Challenges to Effective ICT Implementation in Primary Education Development Projects in Tanzania: A Case Study of Songea District

Luis A. Shekaoneka
Department of Economics, Institute of Accountancy Arusha
Email: luisshekaoneka@gmail.com

Wainyaragania K. Arthur
Institute of Accountancy Arusha
Email: arthurken2005@yahoo.com

Abstract

The implementation of Information and Communication Technology (ICT) in education is essential for improving learning outcomes and addressing educational inequalities, particularly in rural Tanzania. Despite various ICT initiatives in primary education, effective implementation remains challenging. This study examines factors hindering ICT implementation in Tanzania's primary education, with a focus on Songea District. Guided by objectives assessing ICT skills, infrastructure adequacy, and necessary implementation procedures, a case study design and mixed-methods approach were utilized. Data were collected from district education officers, teachers, and students across five primary schools using structured questionnaires and interviews. Analysis included descriptive statistics for quantitative data and thematic analysis for qualitative insights. Findings revealed barriers such as inadequate ICT skills, limited infrastructure (computers, internet), and poorly defined ICT procedures. Recommendations include policy enhancements, training programs, infrastructure development, and clearer ICT guidelines to support effective ICT use in classrooms, promoting success in Tanzania's educational development projects.

NG Journal of Social Development

Vol. 14 Issue 2 (2024)
ISSN(p) 0189-5958
ISSN (e) 2814-1105
Home page
https://www.ajol.info/index.php/ngjsd

ARTICLE INFO:
Keyword
Effective Implementation; Information Communication Technology (ICT); Primary Education; Development Project

Article History
Received: 4th September 2024
Accepted: 2nd November 2024

DOI:*https://dx.doi.org/10.4314/ngjsd.v14i2.19*

1. Introduction

Information and Communication Technology (ICT) encompasses a broad range of tools and systems that facilitate the processing, storage, transmission, and retrieval of information, playing a transformative role across various sectors, especially education (Agbedahin, 2019; Kitole & Shuka, 2024). In the educational context, ICT enhances instructional methods, expands access to information, and promotes collaboration between students and teachers (Eugenia, 2020). Since the mid-20th century, ICT development has revolutionized fields like communication, healthcare, business, and education, marking a significant shift in how society interacts with technology (Leonid, 2024; Anandakumar, 2020). These technologies are instrumental in addressing issues of inequality, governance, and access to information, especially in developing countries (Adams, 2021; Amankwah-Amoah, 2019). ICT's influence continues to expand, making digital literacy an essential skill for navigating today's digital age (Saif, 2022; Yamamoto & Yamaguchi, 2019).

The global adoption of ICT has been accelerated by its potential to improve educational outcomes, provide equitable access to resources, and equip students with essential skills needed in a modern, knowledge-based economy (Fernández-Gutiérrez, 2020; Bariu, 2020). Developed nations recognized these advantages early on, investing significantly in ICT infrastructure, teacher training, and digital content to enhance learning (Paudel, 2021). In Sub-Saharan Africa, ICT integration in schools is seen as a way to support sustainable development goals and improve the quality of education, but successful implementation faces challenges due to infrastructural limitations (Agyei, 2020; Mwapwele, 2019). In addition to education, ICT is critical in healthcare and business, where it supports telemedicine and data-driven decision-making, facilitating services in remote areas and boosting organizational efficiency (Kvedar, 2014; Mwantimwa, 2019; Nyame-Asiamah, 2019).

In Africa, ICT development has primarily focused on bridging the digital divide, with initiatives designed to foster economic growth, improve educational access, and address socio-economic disparities (Rana, 2020; Adams, 2021). Increased connectivity and mobile phone adoption in the early 21st century significantly advanced the region's ICT landscape (Anasel et al., 2024). Programs like the African Union's Smart Africa Alliance and investments in ICT training aim to leverage technology for educational and economic development (Yadav, 2021). However, ICT integration faces challenges like funding disparities, resource constraints, and unequal access, particularly in rural areas (Anathe & Kimaro, 2021; Basar, 2021).

Tanzania's journey with ICT began in the late 1990s, driven by both government initiatives and private sector investments aiming to enhance communication infrastructure and support socio-economic development (Ananditha, 2024). The Tanzania Communications Regulatory Authority (TCRA), established in 2003, played a pivotal role in regulating and promoting ICT use across the country (Ngasa, 2020). In the educational sector, efforts to integrate ICT include providing digital resources, e-learning platforms, and establishing ICT infrastructure within schools to improve student engagement and learning outcomes (Innocent & Masue, 2020). Recognizing ICT's potential, the Tanzanian government implemented policies like the National ICT Policy of 2003 and the Ministry of Education's ICT policy of 2007, which emphasized digital literacy and curriculum integration (URT, 2007; Bishel, 2022). These policies reflect Tanzania's commitment to equipping students with digital skills to prepare them for the evolving technological landscape (URT, 2016).

Global initiatives such as the Millennium Development Goals (MDGs) and the World Summit on

the Information Society (WSIS) emphasize equitable access to quality education, recognizing ICT as an essential driver of educational reform (Eileen de Jong, 2021). These frameworks, along with Tanzania's ICT policies, highlight the importance of ICT for development, particularly in rural areas (URT, 2010; Minga, 2024). In Tanzania, ICT is not only seen as a tool for improving educational outcomes but also as a way to address socio-economic inequalities, especially in underserved regions (Zenda, 2022; Basar, 2021). However, implementing ICT in primary education remains challenging in areas like Songea District due to limited infrastructure, inadequate resources, and a shortage of trained personnel (Malero, 2015; Joseph, 2021).

Research highlights the need for tailored approaches to ICT adoption in rural areas, where infrastructural and training challenges are particularly pronounced (Kweka, 2018; Ndibalema, 2018). The Resource-Based View (RBV) theory underlines the importance of human resources, such as adequately trained teachers, as vital assets for achieving competitive advantages (Barney, 1991). Similarly, the Technology Acceptance Model (TAM) emphasizes that perceived usefulness and ease of use significantly affect ICT adoption, suggesting that addressing skill gaps is essential for successful integration (Davis, 1989; Ashraf, 2020). This study, therefore, seeks to identify specific barriers to ICT implementation in Songea District, offering targeted recommendations to improve policies, training, and resources (Malekani, 2018; Kitole et al., 2023; Kitole & Genda, 2024; Dimoso & Andrew, 2021). Ultimately, findings from this study aim to support policy enhancements, better resource allocation, and effective ICT use in primary education, addressing the digital divide between urban and rural areas (Mtebe, 2018; Mwila, 2018). Such efforts are critical for improving educational quality and equipping students with skills relevant to a modern workforce, contributing to broader goals for sustainable national development (Utouh & Kitole, 2024; Sawmar, 2021; Mwendwa, 2017). Therefore, this study examines challenges ffecting effective implementation of the ICT in Primary Education Development Projects in Tanzania.

2. Review of Related Literature

2. 1 Theorical Review

This study draws upon the Technology Acceptance Model (TAM) and the Resource-Based View (RBV) theory to understand the factors influencing the successful implementation of ICT in primary education development projects. TAM, developed by Davis (1989), provides a framework for examining how users come to accept and use new technologies, focusing on two main factors: perceived usefulness (PU) and perceived ease of use (PEOU). Perceived usefulness refers to the belief that using a particular technology will enhance job performance or productivity, while perceived ease of use relates to how simple the technology is to operate. According to TAM, when users perceive a technology as both useful and easy to use, they are more likely to adopt it. This model is valuable for exploring user acceptance in various domains, including education.

Similarly, the Resource-Based View (RBV) theory, introduced by Barney (1991), offers insights into how organizations can gain competitive advantages by leveraging unique resources and capabilities. According to RBV, firms achieve sustainable competitive advantage by acquiring and utilizing resources that are valuable, rare, and difficult to replicate. These resources can include tangible assets like infrastructure and equipment, as well as intangible ones like skills, knowledge, and organizational culture. RBV suggests that organizations with distinctive resources are better positioned to achieve success, as these assets support more effective operations and strategic positioning.

In the context of this study, TAM and RBV together underscore the significance of stakeholders'

perceptions of ICT's usefulness and ease of use in educational projects. If stakeholders view ICT as valuable and user-friendly, adoption is likely to increase, facilitating successful implementation. Conversely, if ICT is perceived as complex or of limited utility, barriers to adoption may arise, potentially hindering effective implementation. Thus, addressing stakeholder concerns and fostering positive perceptions of ICT can significantly improve its acceptance and integration within primary education projects.

Furthermore, RBV emphasizes the need to identify and capitalize on available resources and capabilities to support ICT implementation. Recognizing and utilizing resources such as infrastructure, skills, and effective procedures can create a competitive advantage, facilitating smoother integration of ICT in primary education. By integrating these theoretical frameworks, this study highlights that successful ICT adoption in educational settings relies on positive stakeholder perceptions and strategic resource deployment, ultimately promoting sustainable development in the education sector.

2.2 Empirical Literature Review

Joseph (2021) conducted a study on the role of ICT in teaching and learning within selected secondary schools in Mikindani Municipality, Tanzania. The study explored the extent of ICT use, the benefits derived from it, and the challenges faced in its implementation. Findings revealed that ICT enhances the educational experience by broadening access to resources, improving students' understanding, facilitating collaborative learning, and increasing student engagement. However, several critical challenges emerged, including inadequate ICT infrastructure, insufficient ICT skills among teachers, lack of technical support, and limited teacher training. These issues collectively restrict the full integration of ICT into the teaching and learning processes, underscoring the need for significant improvements in infrastructure and teacher preparedness to maximize the benefits of ICT in secondary education.

Similarly, Mwila (2018) investigated ICT infrastructure deployment in fifteen secondary schools across the Kilimanjaro region of Tanzania. This study aimed to examine how ICT resources, including computer labs, internet connectivity, and digital learning materials, were integrated into the educational setting and their impact on learning outcomes and teaching methods. Employing both quantitative and qualitative methods, including surveys, interviews, and classroom observations, Zeda (2022) gathered detailed insights into the effects of ICT on education quality. Results indicated that schools with robust ICT infrastructure experienced enhanced educational quality. Students benefited from a richer learning experience, with increased access to diverse educational content, the ability to engage in online activities, and improved research skills. Teachers also adapted their instructional methods to be more interactive and student-centered, incorporating multimedia content and digital tools to explain complex concepts, which ultimately enriched the overall learning environment.

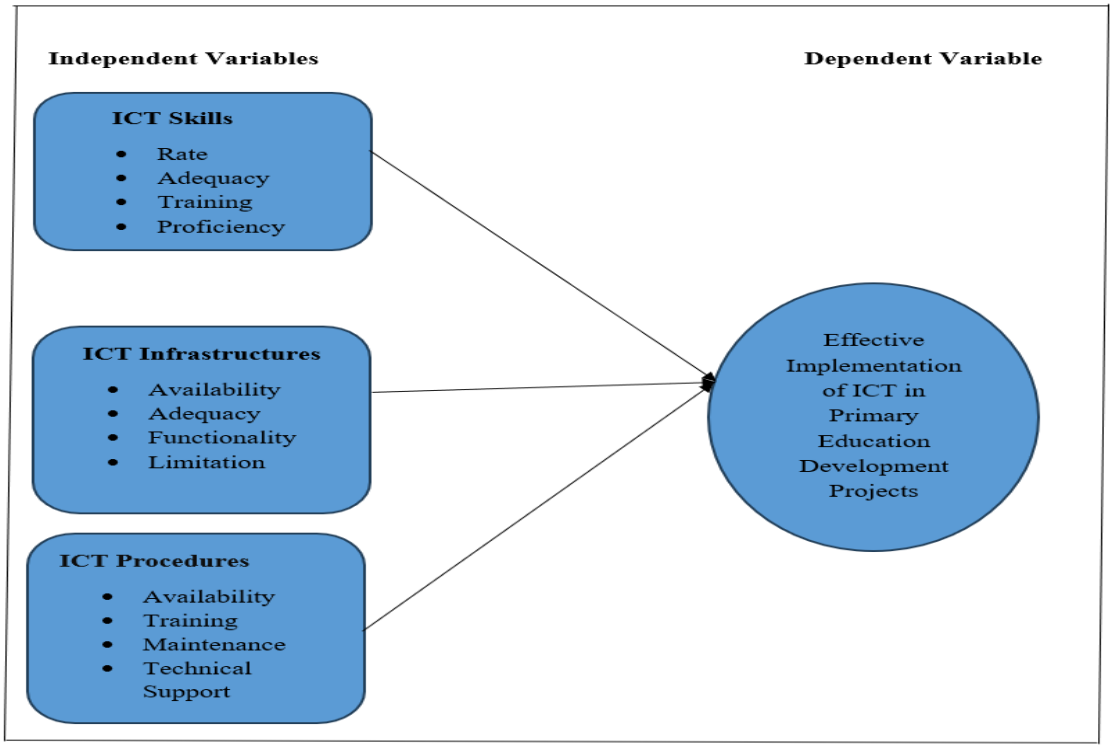
Oreku (2021) examined the adoption of ICT innovations in university administrative processes, focusing on the Open University of Tanzania (OUT). Using a mixed-methods approach, the study assessed the effectiveness of ICT tools, especially during the COVID-19 pandemic, when traditional administrative processes were disrupted. Data were collected from a sample of 250 respondents, including students, lecturers, and administrative staff, through systematic online distribution via platforms like WhatsApp. The study found that ICT innovations, particularly the Online Oral Examination System (OREX), significantly improved administrative efficiency and streamlined university processes. A mean score of 3.56 reflected positive perceptions of ICT's role in administration. ANOVA results showed no significant differences among students, lecturers,

and administrators in their views, suggesting a broad consensus on the benefits of ICT innovations in enhancing university operations. The study recommended that the university further strengthen its ICT infrastructure and offer targeted training to ensure effective implementation.

These studies collectively highlight both the potential and challenges of ICT integration in various educational settings. Joseph's (2021) and Mwila's (2018) findings suggest that when ICT is accessible and properly implemented, it enhances learning and teaching experiences by providing richer educational resources and facilitating innovative instructional methods. However, both studies also point out persistent challenges, such as inadequate infrastructure and limited ICT skills among educators, which hinder the effective utilization of technology. Oreku's (2021) research adds to this discourse by demonstrating how ICT can streamline administrative processes in higher education, showcasing its potential to improve operational efficiency beyond classroom settings. The convergence of these findings underscores the need for comprehensive policies and investments in ICT infrastructure, technical support, and capacity-building initiatives to address existing limitations and fully leverage ICT's benefits in education.

The empirical evidence from these studies emphasizes that while ICT holds considerable promise for enhancing education, successful implementation requires overcoming substantial barriers. Inadequate resources, insufficient training, and infrastructure gaps are recurrent challenges that limit the transformative potential of ICT in educational contexts. Addressing these barriers through policy reform, investment in ICT infrastructure, and continuous professional development for educators is essential for ensuring that ICT can genuinely enhance teaching, learning, and administrative processes across educational institutions.

Figure 1: Conceptual Framework



Source: Authors' design (2024)

3. Methodology

The study was conducted in Songea District, focusing on five public primary schools—Morogoro, Lundusi, Mapinduzi, Peramiho, and Mbingamhalule—in the Ruvuma region of Tanzania. These schools were selected based on their involvement in ICT primary education projects and their varied use of ICT methods, such as e-learning and digital devices in classrooms. Student enrollment numbers also influenced the selection criteria. A mixed-methods research approach was used, combining quantitative and qualitative data to allow a comprehensive understanding of ICT implementation challenges in primary education (Creswell, 2017). This approach facilitated triangulation, enhancing the depth and reliability of the findings.

A case study design was adopted to enable an in-depth examination of ICT usage within its real-world context, providing a holistic view of the phenomenon. The study population included one district education officer, 3,231 students, and 56 teachers, totaling 3,288 individuals. To determine the sample size, Yamane's (1967) formula was applied, using a 5% margin of error for a 95% confidence interval. The primary district education officer was selected through purposive sampling due to their expertise on ICT initiatives, while simple random sampling was used for teachers and students to ensure each individual had an equal chance of selection.

Data were collected through interviews and questionnaires. The district education officer was interviewed to provide detailed insights into ICT usage, while questionnaires were distributed to teachers and students to allow for data collection from a larger group, ensuring confidentiality and reducing bias. Closed-ended questions on a 5-point Likert scale gathered quantitative data on participants' views regarding ICT implementation. Data analysis combined quantitative and qualitative techniques: quantitative data were analyzed using descriptive statistics (mean, standard deviation, percentages, and frequencies) with SPSS version 18, while qualitative data were examined through content analysis. Ethical considerations were rigorously maintained, with confidentiality, anonymity, and informed consent upheld throughout the study, allowing participants to provide honest responses and enriching the overall quality of the data collected.

4. Findings

4.1 Demographic of the Respondents

The demographics of the respondents provides an overview of the key characteristics of the respondents involved in the study (Ashraf, 2020). The background information of respondents in this study includes name of school, school ownership, school category, gender, education level and number of years have been serving in school. This helps to establish the context of the research by offering insights into the composition of the sample, allowing for a better understanding of how representative the respondents are of the broader population (James, 2019). The findings are presented in Table 1, and Table 2.

Table 1 presents the demographic data of teachers from five public primary schools participating in the study, showing a fairly even distribution across the district, with Peramiho Primary School having the largest representation (25%) and Morogoro Primary School the smallest (14.3%). All schools involved are publicly owned day schools, ensuring a uniform representation of the district's public education system. Gender distribution shows a predominance of female teachers (64.3%), reflecting a common trend in primary education where women are more frequently employed as teachers. Regarding educational qualifications, most respondents (60.7%) held certificates, suggesting a need for continuous professional development, especially in ICT, as only a small proportion (16.1%) had attained a Bachelor's degree. Teaching experience was varied, with the

majority (44.6%) having 8-10 years of experience, followed by 4-6 years (37.5%), which points to a largely seasoned workforce that may show resistance to new technologies or require training for ICT integration.

Table 1: Frequency Distribution Table for Teacher's Demographics Characteristics.

Parameter	Level of Agreement	Frequency	Percent
School Name	Peramiho Primary School	14	25
	Mapinduzi Primary school	13	23.2
	Lundusi Primary School	10	17.9
	Morogoro Primary School	8	14.3
	MbingaMhalule Primary School	11	19.6
	Total	**56**	**100**
School Ownership	Private	0	0
	Public	56	100
	Total	**56**	**100**
School Category	Boarding	0	0
	Day	56	100
	Total	**56**	**100**
Gender	Male	20	35.7
	Female	36	64.3
	Total	**56**	**100**
Education Level	Certificate	34.0	60.7
	Diploma	13.0	23.2
	Bachelor's Degree	9.0	16.1
	Total	**56.0**	**100**
Years in School	1 - 2 year	2	3.6
	2 - 4 years	8	14.3
	4 - 6 years	21	37.5
	8 – 10 years	25	44.6
	Total	**56**	**100.0**

Source: Field Data (2024)

Understanding these demographic characteristics is essential, as they directly impact the effective implementation of ICT in primary education. Teachers' education levels, years of experience, and gender distribution can influence their readiness to adopt and use new technologies. For example, teachers with lower qualifications may need more extensive ICT training, while the gender distribution may point to disparities in access to professional development opportunities. By identifying these demographic factors, interventions can be tailored to address specific needs within this teaching population, ensuring a more inclusive and responsive approach to ICT integration in primary education.

The demographic insights from this study provide a foundation for developing strategies that address challenges in ICT implementation in Songea district schools. Recognizing the need for targeted professional development, especially for teachers with lower qualifications or limited prior exposure to ICT, can help overcome barriers to effective technology use. Similarly, gender dynamics may require addressing any potential disparities in training access to ensure that all teachers, regardless of background, are well-prepared to support ICT-based learning. These tailored approaches can foster a more effective and sustainable ICT integration in the district's primary education system.

Table 2: Frequency Distribution Table for Students Demographics Characteristics

Parameter	Level of Agreement	Frequency	Percent
School_Name	Peramiho Primary school	68	19.1
	Mapinduzi Primary School	85	23.9
	Lundusi Primary School	75	21.1
	Morogoro Primary School	34	9.6
	MbingaMhalule Primary School	94	26.4
	Total	**356**	**100**
School_Owernership	Private	0	0
	Public	356	100
	Total	**356**	**100**
School_Category	Boarding	0	0
	Day	356	100
	Total	**356**	**100**
Gender	Male	180	50.6
	Female	176	49.4
	Total	**356**	**100**

Source: Field Data (2024)

Table 2 presents the demographic data of students involved in this study, offering essential insights into the environment where ICT implementation in primary education development projects is being evaluated. The sample comprises 356 students from five public primary schools: Peramiho Primary School accounts for 19.1% of the sample, Mapinduzi Primary School 23.9%, Lundusi Primary School 21.1%, Morogoro Primary School 9.6%, and Mbinga Mhalule Primary School 26.4%. The inclusion of only public schools highlights that ICT integration challenges are predominantly faced within the public education sector in Songea District, emphasizing the role of government-supported initiatives in advancing technology use in these schools.

All five schools operate as day schools, with no boarding schools included in the study. This aspect has implications on students' access to technology, as day school students may have limited opportunities to engage with ICT outside of school hours. Thus, ICT implementation in these settings largely depends on resources available during school hours, potentially impacting students' familiarity and comfort with technology. This structure underscores the need for sufficient ICT infrastructure within the school environment to support students' engagement with technology, given the limited access to digital resources at home.

Gender distribution in the sample is nearly balanced, with 50.6% male and 49.4% female students, indicating that both genders are almost equally involved in the ICT education development project. This balance is crucial for ensuring inclusivity in the study's findings, as it reflects that ICT implementation efforts are accessible and beneficial to all students, regardless of gender. The demographic insights provided by this data serve as a foundation for understanding the context in which ICT is being integrated into education, highlighting the importance of public-sector support, in-school resources, and gender inclusivity in facilitating effective ICT implementation in primary education in Songea District.

4.2 Adequacy of ICT Skills

This section presents the findings related to the first objective, which aimed to identify the adequacy of ICT skills to the teachers and students involved in ICT primary education development projects in Songea district. Specifically, it identifies the levels of competence in

utilizing ICT tools, such as computers, software, and digital platforms, which are essential for integrating technology into teaching and learning processes. Descriptive statistics were applied to analyze the data from both teachers and students.

4.2.1 Description for the Adequacy of ICT Skills

Descriptive statistics were used to assess ICT skills among teachers and students in primary education development projects in Songea District, focusing on frequency, percentage, mean, and standard deviation to provide a comprehensive view of proficiency levels. Frequency and percentage distributions highlighted the proportion of participants with sufficient ICT skills, while the mean score indicated overall competence. The standard deviation was instrumental in showing variability within each group, identifying areas where skills varied significantly, and suggesting the need for targeted training. The results, presented in Tables 3 and 4, revealed strengths in foundational ICT skills but highlighted gaps in advanced areas, pointing to opportunities for tailored support to enhance ICT integration in education.

Table 3: Mean, Standard deviation, Skewness and Kurtosis on the Adequacy of ICT Skills to the Teachers

Statements	Mean	Std. Deviation	Skewness	Kurtosis
How would you rate your overall ICT Skills	3.20	0.519	0.246	0.184
Please indicate your level of Proficiency in Basic Computer Operations	3.13	0.507	0.231	0.785
Please indicate your level of Proficiency in Internet browsing and searching for information	3.23	0.504	0.377	-0.053
Please indicate your level of Proficiency in Using productivity software	2.88	0.605	0.056	3.406
Please indicate your level of Proficiency in Creating and delivering multimedia contents	2.43	0.684	0.975	2.528
Please indicate your level of Proficiency in using education software and applications	2.95	0.519	-0.082	0.900
Please indicate your level of Proficiency in Troubleshooting basic ICT issues	1.77	0.914	1.078	1.081

Source: Field Data (2024)

Descriptive statistics presented in Table 3 show data related to the adequacy of ICT skills among teachers involved in ICT primary education development projects in Songea District based on the mean, standard deviation, skewness, and kurtosis data, show varying levels of proficiency across different ICT areas. The overall rating of ICT skills has a mean of 3.20 and a standard deviation of 0.519, indicated a moderate proficiency level with some variation in responses. The skewness is 0.246, which showed a slight positive skew, meaning more teachers rated their ICT skills as higher than average. The kurtosis value of 0.184 indicated a relatively normal distribution with a slight flattening of the curve. For basic computer operations, the mean score is 3.13, with a standard deviation of 0.507, and the skewness is 0.231, again showing a slight positive skew toward higher proficiency levels. The kurtosis of 0.785 indicated a moderate peak in the data distribution.

The mean for internet browsing and searching for information is 3.23, with a standard deviation of 0.504, skewness of 0.377, and kurtosis of -0.053. The positive skew suggests more teachers rated themselves higher in this skill, and the near-zero kurtosis showing a fairly normal distribution. The use of productivity software has a mean score of 2.88, a standard deviation of

0.605, skewness of 0.056 (indicated almost no skew), and kurtosis of 3.406, which show a sharp peak in the data distribution, meaning most responses are concentrated around the mean. For creating and delivering multimedia content, the mean is 2.43 with a higher standard deviation of 0.684, skewness of 0.975 (showed a notable positive skew), and kurtosis of 2.528, showing a more peaked distribution. The use of educational software and applications has a mean score of 2.95, a standard deviation of 0.519, a slight negative skewness of -0.082 (indicating a minor tendency toward lower ratings), and kurtosis of 0.900, showing a relatively normal distribution. Lastly, troubleshooting basic ICT issues has the lowest mean score of 1.77, the highest standard deviation of 0.914, a significant positive skewness of 1.078 (showing many teachers rated themselves low), and kurtosis of 1.081, indicated a somewhat peaked distribution.

Table 4: Mean, Standard deviation, Skewness and Kurtosis on the Adequacy of ICT Skills to the Students

Statements	Mean	St. Deviation	Skewness	Kurtosis
Basic Computer Operations	3.03	1.012	0.107	-0.542
Using Educational Software/Apps	3.01	1.059	0.178	-0.54
Internet navigation	2.94	1.112	0.025	-0.659
Document Creation/Editing	2.95	1.085	0.12	-0.588
Email/Online Communication	2.89	1.148	0.087	-0.704
Online safety practices	2.96	1.050	0.099	-0.555

Source: Field Data (2024)

Descriptive statistics presented in Table 4 show data related to the adequacy of ICT skills among students involved in ICT primary education development projects in Songea District. The mean scores for each skill area indicated a general trend of moderate proficiency, with basic computer operations showing the highest mean of 3.03, followed closely by using educational software/apps at 3.01. Other areas such as internet navigation (Mean = 2.94), document creation/editing (Mean = 2.95), email/online communication (Mean = 2.89), and online safety practices (Mean = 2.96) demonstrated slightly lower mean scores. The standard deviations across these skills ranged from 1.012 to 1.148, showed some variability in students' proficiency levels, with email/online communication exhibiting the highest variability. The positive skewness values for most skills, particularly in basic computer operations (0.107) and educational software/apps (0.178) showing a slight tendency towards higher scores, show that more students feel adequately skilled in these areas. The skewness close to zero for internet navigation (0.025) implies a more symmetrical distribution of responses. The kurtosis values for all skills were negative (ranging from -0.542 to -0.704) showing platykurtic distribution, that the distribution of students' responses is relatively flat compared to a normal distribution.

5. Discussions

The primary objective of this study was to evaluate the adequacy of ICT skills among teachers and students involved in ICT-based primary education development projects in Songea District. Findings from descriptive statistics indicate that teachers generally possess moderate ICT proficiency, with an overall mean score of 3.20. Teachers report confidence in basic computer operations (mean = 3.13) and internet browsing (mean = 3.23), suggesting foundational skills are in place. However, a lower mean score for troubleshooting (1.77) and higher standard deviation (0.914) indicate significant challenges with advanced skills, which are essential for effective ICT integration. This gap in key skills is a crucial barrier to the successful implementation of ICT, as it limits teachers' ability to fully utilize technology in their instructional practices.

The study’s findings align with the Resource-Based View (RBV) theory, which emphasizes the

importance of human capital, such as teachers' ICT skills, in achieving competitive advantage (Barney, 1991). Here, ICT skills represent a vital resource for the effective implementation of technology in education. However, the Technology Acceptance Model (TAM) (Davis, 1989) also highlights that perceived ease of use and usefulness influence technology adoption. Teachers' comfort with basic skills contrasts with their difficulties in advanced functionalities, such as multimedia content creation (mean = 2.43), potentially creating a barrier to full ICT adoption. This gap mirrors Joseph's (2021) findings, which pointed to insufficient technical support and inadequate training as barriers to ICT integration in Tanzanian schools. Addressing these skill deficits is essential for fostering positive attitudes towards ICT and enhancing its application in the classroom.

For students, the data also indicates moderate proficiency across basic ICT skills, with the highest mean score (3.03) for basic computer operations. Students appear confident in foundational skills, such as using educational software (mean = 3.01), though they demonstrate lower proficiency in internet navigation, document creation, email communication, and online safety (mean scores ranging from 2.89 to 2.96). Standard deviations indicate variability in these skills, with significant differences in email communication skills, where some students excel, while others lack proficiency. This disparity in skill levels, combined with a flatter distribution of responses (negative kurtosis), suggests inconsistencies in students' ICT readiness, which could impede the successful integration of ICT into the educational projects in Songea.

These findings corroborate previous research, such as Mwila's (2018) study, which observed that attitudes toward ICT integration among teachers and students are influenced by their skill levels and confidence in using technology. Students' positive self-assessments in certain areas indicate a willingness to engage with ICT; however, the variability in proficiency suggests that not all students are equally prepared to benefit from ICT resources, which may impact their engagement and learning outcomes. The Primary Education Officer also highlighted this issue, noting that adequate ICT skills among both teachers and students are critical for the effective implementation of ICT in primary education projects in Songea District. These insights reinforce the importance of addressing specific skill gaps to ensure successful ICT integration and to enhance the overall learning environment.

The interview conducted with Primary Education Officer commented on the adequacy of ICT skills among teachers and students, emphasizing its critical role in the effective implementation of ICT in primary education development projects:

> *"In my experience, the lack of adequate ICT skills among both teachers and students is a major obstacle to the successful implementation of ICT in primary education development project in Songea district. It is clear that teachers in Songea district currently lack sufficient ICT skills, particularly in troubleshooting and creating multimedia content, which are essential for fully integrating technology into teaching practices. This gap is a significant barrier to the success of effective implementation of ICT projects in primary schools. Similar to the students, much like their teachers, lack the necessary ICT competencies beyond basic operations, with significant disparities in their ability to navigate the internet, communicate via email and practice online safety. These gaps reflect a broader issue where the implementation of ICT in education development project fails to meet its full potential."*

The findings from primary education officer support Resource-Based View (RBV) theory suggests that teachers and students skills are a valuable resource, and without adequate development in this area, the effectiveness of ICT implementation remains limited (Barney, 1991). This directly relates to the research problem, as the inadequate skills of both teachers and students impede the overall success of effective implementation of ICT in primary development project in Songea District, as the success of projects depends on the readiness and capability of both educators and learners to embrace technology. The Empirical literature review supports this finding, According to Joseph (2021) identifying inadequate training and technical support as critical barriers to ICT integration. The implications of these findings are significant for policy and practice in the education sector. Highlight the necessity for targeted professional development programs aimed at equipping teachers and students with comprehensive ICT skills, particularly in areas identified as lacking, such as troubleshooting, multimedia content creation and online communication and safety. This aligns with the recommendations from existing literature that emphasize ongoing training and support for teachers to enhance their confidence and competence in using technology effectively. By addressing these gaps, stakeholders can work towards creating a more conducive environment for the effective implementation of ICT in education development projects, ultimately enhancing learning experiences for students in Songea District.

6. Conclusions and recommendations

The first objective of this study was to assess the ICT skills of teachers and students participating in ICT-based primary education development projects in Songea District. Findings indicate that while teachers demonstrate moderate proficiency in basic ICT operations and internet browsing, they face notable challenges with advanced skills such as troubleshooting and multimedia content creation, which are essential for effective ICT integration in the classroom. Students similarly show confidence in foundational ICT skills, but their proficiency varies across other areas, including online communication and digital safety. These skill gaps among both teachers and students highlight substantial barriers to the effective implementation of ICT within Songea District's primary education projects.

Addressing these skill gaps is critical for ensuring successful ICT adoption in education. The study emphasizes the need for skill-building efforts that go beyond foundational ICT knowledge to encompass advanced competencies. Focusing on advanced skills, such as troubleshooting and multimedia content creation, would enhance both teaching efficacy and student learning experiences. Tailored training programs that include hands-on workshops, online courses, and mentorship opportunities could be highly effective in bridging these gaps. Through such programs, teachers would be better prepared to integrate ICT tools into their pedagogical practices, while students would gain the competence needed to navigate and utilize technology confidently in a digital world. This approach would ultimately enhance the efficacy of ICT-based primary education development projects within the district.

To further strengthen ICT skills in the education system, future research should evaluate the effectiveness of digital literacy programs for teachers and students in Songea District. By assessing how structured training initiatives improve ICT competencies—especially in areas like troubleshooting, online safety, and multimedia content creation—researchers can identify strategies that are most effective in fostering digital literacy. Another area of investigation could focus on student engagement in extracurricular ICT learning activities, such as coding clubs and robotics programs. Exploring how these activities influence students' attitudes towards

technology, problem-solving skills, and collaborative abilities would provide valuable insights into developing inclusive and effective ICT learning environments that actively engage students.

At a policy level, the study suggests that the Ministry of Education should consider implementing a national ICT skills certification program for teachers. This program would set clear standards for both foundational and advanced ICT skills, ensuring that educators are equipped to integrate technology into their teaching practices effectively. The certification should be integrated into pre-service teacher training and offered as part of in-service professional development, enabling current teachers to continuously upgrade their ICT competencies. Additionally, localized ICT skill development workshops could be organized by the Songea District Education Office to make training more accessible. By offering tailored programs to both teachers and students, policymakers and educational leaders can foster a more supportive learning environment that enhances ICT integration in primary education, ultimately bridging skill gaps and promoting digital literacy across the district.

References

Adams, S. (2021). ICT, governance and inequality in Africa. Telecommunications Policy, 45(10). https://doi.org/10.1016/j.telpol.2021.102198

Agbedahin, A. V. (2019). Sustainable development, Education for Sustainable Development, and the 2030 Agenda for Sustainable Development: Emergence, efficacy, eminence, and future. Sustabanle development, 27(4), 669-680. https://doi.org/10.1002/sd.1931

Agyei, D. D. (2020). Integrating ICT into schools in Sub-Saharan Africa: from teachers' capacity building to classroom implementation. Education and Information Technologies, 26, 125–144. https://doi.org/10.1007/s10639-020-10253-w

Amankwah-Amoah, J. (2019). Technological revolution, sustainability, and development in Africa: Overview, emerging issues, and challenges. Sustainable development, 27(5), 910-922. https://doi.org/10.1002/sd.1950

Anandakumar, H. S. M. (2020). Evolution, challenges, and application of intelligent ICT education: An overview. Computer Applications in Engineering Education, 29(3), 562-571.

Ananditha, A. R. (2024). Beyond Digital Financial Services: Exploring Mobile Money Agents in Tanzania as General ICT Intermediaries. ACM Journal on Computing and Sustainable Societies, 2(1), 1 - 26. https://doi.org/10.1145/361638

Anasel, M.G., Komba, C., Kacholi, G. et al. (2024). The Effects of Health Insurance on Maternal Healthcare Utilization in Tanzania. Glob Soc Welf (2024). https://doi.org/10.1007/s40609-024-00345-7

Anathe, R., & Kimaro, M. M. (2021). Access and Use of ICT among Tutors in Public Teachers Training Colleges: A Case of Moshi Rural District Tanzania. 1-14, https://jaet.iae.ac.tz/index.php/adulteducation/article/view/47/35

Ashraf, M. A. (2020). Demographic factors, compensation, job satisfaction and organizational commitment in private university: an analysis using SEM. Journal of Global Responsibility, 11(4), 407-436. https://doi.org/10.1108/JGR-01-2020-0010

Bariu, T. N. (2020). Status of ICT Infrastructure Used in Teaching and Learning in Secondary Schools in Meru County, Kenya. European Journal of Interactive Multimedia and Education, 1(1), 2732-4362. https://doi.org/10.30935/ejimed/8283

Barney, J. B. (1991). Firm resources and sustained competitive advantage. Journal of Management, 17(1), 99-120. https://doi.org/10.1177/014920639101700108

Basar, Z.A. N. (2021). The Effectiveness and Challenges of Online Learning for Secondary School Students – A Case Study. Asian Journal of University Education (AJUE), 17(3), 119-129. https://doi.org/10.24191/ajue.v17i3.14514

Bishel, E. (2022). ICT landscape, focusing on infrastructure development, digital literacy, and e-governance. 1-40. https://www.etd.ceu.edu/2022/bishel_eric.pdf

Creswell, J. W. (2017). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (5th ed.). Thousand Oaks: Sage Publications.

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

Dimoso, R.L., & Andrew, F. (2021). Rural Electrification and Small and Medium Enterprises' (SMEs) performances in Mvomero District, Morogoro, Tanzania, J. Bus. Sch. 4 (1), 48–69, https://doi.org/10.26677/TR1010.2021.717

Eileen de Jong, M. J. (2021). From Millennium to Sustainable Development Goals: Evolving discourses and their reflection in policy coherence for development. Earth System Governance, 1-12. https://doi.org/10.1016/j.esg.2020.100087

Eugenia, M. J. L. (2020). Integration of ICT into the higher education process: The case of Colombia. Journal of Small Business Strategy, 30(1), 58-67. https://jsbs.scholasticahq.com/article/26350

Fernández-Gutiérrez, M. (2020). Is the use of ICT in education leading to higher student outcomes? Analysis from the Spanish Autonomous Communities. Computers & Education, 157. https://doi.org/10.1016/j.compedu.2020.103969

Innocent, W. A., & Masue, O. S. (2020). Applicability of E-Learning in Higher Learning Institutions in Tanzania. International Journal of Education and Development using Information and Communication Technology, 16(2), 242-249. https://files.eric.ed.gov/fulltext/EJ1268804.pdf

Issa, F. H. (2021). Determining the Nexus between National Policies and Local Practices in the Promotion of Businesses for Local Economic Development in Tanzania. Journal of Development Policy and Practice, 7(1). https://doi.org/10.1177/24551333211047698

James, T. C. M. (2019). Establishing microbial composition measurement standards with reference frames. Nature Communications, 27(19), 1-11. https://doi.org/10.1038/s41467-019-10656-5

Joseph, P. (2021). Use and Challenges of ICT in Secondary Schools in Tanzania: A study of Selected Secondary Schools in Mikindani Municipality, Tanzania. African Journal of Accounting and Social Science Studies (AJASSS), 3(1), 39-60. https://www.ajol.info/index.php/ajasss/article/view/226945

Kitole, F., Lihawa, R., Sesabo, J., & Shitima, C. (2023). The dynamism of communication technology adoption, market information and welfare: Evidence from Nile perch (Lates niloticus) fish market, Mwanza, Tanzania. *Lakes & Reservoirs: Research & Management*, 28, e12433. https://doi.org/10.1111/lre.12433

Kitole, F.A., & Shukla S. (2024). Cloud Horizons: Strengthening Rural Healthcare Through Telemedicine's Digital Canopy. Health Services Insights. 2024;17. doi:10.1177/11786329241284401

Kitole, F.A., Mbukwa, J.N., Tibamanya, F.Y., & Sesabo, J.K. (2024). Climate change, food security, and diarrhoea prevalence nexus in Tanzania. Humanit Soc Sci Commun 11, 394 (2024). https://doi.org/10.1057/s41599-024-02875-z

Kvedar, J. C. (2014). Connected health: A review of technologies and strategies to improve patient care with telemedicine and telehealth. Health Affairs, 33(2), 194-199. https://doi.org/10.1377/hlthaff.2013.0992

Kweka, K. H. (2018). Constraints Hindering Adoption of ICT in Government Secondary Schools in Tanzania: The Case of Hanang District. International Journal of Educational Technology and Learning, 4(2), 46-57. https://doi.org/10.20448/2003.42.46.57

Leonid, A. G. (2024). Global Technological Transformations Since the Stone Age: Theory and History. Cybernetic Revolution and Global Aging, 57–106. https://doi.org/10.1007/978-3-031-56764-3

Malekani, A. A. (2018). Access to, Use and Challenges of ICTs in Secondary Schools in Tanzania: A study of Selected Secondary Schools in Morogoro Municipality. Journal of Information and Knowledge Management, 9(2), 44 - 57. https://dx.doi.org/10.4314/iijikm.v9i2.4

Malero, A. I. (2015). ICT usage Readiness for Private and Public Secondary school in Tanzania: A case of Dodoma Municipality. International Journal of Computer Application, 129(3), 1-4. https://doi.org/10.5120/ijca2015906791

Minga, C. A. (2024). Teachers' Perceptions of ICT Use in Promoting Teaching Learning Processes and Its Outcomes at Senior Secondary Level in Mbeya Region, Tanzania: A Review. Journal of Education, Society and Behavioural Science, 37(1), 39-50. DOI |10.17632/dmbw3t9ytw.1

Kitole, F.A., & Sesabo, J.K. (2024). The Heterogeneity of Socioeconomic Factors Affecting Poverty Reduction in Tanzania: A Multidimensional Statistical Inquiry. Soc (2024). https://doi.org/10.1007/s12115-024-00957-x

Mtebe, J. S. (2018). A critical review of eLearning research trends in Tanzania. Journal of Learning for Development, 5(2), 163-178. https://doi.org/10.56059/jl4d.v5i2.269

Mwantimwa, K. (2019). ICT usage to enhance firms' business processes in Tanzania. Journal of Global Entrepreneurship Research, 9(46), 1-23. https://doi.org/10.1186/s40497-019-0170-6

Mwapwele, S. D. (2019). Teachers' ICT Adoption in South African Rural Schools: A Study of Technology Readiness and Implications for the South Africa Connect Broadband Policy. The African Journal of Information and Communication (AJIC)(29), 1-29. http://dx.doi.org/10.23962/10539/28658

Kitole, F.A., & Genda, E.L. (2024). Empowering her drive: Unveiling the resilience and triumphs of women entrepreneurs in rural landscapes, Women's Studies International Forum, Volume 104, 2024, 102912, ISSN 0277-5395, https://doi.org/10.1016/j.wsif.2024.102912

Mwendwa, N. K. (2017). Availability of Resource Materials and Facilities for ICT Integration in the Public Primary School Curriculum in Kitui County, Kenya. Saudi Journal of Humanities and Social Sciences, 2(5), 362-368. https://kerd.ku.ac.ke/handle/123456789/639

Mwila, P. (2018). Assessing the attitudes of secondary school teachers towards the integration of ICT in the teaching process in Kilimanjaro, Tanzania. International Journal of Education and Development using Information and Communication Technology, 14(3), 223-238. https://eric.ed.gov/?id=EJ1201563

Ndibalema, K. H. (2018). Constraints Hindering Adoption of ICT in Government Secondary Schools in Tanzania: The Case of Hanang District. International Journal of Educational Technology and Learning, 4(2), 46-57. https://doi.org/10.20448/2003.42.46.57

Ngasa, A. N. (2020). Role of ICT Usage in Market Accessibility of Small Business Enterprises in Tanzania. International Journal of Advance Research and Innovative Ideas in Education (IJARIIE), 6(3), 202-210. http://ijariie.com/FormDetails.aspx?MenuScriptId=180807&srsltid=AfmBOoqkCRGEN4xDvtsAVNcHykyRBwPPLhMF-sx6i0ZhiWIACnkX_lBm

Nyame-Asiamah, F. (2019). Improving the 'manager-clinician' collaboration for effective healthcare ICT and telemedicine adoption processes – a cohered emergent perspective. Information Technology for Development, 26(3), 525-550. https://doi.org/10.1080/02681102.2019.1650326

Oreku, G. S. (2021). Adopting the ICT Innovation to Administrative and Activity. Interdisciplinary Journal of Education Research, 3(2), 60-73. https://doi.org/10.51986/ijer-2021.vol3.02.07

Paudel, P. (2021). Information and Communication Technology in Foreign Language Classes in English: Roles and Practices. International Journal of Technology in Education and Science (IJTES), 5(1), 37-55. https://doi.org/10.46328/ijtes.179

Rana, K. (2020). ICT integration in teaching and learning activities in higher education: A case study of Nepal's teacher education. Malaysian Online Journal of Educational Technology, 8(1), 36-47. https://doi.org/10.17220/mojet.2020.01.003

Saif, S. M. (2022). Impact of ICT in Modernizing the Global Education Industry to Yield Better Academic Outreach. Sustainability, 14, 1-18. https://doi.org/10.3390/su14116884

Sawmar, A. A. (2021). Enhancing zakat compliance through good governance: a conceptual framework. ISRA International Journal of Islamic Finance, 136-154. https://doi.org/10.1108/IJIF-10-2018-0116

URT. (2007). Information & Communication Technology Policy for basic Education. Dar es Salaam: Mture Press.

URT. (2016). National ICT Policy. Dar Es salaam: National Printer.

Utouh, H. M. L., & Kitole, F. A. (2024). Forecasting effects of foreign direct investment on industrialization towards realization of the Tanzania development vision 2025. Cogent Economics & Finance, 12(1). https://doi.org/10.1080/23322039.2024.2376947

Yadav, M. S. (2021). Role of Social Media in English Language Learning to the Adult Learners. International Journal of Linguistics, Literature and Translation (IJLLT), 4(1), 238-247. https://doi.org/10.32996/ijllt.2021.4.1.25

Yamamoto, Y., & Yamaguchi, S. (2019). Relationships between ICT Implementation at Schools and Factors Related to Transformational Leadership: A Case of Primary School in Mongolia. International Journal of Education and Development using Information and Communication Technology, 15(2), 45-61. https://eric.ed.gov/?id=EJ1220748

Zenda, R. D. (2022). Examining factors that influence teachers to adopt information and Communication Technology in rural secondary schools: an empirical study. Education and Information Technologies, 28, 815–832. https://doi.org/10.1007/s10639-022-11198-y