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Stakeholders' Perceptions of Modern Technology Usage in Secondary Schools in Mvomero District, Tanzania

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ABSTRACT

Modern technology has been perceived as a tool to achieve educational development goals and lifelong learning. To integrate modern technology into education, the government of Tanzania established a curriculum for ordinary secondary education in 2010 that recognizes technology as an instrument for offering quality education, and as a resource for enlightening teaching and learning, providing learners with real-world experience. The study aimed to assess stakeholders' perceptions of modern technology usage in secondary schools in Mvomero District. Using diffusion of innovation theory, a mixed research approach was used with a cross-sectional design. A sample of 185 participants was included, and data were collected using questionnaires, interviews, and observation methods. The findings of the study reveal that modern technology is commonly used in secondary school teaching and learning, with a positive relationship between stakeholder perception and technology use. The results obtained through multiple regression analysis show a positive and significant relationship between stakeholder perception and the use of modern technology in teaching and learning; more specifically, it was shown that perceived ease of use (PEU) has (β=.127, *P*<.002), perceived usefulness (PU) has (β=.644, P<.000), and user satisfaction (ST) has (β =1.78, p<.000). However, challenges such as insufficient teachers, funding, and inadequate infrastructure hinder the adoption of modern technology. The study recommends government support for enhancing school ICT infrastructure, building teachers ICT skills, ensuring a constant power supply, integrating ICT skills into the curriculum, and subsidizing the cost of ICT devices and Internet packages.

Keywords: *Modern Technology; Teaching; Learning; Stakeholder Perception; ICT Integration; secondary schools; Tanzania*

INTRODUCTION

Teaching and learning processes in the 21st century have been connected with the application of modern technology to improve people's lives and meet sectorial diversification. The use of modern technology in teaching and learning has shown positive signs for stable education and is used as a catalyst in the provision of quality education. In addition, it is vital for enlightening teaching and learning and preparing students to master global changes (International Labour Organization ILO, 2021). Hence, the use of modern technologies in education depends on the perception of the facilitators and the receivers, who are the teachers and students.

For instance, in the United States of America, it was found that modern technology in teaching is crucial for teachers' and students' engagement, but many teachers struggle with it due to obstacles, leading to idle classrooms and a lack of enthusiasm for technology (Merillo & Domingo 2019). Modern technology in Indonesia improves teaching and learning processes, enhances material delivery, monitoring, and evaluation and is perceived as essential by students for effective active education (Abdullah et al. 2019). Similarly, Malaysia's schools embrace modern technology in teaching and learning, shifting from traditional teacher-centred to learner-centred pedagogy. Teachers and students see technology's effectiveness in enhancing learning, improving

communication, inspiring, and enhancing capabilities (Akinfolaring & Rufai, 2017; Dias & Victor, 2022).

Modern technology is also widely used in Africa to enhance access to quality education. In Nigeria, it positively influences communication competence, allowing clearer, quicker reactions. However, teachers often neglect to regularly incorporate technology into their teaching and learning processes (Olorunsola & Ogwueleka, 2021). In Namibia, stakeholders appreciate modern technology in education, believing it enhances teaching and learning. However, they perceive themselves as incompetent in incorporating it. In Rwanda, there is greater appreciation for technology's usefulness, but there are concerns about Internet problems and bundle costs (Jatileni & Jatileni 2018). In other East African countries, technology integration has been found to improve education effectiveness, quality, and availability (Nsyabayezu, E. et al. 2022; Ntorukiri et al, 2021).

In Tanzania, modern technology has been perceived as a tool to achieve educational development goals and lifelong learning (ILO, 2021). Since independence, the government of Tanzania has developed several initiatives and strategies to incorporate modern technologies into the teaching and learning processes. This has been stressed in the National Science and Technology Policy and the National Information and Communication Technology Policy (NICTP) of 2003 and reviewed in 2016, insisting on the adoption of technology in instruction to enhance the effective delivery of both formal and informal education (URT, 2016 pg.6). The study findings demonstrate that modern technology supports improving teaching and learning in Tanzania. However, some of these policies need to be updated for the future effective integration of modern technology in education.

To integrate modern technology into education, the government of Tanzania established a curriculum for ordinary secondary education in 2010 that recognizes technology as a resource for enlightening teaching and learning, gives learners real-world experience and recognizes technology as an instrument for offering quality education (Tanzania Institute of Education, 2010 pg. 15). Hence, the government, through the Ministry of Education Science and Technology, initiated teacher training in the pedagogical use of technologies to comprehend the benefits of technology for quality education (URT, 2016). In January 2023, Tanzania distributed tablets to teachers in public secondary schools to promote the use of modern technology in education. According to Mponela & Mkulu (2023), this aligns with the 2016 NICT mandate to enhance science-based education and create a knowledge-based society.

In the Mvomero district, similar to other districts in Tanzania, the integration of modern technology in education aimed to serve the same purpose of improving teaching and learning. However, despite all efforts made by the government to integrate modern technology into secondary education, the application of these technologies in teaching and learning is still minimal. The literature has confirmed that even though the government has introduced many policies and initiatives, the readiness of teachers in secondary schools to use modern technologies in learning and teaching activities is still weak, and a remarkable number of secondary schools have limited modern technology devices for effective teaching-learning processes (Raja & Nagasubramani, 2018). Data from URT (2016) showed that the number of desktop computers available in public and nonpublic secondary schools in Tanzania was only 60,451 (URT 2016). Further, with a total of 1,562,770 secondary school students in Tanzania, there was one desktop computer shared among 26 students (URT 2020a). The current trend shows that the computer-to-student ratio in Tanzania is declining because the number of students enrolled in secondary schools is increasing by approximately 2338,457 per year. The most recent data shows that Tanzania has approximately 145,334 desktop computers available in public and nonpublic secondary school (URT 2016).

It is not known whether this is due to stakeholder perceptions of modern technology in the teaching and learning process or other factors, since stakeholders' attitudes toward modern technology is a key factor in the successful implementation of modern technology in education. Additionally,

stakeholders always need to have positive attitudes towards modern technologies, and their poor attitudes may lead to the failure of modern technology-based projects. Therefore, this study intends to investigate stakeholders' perceptions of modern technology in teaching and learning processes in the Mvomero district, Tanzania. Specifically, the study was guided by the following research objectives:

i. To identify types of modern technologies used in teaching and learning processes in secondary schools,
ii. To describe the perceptions of stakeholders about the use of modern technologies in the teaching and learning process,
iii. To explore the challenges associated with modern technology usage in teaching and learning processes in secondary schools.

This study is important because it has the potential to inspire government leaders in evaluating factors contributing to the poor usage of modern technologies in teaching and learning in Tanzania. The outcome of this study may be beneficial because it has the potential to inspire policy makers, educational planners, and educational managers to develop policies and strategies on stakeholder perceptions towards the use of modern technologies in Tanzanian secondary schools. Nevertheless, the study findings may be useful for district education officers (DEO) and heads of schools in their consideration of strategies for improving modern technology usage in education. Moreover, the study may also lead to a change in mindset among teachers, especially regarding how they regard modern technology use. Teachers can change their perceptions of the use of modern technology in the teaching process to increase their positive attitudes towards the use of the tools in teaching. Finally, the study findings may be important to researchers who wish to address the use of modern technology in the teaching and learning process.

LITERATURE REVIEW

Theoretical Review

The diffusion innovation theory (IDT), which was proposed by Everett Rogers in 1961, has been chosen as a theory to support the study (Rogers (2003). Since the study is about the perception of educational stakeholders on the integration of modern technology in education, diffusion innovation theory can help to explain the rate of adoption of this phenomenon since it was brought into the action plan and the procedures for its implementation. The theory explains how social members adopt innovations or ideas and how they make decisions toward them. The theory suggests that both mass media and interpersonal communication channels are involved in the diffusion process.

According to (Rogers (2003)), diffusion means the process by which an innovation or idea communicates through certain channels over time, among the members of society. The theory heavily relies on human capital, suggesting that innovation or new ideas must be widely adopted to attain development and achieve sustainability. Based on the theoretical concepts, the rate of adoption of integrating modern technology into education depends on various factors or elements, including; innovations, channels, social systems and time. According to the theory, these factors depend on one another to affect social change. When a new idea exists to be adopted, an effective means of communication will be needed to make the community aware of that idea. How people are informed will determine the time for social change. Time has to do with the length of time for people to adopt the new idea. The last factor is the social system itself, which involves the people themselves who are the centre of innovation. For society to adopt innovations, all other factors or elements must be in place. Finally, the theory suggests ways of making decisions for the adoption of innovations.

The use of the diffusion of innovations theory insists that teachers know about new technology. Qualified teachers should be introduced to modern technology resources such as computers, the Internet and relevant software, and technical support should equally be provided. Thereafter, teachers should be persuaded and willing to actively participate in the implementation process by attending to various aspects of contexts within which the innovation is being used. At the decision level, teachers should be trained, and in the process, different attitudes towards innovation would be developed, leading to their perception of the use of innovation.

During the implementation process, teachers judge the value of using modern technology and then consistently express their commitment to its use. In this study, the attributes that affect both individual adoption and the larger collective diffusion of innovation as identified by Rogers (2003) were applied. The attributes in the theory provide a framework that helps in understanding why some teachers use modern technology in carrying out their administrative tasks while others do not. Diffusion theory can be used to explain, predict and account for factors that increase or impede the use of modern technology in the administration of secondary schools. The diffusion of innovations theory also helps education practitioners identify qualities that will make the use of modern technology in the administration of schools more appealing to potential users.

The communication channels used to spread word about the adoption of any innovation and the nature of society determine the rate of adoption of new technology. In schools, this can be achieved through modern technology literacy upgrading courses. The theory was found to be appropriate for this study because it brings out perceptions and factors affecting the use of modern technology in the administration of secondary schools. The factors include the availability of facilities and technical support. According to this theory, teachers need to be sensitized to innovation before adopting it for use in administration.

The theory further explains that some teachers are slow in taking up the new technology and applying it because they wait to see how others have benefited from it before accepting it. Others have already adopted the technology and are enjoying its benefits. Overall, technology is constantly changing, and the introduction of new hardware and software components is ongoing; hence, the theory provides an understanding of how to introduce new ideas into the social system and sustain them.

Empirical Review

Types of Modern Technologies Used in Teaching and Learning Processes

The type of modern technology used in the teaching and learning process in secondary schools includes computers, the Internet, smartphones, smart TVs, projectors, tablets, smart boards, and laptops, depending on the level of development and availability of modern technology tools in the particular country. In Malaysia, the study by Garba at el. (2015) as cited in Dias & Victor (2022).showed the kind of modern technology used in secondary schools. The study findings implied that the availability of computers, tablets and Internet connectivity provides a platform for shifting from the use of teacher-centred pedagogy or content-based learning to learner-centred pedagogy that is more interactive and activity oriented. Therefore, to ensure effective teaching and learning in secondary schools, the use of modern technology should not be taken for granted, as it contributes to students' learning as well as academic performance.

In Kenya, a study by Heinrich (2020) pointed out that schools with modern technology, such as tablets, computers, projectors, and Internet platforms, simplified the process of teaching more than schools with no modern technology tools. The researcher used an ex-post facto research design with a sample size of 375 participants. The instrument was a questionnaire. The findings indicated that the government and nongovernment organisations should provide secondary schools with

modern technology so that teachers and students can be engaged in all meaningful activities. Similar findings were also reported by Kinyanjui (2019), indicating that technology when skilfully integrated into various topics, encouraged students' critical thinking, creativity, and teamwork. When using digital tools and resources, technology integration encourages students to explore and acquire information. Consequently, schools as education institutions should allocate funds to be used in modern technology acquisition and modern technology maintenance as well. This is an important aspect to be observed by educational stakeholders to ensure that the modern tools in schools are well maintained to facilitate an effective teaching-learning process.

In addition, Claudius & Ndinagwe (2016) in Olorunsola & Ogwueleka (2021) identified various types of modern technologies used in secondary schools, such as computers, projectors, and smartphones. Therefore, to achieve educational goals, the government must ensure that private and public secondary schools are well supplied with all essential modern technology tools that will support teaching and learning more efficiently. This suggested that education institutions in Tanzania, such as secondary education institutions, still need more income to be used in the mobilization of the needed resources to have sufficient technology tools that can help improve secondary education.

In Tanzania, Nzilano & Daudi (2019) conducted a study on modern technology. The study used both qualitative and quantitative approaches. The size of the sample for investigation included 35 participants. The study used a simple random sampling technique to select students and teachers purposively. The findings showed that among the types of modern technology used in teaching and learning, were desktop computers, laptops, smartphones, smart boards, and Ipads. Moreover, to achieve the stated educational goals, both students and teachers need enough modern technology. Therefore, the central government needs to ensure that adequate modern technology tools are mobilized to facilitate the process of teaching and learning in secondary schools.

Views of Stakeholders About the Usage of Modern Technology in Teaching and Learning

Stakeholders' views on the usage of modern technology refer to the set of beliefs that stakeholders have about the relevance of integrating modern technology into teaching and learning and the perceived obstacles that are associated with using modern technology in education.

In the USA, Liu et al. (2021) conducted a qualitative study on stakeholders' perception of the impact of technology on students' learning in the humanities classroom. The findings revealed that stakeholders had positive views on the use of modern technology. They believed that the impacts of modern technology usage on learning and teaching were positive, that is, students who use modern technology more frequently are also more likely to be successful on standardized tests as well as in college and future careers. This finding implies that incorporating technology into the aspects of instruction, assessment and feedback may improve students' performance.

Similarly, in Switzerland, Abel et al. (2022) studied teacher perceptions of modern technology integration into classroom instruction. The findings indicated that teachers had positive perceptions of the usage of up-to-date technology in classroom instruction. However, perceptions were determined by local settings and global educational trends. This finding concurs with the findings of Merillo & Domingo (2019), who conducted a study on technology in pedagogy: teachers' perceptions of the effectiveness of advanced technology integration in language teaching in the Philippines. Merillo & Domingo (2019) observed that teachers perceived modern technology integration as an important tool in enhancing the teaching and learning process. This entails that students learn more effectively with the use of computers, as the lesson designed is more engaging and interesting. Therefore, it is recommended that the government equip schools with adequate technological resources that facilitate student learning.

The perception of stakeholders on the use of modern technology in teaching and learning in Africa is positive; however, the usage is minimal. In Namibia, the study conducted by Jatileni & Jatileni (2018) on teachers' perception of the use of the Internet in learning and teaching: A case of Namibian primary education showed that teachers' perception of modern technology usage in schools would improve teaching and learning. Teachers believed that the use of the Internet in teaching and learning based on lessons, objectives, activities, subjects, curriculum, learner diversity, accessibility and availability of devices was effective in improving students' performance. However, there was moderate use of modern technology in classrooms in Namibia. This finding suggests that although teachers in Namibia prefer to use modern technology in teaching and learning, devices are inadequate to make them effective. Hence, there is minimal usage of modern technology classrooms. Therefore, it was recommended that various measures aimed at boosting teachers' perceptions of modern technology in classrooms inevitably need to be undertaken at all levels of the education sector. These measures may include and are not limited to teachers' pedagogical and technical training in modern technology, equitable provision of modern technology tools and electricity supply.

In Ghana, for instance, Kolog et al. (2018) carried out a study on the use of mobile devices in school. The study revealed that the majority of stakeholders produced positive ideas that allowing students to use mobile phones will help them search for materials, communicate with other students, and read, even though they are far from school. However, the findings reported that the use of phones in school has had negative impacts on students' performance. This finding demonstrates that the purpose and usage of modern technology determines its impact on student achievement. Therefore, stakeholders should maintain the proper use of these technologies.

In Uganda, a study conducted by Nyakit et al.(2021) on the challenges of integrating modern technology in teaching among national teachers' colleges revealed that teachers appreciated the importance of modern technology integration into classroom instruction practices. However, there are a host of challenges, such as a lack of experience and skills in using modern technology, inadequate resources, overcrowded classrooms, lack of time, heavy workloads, and slow Internet connectivity. This implies that a lack of technological resources is a major obstacle to integrating modern technology in teaching and learning in most underdeveloped countries. Therefore, the study calls for government interventions with a clear policy on modern technology inclusion in the curriculum and the provision of modern technology equipment. In Tanzania, stakeholders also perceive modern technology in teaching and learning as the best way of improving the teaching and learning process. The study conducted by Mwila (2018) on the attitudes of secondary school teachers towards the integration of modern technology in the teaching process revealed that both female and male teachers had positive attitudes towards the integration of modern technology in their teaching processes. Teachers believed that the integration of modern technology can change teaching and learning processes. It can enhance educators' planned work, enhancing students' learning process and, hence improving academic performance. This entails that the effective integration of modern technology in the classroom depends greatly on stakeholders' attitudes. Positive modern technology attitudes are expected to foster modern technology integration in the teaching and learning process. The study then recommends that curriculum development should integrate modern technology into a curriculum with an account of economic, cultural, political, social, educational and catalytic rationales.

Likewise, in the Rungwe district, the study by Mponela & Mkulu (2023) on teaching with digital gadgets: attitudes and hindrance in public secondary schools indicates that teachers are interested in using digital gadgets due to access to a variety of teaching resources, ease of preparation of teaching notes, the offer of new ways of teaching, the ability to update students' information, and the integration of teachers into the digital world. However, using digital devices faces several challenges, including digital illiteracy, technical problems, the cost of Internet services, and low Internet connectivity. This implies that although the integration of digital devices in secondary

schools is crucial for improving the performance of students, it requires an intensive investment of human capital and financial resources. The study concluded that to improve the use of digital devices in public secondary schools, the government should ensure that modern technology facilities are adequate and accessible and that teachers are enabled to apply them in their teaching and learning processes.

In Tanzania, students also have a positive perception of the use of modern technology in teaching and learning. The study conducted in Ilala, Dar es salaam by Nzilano & Daudi (2019) on modern technology integration in teaching and learning: perception and practices of secondary school students in Tanzania, indicated that students not only had positive attitudes towards the use of modern technology in learning and teaching but also had knowledge and skills of using modern technology tools such as desktop computers, laptops, smartphones, smart boards, and iPads. However, students were provided insufficient time to spend on computer programs. This finding suggests that students are ready and enthusiastic to use modern technology in learning, but the school rules and regulations prohibit them from accessing these technologies in the learning process. The study recommended that school administrations change unfriendly rules that limit students from using personal modern technology devices in the teaching and learning processes.

Challenges of Modern Technology Usage in Teaching and Learning

The use of modern technologies in teaching and learning has faced several challenges in almost all educational systems worldwide. In Sweden, the study conducted by Ekberg & Gao (2018) investigated the challenges of using modern technology in secondary schools in Sweden from teachers' perspectives. The findings revealed that the greatest challenges were associated with the perspectives of teaching and teaching preparation. It was observed that there was a lack of modern technology training in digital resources provided by schools; it was also time-consuming to find plagiarism in students' exercises. This implies that teacher training on the use of modern technology in teaching and learning is crucial if the integration of modern technology is to be realized.

In Asian countries, information and communication technology and the movement from traditional societies to information communities have affected all human dimensions and needs. However, several barriers hinder its effectiveness. In Iran, Safari & Noor (2019) conducted a study on educational system challenges from the perspective of modern technologies. The findings revealed that the most important obstacles to the use of modern educational technologies are economic impediments and strategic, educational, technical, legal and cultural barriers. The study findings indicated that there are many barriers to using information and communication technology that are influenced by the situation and its application field. This implies that the integration of modern technologies in teaching and learning requires the economic, social, political and legal commitment of both government and stakeholders.

In most of the African education system, the major challenges in using modern technology in teaching and learning are associated with a lack of modern technology facilities, a lack of funds, and the perception of stakeholders about the use of modern technology tools by students. In Nigeria, Benedicta (2023) conducted a study on the factors influencing the effective use of modern technologies and challenges associated with the use of modern technologies in teaching and learning by lecturers in tertiary institutions in the Sokoto metropolis. The results revealed that challenges such as the incessant disruption of the power supply, lack of funds, lack of computer hardware and lack of in-service training contributed to the inability of teachers to integrate modern technology into the execution of their duties. Although the study was confined to tertiary institutions, its findings verify that the integration of modern technologies in teaching and learning is still a challenge even in secondary education. It was then recommended that necessary technologies needed for teaching-learning should be made available to lectures and institutions, technology

infrastructure upgraded, and seminars and conferences be made available to current lecturers so that their professional output is enhanced and guaranteed for higher productivity and long service to their employers.

Similarly, in Morocco, the study by Malekani (2017) on the status of modern technology in selected secondary schools revealed that low band width resulting in poor Internet connectivity, lack of standby power, and lack of policy and training schedules hindered the utilization of modern technology in the selected schools. This implies that there are still some unsupportive environments for the installation of modern technology facilities in secondary schools in Tanzania. For the effective introduction and utilization of these emerging technologies, remedies should be made to overcome the stated challenges.

In Uganda, Nyakit et al. (2021) conducted a qualitative study to investigate the challenges experienced by teacher educators in secondary schools in their quest to integrate modern technology into the teacher training process. The findings revealed that the integration of modern technology is faced with a lack of modern technology curriculum, slow Internet, attitudinal barriers and a lack of clear government policy. This entails that the use of modern technology in teaching and learning in Uganda will improve if the government includes modern technology in the curriculum. It is recommended that the government intervene with a clear policy of modern technology inclusion in the curriculum, equip schools with adequate and up-to-date equipment, and recruit more human resources in schools to reduce the workload.

In Tanzania, modern technology is integrated into teaching and learning, and it is crucial in improving teaching and learning in secondary schools. However, it is faced with several barriers. The study conducted by Joseph (2019) on the use and challenges of modern technology in secondary schools in Mikindani municipality revealed that poor modern technology infrastructure, lack of modern technology skills and knowledge, and lack of technical support and teacher training were critical challenges limiting the use of modern technology for teaching and learning in secondary schools. The implication is that the integration of modern technology in learning and teaching in Tanzania is in documents and not in implementation. Therefore, it is recommended that the government invest in modern technology infrastructure, such as computer laboratories, and recruit specialized technicians.

METHODOLOGY

The study was centred in the Morogoro region, particularly in the Mvomero district, in secondary schools. Mvomero is one of the seven (7) districts in the Morogoro region. Other districts include Mrogoro, Kilosa, Gairo, Kilombero, Malinyi and Ulanga. The district borders the Handen district in the north, the Bagamoyo district in the east, the Kilosa district in the west, and the Morogoro rural and Morogoro urban (municipality) districts in the south. The district is administratively divided into four (4) divisions, 30 wards, 130 registered villages and 686 hamlets. The Mvomero district consists of 24 secondary schools, and the study was conducted in five selected secondary schools. The choice of the Mvomero district was appropriate because, despite the government's effort to mobilize modern technology for secondary schools, the problem still exists, as secondary schools in the district encounter a shortage of modern technologies, which is essential for effective teaching and learning processes in secondary schools. Therefore, the Mvomero district is a fair representation of the rest of the districts in the region and the country at large.

The study employed a mixed methods approach. This approach involves collecting, analysing, and interpreting data by employing both qualitative and quantitative approaches to broadly understand a research problem. In a cross-sectional survey design, the researcher visited the field study once, and the data were collected simultaneously. Therefore, the targeted population of this study comprised 24 secondary schools, 17,073 form three and form four students, 420 teachers, 24

heads of schools and one district education officer (DEO) in the Mvomero district. Thus, the target population consisted of 17,518 individuals, and a sample size of 185 individuals, which included 1 district secondary educational officer (DSEO), 5 heads of secondary schools, 80 teachers of secondary schools and 99 students. This study employed three methods of data collection: questionnaires, interview guides and observation guides. Validity and reliability were checked through source and methodical triangulation, content validation, and member checking. The reliability was checked through the split-half method, and the results yielded a Cronbach's alpha coefficient of 0.794, meaning that the data were reliable and good for analysis. Quantitative data were analysed with the support of the Statistical Package for Social Science (SPSS) version 21, while the qualitative data were analysed through the thematic method. The study observed all research ethical procedures, namely, informed consent, confidentiality, privacy and plagiarism.

RESULTS AND DISCUSSION

Modern Technologies Used in Teaching and Learning Processes in Secondary School

In the first objective, the researcher intended to understand the kinds of modern technology used in the teaching and learning processes in secondary schools in the Mvomero district. To obtain information, the researcher used questionnaires, interviews and observation methods of data collection. The quantitative data were aggregated into means and standard deviations. The summary findings are shown in Table 1 below.

Table 1: *Modern Technologies Used in Teaching and Learning Processes in Secondary School*

Responses	N	Mean	Std. Deviation
The use of Computers	179	3.62	1.107
The use of Internet	179	3.50	1.347
The use of Smartphones	179	3.96	.979
The use of Television	179	3.92	1.073
The use of Projectors	179	3.62	1.107
The use of Tablets	179	4.01	1.044
Valid N (listwise)	179		

Source: Field Data (2023)

The data in Table 1 shows that that the value of the standard deviation is very close to the mean values for all the factors, except for the use of smartphones, which had a standard deviation of less than 1.

The overall mean is 3.77 and SD = 1.109, which means that the predetermined relationship between technologies in teaching and learning in secondary school is established. These findings are also supported by Garba et al. (2015), who showed that the type of technology used in the teaching and learning process in secondary school included computers, the Internet, smartphones, TV projectors, tablets and others depending on the level of development and availability of modern technology in the particular country. In the same vein, Liu et al. (2021) affirmed that schools with modern technology, such as tables, computers, projectors and Internet platforms, facilitate the process of teaching more than schools with no modern technology tools. Furthermore, according to Kolog et al (2018), the use of digital tools and resources and technology integration encouraged students to explore and acquire information; hence, it helped to simplify their learning process.

Primarily, the study participants mentioned the types of modern technology used in teaching and learning in secondary schools and the findings. In the interview conducted with the head of the school the following was noted:

> "*In our school, all teachers have tablets (vishikwambi) because, since last year, the government has been trying to implement the use of technology in teaching and learning, which is why teachers in public secondary schools were given tablets to enhance the provision of education through technology*" (Interviewee A, 21st July 2023).

Another interviewee noted:

> *"In our district, we have ensured that every teacher uses tablets in teaching. We are implementing the government goals to ensure the use of technology in the provision of quality education"* (Interviewee, F, 26th July 2023).

This entails that in the selected secondary schools in the Mvomero district, tablets have been used in the teaching and learning process. This concurs with the study conducted by Garba et al. (2015), who noted that accessibility to tablets has ensured the utility of modern technology in the teaching and learning process. Additionally, Nzilano & Daudi (2019) stated that tablets were among the cheapest technologies used in the provision of education. Thus, it was concluded that tablets are a type of modern technology used in teaching and learning in the Mvomero district.

Likewise, the interview carried out with one interviewee indicated that:

> *"…our school has a laptop, although they are not enough for all teachers. However, if a teacher wants to use it, he or she is allowed to take it and return after use*" (Interviewee, D 24 July 2023).

This entails that the selected secondary schools in the Mvomero district utilize a laptop in teaching and learning. The findings concurred with the study by Heinrich (2020), who noted that schools with computers were found to simply teach processes than those without computers. Therefore, computers are another modern technology that has been used in teaching and learning in secondary schools.

Additionally, radio is a technology used in the teaching and learning process in the Mvomero district, as students represented 10.3% and teachers 13%. During the interview, one of the participants noted:

> *"In our school, teachers have been using radio to teach some topics, such as listening skills, so that students can capture the topic well. Teachers may put on the radio and tell the students to listen to some news, and then they are asked some questions based on the news. This helps students to understand well the topic being taught"* (Interviewee B, 22 July 2023).

This implies that some secondary schools in the Mvomero district have been utilizing the available tools such as radio to improve the teaching and learning process in schools. The findings correlate with the studies by Claudius & Ndinagwe (2016) and Heinrich (2020), who found that some schools use projectors to improve the teaching and learning process. It was noticeable that a projector is used in secondary schools to enhance teaching and learning. Concerning the use of smart television, this was reported by only 10.4% of teachers. Mvomero district television is also among the modern technologies used in the teaching and learning process in secondary schools. The views of one of the interviewees illustrate:

> *"In our school, teachers have been using television to teach students some current issues that are not addressed in the syllabus. However, also, television has been used in our*

> *school to teach some of the topics like government in the area of parliament, we allow students to watch parliament session so that they could understand how the parliament of Tanzania works"* (Interviewee D, 24 July 2023).

Nzilano & Daudi (2019) noted that the use of television helps students obtain a deep understanding as they learn things as they happen and achieve their goals by improving their performance

Additionally, the researcher employed the observation method to gather information as the research unfolded in the field. The observations indicated that most teachers had tablets and smartphones that they used in the teaching and learning process. At the level of the schools, the researcher found that few schools had computers that can be used by teachers and students. However, the researcher witnessed a projector in one school and smart television among the modern technologies used in teaching and learning.

Based on the findings obtained it can be established that the types of technologies that are mostly used in the learning process are smartphones and tablets, by both teachers and students who participated in this study. The effective use of smartphones and tablets is associated with the simplification of their access to various information in the form of news, publications, photos and videos. Moreover, smartphone use was found to be useful because it enabled them to take lecture notes, surf the Internet and instantly take concepts for later use. In addition, the students may not have to ask questions or seek clarification in an open classroom because they can use smartphones to obtain the answer; and by looking for video and audio, can bring learning to life.

These findings are supported by Garba et al., (2015), who showed that the type of technology used in the teaching and learning process in secondary school included computers, the Internet, smartphones, TV projectors, tablets and others, depending on the level of development and availability of modern technology in the particular country. In the same vein, Heinrich (2020) affirmed that schools with modern technology, such as tables, computers, projectors and Internet platforms, integrated the process of teaching more than schools with no modern technology tools. Ngeze (2017) conducted a study on modern technology integration in teaching and learning in secondary schools in Tanzania. The study revealed that the use of modern technology in secondary school is low because most secondary schools do not have modern technology infrastructure in place. In schools where there is infrastructure, the student-computer ratio is high.

The findings concurred with the diffusion innovation theory (Everett Roger 1961), which supported diffusion and the use of innovative technology in teaching and learning processes, such as the use of innovative computers, the Internet and relevant software, which have been adopted by some schools. The conceptual framework and theory had a strong relationship with the findings of the study, implying that schools need to foster the integration of modern technology in school surroundings to facilitate the ease of use of technology in teaching and learning among students and teachers. This means that for schools to play a role in enhancing the effective use of smartphones and tablets, first, schools must enhance the availability of effective Internet connections.

Perception of Stakeholders about the Use of Modern Technology in Teaching and Learning

Technology use, especially in teaching and learning, is a phenomenon that gained popularity; however, different educational stakeholders have different perceptions of the use of modern technology, especially in the teaching and learning process. Thus, this objective was intended to solicit the views and ideas of different education stakeholders towards the use of technology in the teaching and learning process in secondary schools. Data for this objective were collected using Likert scale questionnaires containing the level of ratings, namely, Strongly Disagree, Disagree, Neutral, Agree and Agree. The results obtained were analysed using descriptive statistics in which

mean and standard deviation values were computed, and the results obtained are summarized and presented in Table 2.

Table 2: *Perception of Stakeholders about the Use of Modern Technology in Teaching and Learning.*

Responses	N	Mean	Std. Deviation
The school has a clear policy on the use of MT in the teaching and learning process.	179	3.62	1.107
The school principal has the expertise to evaluate the use of modern technology	179	3.50	1.347
I like using modern technology in the teaching process	179	3.96	.979
Students certified with modern technology in the teaching and learning process.	179	3.92	1.073
The school infrastructures support the use of modern technology in the teaching and learning process.	179	3.62	1.107
The school environment meets the expectations of the teachers on using modern technology.	179	4.10	.955
The school has sufficient means of information and communication technology.	179	4.02	1.294
Using modern technology in teaching influences effective learning by students	179	3.68	1.100
Valid N (listwise)	179		

Source: Field Data (2023)

The results in Table 2 indicate various responses from the participants. The general findings of this study show that the values of standard deviation are closer to the mean for all perceptions of stakeholders regarding the use of modern technology in teaching and learning services, with the exception of "I like using modern technology in the teaching process" and "The school environment meets the expectations of the teachers on using modern technology" that had standard deviations less than 1. The general findings of this study show that the overall mean is 3.80 and the standard deviation is 1.120, which means that the perceptions of different stakeholders regarding the use of technology have successfully been determined. These results are supported by Liu et al. (2021), who perceived that the impacts of modern technology usage on learning and teaching are very positive. It was also perceived that students who use modern technology more frequently are also more likely to be successful in their learning process. Abel (2022) established that teachers have positive attitudes towards the use of modern technology in classroom instruction. They also have a positive perception of the usage of up-to-date technology in classroom instruction, while Merillo & Domingo (2019) perceived the effectiveness of advanced technology integration in language teaching, which entails that students learn more effectively with the use of computers, as the lesson designed is more engaging and interesting.

Additionally, Nyakit et al. (2021) in noting the challenges of integrating modern technology in teaching among national teachers' colleges revealed that teachers appreciated the importance of modern technology integration into classroom instruction practices. Mwila (2018), on the attitudes of secondary school teachers towards the integration of modern technology in the teaching process, revealed that both female and male teachers had positive attitudes towards the integration of modern technology in their teaching processes. Mponela & Mkulu (2023) on teaching with digital gadgets: attitudes and hindrance in public secondary schools indicated that teachers are interested in using digital gadgets due to access to a variety of teaching resources, making it easier for teachers to prepare teaching notes, offer new ways of teaching, update students' information, and integrate teachers into the digital world.

Challenges Associated with Modern Technology Usage in Teaching and Learning Processes

This study also aimed to assess the challenges that are likely to be faced by the user of modern technologies in teaching and learning. Data were collected using the Likert Scale, which contained ratings such as Strongly Disagree, Disagree, Neutral, Agree and Strongly Agree. The results obtained were analysed using descriptive statistics in which the mean and standard deviation were computed, and the results obtained are presented and summarized in Table 3.

Table 3: *Challenges of Modern Technology Usage in Teaching and Learning*

Responses	N	Mean	Std. Deviation
The school has insufficient number of teachers	179	3.99	1.084
The school has inadequate teachers qualified with technology use	179	3.50	1.347
Insufficient Funds to meet expected technological goals	179	3.62	1.107
The school infrastructures do not support the use of Modern technology in the teaching and learning process.	179	4.02	1.294
The school lacks sufficient means of information and communication technology	179	3.50	1.347

Source: Field Data (2023)

The results in Table 3 show that there are an insufficient number of teachers, qualified with technology use and there are insufficient funds to meet expected technological goals. Further, the infrastructure did not support the use of modern technology in the teaching and learning process. Additionally, the schools lack sufficient means of information and communication technology. The overall findings of this study show that the overall mean was 3.726, and the SD = 1235. Indicating that despite the value that modern technology has in teaching and learning, there are still challenges associated with the use of technology. The results are also supported by Ekberg & Gao (2018), who suggested that the greatest challenges were associated with perspectives and teaching preparations. Additionally, there was a lack of modern technology training in digital resources provided by schools. On the other hand, Safari & Noor (2019) established that the most important obstacles to the use of modern technology were economic impediments and strategic, educational, technical, legal and cultural barriers. Additionally, it was revealed that there are many barriers to using information and communication technology that are influenced by the situation and its application field. On the other hand, Malekani (2017) showed that the status of modern technology with its low bandwidth resulted in poor Internet connectivity, a lack of standby power and a lack of policy and training schedules, which also hindered the utilization of modern technology.

The teacher and student participants explained the challenges encountered in the use of modern technology in the teaching and learning process as follows:

> "*In our school, most of the teachers do not have enough skills to use technology in teaching and learning. There are some teachers even though they have been given tablets but are unable to use them for writing even a small page of the test"* (Interviewee D1, 21 July 2023).

It can be concluded that in the Mvomero district, most teachers in secondary schools do not have sufficient skills to use modern technology in the teaching and learning process. The findings concur with the study by Joseph (2021), who noted that a lack of modern technology skills and knowledge limited the applicability of modern technology in teaching and learning in secondary schools. Moreover, the findings contradicted Everett Rogers's diffusion innovation theory, which insisted on knowledge and skills in diffusing technology from one place to another.

Additionally, the power cut-off was found to be a challenge in the teaching and learning process, as shown by 38.1% of the students and 18.2% of the teachers. This shows that power supply has been challenging the use of modern technology in the teaching and learning process. The use of modern technology highly depends on the availability of a power supply; without a power supply, the application of modern technology in education is difficult. This is supported by Benedicta (2023), who found that continuous electricity cut-offs hamper the applicability of modern technology in secondary schools. The power supply is crucial for the usability of modern technology. Thus, there should be efforts to ensure continuous accessibility to electricity in secondary schools.

Poor infrastructure has also been seen as a challenge facing the use of modern technology in teaching and learning with student participants (15.5%) and teacher participants (15.6%) noting this challenge. This shows that infrastructure in the selected secondary schools has been a challenge that limits the use of modern technology in the teaching and learning process. The interviewee from school B illustrated:

> *"In our school, among the challenges we encounter in the use of modern technology, our infrastructures do not effectively support the use of modern technology in teaching and learning. Since some of our classes are not connected with electricity, it is difficult for the teachers to use tools such as a projector. Additionally, in some classes, there is no socket for connecting these technological devices for teaching and learning to take place via technology"* (Interviewee H2, 22 July 2023).

This implies that in the Mvomero district, most of the infrastructure challenges the use of modern technology in the teaching and learning process. This is in line with the findings from the study by Joseph (2021), who noted that the ineffective utility of modern technology in teaching and learning resulted from deprived infrastructure. This has been a critical limitation on the utilization of modern technology in the teaching and learning process. There is a need for the government and other stakeholders to invest in modern technology infrastructure for clear adaptation of modern technology in the education sector.

On the other hand, 28.9% of students pointed out inadequate ICT devices, as they challenge the utility of modern technology in secondary schools. Similarly, the views of one of the interview participants illustrates:

> *"In our school, teaching devices for utilizing technology is a major challenge, especially for students, because on the side of teachers, the challenge to some extent has been solved because the government has given tablets to all teachers. This has led to the majority of students being left behind in learning through technology"* (Interviewee H3, 23 July 2023).

This shows that in the selected secondary schools in the Mvomero district, students are challenged by the lack of learning gadgets; as a result, they failed to engage in learning using technology. The findings correlate with those of Benedicta (2023), who showed that the inadequacy of computer hardware has contributed to the inability of teachers to apply modern technology in teaching. Modern technological tools are vital for integrating modern technology into education. Thus, ensuring the availability of modern technology tools is relevant. Furthermore, 16.9% of the teachers mentioned the lack of ICT technicians as a challenge to the use of modern technology in teaching and learning. This entails that in the selected secondary school's ICT technicians, it is a challenge to support the use of modern technology, something that seems to be a big challenge in bringing about the efficient use of modern technology and the performance of students. ICT technicians are important to assist with the use of modern technology in teaching and learning. The absence of ICT technicians leads to a lack of technical assistance. This is supported by Joseph (2021), who noted that a lack of technical support may lead to the inefficient use of modern technology in education.

Likewise, the high cost of the Internet package was found to be a challenge in the use of modern technology, by 15.6% of the teachers. Additionally, 10.4% of the teachers pointed to a lack of incentive for Internet bundles. The Internet is crucial for the effective use of modern technology in the teaching and learning process, as it helps stakeholders connect with varieties of teaching and learning resources from different corners of the world. The use of modern technology may be difficult, as Malekani (2017) noted that poor Internet service hinders the effective use of modern technology in education. Therefore, the accessibility of schools to the Internet must be considered for the future effective utilization of modern technology.

Moreover, during the interviews, the researchers noted that teachers are incompetent in integrating modern technology into teaching and learning, which is another challenge limiting the use of modern technology in teaching and learning in secondary schools in the Mvomero district. This is supported by the study carried out by Benedicta (2023), which indicated that most teachers are incapable of integrating modern technology in teaching and learning. Being aware of integrating technology and teaching is crucial.

Likewise, the study used the observation method to collect information from the field study. The researcher used a non-participatory observation method to observe the real situation. The researcher observed that some schools lack modern technology equipment for teaching and learning, while other schools have some facilities, such as a desktop computer, photocopy machine, and printer, but they are outdated and cannot work properly. The findings related to the study by Benedicta (2023) which noted that the problem of computer hardware contributed to the inability of teachers to integrate modern technology into their activities. This was supported by Everett Roger's Diffusion Innovation Theory that predicted the factors impeding the use of modern technology in secondary schools in the Mvomero district.

Relationship between Research Variables

In this section, we discuss the relationship between the use of modern technology and the teaching and learning process. The study employed various statistical tests of significance; thus, first, the researcher determined the reliability of the data, as presented in Table 4.

Table 4: *Reliability Test*

Cronbach's Alpha	Part 1	Value	.794	
		N of Items	2[a]	
	Part 2	Value	.725	
		N of Items	2[b]	
	Total N of Items		4	
Correlation Between Forms			.801	
Spearman-Brown Coefficient	Equal Length		.890	
	Unequal Length		.890	
Guttman Split-Half Coefficient			.890	
a. The items are: TLP, PEU.				
b. The items are: PU, ST.				

Source: Field Data (2023)

Table 4 shows that reliability was tested using the split-half method, in which the total number of respondents was divided into two halves during the pilot study. This means that the first part of the response was correlated with scores from the second part. This correlation was determined by using Cronbach's alpha coefficient scale, whose results were r. 794, which was above 0.7 as the acceptable standard of reliability. This shows that the tools of data collection used were reliable and fit for further analysis of the data.

Table 5: *Pearson Correlation Analysis*

Variables	Correlation				
TLP	Pearson (r)	1			
	Sig. (2-tailed)				
	N	179			
PEU	Pearson (r)	.399**	1		
	Sig. (2-tailed)	.000			
	N	179	179		
PU	Pearson (r)	1.000**	.399**	1	
	Sig. (2-tailed)	.000	.000		
	N	179	179	179	
ST	Pearson (r)	-.229**	-.332**	-.229**	1
	Sig. (2-tailed)	.002	.000	.002	
	N	179	179	179	

****. Correlation is significant at the 0.01 level (2-tailed).**

The results in Table 5 show that the overall relationship between the use of modern technology and the Teaching and Learning Process (TLP) is 0.01, which means that there is a positive and significant relationship. More specifically, the results show that Perceived Ease of Use (PEU) (r (179)>.399, p<.000) of modern technology is positive and significantly correlated with the teaching and learning process in secondary schools. Perceived usefulness (PU) has a correlation of (r (179)>.399, p, <. 000), indicating a positive and significant relationship between perceived usefulness and the use of modern technology in the teaching and learning process. Last, for satisfaction (ST), the correlation was (r (179)> 179, p<.002), indicating that satisfaction with the use of modern technology in the teaching and learning process was positive and significant.

Therefore, from the results obtained through correlation analysis, the study established that there is a positive and significant relationship between the use of modern technology and the teaching and learning process in secondary schools. The results of the correlation analysis are supported by Allan & EdD-Elm (2018), who showed that teachers use modern technology in all areas of their professional lives, especially in their performance of their teaching, assessment and administrative tasks. This implies that in the Philippines, the level of use of modern technology in teaching and learning is high, as teachers always use modern technology in teaching and learning. Additionally, Okoye et al. (2022) found that the level of use of modern technology in teaching and learning encouraged effective teaching and learning processes, while Akinfolarin & Rufai (2017) found that the level of modern technology usage in education increased due to the distribution of laptops to teachers and the distribution of computers and uninterruptible power supplies to secondary schools, hence improving the teaching and learning process.

Table 6: *Model Summary*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.854[a]	.729	.724	.657	2.117

a. Predictors: (Constant), ST, PEU, PU
b. Dependent Variable: TLP

In Table 6, the model summary, shows that the predictors were extremely potent, as shown by R square, in which 854 (approximately 85.4%) of the dependent variables' changes are explained by the model. Thus, it can be said that there was a positive and significant correlation between independent variables and the dependent variable. This relationship between variables is supported by Kolog et al (2018).

Table 7: *ANOVA[a] Test*

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	202.996	3	67.665	16.52	.000[b]
	Residual	75.629	175	.432		
	Total	278.626	178			

a. Dependent Variable: TLP

b. Predictors: (Constant), ST, PEU, PU

The results of the F test (Table 7) were run to confirm further analysis of the relationship between groups of variables. Analysis of variance (ANOVA) was performed to test the interaction effects between the independent and dependent variables. The results showed that the F test was 16.14, which was statistically significant, as the p value was.000.

Table 8: *Coefficients[a]*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	**Std. Error**	**Beta**		
1	(Constant)	.238	.114		2.094	.038
	PEU	.121	.053	.127	2.304	.002
	PU	.636	.058	.644	10.921	.000
	ST	.159	.043	.178	3.662	.000

a. Dependent Variable: TLP

In Table 8, the final regression results are presented. The results can be summarized as follows.

$Y = 1.21PEU + .636PU + 1.59ST + \varepsilon$

The equation indicates that the usage of modern technology in teaching and learning (TLP) as the dependent variable can be affected by three factors, namely, perceived ease of use (PEU), perceived usefulness (PU) and satisfaction (ST). The effects of the interaction depend on each factor when other factors are constant as follows.

- Perceived ease of use (PEU) has $\beta = .127$, $P < .002$: there is a positive and significant relationship between perceived ease of use and the usage of modern technology in

teaching and learning. A 1-unit increase in the perceived usefulness of modern technology increases the teaching and learning process by 1.2%.

- Perceived usefulness (PU) is β=.644, P<.000: there is a positive and significant relationship between the perceived usefulness of modern technology and teaching and learning. A 1-unit increase in the perceived usefulness of modern technology increases learning and learning by 6.3%.

- Satisfaction (ST), it was shown that (β =1.78, p<.000: there is a positive and significant relationship between user satisfaction with modern technology and the teaching and learning process. An increase of 1.5% in user satisfaction increases the use of modern technology.

From these results, it can be established that there is a positive and significant relationship between technology adoption on teaching and learning. This relationship is demonstrated by the p value of 0.005%. The roles of technology in teaching and learning are supported by Dias & Victor (2022). Teachers and students see technology's usefulness in enhancing learning, improving communication, inspiring, and enhancing capabilities. Similarly, Malaysia's schools embraced modern technology in teaching and learning, shifting from traditional teacher-centred to learner-centred pedagogy (Akinfolaring & Rufai, 2017). Additionally, in the study conducted by Abdullah (2018), it was asserted that it is crucial to comprehend stakeholders' viewpoints since doing so puts one in a better position to make effective use of contemporary technologies. To ascertain stakeholders' desires, it is therefore relatively crucial to comprehend their perceptions.

CONCLUSION

Modern technology has been perceived as a tool to achieve educational development goals and lifelong learning. According to the findings of this study, a range of modern technologies are employed in the instructional and educational processes in secondary schools. These technologies encompass radio, cell phones, tablets, computers, television, and projectors. In general, stakeholders maintain a favourable perception of the utilization of modern technology in the teaching and learning process. Nevertheless, there are several challenges that impede the effective use of modern technology in the educational context, which necessitate appropriate management and regulation. The obstacles encompassed in this context encompassed a range of issues, such as insufficient proficiency in information and communication technology (ICT), unreliable access to electricity, scarcity of qualified ICT professionals, outmoded ICT infrastructure, exorbitant expenses associated with the cost of Internet packages, and a dearth of incentives for Internet bundles. Additionally, subsequent actions should be implemented to mitigate the issues stemming from the use of contemporary technology. Several key factors can contribute to the improvement of information and communication technology (ICT) in educational settings. These factors include the enhancement of ICT infrastructure, the development of teachers' ICT abilities, the provision of current ICT facilities to schools, the assurance of a consistent power supply, the proper integration of ICT skills into the curriculum, and the subsidization of ICT devices and Internet packages for schools.

RECOMMENDATIONS

Based on the study findings and conclusion, it is recommended that policymakers, curriculum developers, and educational managers should be aware of the challenges faced by the use of modern technology in the teaching and learning process. In the process they should develop strategies to curb them to enhance the usage of modern technology in the teaching and learning process, and hence improve the academic performance of students. Additionally, the Ministry of Education Science and Technology should prepare a training schedule to equip teachers with ICT

skills through workshops and seminars. Teachers should be encouraged and supported in using modern technology in the teaching and learning process and upgrading their knowledge and skills to advance the use of modern technology in teaching and learning. This will assist with creating a conducive environment for teachers to use modern technology in the teaching and learning process.

Curriculum implementers should commit themselves to the use of modern technology in the teaching and learning process. Furthermore, teachers themselves should develop a spirit of refining their knowledge and skills on how to use modern technology in teaching and learning by attending seminars and workshops to keep themselves more current with new teaching technologies. Students should be aware of how to use modern technology in the learning process and the relevance of using technology for learning. The government and other education stakeholders should ensure that schools have enough modern technology tools to allow both teachers and students to have reliable access.

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