on education and sustainable development.

5. Conclusion and Recommendation

5.1 Conclusion

The study presents the role of ICT access and usage in enhancing learning among distance learners. While students primarily rely on computers for assignments,

instructor interactions, and accessing platforms like Moodle, the limited use of smartphones and tablets stresses the importance of more inclusive and adaptable technologies. Gender differences were apparent, with male students engaging more with digital tools than females, largely due to socio-economic and technological barriers. The strong, positive relationship between students' attitudes toward IT and their usage further emphasises the need to foster favorable perceptions to maximise learning outcomes.

5.2 Recommendations

This paper, therefore, recommends that institutions should therefore broaden access to diverse ICT tools, including smartphones and tablets, through initiatives like subsidised devices from willing companies. Targeted interventions like mentorship programs, specialised training, and policies that promote equitable access to digital resources for female students can effectively address gender differences.

Policymakers and institutions should prioritise the integration of ICT in distance education by investing in infrastructure like stable internet connectivity and accessible learning platforms. The study recommends further research to examine socio-cultural and economic factors contributing to gender differences in ICT usage and to explore strategies for enhancing mobile technology adoption. These steps are critical to ensuring ICT tools support sustainable, inclusive development in distance learning.

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