JRIIE Journal of Research Innovation and Implications in Education
Center for Research Implications & Practice

Website:www.jriiejournal.com ISSN 2520-7504 (Online) Vol.7, Iss.3, 2023 (pp. 619 - 631)

Influence of Technological Advancement towards Quality Education in Higher Learning Institutions: A Case of Arusha City

Kennedy Omondi Otieno
St. Augustine University of Tanzania (SAUT), Arusha
Email: omondiken2016@gmail.com

Abdul Ayubu
Teacher, Korona Secondary School
Email: abdulayubu91@gmail.com

Abstract: *This study investigated the influence of technological advancement towards quality education in higher learning institutions (HLIs) in Arusha city. The study examined the technological advancement in HLIs and determined the application of technological advancement to quality education of students in HLIs. This study was guided by Technology Acceptance Theory. Convergent mixed methods research design was adopted. The target population for this study was 1110 individuals with the sample size of 64 students selected using stratified sampling, while 20 course instructors and 8 technology experts were selected using purposive sampling technique. Data were collected using questionnaires and interview guides. The validity of instruments was determined by the research experts and the reliability(r=0.83) was tested using Cronbach Alpha Coefficient method. Reliability of instrument for collecting qualitative data was done by ensuring its credibility, transferability and dependability, indicating that the instruments were fairly reliable. Data from questionnaires were analysed using descriptive statistics with the help of SPSS-25 and presented in figures and tables. while qualitative data was analysed thematically alongside research questions. Internet connectivity, access to computer laboratories and ICT training were identified as technological advancements in HLIs. In conclusion, application of technology has facilitated easy access to teaching materials, enhanced student creativity, and provided learning opportunities even during pandemics. The study recommends that instructors should actively seek training opportunities to improve their digital literacy and proficiency in using various educational technologies in addition, students should take an active role in utilizing technological advancements for their educational benefit.*

Keywords: *Technology, Advancement, Quality, Education, Arusha*

How to cite this work (APA):

Otieno, K. O. & Ayubu, A. (2023). Influence of technological advancement towards quality education in higher learning institutions: A Case of Arusha City. *Journal of Research Innovation and Implications in Education, 7*(4), 619 – 631. https://doi.org/10.59765/pida8346.

1. Introduction

Technological advancement and quality education have become a wide discussion in this era of digitalisation. Technological advancement is the improvement of technologies to be more precise, accurate, efficient, or more powerful or capable of enhancing educational upbringing among students in higher learning institutions (Park et al., 2022). Besides, quality education is the applicability of technology in enhancing the development of fundamental skills and ways of working, collaboration, communication, critical thinking, idea-sharing and problem-solving (Pelletier and Hutt, 2021). The use of

technology facilities such as mobile phones, laptops, computers, smart-boards, tablets, printers and audio-visuals provide an ample opportunity to higher learning institutions (HLIs) and other comparable organizations in creating and executing infrastructures for technological communication that provides them access to the right channels for learning. Sayaf et al. (2021) noted that technology has proved helpful in improving communication between students and teachers in higher education. According to Rahayuet al. (2022), educators have modified their methods and taken advantage of increased accessibility through technological advancement Goreti and Vera (2020) established that in countries like Turkey, technological advancement has promoted the development of competitive and alternative learning to enhance flexible, in-depth, and individualized learning experiences.

According to Mugimu (2021), in Africa, countries such as South Africa has adopted the utilisation of information and communication technology in teaching and learning but if Africa is to remain relevant and competitive in today's knowledge-based economy, it has to rely on HLIs as centres of excellence for knowledge production.In East African countries like Uganda, Kenya and Rwanda, according to Innocent andMustapha et al. (2020), there is adaptation of technological advancement in education as the facilities such as computers and projectors are used in facilitating teaching and learning.

Moreover, higher learning institutions in Arusha are falling behind in adopting e-learning as a way of delivering education (Semlamboet al., 2022). Due to restricted and sluggish internet bandwidth, some HLIs in Arusha use blended learning, in which Compact Disks were shown to be effective alternatives to learning materials.In a related study by Alenezi (2021), the landscape of higher education is anticipated to alter, taking into consideration technological advancements in society, not as an isolated force but rather as part of a larger context. Oliveira and Souza (2022) ascertained that the anticipated change brought about by changes in industrial knowledge and competency standards are as a result of increasingly digitalized world. However, the low level of implementation of e-learning in higher education is also highlighted in HLIs in Tanzania that, e-learning is only used for online discussions and student assessment (MoEST, 2022). This being the case, it was important to carry out this study on the influence of technological advancement towards quality education of students in HLIs in Arusha City.

1.1 Research Questions

The following research questions guided the study:

1. What are the technological advancements in HLIs in Arusha City?
2. To what extent are the technological advancements applied to quality education of students in HLIs in Arusha City?

2. Literature Review

The theoretical and empirical literature was reviewed with reference to research objectives. The study was anchored on Technology Acceptance Model which was developed by Davis Fred in 1989.

2.1 Technology Acceptance Theory

Technology Acceptance Theory developed by Davis Fred in 1989 was used to investigate the degree of acceptance of new system or technology. According to Dimitra, et al. (2018), the theory proposed how the organization would accept or reject new technology to use or difficulty to operate and integrate under a particular occasion. The theory developed two variables; perceived ease of use and usefulness to measure acceptance of the technology. According to Park et al. (2022), the Technology Acceptance Model has shown the relationship between the individual beliefs and intention to use or accept new technology for different purposes such as critical problem solving. In the past, the technology acceptance model sought to explain why people accepted or rejected a particular technology. Information Technology Model is one of the influential models used to determine the use of technology or system in performing different tasks.

2.1.1 Applicability of the Theory in this Study

Technology Acceptance Model was employed in this study to find out the influence of technological advancement towards quality education of students in HLIs. The theory was useful to investigate how HLIs have accepted the advancement in technology and its utilisation to influence quality education among students.

2.2 Empirical Review

The researcher reviewed empirical studies under the following study objectives: to assess the technological advancement in HLIs and examine the application of technological advancement to quality education of students in HLIs in Arusha City.

2.2.1 Technological Advancement in HLIs

Pelletier and Hutt (2021) conducted a study on digital transformation in United States: equipping advisors for the journey and students for success, change. The study stresses that the HLIs need to prepare processes, policies and people for research developments in pursuing Digital Transformation technology for supporting students in achieving their personal, academic, and career goals. Ahoet al. (2021) in a study carried out in Nigerian revealed the challenges facing adoption of technology education in teaching and learning such as lack of school equipment, insufficient manpower and experts to implement these technologies, cost of purchasing the equipment and inadequate power supply. These are factors inhabiting greater utilization of technology education. The paper recommended that, the school managers should hold the responsibilities of planning and deciding the resources and development of entire technology education curriculum. Government and the community should take technology education seriously by assisting the schools with the needed facilities and technological experts.

The findings by Nyakito et al. (2021) recommended the government intervention with a clear policy on ICT inclusion in the curriculum, equipping the colleges with adequate and up-to-date equipment, regular training opportunities for the lecturers, provision of alternative and affordable source of power, recruiting more human resource, innovation and utilisation of data analytical software and government subsidizing on the cost of internet connectivity. A study by Raphael (2022) focused on the implementation of digital transformation in the technical HLIs in Tanzania. The results indicate that, students from those two institutions had different levels of awareness on digital transformation. Furthermore, the students from both institutions have low opportunity to experience digital technologies in teaching-learning process.

2.2.2 Application of Technological Advancement to Quality Education in HLIs

Basu and Malik (2020) researched on the role of ICT in education in Urdu University-India. The study concluded that, although ICT has begun to make an appearance in education, its impact has not been as widespread as it has been in other disciplines. However, technological advancement has brought more digital literacy, innovation and critical skills in running education system. According to the findings by Innocent and Masue (2020), there is adaptation of technological advancement in education as the facilities such as computers and projectors as well as whiteboards are used in facilitating teaching and learning. In addition, Mugimu (2021) reported that, technological advancement in education could be achievable through strategic curricula innovation driven by emerging mobile technologies and development of software, that is, data analytical software. Consequently, Africa's HEIs need to embrace the online teaching and learning in their pursuit to expand ICT literacy as a means of increasing students' opportunities in higher education.

In Nigeria,a study by Mustapha et al. (2020) revealed the analysis of education as the transfer of knowledge and facts from the teachers to learners. This presents a gigantic position for the learners to use innovative technologies to significantly achieve everyday jobs and improve critical skills, communicative skills and problem solving skills. Mbowa et al. (2020) established that, despite the challenges, technological advancement provides the global learning experiences. Also, there was no significant difference in technology integration between private and public universities in East Africa.

3. Methodology

The study adopted ex post facto research design. The design allowed the researcher to collect both qualitative and quantitative data and analyze them separately (Creswell and Creswell, 2018). The target population for this study were 1110 who comprised of 1,002 third year students, 100 lecturers or course instructors (CI) and 8 technology experts (TEs) from four HEIs in Arusha City (TCU, 2023). Lecturers or course instructors were targeted because these are facilitators of teaching and learning in higher learning institutions and they integrate technology in providing course instructions among students.

Optimum sample size was selected according to Chetty and Jain (2020).The optimum sample is the one that fulfils the requirements of efficiency, representativeness; reliability and flexibility. This implies that, a good sample size should be manageable in terms of time and cost to fulfil the study coverage. Therefore, the calculation of sample size is based on Yamane Formula which states: $n = \frac{N}{1+N(e)^2}$(Yamen et al., 2017).

Where: n= required sample size, N= target population and

e= margin error (0.1 or 10%)

Therefore:

$$n = \frac{1110}{1 + 1110(0.1)^2}$$

$$n = \frac{1110}{1 + 1110\ (0.01)}$$

$$n = \frac{1110}{1 + 11.1}$$

$$n = \frac{1110}{12.1}$$

$$n = 91.735 \approx 92$$

Out of four HEIs, a total of 92 respondents were selected as follows; 16 students were selected from each institution whereby 8 girls and 8 boys were selected by simple random sampling technique. Additionally, five lecturers from each institution, that is, 3 female and 2 male lecturers were selected using simple random sampling technique. Finally, to select 8 technology experts from four HEIs, two experts, that is, one female and one male were selected purposively from each institution. Gender formed the strata among students and lecturers. In the institutions with either male or female technology experts only, the researcher selected two technology experts of the same gender.

Data were collected using questionnaires and interview guides. The validity of instruments was determined by technology and research experts and the reliability was tested using Cronbach Alpha Coefficient method was found at r=0.83. According to George and Mallery (2003) the instrument was considered reliable. Reliability of instrument for collecting qualitative data was done by ensuring its credibility, transferability and dependability indicating that the instruments were fairly reliable for the study. Data from questionnaires were analysed using descriptive statistics with the help of SPSS-25 and presented in figures and tables with numerical description while qualitative data was analysed using thematic coding and content analysis.

4. Results and Discussion

The findings were discussed according to the research objectives.

4.1 Findings on the Technological Advancement in HLIs in Arusha City

Objective one of this study was set to examine the technological advancement in HLIs in Arusha city. Questionnaires were administered to the sampled higher education students and they were required to agree or disagree with the items which were in the questionnaire. Technological advancement in HLIs was measured by 12-item questionnaire on a five-point Likert scale of Strongly Agree=5, Agree=4, Undecided=3, Disagree=2 and Strongly Disagree=1 were used to develop closed-ended part of the questionnaire. Figure 1presents the summary of the respondents' responses and the results of quantitative findings through questionnaires on the technological advancement in HLIs in Arusha city

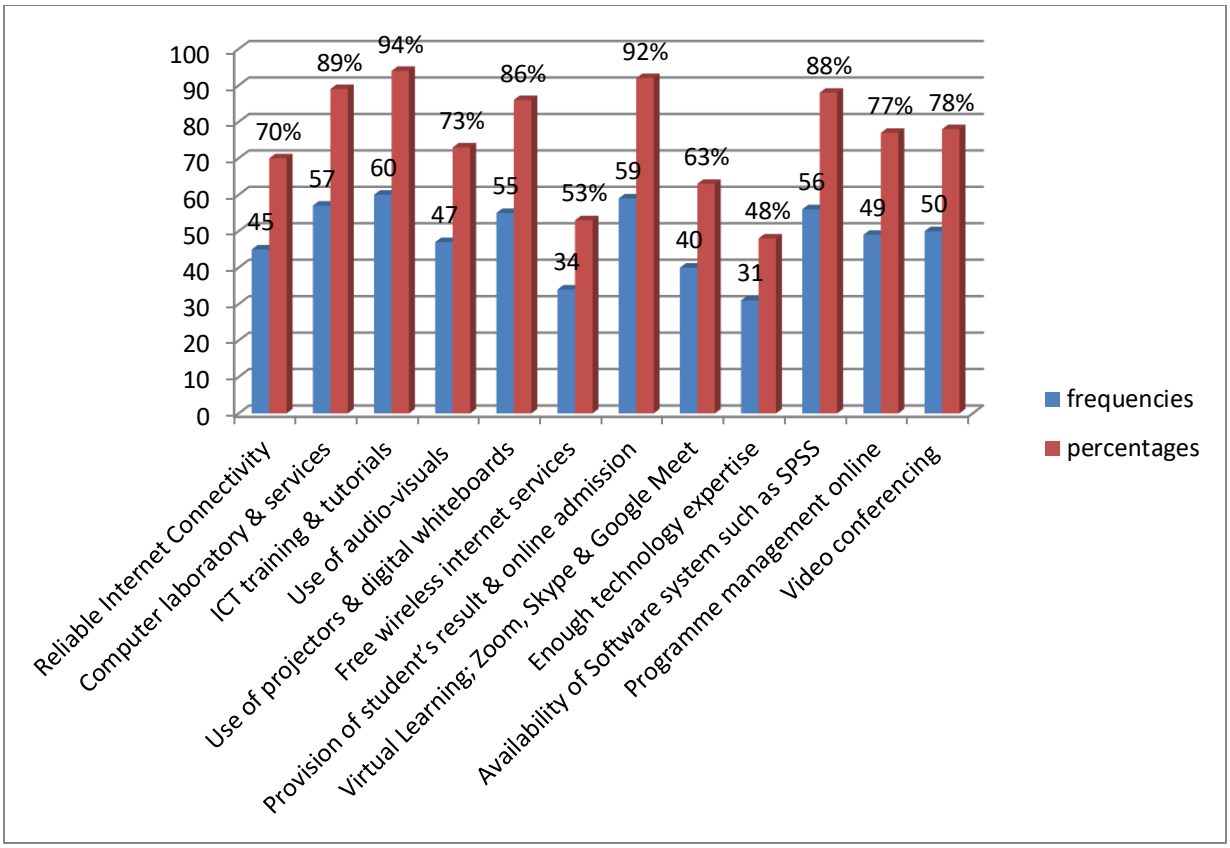

Figure 1: Quantitative Findings on the Technological Advancement in Higher Learning Institutions

Percentages are values of students who agreed with the statement. Those with contrary opinion to the statement are implied.
Source: Field Data (2023)

Figure 1 show that, 70% of the students reported having reliable internet connectivity in higher learning institutions. These results indicate that most HLIs in Arusha city have invested in stable internet infrastructure; therefore, the university students are able to access the internet through institution's Wi-Fi. In relation to this finding, the study by Nyakito, et al. (2021) recommended government intervention with a clear policy on ICT inclusion in the curriculum, equipping the colleges with adequate and up-to-date equipment, regular training opportunities for the lecturers, provision of alternative and affordable source of power, recruiting more human resource and government subsidizing on the cost of internet connectivity. This means that, there is technological advancement in the internet connectivity, but more efforts are required. Also, in the diffusion innovation theory, Wayne (2022) recognised that, the person or adopter must first learn and become aware of the innovations such as networks and have some idea on how it functions. This implies that, there is advancement in connections or networks which require the persons to have basic knowledge. Therefore, it seems that the higher learning institutions have grew in internet connectivity and the student and the faculty members access online resources for their studies, which enhances their learning experience and potentially their academic performance.

From the data as shown in figure 1, it has been indicated that 89% of students reported access to computer laboratories and services. This suggests that these institutions have prioritized providing students with physical spaces where they use computers, which is crucial for research and completing assignments. This implies that there has been advancement in computer laboratory services; however, more strategies are needed to sustain this kind of technological advancement. This was also found by Mustapha et al. (2020) who revealed that although there is availability of computer laboratories and services in higher learning institutions, the challenges such as inadequate classroom space that accommodate a large number of computers, teachers' dislike to take the students to computer laboratory, lack of expedient access to computers at home, inadequate infrastructure, deplorable planning and inadequate healthy human

infrastructures that sustain technology advancement in the classroom were observed. Also, in relation to diffusion innovation theory, the theory suggests that technologies are constantly changing and hardware and software components are being introduced including computer and its services (Stephenson, et al., 2018). Therefore, this means that, although there are challenges in technological advancement, there is a progress in the advancement in computer laboratories and its services in HLIs.

In figure 1, overwhelming (94%) respondents have reported that there is Information and communication technology (ICT) training and tutorials in their institution. This indicates that almost all students have been given the opportunity to improve their digital skills. Correspondingly, the findings by Basu and Malik (2020) concluded that, although ICT has begun to make an appearance in education, its impact has not been as widespread as it has been in other disciplines. This implies that, there is adoption and advancement of ICT especially in the field of education in learning organisations. Likewise, in the theory of technology acceptance, the theory expanded and added an extension to the technology acceptance in a different context of research such as learning management system, use of technology in sports education, mobile learning and e-learning which all these are part and parcel of ICT (Rosli, et al., 2022). This means that, there is a significant growing of ICT among HLIs. These findings imply that, the HLIs are being prepared not just for their studies, but also for a job market that increasingly values ICT proficiency.

In addition, figure 1also revealed that, 73% of students reported the use of audio-visuals in their learning. This suggests that a significant number of institutions are incorporating multimedia in their teaching methods, which enhances understanding and retention of information. These concur with the findings of Rahayu, et al. (2022) who found that, educators have modified their methods and taken advantage of increased accessibility through technological advancement by integrating the use of technology facilities such as mobile phones, laptops, computers, smart-boards, tablets, printers and audio-visuals. This provides an ample opportunity to HLIs and other comparable organizations in creating and executing infrastructures for technological communication that will provide them access to the right channels for learning. Furthermore, in accordance with the technology acceptance model, the theory has been expanded and added an extension to the technology acceptance in a different context of research such as learning management system, use of technology in sports education, mobile learning (displays and audios) and e-learning (Rosli, et al., 2022). Therefore, this implies that, there has been technological advance in terms of video displays and audios among HLIs.

Likewise, in figure 1the data shows that, 78% of the students reported that HLIs in Arusha city have implemented video conferencing facilities. The findings reported that, video conferencing facilitates virtual meetings, guest lectures, and academic discussions, regardless of participants' physical locations. It expands opportunities for knowledge sharing, networking, and enriching the learning environment within the institutions. These findings are related to the findings by Innocent and Masue (2020), that reported adaptation of technological advancement in education as the facilities such as computers and projectors as well as whiteboards are used in facilitating teaching and learning. Besides, in relation to technology acceptance model, the theory is applicable in a different context of research and education such as learning management system, use of technology in education, mobile learning and e-learning, video conferencing, and analytical tools which all these can influence effective teaching and learning. This advancement enables remote communication and collaboration among students, teachers, and external stakeholders.

When the technology experts (TEs) were asked to provide their responses on the evidence for technological advancement in HLIs in Arusha city, one TE commented that: -

> *Yes, there are several evidence for technological advancement in HLIs in Arusha city. Many HLIs, have adopted technology-enhanced learning such as learning management systems, online resources, and multimedia tools to deliver course content and facilitate communication between students and instructors* (Personal Interview, 14thMay, 2023).

The remark by TE indicates that by utilizing online resources and multimedia tools, interactive simulations, and digital tools, instructors can make their lessons more engaging and effective.

Also, the other Technological Expert (TE) said that:

> *Although there are challenges such as lack of ICT infrastructure and limited technical support that hinder the adoption of technological advancement in HLIs, however, there is the evidence of integration of ICT in teaching and learning, administrative tasks and online management systems* (Personal Interview, 15th May 2023).

The excerpt is consistent with the notion that e-governance systems can streamline information access and improve data management in an institution of learning. For instance, the use of e-governance systems promotes transparency and combat corruption in government institutions. Similarly, ICT enhances teaching and learning in HLIs.

Moreover, the TE commented that:

> *We have established partnerships with international institutions to enhance our technological capabilities. For instance, we have launched a joint diploma in electrical engineering with a Chinese college. This collaboration not only enhances our curriculum but also exposes our students and faculty to international standards and practices in technology through the adoption of digital learning platforms* (Personal Interview, 15th May 2023).

The response from the technological experts revealed that many HLIs in Arusha city, have adopted technology-enhanced learning such as learning management systems, online resources, and multimedia tools to deliver course content. However, they are still facing challenges such as lack of ICT infrastructure and limited technical support that hinder the complete adoption of technological advancement in HLIs. These findings are also evidenced by the findings by Oliveira and Souza (2022) who ascertained that, the anticipated change brought about by changes in knowledge and competency standards, social changes brought about by an increasingly digitalized world, new developments in technology and new uses of digital technologies such as computers, internets, multimedia tools, ICT that are likely to result in the creation of new learning environments and modes of instruction. Further, Kaputa et al. (2022) revealed that, due to technological advancements, educational institutions have been compelled to offer more courses that place a heavy emphasis on technical, higher-order cognitive, knowledge-based, and digital skills at the expense of more integrated, collaborative, multidisciplinary, and cross-cultural learning approaches. These imply that, the technological advancement has been evidenced in higher learning institutions in Arusha city whereby there is the adoption of technological developments through increase in multimedia tools such as computers, adoption on online management systems and other digital learning platforms.

4.2 Findings on the Application of Technological Advancement to Quality Education of Students in Higher Learning Institutions in Arusha City

The second objective of the current study was set to determine the application of technological advancement to quality education of students in higher learning institutions in Arusha city. Questionnaires were administered to the sampled higher education students and they were required to agree or disagree with the items which were in the questionnaire. The application of technological advancement to quality education of students in HLIs was measured by 13-item on a 5-point Likert scale of Strongly Agree=5, Agree=4, Undecided=3, Disagree=2 and Strongly Disagree=1.Figure 2 presents the summary of the respondents' responses and the results of quantitative findings through questionnaires.

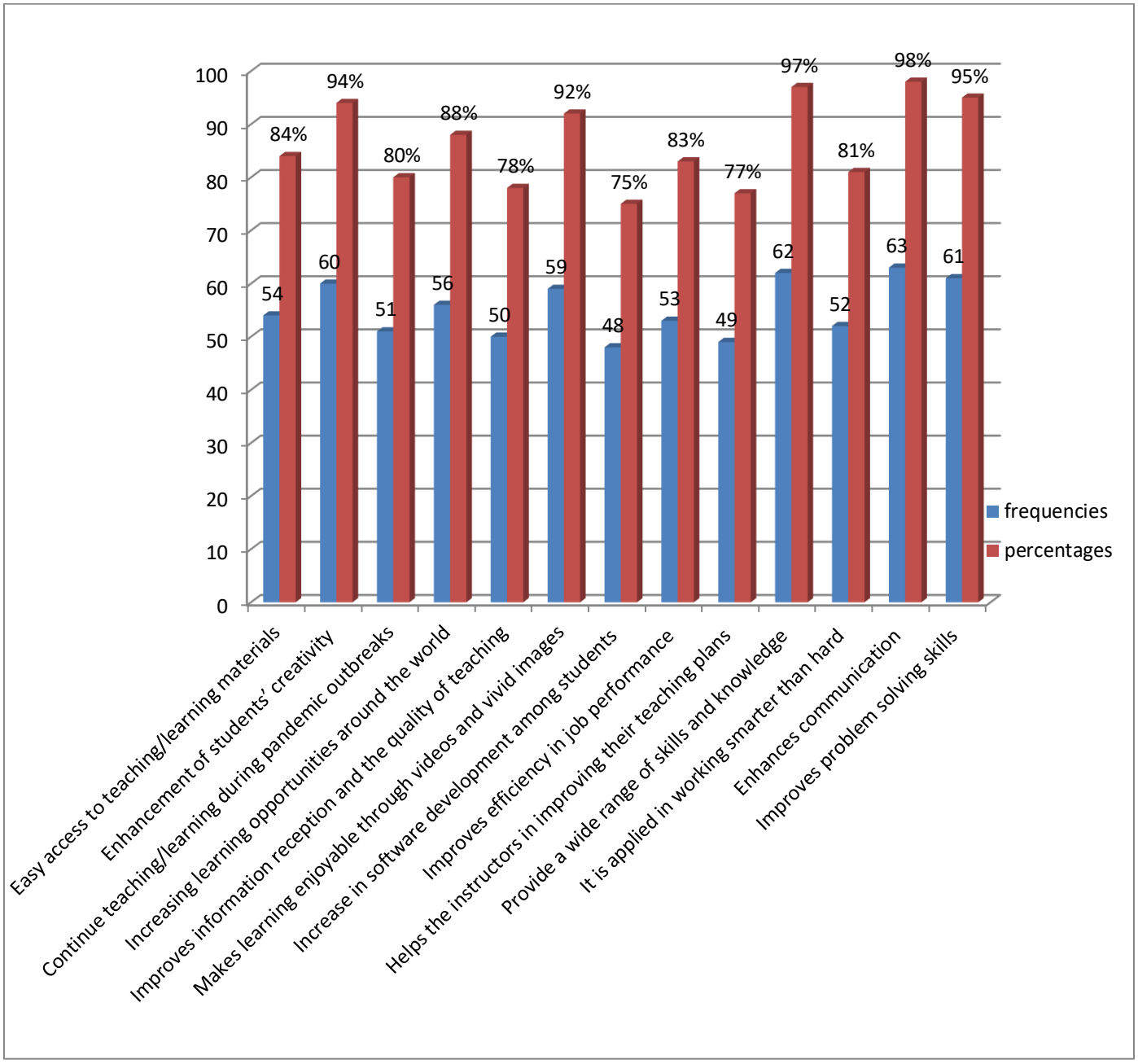

Figure 2: Quantitative Findings on the Application of Technological Advancement to Quality Education of Students in Higher Learning Institutions

Percentages are values of students who agreed with the statement. Those with contrary opinion to the statement are implied.
Source: Field Data (2023)

It has been revealed from figure 2 that 84% of respondents reported that technological advancements provide easy access to teaching and learning materials. This implies that students can access resources such as e-books, online articles, and educational websites, which expands their knowledge base and supports self-directed

learning. This is in line with the findings by Innocent and Masue (2020) who reported that there is adaptation of technological advancement in education as the facilities such as computers, mobile phones, projectors and internet connectivity are used in facilitating teaching and learning through accessing teaching and learning materials. In a related study, Rosli, et al. (2022) revealed that, an extension to the technology acceptance in learning management system, use of technology in sports education, mobile learning and e-learning provide a wide access of teaching and learning facilities. This implies that, technological advancement enables students to study at their own pace and access a wide range of resources, leading to enhanced learning outcomes.

The data as shown in figure 2 also indicates that, 94% of study participants acknowledged that, technology enhances their creativity. Through tools like multimedia presentations, graphic design software, smart phones and coding platforms, students can explore and express their creative ideas. This finding concurs with Kaputa et al., (2022) who found out that due to technological advancements, educational institutions have been compelled to offer more courses that place a heavy emphasis on technical, higher-order cognitive, knowledge-based, and digital skills at the expense of more integrated, collaborative, multidisciplinary, and cross-cultural learning approaches. Also, the diffusion innovation theory applicable under this occasion as it posits the qualities of technology diffusion such as relative advantage, competitive labour market and compatibility that would make innovation more appealing to potential users who in this case, are teachers and students. This finding suggests that incorporating technology into education promotes innovation, critical thinking, and problem-solving skills, ultimately fostering a more well-rounded education.

Additionally, figure 2 show that, 80% of students recognized the ability of technology to facilitate teaching and learning during pandemic outbreaks. This finding highlights the importance of online learning platforms, video conferencing tools, and digital resources in ensuring educational continuity. For instance, the researcher established that during COVID-19 outbreak, most education institutions were closed. Basically, learning was paralysed in institutions with less advance technology. However, institutions with advance technology adopted virtual learning through Zoom, Skype and Google Meet. This approached protected students against excessive effects of the pandemic. These findings are strengthened by those of Mtebe, et al. (2021) who ascertains that, Tanzania is not left behind on the integration of technological advancement in higher learning education as some HLIs in Tanzania appointed a task force to lead the process of rolling out the mandatory and university-wide technology-enhanced teaching during and after COVID-19. This provided the learning through Moodle system, video conferencing, and blended learning. Moreover, the theory of technology acceptance is applicable under this finding because it posits that, the organization would accept or reject new technology to use or integrate under a particular occasion including the period of outbreak of pandemic or disasters (Fung, et al., 2018). Therefore, technological advancements enable institutions to adapt quickly to disruptions; ensuring students can continue their education despite challenging circumstances.

Equally, the data in figure 2 shows that 88% of respondents reported that, technology increases learning opportunities globally. Through online courses, virtual collaborations, and international research networks, students can connect with experts and peers from different countries. These are strengthened by the findings of Mbowa, et al., (2020) who established that, despite the challenges such as, inadequate funding and inadequate technological infrastructure in universities, technological advancement provides the global learning experiences. Likewise, Goreti and Vera (2020) noted that, technological advancement has promoted the development of competitive and alternative learning to enhance flexible, in-depth, and individualized learning experiences around the world. This finding suggests that technology expands students' horizons, exposes them to diverse perspectives, and prepares them to thrive in a globalized world.

The data in figure 2 further shows that, 92% of students reported that, technology makes learning enjoyable through the use of videos and vivid images. Incorporating multimedia elements into lessons captures students' attention and increases their motivation to learn. The researcher found out that the use of technology has made lesson that would ordinarily be lecture centred to be student centred as lecturers and tutors are compelled to engage students in hands on learning process. Learners are given exercise/assignments to undertake and they take advantage of technology to carry out online research. This finding suggests that technology has the potential to make education more engaging, interactive, and enjoyable for students, leading to better learning outcomes. The finding is supported by Basu and Malik (2020) who concluded that, information and communication technology when integrated into the learning process provides the education to be meaningful, engaging, entertaining, and accessible to all.

It was revealed in figure 2 that, 83% of students acknowledged that, technology improves efficiency in job performance. By using productivity tools, project management software, and communication platforms,

students can develop skills that are in high demand in the modern workforce. For example, currently, students access their examination results through Academic Results Information System (ARIS) which is contrary to previous years that results were posted on the notice boards. In essence, efficiency has been improved and students are able to access their results much easily and confidently. Moreover, the results by Joseph (2021) showed that, ICT facilitate teaching and learning, it widens access to education resources, it enhances learners understanding, it facilitates learners to work collaboratively, teacher's working efficiently, and it improves learners' engagement in the lesson. Further, the information technology model is one of the influential models used in this study to determine the use of technology or system in performing different tasks. This finding suggests that technology equips students with the tools and skills necessary for successful careers and professional growth.

Under this theme both TEs and course instructors (CIs) were interviewed. Therefore, the TEs and CIs provided their responses on the extent the application of technological advancement ensure quality education in HLIs in Arusha city. The TE when interviewed pointed out that:

> *There is a significant application of technological advancement to ensure quality education in higher learning institutions in Arusha city. Technological advancements have indeed played a significant role in ensuring quality education in HLIs in Arusha city. These advancements have brought about changes in teaching and learning environments by enabling institutions to stay competitive in the global academic system* (Personal Interview, 26th May 2023).

According to the respondents, variations in the extent to which the application of technological advancement influences quality education in HLIs was perceived, indicates the need for further exploration and potential areas for improvement. These findings align with the importance of e-governance systems in enhancing efficiency, transparency, and service delivery in educational institutions.

Also, among the CIs it was remarked that:

> *The application of technological advancements in HLIs in Arusha city has the potential to improve the quality of education, enhance teaching and learning processes, and keep institutions competitive in the global academic landscape. However, there is still a need for further adoption and integration of these technologies to fully realize their benefits* (Personal Interview, 26th May 2023).

The remark by CI points out the importance of application of technological advancements in HLIs in Arusha city. The researcher established that technological advancements has the potential to improve the quality of education, enhance teaching and learning processes, and keep institutions competitive in the global academic landscape. These views agree with the findings by Semlambo, et al. (2022) who revealed that, the technological advancements have been noted to bring necessary and unavoidable changes to businesses and learning environments. HLIs have adopted various e-learning systems to support learning, research, and publication activities to stay competitive in global academic systems. However, there are some HLIs that lag behind in the adoption of these systems. Thus, there is a need for these institutions to utilise the full benefit of today's ICT that offers the improvement in quality education. This implies that, technological advancement has been applied in ensuring quality education through integrating various academic activities into technology such as research and publications, online learning systems, multimedia displays in teaching and learning and enhanced career developments of learners.

5. Conclusion and Recommendations

5.1 Conclusion

Based on the findings of the current study, the following conclusions were drawn:

The result of the study on the first objective revealed that:

HLIs in Arusha City have made significant progress in embracing technological advancements. They have implemented various measures such as internet connectivity, access to computer laboratories, and ICT training to enhance the learning environment. The use of audio-visuals, projectors, and digital whiteboards is common, and institutions have adopted online admission, result provision, tutorials, and virtual learning platforms. These advancements have positively impacted on students' learning experiences and research capabilities. However, challenges like limited access to free wireless internet services, the need for reliable electricity, more technology expertise, and software system availability still persist. To ensure sustained progress, it is crucial to address these challenges and encourage efforts to continue integrating technology effectively in HLIs in Arusha City is necessary.

Lastly, the findings indicate that technological advancements have had a significant impact on HLIs in Arusha City, leading to the provision of improved quality education. The application of technology has facilitated easy access to teaching materials, enhanced student creativity, and provided learning opportunities even during pandemics. It has also expanded global learning opportunities, improved information reception and teaching quality, and made learning enjoyable through multimedia. Moreover, technology has fostered innovation and problem-solving skills, improved efficiency in job performance, aided instructors in planning and decentralize teaching, and offered a wide range of skills and knowledge. These advancements have transformed teaching and learning environments, making institutions more competitive on a global scale. However, there is a need for further adoption and integration of technology to fully harness its benefits in higher learning institutions.

5.2 Recommendations

Based on the study findings, the following recommendations were made:

1. It is recommended that government and policy makers should take several actions to support the influence of technological advancement towards quality education in higher learning institutions. Firstly, there should be a focus on investing in ICT infrastructure and ensuring reliable internet connectivity in all HLIs. This can be achieved through partnerships with telecommunication companies or by providing subsidies for internet services. Additionally, policies should be put in place to promote research, development and investment in educational technology, encouraging institutions to innovate and adopt the latest advancements.

2. The institutions should prioritize the allocation of resources for the improvement of ICT infrastructure, ensuring that all students have access to reliable internet connectivity and modern computer laboratories. Additionally, efforts should be made to provide technology training for both students and staff to enhance their digital skills and maximize the benefits of technological advancements. Collaboration with technology experts and professionals can help institutions stay updated with the latest trends on advancements. Administrators should also consider expanding virtual learning opportunities and integrating more digital tools and platforms into the curriculum to further enhance students' learning experiences.

3. The findings indicate that technology experts play a crucial role in driving technological advancement in HLIs. To further contribute to quality education, technology experts should actively engage in collaboration with HLIs and provide guidance and support. They should offer training programs and workshops to educators and students, focusing on the effective integration of technology into teaching and learning processes. Technology experts can also assist institutions in identifying and implementing suitable software systems to address existing challenges and optimize the use of technology.

References

Aho,V.K., Kpam, F.T. and Nevkar, D.A. (2021) Improving Quality Technology Education for Sustainable Development in Nigeria Schools: A Curriculum Analysis. *International Journal of Educational Research and Management Technology*, Vol. 6(2), 2021.

Alenezi, M. (2021). Deep Dive into Digital Transformation in Higher Education Institutions. *Education Sciences*, 2021, 11, 770.

Basu, S. and Malik, R. (2020). Role of Information and Communication Technology in Education. *Elementary Education Online*, 2020; Vol. 19 (Issue 1): pp. 845-851.

Chetty, P. and Jain, R. (2020). *How to Calculate the Sample Size of Primary Research*? India: Project Guru Publications.

Creswell, J. W. and Creswell, J.D. (2018) *Research Design. Qualitative, Quantitative and Mixed Methods Approaches* (5th Edition). New Jersey: SAGE Publications, Inc.

Dimitra, S., Wong, A., Peggy, N. & Man-Fung, L. (2018). Factors That Affect the Acceptance of New Technologies in the Workplace: A Cross Case Analysis between Two Universities. *International Journal of Education and Development using Information and*

Communication Technology, 2018, Vol. 14, Issue 3, pp. 209-222.

George, D., and Mallery, P. (2003). SPSS for windows step by step: A sample guided reference 11.0 update. (4th ed). Boston: Allyn& Bacon.

Goretti, C. & Vera, C. (2020). The Impact of Educational Technologies in Higher Education. *Gist Education and Learning Research Journal*, No. 20, pp. 155-169.

Innocent, W.A. and 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*, 2020, Vol. 16, Issue 2, pp. 242-249.

Joseph, P. (2021). Use and Challenges of ICT in Secondary Schools in Tanzania: A study of Selected Secondary Schools in Mikindani Municipality, Tanzania. Mtwara: Tanzania Institute of Accountancy.

Kaputa, V., Loučanová, E., and Tejerina-Gaite, F.A. (2022). Digital Transformation in Higher Education Institutions as a Driver of Social Oriented Innovations. Switzerland: Springer.

Mbowa, H.S., Makewa, L.N., Murongo, E. Mudahemuka, W. and Ngila, W. (2020). Technology Integration Imbalances/Challenges in Higher Institutions of Learning: A Case of Private and

Public Universities in East African Region. *Journal of Research Innovation and Implications in Education*, Vol.4, Iss.1, 2020 (pp. 1-9).

MoEST (2022). The National Science, Technology and Innovation Policy. Tanzania: Minister's Office- MoEST.

Mtebe, J.S., Fulgence, K. and Gallagher, M.S. (2021). COVID-19 and Technology Enhanced Teaching in Higher Education in sub-Saharan Africa: A Case of the University of Dar es Salaam, Tanzania. *Journal of Learning Development*, 2021, Vol. 8, No. 2, pp. 383-397.

Mugimu, C.B. (2021). Higher Education Institutions (HEIs) in Africa Embracing the "New Normal" for Knowledge Production and Innovation: Barriers, Realities, and Possibilities. Uganda: Makerere University.

Mustapha, A., Mohammed, A., Egigogo, A.R. Kutiriko, A.A. andDokoro, A.H. (2020). *Factors Affecting the Utilization and Adoption of Technology in Education*. London: Intech-Open Publishing.

Nyakito, C., Amimo, C., and Allida, V.B. (2021). Challenges of Integrating Information and Communication Technology in Teaching among National Teachers' Colleges in Uganda. *East African Journal of Education and Social Sciences*, Vol. 2, No. 3, pp. 157-171.

Oliveira, K.S. and Souza, R.A.C. (2022). Digital Transformation towards Education. *Informatics in Education*, 2022, Vol. 21, No. 2, 283–309.

Park, I., Kim, D., and Kang, Y. (2022). Searching for New Technology Acceptance Model under Social Context: Acceptance of Intelligent Information Technology in Digital Transformation and Implications.*Sustainability Journal*, 14(1), 2022.

Pelletier, K. and Hutt, C. (2021). Digital Transformation: Equipping Advisors for the Journey, Students for Success, Change. *The Magazine of Higher Learning*, 53 (3), 30-36,

Rahayu, S., Rahmadani, E. &Syafitri, E. (2022). Teaching with Technology during COVID-19 Pandemic: An Interview Study with Teachers in Indonesia. Indonesia: Hindawi Publishers.

Raphael, C. (2022). Implementation of Digital Transformation in the Technical Higher Education Institutions in Tanzania. Dar-e-salaam: University of Dar es Salaam.

Rosli, M.S., Saleh, S., Ali, A. Bakar, A.S. Tahir, M.L. (2022). A Systematic Review of the Technology Acceptance Model for the Sustainability of Higher Education during the COVID-19 Pandemic and Identified Research Gaps.*Sustainability Journal*, Vol. 14(18).

Sayaf, A.M., Alamri, M.M., Alqahtani, M.A.and Al-Rahmi, W.M. (2021). Information and Communications Technology Used in Higher Education: An Empirical Study on Digital Learning as Sustainability. *Sustainability Journal*, 2021, 13, 707.

Semlambo, A., Sengati, F. and Angalia, B. (2022) Factors Affecting the Adoption of E-Learning Systems in Public Higher Learning Institutions in

Tanzania: A Case of Institute of Accountancy Arusha (IAA). *Journal of Computer and Communications, 10*, 113-126.

Stephenson, R., Phelps, A. and Colburn, J. (2018). Diffusion of Innovations and Program Implementation in Areas of Health Behaviour/ Education/Promotion, Physical Activity, and Physical Education. *Journal of Research,* Vol. 10 (3), Issue 1, 2018.

TCU (2019). *The State of University Education in Tanzania*. Dar-es-salaam: The Tanzania Commission for Universities.

Wayne, W.L. (2022). *Diffusion of Innovation Theory*. Boston University: School of Public Health.

Yamen,T., Sato, S and Maruyama, M (2017). *Sample Size Formula*. Atkins: DOI:https://doi.org/10.1016/j.ophtha.2017