THE CONSORTIUM OF TANZANIA UNIVERSITY AND RESEARCH LIBRARIES (COTUL)

PROCEEDINGS

THE 4TH COTUL SCIENTIFIC CONFERENCE

PROCEEDINGS OF THE 4TH COTUL SCIENTIFIC CONFERENCE HELD FROM 7TH TO 11TH NOVEMBER 2022 AT THE INSTITUTE OF ACCOUNTANCY ARUSHA (IAA) IN ARUSHA, TANZANIA

THEME:
"UTILISING DIGITAL TECHNOLOGIES FOR ENHANCING INFORMATION SERVICES: OPPORTUNITIES AND CHALLENGES"

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Foreword

The Consortium of Tanzania University and Research Libraries (COTUL) is a formally registered association of higher learning and research institutional libraries from both public and private sectors. It was established in 2008 as a voluntary organisation for the purpose of engaging in joint information provision activities, particularly: acquisition of electronic information resources, supporting research works and providing capacity building training to its members geared towards enhancing teaching, learning and research works in Tanzania. COTUL was officially registered in 2017 by the Ministry of Home Affairs (Reg. No. S.A 21148) under the Societies Act [CAP. 337 R.E. 2002].

The 2013 COTUL Annual General Meeting (AGM) that was held at Ruaha Catholic University in Iringa Region decided, among other issues, to begin conducting scientific conferences for the purpose of sharing research knowledge and expertise among information professionals in the country and beyond. Since then, four (4) scientific conferences have been conducted. The last COTUL scientific conference was held in November 2022 at the Institute of Accountancy Arusha (IAA), whereby twenty (20) papers were presented under the major conference theme: *Utilising Digital Technologies for Enhancing Information Services: Opportunities and Challenges*. Therefore, COTUL is pleased to publish 14 papers that were returned and met the publication merits in its 4th Conference Proceedings.

On behalf of the COTUL Executive Committee and the Conference Organising Committee, I would like to extend my sincere gratitude to all authors, conference participants, sponsors, employers and other individuals for their contributions that have made the AGM and the Scientific Conference successful.

Dr. Sydney E. Msonde
COTUL Chairperson

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Keynote Paper

Realigning Library and Information Services with the Fourth Industrial Revolution

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Abstract
The Fourth Industrial Revolution (4IR) is driven by developments in ICTs particularly emerging digital technologies that blur the boundaries between physical, digital and biological systems. Such digital technologies include the Internet of Things (IoT), Artificial Intelligence (AI), Cloud Infrastructure, or cloud computing, big data analytics, Nanotechnologies, Advanced Robotics, Sensors, Blockchain and 3D Printing. ICT developments and 4IR technologies in particular, have impacted the conventional library processes, activities and services. All these continue to add value to libraries in diverse ways. There are numerous examples where 4IR technologies have been integrated into library systems. There are also many trends and opportunities fostered by emerging technologies and other compelling characteristics of 4IR. As a result, libraries are required to develop strategies to enable them respond to the demands, challenges and disruptive changes of the 4IR environment. This includes the need for libraries to re-examine the management and delivery of their services to proactively invest in ICTs, continuously evolve, become innovative and realign their practices. The new library philosophy in the 4IR era is "access rather than ownership". There is a call for paradigm shift and for librarians to continuously acquire new skills to fit well in the changing work environment. LIS education systems must change their programmes and curricula to provide sufficient content and practices that will produce librarians with the necessary competencies. Moreover, continued capacity building and awareness raising is necessary among leaders and decision makers in the library sector.

Keywords: Fourth Industrial Revolution, 4IR, ICTs, library services

Introduction

The First Industrial Revolution that spanned from 1760 to 1840 was triggered by the construction of railways and discovery of the steam engine. It was mostly confined to Britain. It was responsible for transition from manual labour to machines. It used water and steam power to mechanise production. The Second Industrial Revolution, from 1900 to 1960, was made possible by electrification which enabled mass production. The Third Industrial Revolution, which is regarded as the computer or digital revolution, began in 1960s. It was catalysed by the invention of computers and the internet which enabled automation of production (Schwab, 2016; Pozdnyakova et al., 2019). The World has now entered the Fourth Industrial Revolution which is also known as Industry 4.0 or 4IR. The term "Industry 4.0" was first coined at the Hanover Fair in Germany in 2011 to denote business processes in industry that envisage organisation of global production networks based on new information and communication technologies (ICTs) (Schwab, 2017). The 4IR is building on the Third Industrial Revolution and it is characterised by a fusion of technologies that blur the boundaries between physical, digital and biological spheres. In other words, the 4IR is characterised by unprecedented developments in digital, physical and biological technologies and the convergence of their applications. It is unprecedented in terms of its scale, scope and complexity (WEF, 2016). The 4IR is happening at different pace across countries, sectors and organisations around the world and it strongly impacts all aspects of human life.

Technologies that drive 4IR include the Internet of Things (IoT), Artificial Intelligence (AI), Cloud Infrastructure or Cloud Computing, Big Data Analytics, Nanotechnologies, Advanced Robotics, Sensors, Blockchain and 3D Printing (Figure 1).

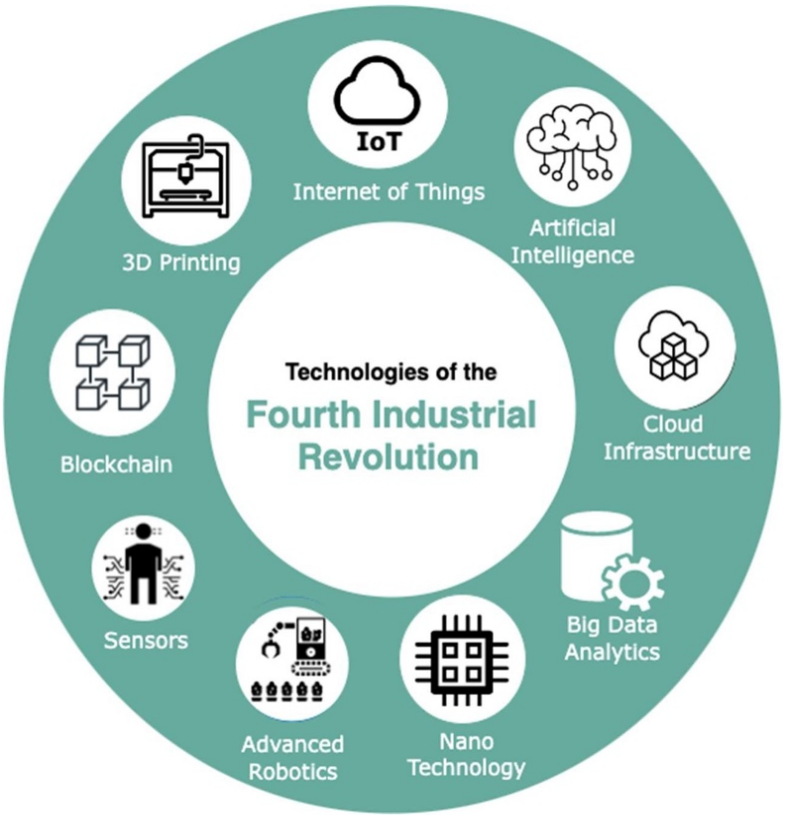

Figure 1: Common 4IR Technologies

***Source*: Authors' Construct (2021)**

The Internet of Things (IoT) describes a connection of such different devices as computers, sensors, refrigerators, washing machines, television sets, vehicles and mobile phones which are made possible by digital technologies (Kayembe & Nel, 2019). It is estimated that by the end of 2021, there were 35.82 billion IoT devices installed worldwide and there will be 75.44 billion devices by 2025 (Steward, 2021). Artificial Intelligence (AI) is a technology used in simulating the thinking and behaving process of human beings. It is the ability of computers to perform tasks normally requiring human intelligence such as visual perception, speech recognition, decision-making and translation between languages (Pfeifer & Scheier, 2001). Cloud infrastructure or cloud computing includes ICT resources that offer storage and processing capabilities in virtual system by serving multiple users. It involves software applications (software-as-a-service), computing power or storage space (infrastructure-as-a-service) and a platform

on which developers can build and deploy applications (platform-as-a-service) (Ndung'u & Signé, 2020). The concept of Big Data applies to large, diverse and complex datasets that are growing exponentially with time. These are either structured, semi-structured, or unstructured data that cannot be stored or processed efficiently using traditional data management tools (Golchha, 2015). Nanotechnology encompasses the fabrication and application of chemical, physical and biological systems at scales ranging from individual molecules or atoms to submicron dimensions. Not only that but also it includes the integration of these resulting nanomaterials into larger systems (Bayda et al., 2020). This advanced field of research and application is enabled by advanced digital technologies. Robots are programmable machines which are usually able to carry out a series of actions autonomously or semi-autonomously (Owen-Hill, 2017). There has also been humanoid robot such as "Sophia the Robot" who can speak at conferences, attend events and meet people (Retto, 2017). Blockchain is a protocol where a network of computers collectively verifies a transaction by enabling people who do not know each other to collaborate without having to go through a neutral central authority. An example of Blockchain application is digital currencies such as Bitcoin in which Blockchain technology records financial transactions made with Bitcoin (Swab, 2016). 3D Printing is a technology that creates physical objects into a three-dimensional shape by printing layer upon layer from a digital 3D Drawing or Model (Alsulaimani & Islam, 2022).

Libraries and Information Services in the Fourth Industrial Revolution

Libraries and information services have been going through various phases of development; most of which are triggered by advancements in ICTs. For example, the automation systems in libraries started in 1960s with Machine-Readable Cataloging (MARC) development process. In 1990s, libraries developed Online Public Access Catalog (OPAC), audio-visual media systems and web-based indexes. At the same time, there were developments and application of CD-ROMs, full-text databases and the Internet and the Web which disrupted some of technologies used since 1960s (Lewis, 2007).

ICT applications have improved such conventional library processes, activities and services as cataloguing, circulation, current awareness and reference services, bibliographic services, document delivery, interlibrary loans, customer relations

and audio-visual services. According to Raju (2014), new ways of scholarly communication, the immense use of mobile devices, the expansion of virtual spaces for libraries and the proliferation of social media have collectively affected the traditional role of libraries. ICTs have transformed libraries from just being a physical structure housing information resources to online collections that can be accessed globally (Ocks & Gabriel, 2021). The worry that ICT developments would devalue library and information services and perhaps the demise of the library and information science (LIS) profession is no longer valid because it is now well known that these technologies increasingly add value to libraries in diverse ways and that the profession itself is evolving.

There are numerous examples where 4IR technologies have been integrated into library and information services. For instance, Smith (2019) as cited by Chigwada and Chisita (2021) reported an advanced robotic conveyer system that transports books from Bryant Park off-site storage area to New York Public Library underground. Some libraries are collecting and analysing data using social media tools, drones, cameras and other digital devices. The University of Pretoria employed Libby, a client service robot in May 2019 for providing guidance, to conduct surveys, display marketing videos and answer questions (Chigwada & Chisita, 2021). Libchain was developed to contain information on how books are often passed on between users, loaning period and home library of the book. Libchain leverages on Blockchain technology in charging and discharging whereby potential borrowers alert the borrowers of the books to pass the books to the potential borrower after usage (Cabello et al., 2017). Among other uses, IoT is expected to be used for self-checkout in libraries, taking stock of information resources, access control in the physical building, tracking assets, monitoring the library network (Ayinde & Kirkwood, 2020).

Nkiko and Okuonghae (2021) describe some important trends and opportunities fostered by emerging technologies of which libraries and information services must embrace and align themselves. These include the following:

i. *Artificial Intelligence and Robotics:* AI technologies are being deployed to facilitate a wide variety of services and resources to library users. AI applications in libraries include automated indexing and abstracting, expert system reference services, cataloging and classification. Some

libraries have automated storage and retrieval systems, autonomous shelf reading robots, humanoid robots, Chatbots and voice activated systems. The Chatbottechnology enables automated conversations between library users and a machine. There is also a speech-to-text-to-speech service where a user explains to the robot their information needs and it uses machine-made indexes to locate potential contents.

ii. *New Library Spaces:* Libraries in the 4IR era are supposed to provide a welcoming, conducive, secure, serene, aesthetic and common space that is technologically enabled. The space provided by libraries should engender inspiration, reflection, creativity, innovation and exchange of ideas. Such libraries are expected to reconfigure their physical spaces to suit current realities of fostering learning, sharing, communication and collaboration. There should be inclusion of supportive and communal environment that allows for a group study by like-minded persons, dealing with similar issues and related problems. There should also be research spaces dedicated to postgraduate students and researchers. Such spaces should consist of technological resources, seminar rooms, teleconferencing facilities, areas for discussion and relaxation as well as those offering services which directly support research endeavours.

iii. *Robust Hybrid Library Collection:* Libraries should continue to operate in a hybrid environment integrating the traditional and the digital as one. Collection development should provide a broad range of contents in formats accessible to the broadest possible spectrum of end users. It is imperative, therefore, that the library provides varied, authoritative, up-to-date and excellent materials to meet the information needs of users. Libraries as gateways to knowledge now subscribe to electronic databases containing a plethora of electronic books and journals. They also facilitate access to the global information networks and curated information resources such as videos, case studies, company profiles, magazines and thesauri.

iv. *Virtual Operations and Full Automation:* The Web Online Public Access Catalogue now replaces the traditional card catalogue by enabling remote login to the library catalogue on the cyberspace through a Universal Resource Locator (URL). Virtual library provides access to databases

containing electronic books, journals, theses, dissertations, alert services and electronic document delivery. It also provides such online transactions as renewal of loans, reserving items, booking rooms and equipment, online chat services and online tutorials. Automation of library routines and processes include the installation of automatic doors, tele lift to deliver books to several floors, biometric systems, provision of self-service machines with RFID functionality, electronic security gates, CCTV, automated bindery system, the use of scanners and beacon application as well as automatic book sorters.

v. *Research Data Management (RDM):* RDM involves storage of full dataset files, preservingand keeping sensitive data secure as well as scanning research data recorded on paper to be kept in digital formats. All raw data in the collection are curated to increase access andare assigned object identifier (DOI). Different institutional policies must provide necessaryguidelines for data sharing and reuse as well as requirements for removal (Tenopir *et al.*, 2014).

vi. *Open Scholarly Communication:* According to UNESCO (2015), open scholarly communication is a process of sharing, disseminating and publishing research findings conducted by researchers for its free availability to the global communities. It is the responsibility of a library in the 4IR era to ensure global visibility and unhindered access to its institutional intellectual productivity and all scholarly outputs. The libraries advance this objective through institutional repositories, Open Educational Resources (OER) and influencing faculty members to publish in reputable open access outlets.

vii. *Bibliometrics:* This relates to understanding and evaluating the patterns, impact, relevance,influence direction and utility of research outputs. One of the major parameters in the global ranking of universities is the volume of research output and citations. For instance, the Times Higher Education (THE) relies on metrics provided by the Scopus database. Issues of impact factor, citation index, visibility on such social web platforms as Google Scholar, Mendeley, ResearchGate, Zotero, Academia.edu and Almetrics should be thoroughly understood by all academic staff through the intervention of the university library.

What Should be Done to Align Libraries and Information Services with 4IR?

The 4IR environment brings with it disruptive and transformative opportunities and technologies that require appropriate strategies to align to the new environment. The new environment requires libraries to re-examine the management and delivery of their services so that they can proactively invest in ICTs, continuously evolve, become innovative and align their practices. Lichterman (2011) reports a concern for some librarians who consider ICTs as potential threats to the importance of library, its resources and its personnel. Fortunately, this is not the case because ICTs have significantly redefined the library's place in society.

There is no doubt that traditional library buildings and libraries as institutions will continue to exist for many years although their roles will continue to change. Xing and Marwala (2017) call for the reimagining of libraries to embrace a combination of physical and virtual environments that facilitate access to information. Similarly, Islam and Islam (2015) argue that technology should form part of the library's internal environment rather than replacing it. This will enable development of smart libraries that keep abreast with smart technologies. The new approach in the 4IR era is "access rather than ownership", meaning that libraries should no longer be interested in collecting everything required by their users. Emphasis should be put on providing access to information resources, regardless of their location, in whatever format, as and when they are needed. Penniman (1993) stresses that libraries must aim at the delivery of information rather than its storage and that they should be evaluated based on services delivered not assets controlled.

Implementing and integrating ICTs within library functions and services has led to, among other things, a shift in work patterns, a need for new skills and a reclassification of positions and job retention in libraries (Ukachi, 2014). There is a call for paradigm shift among librarians to continuously acquire new skills to fit well in the changing work environment. According to Manda and Backhouse (2017) as cited in Chigwada and Chisita (2021), librarians in the 4IR era should be skilled, innovative and technologically knowledgeable. Deloitte (2018) stresses that the attributes required among the 4IR librarians are agility, resilience, responsiveness and adaptability. Hysa and Juznic (2013) suggest that librarians should enhance their computer competencies, allowing them to keep up to date with the necessary knowledge and skills required in this digital era.

LIS education systems are urged to change their programmes and curricular to provide sufficient content and practice that will produce librarians with the necessary competencies (Hysa & Juznic, 2013). There is also a challenge of overreliance on ICT personnel from outside the libraries with little or no orientation in library services and practices. LIS education systems should produce librarians with sufficient ICT skills to design and manage appropriate library systems. On the other hand, libraries should also promote digital literacy among their users so that they can access and use information resources using various technologies. Librarians should also deal with challenging issues such as how to handle the information overload, how to conduct sound research and manage big data as well as dealing with predatory publications and publishers. Since innovation is key in the 4IR, libraries should invest in research and development (Manyika *et al.,* 2017).

Ayinde and Kirkwood (2020) explain the 10 skills predicted by WEF 2016 that will be needed by, among others, information professionals, to thrive in the 4IR. The 10 skills are:

i. *Sense making*: This is the ability to make deeper meaning of what is expressed. It is argued that the 4IR technologies can do a lot of things, but all is GIGO. Librarians can answer users' queries more exactly.

ii. *Social intelligence*: The ability to bring deep connection to users to stimulate reactions and desired interactions. Librarians should be able to study the attitude and behaviour of users which machines could not do.

iii. *Novel and adaptive thinking*: Being innovative and creative by going extra miles in meeting the user's needs. Information professionals should apply convergent or divergent thinking (different approaches to innovation and connections of ideas) to provide solutions.

iv. *Cross-cultural competency*: Readiness to work with different ages such as kids and the old.

v. *Computational thinking*: Turning a large amount of data into abstract concepts and to understand databased reasoning (Burrus et al., 2017; Cansu & Cansu, 2019).

vi. *Transliteracy*: To acquire, create, analyse, process, evaluate and use all categories of information, engage and persuade their users.

vii. *Transdisciplinary*: This means understanding concepts across multiple disciplines. Information professionals should team up with different departments or organisations to improve and rethink about ways of rendering services better to effectively meet users' needs.

viii. *Design mindset*: This involves farsightedness, an open and clear mind for learning and the ability to adopt and adapt to any situation to survive in 4IR.

ix. *Cognitive load management*: This has something to do with the amount of load the brain can retain. The ability to make informed judgment despite information overload in meeting the users' information needs.

x. *Virtual collaboration*: The world is experiencing virtual collaboration which helps to break barriers in communication whereby two or more people can collaborate without physically coming together. This entails the ability to use technologies such as webinar or zoom to facilitate virtual collaboration.

Other important things to consider include continued capacity building and awareness raising among other actors in the library sector. This is because some leaders and decision makers in many libraries in Africa still show aversion toward adapting to a digital environment. Overcoming such aversion will lead to adequate funding of libraries, which is one of the biggest challenges. Smart leadership is also necessary to overcome constraints such as low bandwidth, poor network systems, inadequate requisite hardware and software, cybersecurity risks and interrupted power.

Conclusions

The 4IR is driven by smart technologies such as IoT, AI, Cloud Infrastructure, Big Data Analytics, Nano Technologies, Advanced Robotics, Sensors, Blockchain and 3D Printing. The world has already entered this era which is largely characterised by rapid changes. The changes are both disruptive and transformative and they are unavoidable. ICT applications have improved the conventional library and information processes, activities and services and transformed libraries from just being physical structures to online collections for global access. Generally, ICTs are adding value to library and information services in diverse ways. There are numerous examples where 4IR technologies have been integrated into these systems. There are also many trends and opportunities fostered by emerging technologies and other compelling characteristics of 4IR.

Libraries and information services are required to develop strategies that will enable them respond to the demands, challenges and disruptive changes of the 4IR environment. This includes the need for libraries to re-examine the management and delivery of their services to proactively invest in ICTs, continuously evolve, become innovative and align their practices. Technology is forming part of the library's internal environment rather than replacing it. The new philosophy in the 4IR era is "access rather than ownership". ICTs have significantly redefined the library's place in society hence there is no need for some librarians to consider ICTs as potential threats to the importance of library, its resources and its personnel. There is a call for paradigm shift and for librarians to continuously acquire new skills to fit well in the changing work environment. There are numerous skills that are needed by librarians to thrive in the 4IR. LIS education systems must change their programmes and curricula to provide sufficient content and practices that will produce librarians with the necessary competencies. Moreover, continued capacity building and awareness raising is necessary among leaders and decision makers in the library sector in order to overcome constraints such as inadequate funding, low bandwidth, poor network systems, inadequate requisite hardware and software, cybersecurity risks and interrupted power supply.

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Assessment of Mobile Phone Digital Literacy Skills among Fish Farmers in Iringa Region, Tanzania

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Abstract

The main objective of this study was to assess the level of mobile phone digital literacy skills of the fish farmers. Specifically, the study focused on assessing the level of mobile phone digital literacy skills of the farmers, exploring the influence of demographic data on the level of mobile phone digital literacy skills and identifying the types of information accessed through mobile phone among fish farmers. The study was carried out in two purposefully selected districts of Iringa Region, namely Killolo and Mufindi. The study involved 100 randomly selected respondents and employed a cross-section research design. It also employed quantitative and qualitative approaches in collecting data. Questionnaires, Focus Group Discussion, observation and key informants, interview were used to collect data. Quantitative data were analysed by using both descriptive and inferential statistics with the aid of SPSS version 20. Qualitative data were analysed using content analysis. Overall findings indicate that the level of mobile phones digital literacy skills were low. In addition, the study revealed that fish farmers were using mobile phones in accessing information on fishpond construction, fish feeds management and selection of improved fish species. Moreover, the income, age, sex and level of education was found to have statistical significant and positive relationship with the level of mobile phone digital literacy at $p<0.000$. Thus, it is recommended that information services providers and other responsible organs should empower fish farmers with training on mobile phone digital literacy particularly on communication, software and problem-solving skills. It is expected that this will encourage more farmers to utilise mobile phones for accessing fish farming information.

Introduction

Aquaculture farming in Tanzania plays a significant role in building and strengthening a strong national economy by increasing food security, employment opportunities and household income. In 2014, Tanzania fish farming or aquaculture sub-sector employed 183 800 full time fishermen and about 4.0 million people earned their livelihoods from fish farming related activities (URT, 2015). On top of that, the sector contributed 2.4% to the GDP (Economic Survey Report, 2014). In fish farming, information plays a very crucial role in determining the extent of fish farming productivity. This is due to the fact that farmers need to employ up-to-date aquaculture practices for higher yields. Access to and use of aquaculture information in fish farming enhance informed decisions on various improved farm yields, improved farm technologies, access to credits, provision of revenue and increased productivity (Soyemi & Haliso, 2015).

Fish farmers need to be updated with various aquacultural information in order to improve their fish farming management practices. This is backed by researchers (such as Benard *et al.* 2018; Adefalu *et al., 2013;* Ijatuyi *et al.*, 2016) who recommend that fish farmers need to be informed and updated with various information on construction of fishponds, fish spawning, fish processing, feeding and feed formulation techniques, storing and preservation, record keeping, identification of disease symptoms and stocking operations. These categories of information need to reach farmers through right communication channels and in the right time. In this regard, Information and Communication Technologies (ICT) particularly the mobile phone can play an important role. Mobile phone-based communication has rapidly grown in the recent past and become the most used communication among all ICTs of the current age. Recent statistics revealed that 62.9 per cent of the population worldwide already own mobile phones with 4.68 billion users on the planet (STATISTA, 2019).

In the fish farming context, the mobile phone has empowered the fish farmers to share fish farming experiences, improved fish farming technologies, markets and other important fish farming innovations (Kacharo 2016). Mobile phones facilitate the availability and accessibility of information to fish farmers and reduce the cost of communicating and disseminating the information. All these interventions are possible if farmers have a basic level of digital literacy skills that will help them in using mobile phones. Lankshear and Knobel (2008) describe digital literacy as the ability to read, write, view, listen, compose and communicate

information. Moreover, Martin (2008) defines a digital literate person as someone with the skill to identify, access, manage, integrate, evaluate, analyse and synthesise digital resources. A study conducted in China by Zhong and Qu (2018) on agricultural information literacy of farmers shows that farmers lacked skills in identifying the sources of information they preferred. A similar study by Eric *et al.* (2013) revealed that the overall digital literacy of the new generation farmers was relatively weak. The lack of knowledge prevented them from mastering and utilising modern ICTs tools like mobile phone and preventing their realisation of agriculture informatisation.

Mobile phone is the most popular ICT tool across the world today (Verma, 2012). Its popularity is due to the fact that mobile phone technology is perceived as a low cost and a widely available communication tool that holds considerable promise for knowledge mobilisation in various sectors including fish farming (Nyamba, 2012). With the use of mobile phones, fish farmers can share up-to-dated information on fish spawning or breeding operation, construction of fishponds, feeding and feed formulation techniques, fish processing, storing and preservation and stocking operations. This view is supported by Aker (2010) who claimed that one promising area for agricultural extension to reach farmers on time and with low cost is through using mobile phones. Making all these possible requires farmers to possess basic mobile phones and digital literacy skills. Hence, they can have access and use such information. According to Gilster (1997), digital literacy skills is the ability to use information and communication technologies (mobile phones) to find, operate, evaluate, create and communicate information. In this context, digital literacy skills are very important in helping farmers in accessing, using, retrieving, communicating and sharing information. They are also required for effective use of ICTs (Becker *et al.*, 2012).

Recent studies by Awadalla (2019) and CTA (2019) have revealed that farmers' low digital literacy, along with insufficient digital human capital development and infrastructure investments in rural areas, has been mentioned as the barriers and constraints for them to access and effectively use mobile phones in accessing information. However, there is scarcity of studies that have been done in Tanzania particularly in Iringa Region to assess the level of digital literacy skills among fish farmers. In supporting this view, Evans (2019) reported that farmers basic digital literacy skills, motivation values and use of information accessed through mobile phone were overlooked in past studies conducted in most developing countries including Tanzania. This study, therefore, intended to assess

the level of digital literacy skills among fish farmers and consequently improving fish farming information accessibility in Tanzania.

Research Objectives

The following research objectives guided this study.

Main objective

The main objective was to assess the level of digital literacy skills among fish farmers and consequently improving fish farming information accessibility in Tanzania.

Specific objectives

The specific objectives were:

i. to assess the level mobile phones digital literacy skills of the farmers.
ii. to identify types of information accessed through mobile phones.
iii. to explore the influence of demographic data on mobile phone digital literacy skills among farmers.

Concept of mobile phone digital literacy

In this study, farmers' mobile phone digital literacy implies the ability to identify, access and compose information. It also entails using mobile phones in communicating, reading, viewing, writing, retrieving and creating information through mobile phone. This definition was used to develop four measurements of the mobile phone digital literacy assessment tool. Those tools were:

Mobile phone Information literacy skills - writing a text message, opening a sent message and reading it, making phone calls, recording video clips and identifying missed calls.

Mobile phone Communication literacy skills - sending/receiving emails, skills on sending/receiving messages through social media, browsing through internet, skills on telephoning/video calls over the internet, skills on sending/receiving photos through social media and skills on uploading self-created content to any website.

Mobile phone Software literacy skills - skills to create accounts on social media, skills to update software/mobile applications, skills to install mobile applications, skills to use word processing software and skills to use software to edit photos, videos, or audio files.

Mobile phone Problem solving skills - online purchases, skills for using of government services using mobile applications, skills for obtaining information from public authorities/services websites, skills for finding information about goods/services from online resources and skills for selling online. The similar tools were adopted by Alant and Bukire (2021). This study, therefore, intended to assess the level of the mobile phone digital literacy skills among the fish farmers in Iringa Region, Tanzania.

Methodology

This study was carried out in Iringa Region specifically in Kilolo and Mufindi Districts. Iringa Region was chosen because it is among the regions with relatively big number of fishponds and well-developed mobile networks coverage. According to the URT (2018), Iringa, Ruvuma and Mbeya Regions have more fishponds than other regions in the country.

Sampling procedures and sample size

In this study, the sampling frame included all individual fish farmers from three divisions of the two districts, namely Kilolo and Mufindi. The districts were purposively selected based on the number of fish farmers and the presence of such basic ICT infrastructures as mobile networks. In this case, 60 fish farmers were chosen from Kilolo District and 40 farmers from Mufindi District. Simple random sampling to obtain a sample size of 100 respondents. According to Saunders *et al.* (2007), a sample size of 30 or more results in a sampling distribution that is very close to the normal distribution and the larger the absolute size of a sample the closer it becomes normal distribution**.** In addition, Bailey (1994) adds that a sample or sub-sample of 30 respondents is the bare minimum for studies in which statistical data analysis can be done.

Methods of data collection

The study employed both qualitative and quantitative approaches. A cross-sectional research design was used in collecting primary data. In this case, data were collected once from individual fish farmers. In order to ensure validity and reliability in this study, the copies of questionnaire were pretested. The value of 0.76 for reliability of scale (Cronbach's Alpha) for overall variables in this study was obtained. This indicated good internal consistency reliability for the tools. After conducting the pre-test, the questionnaire with both open-ended and closed-ended questions was amended and administered to 100 respondents using face-to-face interviews. One major advantage of the face-to-face interview is that

it allows the researcher to probe and clarify issues on the spot (Walliman, 2006). Two Focus Group Discussions (FGDs) were conducted. Eight participants who had an experience of five years in fish farming were purposively selected in each district. According to Lengua *et al.* (1992), a good Focus Group Discussion (FGD) is the one which normally consisting of 6-12 participants. The study also collected data from four key informants (two fisheries extension officers from each district) who were purposively selected and interviewed.

Data analysis

Famers mobile phone digital literacy skills were measured by the respondents responding to a list of mobile phone digital literacy skills on the following dimensions: Information skills (10 items), Communication skills (8 items), Software skills (8 items) and Problem-solving skills (8 items). Respondents were requested to rate their level on the items of each dimension using the scale highly sufficient, sufficient, moderate and insufficient. They were later scored as 4, 3, 2 and 1 respectively. Each respondent's self-assessment score was obtained by summing up all the information items for each dimension to get the level of access for each dimension. The higher values indicated high level of skills while low values indicated low skills. Furthermore, the level for each dimension was categorised as low, medium and high. For farmers, information skills have 10 items. Therefore, the highest possible score was calculated by multiplying 10 statements by 4 points to get 40 points. Conversely, the middle point was calculated by multiplying 10 statements with 3 points to get 30 points and the lowest possible score was calculated by multiplying 10 statements by 1 point to get 10 points. Therefore, 30 was the cut-off point and stood for moderate skills. Hence, scores from 10 to 29 on the overall scores were considered as low skills; while 31 to 40 stood for high skills.

Furthermore, overall total score was computed by summing up all items for all the items (34 items). The highest possible score was calculated by multiplying 34 items 4 points to get 136 points. On the other hand, the middle point was calculated by multiplying 34 statements with 3 points to get 102 points. The lowest possible score was calculated by multiplying 34 items by 1 point to get 34 points. Therefore, 102 was the cut-off point and stood for moderate overall skills. Hence, scores from 34 to 101 on the overall scores were considered as low overall skills while 103 to 136 stood for high overall skills.

The multiple linear regression equation used for analysis. It analysed the influence of demographic data on level of mobile phone digital literacy skills among fish farmers.

$Y = \beta_0+\beta_1X_1+ \beta_2X_2+\ldots+\beta_nX_n + \varepsilon,$

Where;

Y= Mobile phone digital literacy skills total score

β= Regression Coefficients

β_0= Intercept

i. Sex (1-Male, 0-Female)
ii. Age of the farmer was measured as respondent's age in number of years.
iii. Marital status (1; married, 0-Single)
iv. Education level (1=No formal Education, 2-Primary, 3-Secondary, 4-Tertiary)
v. Household size is the number of people living in a household
vi. Mobile phone use experience was measured as number of years the person had been engaged in using mobile phones.
vii. Membership on farmers groups/association (1=Member, 0-Non-Member)
viii. Annual income was measured in Tanzanian currency (Tsh).

Results and Discussion

Socio-economic characteristic of the respondents

Table 1 summarises the findings of the research study on demographic characteristics of the respondents. It was revealed in this study that 72% of the respondents were male while 28% were female. These findings are similar to those of Chenyambuga (2014), Benard *et al., (*2018) who also reported that almost all fishponds surveyed in Ruvuma, Kilimanjaro, Njombe, Morogoro, Mbeya and Dar es Salaam regions in Tanzania were owned and managed by male farmers. This probably could be due to the tedious nature of fish farming especially on pond management practices. This was also reported by Ofuoku *et al. (*2008) from Nigeria who noted that the male dominance in aquaculture farming suggests the labourious nature of farming operations which their female counterparts could not afford.

Similarly, findings reveal that nearly half (28%) of the respondents were in the age group of 41 to 50 (Table 01). This suggests that most of the respondents were within the economically active age group and this could have a positive influence

on digital literacy skills in the study area. Olaoye *et al.* (2014) opine that ages between 40 and 50 are considered highly productive and active to undergo energetic tasks associated with fish farming activities.

Furthermore, the research findings revealed that 34% per cent of the respondents had income level of more than TZS 1,250,000 per year. This means that income level of the fish farmers in the study area was below the per capital income of Tanzanian which is TZS 2,100,000 per year (TNBS, 2016). Income level can have positive or negative consequences on the level of digital literacy of the fish farmers.

Likewise, research findings noted that 53% per cent of the respondents had attained the primary level education. Ortindi and Katikpo (2015) describe that the level of education may affect mobile phone digital literacy level and information accessibility.

Table 1: Demographic characteristics (n=100)

Variable	Category	n	%
Sex	Male	72	72.0
	Female	28	28.0
Age	20 – 30	16	16.0
	31 – 40	27	27.0
	41 – 50	28	28.0
	More than 50	29	29.0
Household	1 – 3	24	24.0
	4 – 6	56	56.0
	More than 6	20	20.0
Marital status	Single	9	9.0
	Married	85	85.0
	Divorced	1	1.0
	Widowed	5	5.0
Education	No formal education	3	3.0
	Primary education	53	53.0
	Secondary education	39	39.0
	Tertiary education	5	5.0
Household income	100,000.00 – 500,000.00	28	28.0
	500,001 – 750,000	10	10.0
	750,001 – 1,000,000.00	16	16.0
	1,000,001 – 1,250,000.00	12	12
	More than 1,250,000.00	34	34.0

Mobile phone use experience	Less than 3	23	23
	3 – 6	29	29
	6 – 9	10	32
	More than 9	30	16
Use mobile phone	No	3	3
	Yes	97	97
Type of mobile phone used	Ordinary/basic	61	61
	Smart phone	39	39

It can be noted from Table 2 that the majority of the respondents (85%) had high level of information literacy skills toward mobile phone use. This implies that fish farmers had high sufficient knowledge on how to make such simple operations using mobile phones as writing a text message, opening a sent message and reading it, making phone calls, recording video clips and identifying missed calls. This result tallies with the findings of Komolafe *et al.* (2018) who revealed that most of farmers interviewed had a basic information literacy skill of preforming simple operation. This information literacy is very important as it encourages farmers to utilise mobile phones in accessing information and consequently improving fish farming productivity.

Likewise, further results showed that nearly half of the fish farmers (55%) had a low communication skill in mobile phone operations. This suggests that fish farmers had low sufficient skills on how to perform such different communication operations via mobile phones as sending/receiving emails, skills on sending/receiving messages through social media, browsing through internet, skills on telephoning/video calls over the internet, skills on sending/receiving photos through social media and skills on uploading self-created content to any website. These findings are similar to what have been reported by Domician (2017) who mentioned that only 36 (i.e. 35%) of farmers interviewed were found to make use of digital cameras, audios, videos and multi-social media on their mobile phones. This result could be attributed to the fact that some of the farmers were missing some important skills on how to perform important mobile communication features on their smart phones. Besides, some farmers were not aware of the existence of some important features. This is supported by results obtained through the FGDs from Boma in Mufindi District whereby one farmer narrated:

> *I have a smart phone, but I don't know how to operate some important functions like how to conduct a video call.*

This was evidenced during the interview with one of the fisheries officers in Kilolo who pointed out: "Some of the farmers have very good and modern smart phones but they are not aware of the existence of some of the important features using WhatsApp in sending videos". In confirming this, findings from a study conducted by Matuha *et al.* (2015) reported that the farmers were not aware of important application services/functionalities they could get through mobile phones.

Further, results reveal that more than a half (71%) of the fish farmers had low software skills on mobile phone operations. This implies that fish farmers had insufficient skills on how to perform different mobile phone software related such operations as skills to create accounts on social media, skills to update software/mobile applications, skills to install mobile applications, skills to use word processing software and skills to use software to edit photos, videos, or audio files. The results are similar to what have been reported by Alant and Busire (2021) who revealed that majority of the fish farmers interviewed were not able to the display use of the various mobile phone related skills such as activating/installing mobile application, sending and checking emails, creating social media account, downloading mobile applications and setting GPS. This could be attributed by the language barrier. This situation is possible because such operations use English language which could be difficult for the farmer to comprehend. In addition, another contributing factor can be the lack of technical training on mobile phone software operations and the lack of interest. In supporting this, findings from a study conducted by Benard *et al.* (2018) and Mabika (2019) reported that the education level of farmers play an important role in their utilisation of mobile phone application features to access farming information and in navigating through their phones.

Furthermore, study findings showed that 76% per cent of the fish farmers had low problem-solving skills on mobile phone operations. This suggests that fish farmers had insufficient skills on how to apply mobile phone problem solving skills in acquiring a certain solution. Such problem-solving skills were skills for online purchases, skills for use of government services using mobile applications, skills for obtaining information from public authorities/services websites, skills for finding information about goods/services from online resources and skills for

selling online. This could be explained by the fact those skills are not of much important to farmers. Some of the farmers are not aware of those skills, though some few farmers who had attained secondary school education were practicing some of those skills like selling their fish products online. This is supported by the results obtained through the FGDs in Ihalimba, whereby one farmer narrated:

> *Those functionalities use English language to operate. For example, preforming online purchase with my primary education will be very difficult to perform such a task.*

Thus, this indicates that there is a need of frequently training fish farmers especially on those areas with low mobile digital literacy skills. There is a need to encourage them on the full utilisation of mobile phones on accessing important information especially on fish farming.

Table 2: Level of mobile phone digital literacy skills of the farmers

Dimension	Low (%)	Medium (%)	High (%)
Information skills	14	1	85
Communication skills	55	1	44
Software skills	71	5	25
Problem-solving skills	76	3	21
Overall	63	0	37

The research findings as shown in Table 3 below indicate that some of the fish farmers (44%) used the mobile phone to request information/knowledge on pond construction. This is attributed to the fact that construction of fishpond requires technical knowledge. At the same time, due to limited numbers of fisheries officers, the immediate solution is for farmers to request such information from an expert via her or his mobile phone. This is supported by results obtained through the FGDs from Nundwe in Kilolo District, whereby one farmer narrated:

> *Due to the unavailability of fisheries extension officers nearby our farms, I normally use my mobile phone to browse through internet to obtain some important information required before pond construction.*

Matuha *et al.* (2015) confirm that due to technical skills required in fishpond construction and limited knowledge of fishpond construction, farmers usually seek technical guidance from experienced fish farmers via mobile phones.

Further, results reveal that nearly a half (43%) of the fish farmers use mobile phones in seeking information on where and how select and to improve fish

species. This is probably because of existence of low numbers of fisheries extension officers as the source of information in the study area. Thus, farmers use mobile phones as an alternative source of information whereby with mobile phones, farmers can quickly search and access such information through internet or by asking experts. Besides, the farmers may obtain information from other experienced farmers without travelling long distance looking for such knowledge. In confirming this, findings from a study conducted by Masuki *et al.* (2010) in Nigeria found that the use of mobile phones was appreciated by rural farmers because they are user-friendly, fast and convenient to share and get prompt answers of respective problems.

Moreover, other information that was requested by fish farmers via mobile phone was information on markets of their fish produce. This is due to the fact that with mobile phones, farmers can have ability to search wider markets from different sources or networks and sell their products in a greater number of markets. In supporting this, some fisheries extension officers claimed that they preferred to use mobile phones more frequently to communicate and update, share market information with farmers because they assisted them to overcome transport problems. Similarly, in confirming this also, during the FGD, one respondent in Ihalimba Division narrated:

> *Without a mobile phone, I would have been forced to walk and look for the fish market. That would have taken a lot of time.*

In addition**,** Matuha *et al.* (2015) pointed out that the existence of mobile phones has made it easier for a fish farmer to communicate with businessmen and middlemen by informing them of the availability of fish. Likewise, other information accessed by farmers through mobile phones were information on fish feed management, fish seed stocking and fishpond water quality management. This is also in line with Aphunu and Atoma (2011) who confirmed that mobile phones were highly applied in getting information with regard to the availability of fish seeds, fish harvesting techniques, fish stocking density and management of fishpond water parameters. This means that mobile phone play very important role and alternative source of knowledge particularly in a situation where fishery extension officers are unavailable or are limited in numbers.

Table 3: Types of information acquired through mobile phones

Types of information	n	%
Pond construction	44	44.0
Record keeping	25	25.0
Selection of improved species	43	43.0
Fish seed stocking	33	33.0
Pond water quality management	29	29.0
Fish feeding management	34	34.0
Harvesting	24	24.0
Feed formulation	28	28.0
Production of monosex fingering	12	12.0
Fish preservation	23	23.0
Water treatment management	15	15.0

Table 4 shows a regression model of the selected socio-demographic characteristics influencing mobile phone digital literacy skills among farmers. Eight socio-demographic factors were included in the model: sex, age, marital status, education level, household size, mobile phone use experience and membership on farmers' groups/association. The study results show that the Variance Inflation Factor (VIF) for all variables in the model ranged from 1.083 to 1.393 and meets the VIF as stipulated by Pallant (2011). Furthermore, the Durbin-Watson's d tests were used to test the autocorrelations. The results showed that the Durbin-Watson's is 1.644 which falls within the values of $1.5 < d < 2.5$ (implying that there was no autocorrelation) (Kutner *et al.,* 2005). Hence, there is no auto-correlation in the multiple linear regression data.

Results in Table 4 revealed that sex, income and level of education were positive while age were negative and statistically significant ($p<0.000$) with the level of mobile digital literacy skills.

The positive correlation between the sex of the farmer and level of mobile phone digital literacy skills implies that the male is more likely to have high level of mobile phone digital literacy than their female counterparts. This is probably because men have more access and are exposed to various mobile phone applications and features in searching various information that makes them to improve their digital literacy skills than women. This might be due to cultural practices which allocate most of the domestic responsibilities to women, leaving them with almost no extra time to allow them to pursue additional services related

to mobile phone use. In supporting this, findings from a study conducted by Rana (2009) and Mwalukasa (2018) reported that there were higher skills of mobile phone use in searching internet and other information in male than female who often did not dedicate much time on technological experimentation as compared to their male counter parts. This indicates that sex should be taken into account during the design of mobile phone application systems for delivering agricultural information to farmers.

Moreover, the positive correlation between the level of the education of the farmer and level of mobile phone digital literacy skills suggests that farmers with higher education levels have more digital literacy skills on mobile phone applications compared to one with low education level. This conforms to studies by Ali (2012) Mwalukasa (2018), Benard *et al.* (2018), as well as Alant and Busire (2021) who mentioned that farmers with higher education levels had a high digital skill on using mobile phone in searching agricultural information than farmers with low level of education. This shows that education plays an important role in increasing knowledge for improving mobile digital skills and the ability to receive new farming methods. Thus, information service providers should take into consideration the education levels of farmers during designing of mobile phone application system for information dissemination.

In addition, the negative correlation between the age of the farmer and level of mobile phone digital literacy skills implies that younger farmers had higher digital skills of using mobile phones in accessing various information in the study areas than the older farmers. This could be attributed to the fact that the older farmers are less interested in adopting technology than the younger ones. This leads to the older farmers have low mobile phone digital literacy skills than the younger ones. This is supported by a study by Nyamba and Mlozi (2012) who revealed that younger respondents in Tanzania had higher skills and chances of using mobile phones for accessing information than the older ones. Therefore, in designing any mobile phone related project training should be taking into account all age groups.

The positive correlation between the level of income of the farmer and level of mobile phone digital literacy skills implies that as the income level of farmer rises the use of ICTs will increase to escalate the mobile phone digital literacy skills. This is probably due to the fact that farmers with high income can afford to buy or use mobile phones. As a result, they can maintain them through airtime recharging, acquiring internet bundles and hence improving their digital literacy

skills. In confirming this, findings from a study conducted by Luqman *et al.* (2019) in Pakistan found that the increased income level of the farmer could persuade farmers to improve their digital literacy skills by accessing and using advanced ICTs.

Table 4: Influence of demographic data on mobile phone digital literacy skills among farmers

Factor	Unstandardised Coefficients		Standardised Coefficients			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
(Constant)	26.558	11.750		2.260	.026		
sex	16.309	4.319	.262	3.776	.000	.829	1.206
Age	-.485	.173	-.209	-2.809	.006	.718	1.393
Number of family members	-1.184	.881	-.091	-1.344	.182	.862	1.160
Marital status	5.507	5.069	.071	1.087	.280	.923	1.083
Level of education	27.877	2.876	.642	9.692	.000	.909	1.100
Average income	1.869E-6	.000	.089	1.242	.0018	.772	1.295
Mobile phone use experience	-.337	.472	-.050	-.714	.477	.821	1.218
Being member farmers groups	5.996	4.345	.091	1.380	.171	.909	1.100

Multiple R=.808; R Square=.653; Std. Error of the Estimate=17.32331; $F_{8,87}$ =20.497p=0.000; Durbin-Watson=1.654

Conclusions and Recommendations

The findings established that the overall level of mobile phone digital literacy was low. This could greatly affect the adoption and use of mobile phones by farmers in accessing and sharing various important fish farming information and consequently poor fish farming productivity. From the findings, researchers, policy makers, information providers and ICT experts in Tanzania can come up with more relevant farmers' mobile phone digital skills training programmes. Such skills will assist fish farmers to use and access mobile phone. Therefore, to enhance mobile phone digital literacy skills among farmers, the study recommends the following:

i. Information services providers and other responsible organs should empower fish farmers with training on mobile phone digital literacy particularly on communication, software and problem-solving skills to encourage more farmers to utilise mobile phone for accessing fish farming information.

ii. Responsible organs like research institutions, policy makers and information providers should make sure that demographic characteristics

like farmers' sex, income, level of education and age that affect farmers mobile phone digital literacy skills are considered prior to introduction or designing of any farmers mobile application system. This could assist responsible organs to design the mobile phone application models that are relevant to fish farmers' needs.

iii. Likewise, there is a need for the NGOs, researchers, policy makers and the Government through her department of aquaculture extension, to consider establishing fish farmers' Mobile phone applications system to encourage sharing of more agricultural information on fish production and knowledge that is more relevant to the farmers.

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Registry Staff' ICT Competences of Using Electronic Records Systems

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Abstract

Despite the substantial development of electronic records systems, most higher learning institutions in developing countries are not effectively deploying e-records systems. Most registry staff in developing countries have been striving to use e-records management systems. Against this, the present study examined the ICT skills and knowledge possessed by registry staff in higher learning institutions in Tanzania. To achieve its objective, the study has used a descriptive research design which integrated quantitative and qualitative approaches. A stratified random sampling technique was used to select 33 registry staff while 10 key informants were selected using purposive sampling. The quantitative data were collected using questionnaire were analysed using Statistical Product Service Solution (SPSS) version 25. On the other hand, the qualitative ones were collected using semi-structured interviews and they were analysed thematically. The findings of the study revealed that registry staff of the higher learning institutions studied had limited ICT skills. and this was attributed to limited ICT training opportunities. The study recommends that registry staff should be provided with continuing ICT training. Furthermore, it recommends the recruitment criteria for registry staff should be reviewed.

Keywords: e-records, digital records, ICT, e-records systems, registry staff, higher learning institutions, Tanzania

Introduction

The adoption of ICTs has brought a paradigm shift in the creation, receipt and use of records and archives from paper to digital (Tsvuura, 2021; Dotto & Mwantimwa, 2022; Lwoga et al., 2021; Smallwood, 2013; Mosweu, 2019). As a consequence, higher learning institutions are adopting e-records systems hence their growing dominance in most of these institutions (Tsvuura, 2022). The reasons for these systems' adoption and popularity are many. For example, the systems appear to improve performance, efficiency, productivity, accountability, responsiveness and transparency (Ambira, 2016; Kamatula, 2018; Wamukoya & Mutula, 2005; Mukred *et al*., 2021; Clemence *et al*., 2023). In addition, the systems ensure timely planning and informed decision-making, reduce operational costs, improve the quality of service delivery, preserve corporate memory, improve productivity and increase transparency (Asogwa *et al*., 2021; Mukred *et al*., 2019; Ukata & Wechie, 2019).

Noting from existing literature (e.g., Mosweu, 2019; Tsvuura, 2022), the adoption and effective usage of e-records management systems mainly depend on knowledge and skills. In contrast, in the paper-based world, experience was an important records management factor as it was easier to obtain it in records management than other professions (Pember, 2003; Evans, 2003). This is not the case in the digital records age in which constant changes in ICTs, functions and regulatory frameworks exert growing pressure on professionals in the field (Tsvuura, 2022). Such changes have seen higher learning institutions introduce various records management curricula and integrate e-records courses in Library and Information Sciences (LIS) programmes. For instance, in Tanzania, records management programmes have been introduced in such higher learning institutions as Sokoine University of Agriculture (SUA), the University of Dar es Salaam (UDSM) and the Open University of Tanzania (OUT) to support e-records systems adoption (Dotto & Mwantimwa, 2022).

However, despite the aforementioned initiatives, most higher learning institutions in developing countries are not effectively deploying e-records management systems (Major & Omenu, 2016; Phiri, 2016; Musembe, 2016; Tsvuura, 2022; Nkebukwa, 2019; Newa & Mwantimwa, 2019). Looking at such a state, the main question that arises is what factors are behind it? Considering the documented importance of the factor of ICT competences in the adoption and effective use ERMS, this study was designed to establish its role in the aforementioned state

by assessing ICT competences possessed by registry staff in Tanzania's higher learning institutions. This study was guided by the following research questions:

i. What types of e-records systems are used by Tanzania's higher learning institutions?
ii. What ICT skills and knowledge for deploying e-records management systems do registry personnel of Tanzania's higher learning institutions possess?
iii. How do records registry personnel acquire ICT skills and knowledge?

Literature Review

The literature review of this study is organised based on the earlier mentioned research questions. Before going to the themes formulated from these research questions, the literature discusses the general concepts of records and records management.

Concept of records management

The International Standard Organisation (ISO, 2016) describes records as "an information created, received and maintained as evidence and information by organization or person, in pursuance of legal obligations or in the transaction of business". ISO (2016) defines records management as the field of management responsible for the efficient and systematic control of the creation, receipt, maintenance, use and disposition of records. Records can be physical or electronic entities. In physical form, records are tangible due to their media as they use such things like pieces of paper. In contrast, when in electronic format, records are intangible. According to Smallwood (2013), electronic records are those created with the support of computer technology.

Types of e-records management systems

There are various types of systems used to manage e-records in higher learning institutions. For example, studies (e.g., Ambira, 2016; McLeod & Hare, 2008; Smallwood, 2013) specify that word-software used to create and keep word-processed documents, spreadsheets, multimedia presentations, emails, websites and online transactions are examples of electronic records management systems. In addition, Idris (2017) explains that audio and video files, programme data and calendar entries, business information systems, shared folders and hard drives are commonly used to manage e- records. Besides, such desktop applications as financial systems, human resource systems and corporate databases are deployed to facilitate records management. A study conducted at Moi University by

Musembe (2016) revealed that most records were largely managed manually while the few kept in electronic format were managed mostly in emails. The author further reveals that the university website was the main electronic records management system mostly used to display university programmes.

ICT skills and knowledge

Skills and knowledge of how to transmit, use, maintain, store and dispose records are important for fostering the usage of e-records management systems (Adu & Ngulube, 2017; McLeod & Hare, 2008; Shepherd, & Yeo, 2003; Smallwood, 2013). Other ICT skills and knowledge deemed important to effective use of e-records management systems include those to do with database management, e-mail management, digital literacy, usage of processing systems and file tracking. These are some of the competencies that have to be possessed by records professionals (Johare, 2006; Katuu, 2015). Similarly, Mosweu (2019) listed different types of skills and knowledge required by records practitioners. These included collaboration skills because the author argues that ICT personnel and records practitioners should work together to enhance the latter's use of ICT infrastructure to manage content (records). The author further argues that the collaboration between ICT personnel and records management professionals enables institutions to have reliable and trustworthy records. Apart from that, Mosweu (2019) recommends that records management professionals should leave their preference of paper and adopt such electronic approaches to records management as cloud computing, social media, machine learning, artificial intelligence and block chain technology. Similarly, Tsvuura and Ngulube (2020) insist that records and archives professionals must possess a high level of digital literacy. According to Mosweu (2019, p.120) "without requisite skills, the records managers may be rendered useless."

However, the reviewed literature (e.g., Luyombya & Ndagire, 2020) informs that records professionals' training and education are not prioritised hence creating skill gaps. A study conducted by Asogwa *et al.* (2021) on the status of electronic records management (e-RM) in Nigerian university libraries found that librarian were not equipped with e-RM skills. Another recent study carried out by Tsvuura and Ngulube (2020) indicates that records management personnel responsible for managing digital records and archives largely lacked the requisite knowledge and skills demanded by such a responsibility. The authors insist that records

practitioners remain with some noticeable digital records and archives management knowledge and skills gaps.

Methodology

A descriptive research was employed in the present study. It was chosen to examine the ICT skills for effective electronic records management system adoption possessed by registry staff of higher learning institutions. This research design was also employed because it allows the integration of quantitative and qualitative approaches. Basically, the study intended to identify the types of electronic systems used to manage institutional records, examine e-records management systems deployment ICT skills and knowledge possessed by registry personnel and describe ways used by registry personnel to acquire the ICT skills and knowledge. To meet these research objectives, questionnaire for registry personnel and semi-structured interviews for key informants were designed. These helped the study to get comprehensive, credible and valid findings. Creswell (2012) and Mwantimwa (2012) affirm that the deployment of both quantitative and qualitative methods normally helps researchers to harmonise the approaches' strengths and weaknesses.

This study used both probability and non-probability sampling techniques. Non-probability sampling technique (purposive sampling) was used to select five higher learning institutions. Among them, three were public institutions, namely the University of Dar es Salaam (UDSM), Sokoine University of agriculture (SUA) and Open University of Tanzania (OUT) while the remaining two were private institutions, namely University of Iringa (UoI) and Hubert Kairuki Memorial University (HKMU). These institutions were purposively selected due to the progress they have made in the adoption of ICT over the years. The same sampling technique was used to select ten key informants from the five higher learning institutions based on their positions. These were directors of human resources and management and directors of ICT. For example, directors of human resources and management are responsible for such roles as recruiting and training employees and ensuring the effectiveness of their institutions. Regarding directors of ICT, their inclusion was based on their role of ensuring that all necessary ICT infrastructures are in place and up-to-date and advising on new technological solutions to adopt. These directors were also selected because they provide technical support and in house training needed to facilitate effectively the utilisation of e-records management systems (software and hardware). Simple

random sampling was used to select a sample of 33 registry staff from the target population of 62. Among those selected, 18 were from UDSM, 7 were from SUA, 6 were from OUT, 1 was from UoI and the remaining 1 was from HKMU. Finally, lottery simple random sampling technique was used to select individuals from the five strata of higher learning institutions.

The study collected both primary and secondary data through a number of methods and instruments. Primary data were collected using questionnaire with both closed and open-ended questions and semi-structured interviews. The copies of questionnaire were administered by the researcher and research assistants to 33 registry staff. The questionnaire mainly comprised two sections of which section one covered socio-demographic characteristics of respondents and section two covered research objectives. Both nominal and ordinal (i.e. Likert) scales were used in the questionnaire. Besides, face-to-face semi-structured interviews were conducted by the researcher involving directors of ICT and directors of human resources and management. The study also gathered secondary data were collected through documentary review. Both published and unpublished sources such as books, journal articles, research reports and electronic resources were reviewed.

Data collected were processed and analysed using both qualitative and quantitative techniques. Data checks were conducted during and after fieldwork. Quantitative data obtained were coded then analysed by using a Statistical Product Service Solution (SPSS) version 25. According to the nature of the study, descriptive statistics were performed using cross tabulation and frequency distribution. Cross tabulation analysis was used to analyse the relationship between multiple variables, whereby frequencies helped the researcher to determine if observations were high or low according to the data distribution. On the other hand, qualitative data were organised into main themes and sub-themes in relation to the research objectives. The results have been presented in narration form and quotations.

Study Results and Interpretation

Socio-demographic information of the respondents

Socio-demographic information of respondents was collected to establish their backgrounds. The variables recorded were institution name, respondents' age, gender, experience and level of education as Table 1 shows.

Table 1: Socio-demographic characteristics of respondents

Variables		Frequency	Percent
Institution	UDSM	18	54.5
	SUA	7	21.2
	OUT	6	18.2
	UoI	1	3.0
	HKMU	1	3.0
Gender	female	23	69.7
	male	10	30.3
Age	<30	12	36.4
	30-39	11	33.3
	40-49	7	21.2
	50 +	3	9.1
Level of education	Certificate	2	6.1
	Diploma	26	78.8
	Bachelor	3	9.1
	Masters	2	6.1
	PhD	-	-
Experience	1-3	14	42.4
	4-6	9	27.3
	7-10	3	9.1
	11 +	7	21.2

Table 1 shows that many respondents were drawn from the UDSM. This can be attributed to the fact that the university has a big number of employees compared to SUA, OUT, UoI and HKMU. Regarding gender, the results indicate that majority (69.7%) of the respondents were women while less than half (30.3%) were males. This entails that there are more women working in this position in Tanzania's higher learning institutions. With reference to age, the results show that a moderate percentage (36.4%) of the respondents was below 30 years old. This was followed by respondents with 30-39 years of age who constituted 33.3 per cent. Apart from that, those in the 40-49 years age category constituted 21.2 per cent. A small percentage (9.1%) of the respondents was in the category of 50 years and above. Therefore, one third of this group of workers were young. In terms of education levels, the results indicate that majority (78.8%) of respondents had diplomas while less than 10.0 per cent had bachelor degrees, masters degrees and certificates. This implies that most registry personnel of Tanzania's higher learning institutions had diploma level of education.

Types of e-records systems used in higher learning institutions

The researcher sought to identify the types of electronic records management systems used by higher learning institutions. Under this inquiry, five common electronic records management systems were listed for respondents to pick the ones they used. Table 2 presents the results.

Table 2: Types of e-records systems used in higher learning institutions

System	UDSM		SUA		OUT		UoI		HKMU		Total	
ERMS	f	%	f	%	f	%	f	%	f	%	f	%
MS word	5	27.8	3	42.9	6	100	0	0.0	1	100	15	45.5
MS excel	5	27.8	3	42.9	6	100	0	0.0	1	100	15	45.5
E-mail	2	11.1	3	42.9	6	100	0	0.0	1	100	12	36.4
Websites	3	16.7	1	14.3	2	33.3	0	0.0	0	0.0	6	18.2
Databases	3	16.7	3	42.9	2	33.3	0	0.0	1	100	9	27.3

The results in Table 2 indicate that more than one-third of the registry personnel cited Microsoft Word, Microsoft Excel and email as the ERMS they used while less than one third cited databases and websites. These results show that MS Word, Microsoft Excel and email are moderately used while databases and websites are barely used. According to these results, the usage of electronic records among registry personnel is moderate.

Levels of ICT skills and knowledge

The respondents were asked to indicate their ICT skills and knowledge and their levels of competence. Four Likert scale (i.e., 1=incompetent, 2= barely competent, 3= moderately competent, 4= very competent) were employed for this purpose. See Table 3 for results.

Table 3: Levels of ICT skills and knowledge competences

System	UDSM		SUA		OUT		UoI		HKMU		Total	
Microsoft word	F	%	F	%	F	%	F	%	F	%	F	%
Not competent	2	11.1	0	0.0	0	0.0	0	0.0	0	0.0	2	6.1
Barely competent	2	11.1	0	0.0	0	0.0	0	0.0	0	0.0	2	6.1
Moderate competent	13	72.2	6	85.7	5	83.3	1	100	0	0.0	25	75.8
Very competent	1	5.6	1	14.3	1	16.7	0	0.0	1	100	4	12.1
Email management												
Not competent	2	11.1	1	14.3	0	0.0	0	0.0	0	0.0	3	9.1
Barely competent	11	61.1	2	28.6	0	0.0	1	100	0	0.0	14	42.4
Moderate competent	4	22.2	1	14.3	3	50	0	0.0	0	0.0	8	24.2
Very competent	1	5.6	3	42.9	3	50	0	0.0	1	100	8	24.2
Spreadsheet												
Not competent	2	11.1	1	14.2	0	0.0	0	0.0	0	0.0	3	9.1
Barely competent	6	33.3	0	0.0	0	0.0	0	0.0	0	0.0	6	18.1
Moderate competent	8	44.4	5	71.4	5	83.3	1	100	0	0.0	19	57.6
Very competent	2	11.1	1	14.2	1	16.7	0	0.0	1	100	5	15.2
Conversion and migration												
Not competent	3	16.7	2	28.6	0	0.0	0	0.0	1	100	6	18.2
Barely competent	11	61.1	3	42.9	3	50	1	100	0	0.0	18	54.5
Moderate competent	1	5.6	2	28.6	3	50	0	0.0	0	0.0	6	18.2
Very competent	3	16.7	0	0.0	0	0.0	0	0.0	0	0.0	3	9.1
Cloud storage												
Not competent	10	55.6	4	57.1	1	16.7	1	100	0	0.0	16	48.5
Barely competent	5	27.8	0	0.0	3	50	0	0.0	0	0.0	8	24.2
Moderate competent	2	11.1	0	0.0	2	33.3	0	0.0	0	0.0	4	12.1
Very competent	1	5.6	3	42.9	0	0.0	1	100	0	0.0	5	15.2

The results in Table 3 show that more than three quarter (75.8%) of registry staff were moderately competent in Microsoft Word while more than half of the registry personnel were moderately competent in spread sheets. On the other hand, the results indicate that nearly half (48.5%) of the respondents were not competent in cloud storage and protection of electronic records. The results show that majority (54.5%) of respondents were barely competent in the convention and migration of records. During one interview session, one key informant (K.1) said that:

> *Registry staffs are very competent in Microsoft Word and Excel because they normally interact with them. However, in these days I think no staff in our institution doesn't use Microsoft Word because majority of records are created with Microsoft word.*

Similarly, another key informant (K. 7) said that "registry staff are very competent in Excel because they normally create them and use them to manage incoming

and outgoing records". These narrations confirm that registry personnel acquire ICT skills and knowledge needed to use electronic records management systems through their own initiatives.

Ways of acquiring ICT skills and knowledge

This study also sought to find out how registry personnel acquired ICT skills and knowledge needed to use electronic records management systems. The results obtained are presented by Table 4.

Table 4: Ways of acquiring ICT skills and knowledge

Institution	In-service training		Own initiatives		Colleague support		School learning	
	F	%	F	%	F	%	F	%
UDSM	2	11.1	17	94.4	16	88.9	14	77.7
SUA	3	42.9	6	85.7	5	71.4	2	28.6
OUT	6	100	6	100	6	100	3	50
UoI	0	0	1	100	1	100	1	100
HKMU	0	0.0	1	100	0	100	1	100
Total	11	33.3	31	93.9	28	84.8	21	63.6

The results in Table 4 show that majority (93.9% and 84.8%) of respondents said they acquired ICT skills and knowledge through their own initiatives and through collegial interactions respectively. The results also show that almost all registry staff at OUT and fewer from SUA also obtained these skills and knowledge through in-service training. On the other hand, the results show that very few UDSM registry staff acquired these competencies through in-service training. However, the results show that the situation is more severe at UoI and HKMU where no registry staff acquired ICT skills and knowledge through in-service training. These results imply that registry personnel of public higher learning institutions are more likely to acquire these skills and knowledge through in-service training than those of private higher learning institutions. During an interview session, K.3 argued that:

> *Registry staffs normally deal with paper-based records which do not need ICT training. Normally, ICT training is provided to accountants because they are the ones who deal with electronic systems. For example, they are dealing with student billings, staff transactions and they have their financial systems which support their work. So, we should provide ICT training to registry staff for what purpose?*

This quotation shows that registry staff of higher learning institutions do not receive ICT training because they still manage paper records. Apart from that, it was noted through observations that registry staffs' offices of all the five studied institutions were occupied with physical files arranged on shelves. The study has also established the extent of in-service training provided through seminars, workshops and short course training by the studied institutions. This was done by asking respondents to state how many times they attended such training through seminars, workshops and short course training since they got employed. The responses that participants were asked to choose from are never, once, two times, three times and above. The figure that follows presents the results obtained.

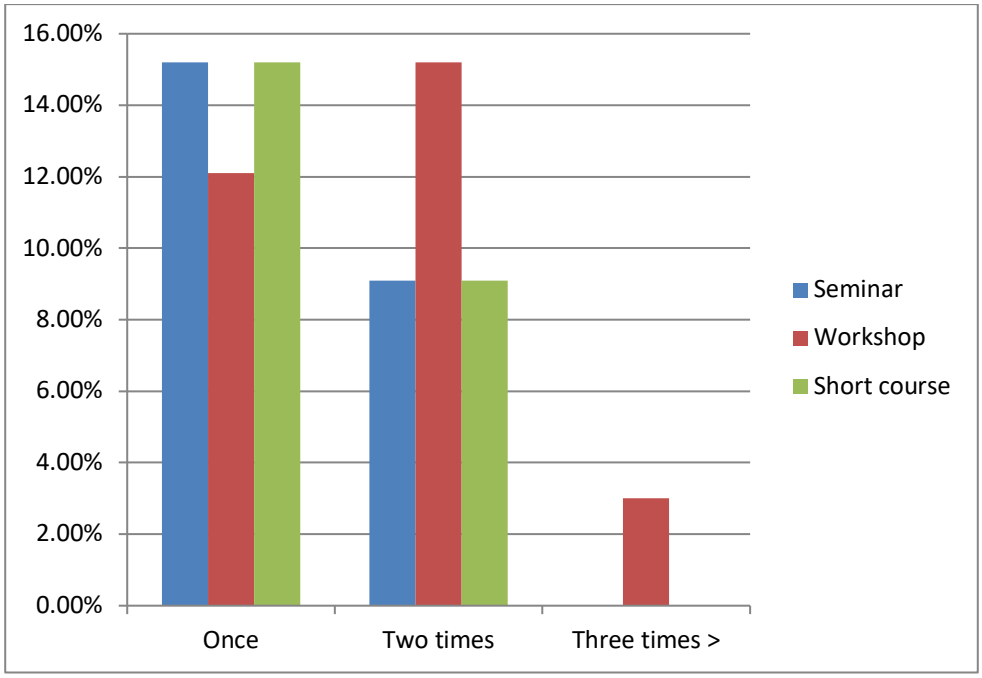

Figure 1: The extent to which in-service training is provided

The results in Figure 1 show that majority of the respondents attended seminars, workshops and short courses once since they were employed. Apart from that, the results indicate that majority of the respondents attended workshops three times since they were employed but these were very few. The results also show that there was no registry staff who attended short courses or seminars for three or and more times since they got employed.

Discussion

This study identified common types of electronic records management systems and assessed the ICT skills and knowledge that registry personnel have. Generally, the study reveals different electronic record management systems used by registry personnel which include Microsoft Word, Microsoft Excel, email, websites and databases. However, the usage of these systems has been found to be limited and this reflects the ICT skill gap among registry personnel. The underutilisation problem of e-records systems is not only the case in Tanzania but also other higher learning institutions in developing countries (e.g. Adu & Ngulube, 2017; Katuu, 2015; Asogwa *et al*., 2021).

The study also revealed limited ICT training opportunities for registry personnel. Regarding inadequacy of ICT training, the study has revealed that majority of registry personnel were not provided with ICT training opportunities related to usage of ERMS. Looking at the type of training, this study revealed that majority of registry personnel acquired ICT skills and knowledge through their own efforts and with the help of their colleagues. These are informal training programmes that cannot help registry personnel to become competent enough. The same observation was made by Maseh (2015) that records management staff made personal initiatives to acquire competencies while some went for self-sponsored training. Apart from that, the study revealed that in-service training for registry personnel, which is identified by Mosweu and Bwalya (2018) as key in closing registry personnel's skill gaps, is not provided enough. For example, the study has reported that registry personnel with 11 years of work experience attended ICT training related to the application of records management only once. This suggests that training is not prioritised. In this regard, these findings reflect those from a study conducted in Nigeria by Asogwa *et al.* (2021) who found that librarians' electronic records management skills were not enhanced because formal training was not frequently organised. Similarly, a study conducted in Ghana by Adu and Ngulube (2017) found a knowledge gap in electronic records preservation.

The findings have also shown that records management staff are not receiving enough support to attend continuing training (See also Maseh, 2016; Tsabedgze, 2011; Chinyemba & Ngulube, 2005). In support, Masesh (2015) found that an insignificant number of registry staff attended short courses once while majority were never sponsored to attend any continuing training through conferences, workshops and short courses. In contrast, a study conducted in South Africa by

Tsabedze (2019) found that records professionals who worked for South African universities received continuing training through workshops and conferences.

Study Implications, Conclusions and Recommendations

The study revealed that there is a skills and knowledge gap among registry staff of the studied universities which is caused by lack of training. Therefore, the present study may help to sensitise the managements of higher learning institutions to support registry staff by providing them with ICT training related to ERMS. Doing this will help the staff to thrive in this 21st century. In addition, supporting registry staff to attend frequent ICT training related to electronic records management may increase higher learning institutions' adoption of electronic records management systems in Tanzania. The management of records in electronic environment is very complex hence requiring records management professionals to be well equipped with necessary skills. This may facilitate institutions' movement from traditional to electronic records management systems. As such, this study recommends frequent provision of continuing ICT training through seminars, workshops, conferences and short courses. It is recommended that the recruitment criteria for registry staff should be reviewed.

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Equipping Library Users with Digital Literacy Skills as a Solution to COVID-19 and Other Similar Disasters: Lessons from Mzumbe University Library

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Abstract

The need for equipping students in Higher Learning Institutions with Digital Literacy Skills (DLS) is considered one of the measures that can enable academic libraries to deliver library services during the time of the COVID-19 pandemic and beyond. This study aims at answering the following question: What types of digital literacy skills and tools were used by academic libraries during the COVID-19 closure of the universities. It also aims at analysing the way digital literacy skills could be used to support library services during the COVID-19 pandemic and beyond. Similarly, it examines barriers which inhibited the deployment of digital literacy skills during its outbreak. The study adopted a case study design while using a mixed approach to data collection. A total of 46 respondents were drawn from the population using both census sampling and purposive sampling techniques. Data were collected using interview–guides, questionnaires and documentary reviews. Qualitative data were analysed using content analysis while quantitative data were analysed using Microsoft Excel Spreadsheet. The findings indicated that academic library is required to cooperate with faculties and schools by deploying the following digital tools: e-learning platforms, increasing the use of social media, conducting webinars, updating the library website, encouraging the use of library e-resources and improving the library virtual reference services. The following barriers were strongly mentioned as inhibitors of equipping respondents with digital literacy skills: poor internet connectivity, family income status,

lack of comprehensive training on digital literacy skills, attitudes of lecturers towards digital literacy skills and lack of teleworking culture among librarians, students and lecturers. It was also noted that the deployment of digital literacy skills was worsened by an acute shortage of funding and resources. The study concludes that for libraries to effectively deliver library services both librarians and users must possess the necessary digital literacy skills. The ICT infrastructure, on the other hand, must be improved to enable libraries to apply digital literacy tools and facilities in the delivery of library services. The need to overhaul library training programmes adding a course on digital literacy skills and deployment of other emerging technologies in the delivery of library services. This study is anticipated to provide insights into the conditions of academic libraries during the COVID-19 pandemic. The study findings will be an eye opener to academic libraries that they have to undergo rapid transformations which will enable them to stay relevant and able to provide services during the pandemic and similar disasters.

Keywords: COVID-19 pandemic, digital literacy skills, academic libraries, digital skills competencies, library emerging technologies, digital competency, Digital knowledge,

Introduction

COVID-19 was first noticed in Wuhan which is the capital city of Hubei Province in the Peoples Republic of China in December 2019. This pandemic is caused by the SARS-CoV-2 virus (COVID-19) through contact when people breathe in air contaminated by droplets and small airborne particles containing the virus (WHO, 2020). The pandemic spread rapidly across the world to the extent that as of March 31, 2020, it was noted to have led to more than 800,000 total confirmed cases and 40,000 deaths (Ke, Romero-Severson & Hengartner, (2020). Globally, students in Higher Learning Institutions (HLIs) were adversely affected by the COVID-19 pandemic. The records indicate that the education sector was second to the health sector in the list of the most affected sectors. In Tanzania, on 17th March 2020, all educational institutions were closed down because of the COVID-19 pandemic. This was a prime time for both students and lecturers because the teaching and learning activities had gained high momentum. Following this closure, lecturers were not able to continue with teaching activities except for only very few intrepid lecturers or, those lecturers who were digitally proficient managed to continue doing so through online platforms.

The COVID-19 pandemic brought changes in the mode of teaching. Educational institutions started to consider providing education remotely using online platforms (Martzoukou, 2020). De Giusti (2020) adds that COVID-19 stimulated innovation within the education sector including libraries. The innovations were witnessed by the development of distance learning solutions which comprised several digital learning management systems including e-learning platforms. To help institutions overcome this unexpected disaster, UNESCO started working with ministries of education across nations to ensure the continued learning of students using different alternative modes of delivery and supporting them in various ways with technical help (UNESCO, 2020). Academic libraries were also required to be at the forefront of supporting the provision of online learning resources, online services and training. Libraries were supposed to position librarians in supporting students and staff to develop information and digital literacy skills via online courses, tutorials, workshops and e-consultations (Martzoukou, 2020). The rationale behind this is that digital literacy can affect the output of learning outcomes on students' academic achievement (Yustika & Iswati, 2020).

Digital literacy skills are essential skills required in accessing, managing, understanding, integrating, communicating, evaluating and creating information safely and appropriately through digital devices and networked technologies for participation in education, health, economic and social life (Law, Woo, & Wong, 2018). It has been acknowledged that the level of digital literacy in Tanzania HLIs is low because of several factors. The factors include poor Internet infrastructure, low bandwidth, lack of support from ICT experts and lack of user training (Kavuta &Nyamanga, 2018). Despite their low level of use, few institutions in Tanzania have implemented virtual learning environments which are related to digital literacy (Sife *et al.*, 2007). However, with these current efforts, the library intends to use virtual learning environments to run information literacy courses, as well as implement mandatory information literacy courses for both undergraduate and postgraduate students (Lwehabura, 2018). There is a need to equip library users with digital literacy to enable them to undertake online courses. For example, the use of video conferencing thus allows sharing of quality information during the COVID-19 pandemic and other similar disasters to satisfy their needs even in the period of institution closure is of particular importance.

Digital literacy skills are a great tool for enhancing social, educational as well as economic development. Advancements in ICT and the use of digital literacy skills can improve economic opportunities for the poor, increase the delivery of services to the underserved, improve management and benefit social change (Emiri, 2017). The outbreak of the COVID-19 pandemic proved to be challenging for students, lecturers and the management of the HLIs. The pandemic disrupted the smooth operations of day-to-day of education sector particularly when such institutions were required to close down their operations. The lockdown resulted in the isolation of users from their institutional learning resources, particularly library printing services. Many academic libraries started thinking of ways they could remain relevant by providing their services remotely.

Adoteyi (2020) notes that academic libraries in Africa and Tanzania, in particular, were compelled to move their services online despite having unready infrastructure. A great desire to use technology is to provide easier, larger and more diverse access to learning resources in overcoming the problem of distance between students and lecturers and to facilitate increased interaction and collaboration in online classes to become of paramount importance. Yustika and Iswati (2020) posted that digital literacy skills are of paramount importance to students as they help them to undertake online programmes and courses. However, there is a gap in knowledge since some of the students are illiterate in using digital devices and they lack such devices as computers to use for undertaking online programmes and courses, especially during the COVID-19 lockdown. This study was, therefore, conducted to examine how Mzumbe University (MU) is equipping library users with digital literacy skills during the COVID-19 lockdown and other similar disasters. In specific terms, the present study sought to:

i. establish the levels of MU students' knowledge of the COVID-19 pandemic.
ii. establish levels of digital literacy skills for students at the MU library.
iii. find out digital literacy skills that are used by MU library users during the COVID-19 closure of the University.
iv. establish the way digital literacy skills could be used to support learning during the COVID-19 pandemic and beyond.
v. find out barriers inhibiting the use of digital literacy skills at the MU library.

Literature Review

A brief history of the COVID-19 pandemic

COVID-19 which seems to be an ongoing global pandemic was first identified in 2019. The World Health Organisation (WHO) declared COVID-19 a Public Health Emergency of International Concern on 30 January 2020 and a pandemic on 11th March as a global pandemic (Nash, 2020; Tejedor*et al.*, 2020). The spread of COVID-19 caused 61 countries in Africa, Asia, Europe, the Middle East, North America and South America to announce or implement school and university closures (UNESCO, 2020; Bao, 2020). The virus spread in different ways including close contact with the affected person and via small droplets produced by coughing and sneezing. Some symptoms of COVID-19 include fever, cough, fatigue and shortness of breath (WHO, 2020). The great challenge with COVID-19 is the lack of specific antiviral treatment, although the spread of the virus can be reduced through preventive measures such as hand washing with soap and tap water, covering the mouth when coughing and sneezing, distancing from other people as well as wearing a facemask in public settings (Nash, 2020). The study conducted by Lobo and Dhuri (2021) shows the positive impact of the COVID-19 pandemic in increasing the digital literacy skills of librarians since they improved their technology-savvy skills, upgraded their digital knowledge and communicated with the students via virtual conferencing applications, the situation which led to wider use of social networking sites to interact with the users.

COVID-19 and the higher learning institutions

The COVID-19 pandemic has created an unpredictable situation in higher learning institutions where the majority of universities across the globe started planning to offer fast and efficient services by implementing online learning. The study conducted by Bado (2020) states that for the students to concentrate on online learning in class, teaching shall be broken up to allow the adoption of modern teaching methods where body language and facial expressions are restricted. According to UNESCO (2020), higher education institutions took measures to continue with their academic programmes, mostly moving to e-learning and remote teaching. Several studies revealed that higher learning institutions faced numerous limitations such as digital inequalities, lack of reliable internet access, low readiness and technological competence among instructors and students and limited availability of digital solutions (Ndibalema, 2022). On the other hand, Egielewa et al., (2022) add that universities had both students and

lecturers who lack confidence in embracing digital tools in study and learning, which resulted in low acceptance of online learning technology.

COVID-19 in developed countries

Unlike Africa and other developing countries, most developed countries already had in place digital education infrastructure and policies which facilitated teaching and learning during the COVID-19 pandemic (Paudel, 2021). According to (Lavonen, & Salmela-Aro, 2022) such nations as Estonia, Netherlands and Finland had excellent digital education and learning infrastructure which made them smoothly switch to easier virtual pedagogy compared to the rest of the world. Agasisti and Sonchin (2020) note that only a few countries undertook unique initiatives for their transition to online learning during times of lockdown. In South Asia, the pandemic forced governments to rely heavily on technology to deliver lessons to students. Hybrid learning was opened up and webinars were set up ready to replace face-to-face teaching (Ranawana, 2021).

COVID-19 in Africa

According to Hub (2020), the COVID-19 pandemic spread throughout the African continent in February 2020 with South Africa being a terribly affected country whereby at the time reporting 311,000 cases were reported. Most countries moved quickly in response to the spread of the pandemic by closing schools at an early stage. Furthermore, Hub (2020) ascertained that although the virus is recognised as a significant challenge to their countries and in education, some people think that COVID-19 represents a very significant opportunity due to the recognition that technology will play an important role in the future of education in Africa.

In South Africa, all universities were put on lockdown and required to embark on remote teaching activities. The report shows that despite levels of development in South Africa, some of the universities were not ready in terms of infrastructure, financial and human resources (Mbambo-Thata, 2020).

In East Africa, learning institutions were closed down. at the same time, governments implemented various precautionary measures as creating awareness about the virus and the way to prevent it. These included such measures as sanitisation, quarantining the infected people, lockdown of church activities and social distancing. Despite all these efforts, the transmission continued since most of the people neglected some of the preventive measures. For example, social distancing could not be observed during social practices including funerals and

mass services (Takele, 2020). Opali (2022) reported that in Kenya, in particular, schools were fully closed as a result of the pandemic. Schools and other institutions started using online tutorial platforms. The impact in Kenya was large in hardship areas and rural schools where there was little or no access to computers, mobile phones and internet connectivity.

The state of COVID-19 in Tanzania

On 16th March 2020, the Ministry of Health in Tanzania announced the first case of COVID-19. A patient happened to be a female traveller who departed to Belgium and she further visited Denmark and Sweden. On 15th March 2020, she flew back to Tanzania and arrived at the Kilimanjaro International Airport (KIA). When the victim was screened for COVID-19, she showed none of the symptoms but after a day she decided to surrender for medical tests and found that she was affected by COVID-19 (Tarimo & Wu, 2020). On March 19th 2020, the Tanzania government ordered all colleges and universities to cancel all face-to-face classes, including teaching and learning activities to prevent the spread of the virus. Like many other universities in Africa, the universities in Tanzania faced much impact because of COVID-19 since they were caught unprepared and could not easily switch to technology-enhanced teaching and learning.

In Tanzania, the current status of the spread of the pandemic is unknown; however, more cases are expected to rise from time to time due to the nature of the disease and lack of seriousness among the citizens in adhering to the precautionary measures as advised by health experts. According to a press release by the Minister for Health, Community Development, Gender, Elderly and Children, there were 509 confirmed cases and 21 deaths from Covid-19 in May 2020 (URT, 2020; Mgema & Komba 2020). This being the case the Ministry of Education, Science and Technology mandated higher learning institutions to think of how they could adopt ICTs, particularly digital literacy skills in delivering educational programmes.

The role of university libraries in supporting teaching and learning during COVID-19

University libraries are supposed to collaborate with teaching staff in promoting the use of digital platforms by creating and adding more content to the digital platforms. Such digital platforms will be designed to disseminate information for teaching and learning as well as those which enable users to take precautionary measures against COVID-19 (Chisita, 2020). Another critical role which needs to

be played by libraries and librarians as stated by Falt and Das (2020) is liaising with publishers and e-database owners by making agreements for opening up materials to their universities as a way of bridging the digital divide. Subscription to e-resources remote access tools or information discovery tool/software is another expected role to be played by academic libraries.

Digital literacy skills and access to library resources

Incorporating digital literacy into the educational system aims at providing students with the necessary skills to live and survive in a digitally oriented-world (Audrinn & Audrin, 2022). Digital literacy skills enable students to use digital tools and platforms to enrich their educational experience and improve them for society and lifelong learning (Lwehabura, 2018). In this information technology age, Tanzanian graduates need to develop the skills required for independent information searching, evaluating and utilising all available sources of information.

The development of technology can increase student engagement, enhance independent learning, increase opportunities to practice skills and strengthen knowledge and understanding by accessing learning resources (Stahl, 2015, JISC, 2016). For a student to be successful in learning; there is a need for digital skills. The skills include communicating in different media, collaboration such as sharing digital resources with others, self-presentation and organisation, intensive reading and creative expressions in different media. Similarly, Portillo *et al.,* (2020) discussed digital communication skills (e.g. chat, forums, video conferences and e-mails) that most people usually use regardless of their profession. These digital skills are more related and needed to prove students' performance. Students must be well equipped with these skills to enable them to perform effectively both within and outside their institutions. These skills are acquired through such informal means as colleagues, trial and error and sometimes through assistance from friends (Emiri, 2017). Although the research conducted by Uvarova and Pobol (2021) in eastern partnership countries ascertained that countries faced the outbreak of the pandemic with low digital literacy but lack of digital literacy does not prevent people from using social media mainly by using cellular phones.

Contributions of digital literacy skills in teaching during COVID-19

Digital literacy enables students to interact and enhance participation during classroom learning. Digital literacy increases learners' effectiveness, improves performance and increases learners' competence. In this case, classes with online

learning in terms of average produce stronger learning outcomes than face-to-face classes since students tend to express themselves more in writing rather than in oral presentations hence online learning is most preferred by learners (Underwood 2009; Ukwoma & Lwundu, 2016). Despite the eruption of the COVID-19 pandemic, the adoption of technology and the provision of online teaching, learning, assessment and research collaborative activities across universities were high and were not newly undiscovered for universities across the globe (Martzoukou, 2020). Many countries including Tanzania are racing to utilise technology in support of remote learning and online learning during the COVID-19 pandemic period and other such instances. Having digital literacy, it is possible to provide learners with various learning resources since technologies are used to facilitate learning including texts, hypertexts, audio, videos and computer animations. Additionally, digital literacy enables students to interact with each other via computers and enhances the learning processes within and outside the institution (Wema, 2021; Farrelly *et al*., 2018). However, success in the digital learning process requires digital skills, availability of the infrastructures and internet accessibility.

Barriers to the application of digital literacy skills during COVID-19 in HLIs

Efforts of equipping students with digital literacy skills in developing countries face several challenges as pointed out by Semerci and Semerci (2021), Ouahidi (2020), Becta (2004), Cartile (2020), Sangster *et al*., (2020); Zhu and Liu(2020) and (Mpungose(2020) and Hoq (2020). Their investigations came up with the following barriers: poor internet accessibility, unavailability of laptops, lack of training, extra workload and prolonged screen exposure, lack of quiet environment at home, inadequate technological infrastructures such as mobile phones, lack of technical knowledge and skills, fear of technology and lack of interest about technology (technophobia) and physical defects such as eye defect. These barriers can be addressed when students become aware of the importance of digital literacy in learning systems.

Technology Acceptance Model (TAM)

To explore the extent to which students were equipped with digital literacy skills, this study adopted the Technology Acceptance Model (TAM) which includes three important variables referred to as Perceived Usefulness of Using Digital Literacy Skills (PU-DLS), Perceived Ease of Use of Digital Literacy Skills (PEU –DLS), Attitudes Towards Digital Literacy Skills (AT-DLS) and the Intention of having Digital Literacy Skill (I-DLS).

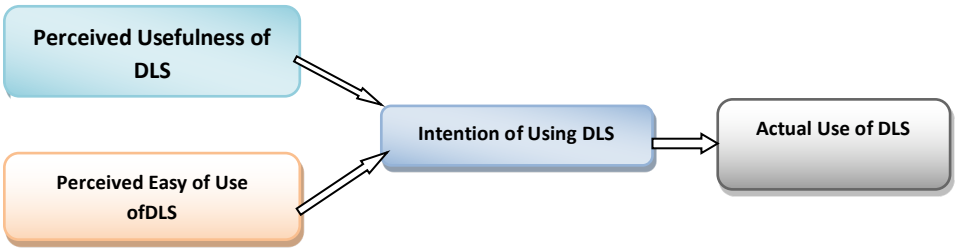

Figure 1: Technical Acceptance Model

Source: Modified Davis (1989) Technical Acceptance Model

Perceived Usefulness (PU) refers to how much a student believes that digital literacy skills will enable him/her to access library digital resources during and after the COVID-19 pandemic. Perceived Ease of Use (PEU), in this study, refers to the extent to which a student believes that having digital literacy skills will enable him/her to access the library online services with minimal effort during and after the COVID-19 pandemic. Attitude and Digital Literacy Skills: The model assumes that a better attitude could increase the willingness of a student to acquire digital literacy skills for accessing online digital library resources during and after the COVID-19 pandemic. The Intention of Using Digital Literacy Skills: This shows the attitude towards using digital platforms and tools. It is concerned with the user's evaluation of the desirability of employing digital literacy skills. It is also a measure of the likelihood of the person using digital literacy skills as enablers in accessing online library services during the COVID-19 pandemic.

Methodology

This study used a mixed research approach with a case study method. A case study design was opted because it is reliable in studying a single case about a particular area especially when there is a unique or interesting story to be extracted to give the most complete picture that cannot be obtained by other methods (Schoch, 2020). A total of 46 third-year 2022 students pursuing library programmes were found using Census Sampling Technique (CSP). This is a technique which attempts to gather information about every member of the population (Rodda, Campbell, & Fritts, 2001). Additionally, a total of four (4) students and two (2) IT staff were purposively selected to participate in this study and they were interviewed.

The qualitative data gathered from the in-depth interviews were analysed thematically using content analysis. The contents analysis method involves a detailed and systematic assessment of the content of a particular body of material

to identify patterns. The method helped to classify and organise unorganised data to give them a scientific shape. In this study, a Microsoft Excel Spreadsheet was used to analyse quantitative data. This programme was used because it offers great and easy ways to extort data, reduces the time required to evaluate data and reduces errors involved in coding data for quantitative data. At the same time, such descriptive statistics as frequencies and percentages were generated.

Results and Discussion

Respondents' levels of knowledge on the COVID-19 pandemic

The findings revealed that 21 (45.7%) of the respondents had average knowledge of the COVID-19 pandemic and 5(10.9%) had poor knowledge of COVID-19. Two percent (2.2%) declared that they did not know much about the COVID-19 Pandemic whereas 19 (41.3%) respondents had above-average knowledge of the COVID-19 pandemic. These findings are similar to that of Lobo and Dhuri (2021) who showed a positive impact of the COVID-19 pandemic in increasing the digital literacy skills of library users.

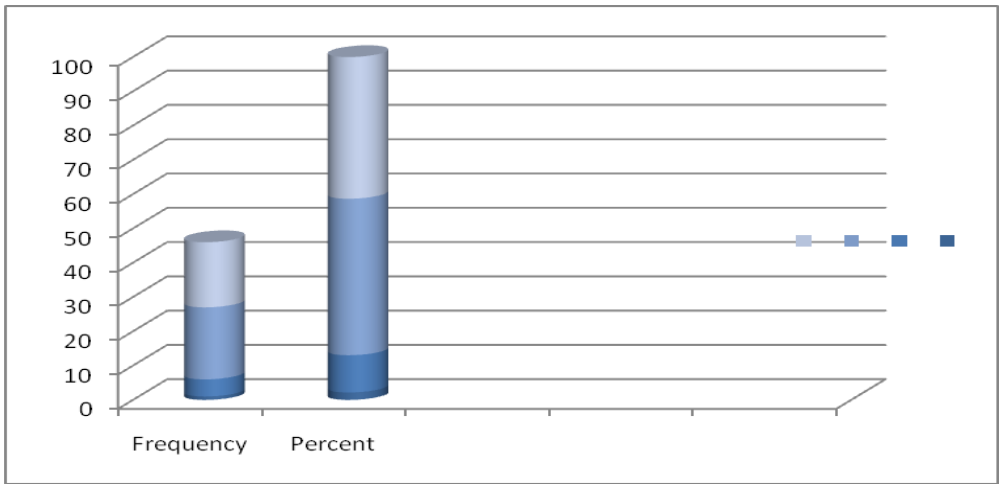

Figure 2: Respondents' knowledge of COVID-19 (n=46)

Source: Field Data (2022)

These findings underscore the importance of addressing knowledge gaps and ensuring accurate information reaches the population. Efforts shall be made to provide educational resources, raise awareness and combat misinformation to ensure a well-informed population capable of making informed decisions regarding the COVID-19 pandemic.

Level of knowledge on the symptoms of COVID-19

The respondents were asked about their level of knowledge regarding the symptoms of COVID-19. The levels of knowledge established by the respondents indicate that half of the respondents (23.50%) of the respondents possessed average knowledge of the symptoms of the COVID-19 pandemic. A total of 8 (17.4%) of the respondents had very high knowledge of the pandemic. A total of 12 (26.1%) of the respondents had above-average knowledge whereas 3 (6.5%) had very low knowledge of the symptoms of the COVID-19 pandemic (See Figure 3 below).

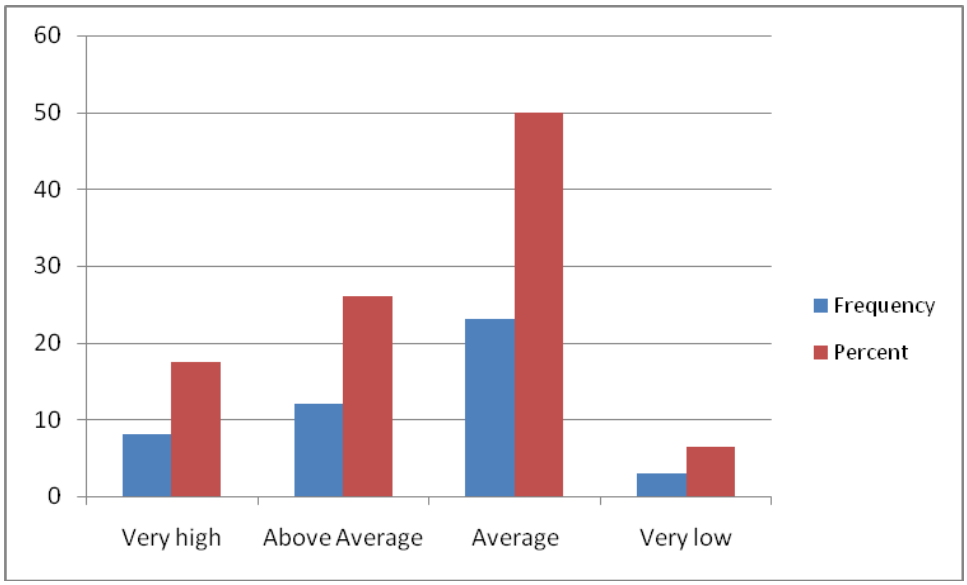

Figure 3: Respondents' knowledge of symptoms of COVID-19 (n=46)

Source: Field Data (2022)

The findings imply that most of the respondents had knowledge about the symptoms of the COVID-19 pandemic. This is a very interesting story because this level of knowledge may be very useful especially when it comes to the issue of taking precautionary measures. Knowledgeable people can easily be influenced to change their behaviours towards the COVID-19 pandemic.

Respondents' level of digital literacy skills

The study intended to establish the level of digital literacy skills of the respondents. The findings summarised in Table 1 reveal that less than half 22, (47.8%) of the respondents had a good level of information or literacy skills**.** A

total of 21 (45.7%) of respondents were computer literate. Slightly more than half (25; 54.3%) of the respondents had the ability to share digital content, 16 (34.8%) had the ability in using ICT to process and retrieve information and 21(45.7%) were able to use the e-learning platform. Furthermore, 24 (52.2%) of the respondents had online safety skills whereas 16 (34.8%) of the respondents had the ability to use online communication programmes.

Table 1: Level of digital skills (n=46)

Category of Responses	Excellent		Good		Average		Poor		Total	
	F	%	F	%	F	%	F	%	F	%
Information Literacy Skills	12	26.1	22	47.8	12	26.1	0	0	46	100
Computer literacy	10	21.7	21	45.7	14	30.4	1	2.2	46	100
Online Safety skills	4	8.7	12	26.1	24	52.2	6	13	46	100
Sharing digital content	7	15.2	25	54.3	12	26.1	2	4.3	46	100
Using online communication programmes	11	23.9	15	32.6	16	34.8	4	8.7	46	100
Using ICT to process and retrieve information	10	21.7	16	34.8	14	30.4	6	13	46	100
Using E-learning platform	8	17.4	21	45.7	15	32.6	2	4.3	46	100

Source: Field Data (2022)

The results suggest that the majority of the respondents were able to share digital content because they had above-average digital literacy skills. Additionally, these findings are supported by the TAM model which assumes that users' attitudes towards the usage of digital literacy skills depend on the acceptance of the technology and its perceived usefulness. Furthermore, an interview with one library staff yielded the following responses:

> *"… Digital literacy skills are very important as they can enable information seekers to locate the right information at the right time, to access information remotely and help to evaluate information, especially in this digital era of information explosion and sharing of information in different media".*

The implications of the above findings are significant. The study reveals that a notable proportion of the respondents lack adequate digital literacy skills, which can hinder their participation in the digital world and limit their access to various

opportunities. The results emphasize the importance of addressing digital literacy gaps through targeted interventions, training programs and educational initiatives.

Respondents' levels of digital literacy skills

The second research objective of this study dwells on describing relevant digital skills used by Mzumbe University library users and the digital skills needed to exploit library digital resources during the COVID-19 pandemic.

Relevant digital skills used by library users

The respondents were asked to indicate the level of digital literacy skills they possess. The findings summarised in Table 2 indicate that 19 (41.3%) respondents could engage in online discussions, 21(45.7%) could use web search engines, 17(37%) could use online databases and 18(39.1%) could somehow use video conferencing. The findings show that most of the respondents had skills in using web search engines.

Table 2: Relevant digital skills used by library users (Sample n=46)

Category of Responses	High		Moderate		Low		None		Total	
	F	%	F	%	F	%	F	%	F	%
Online discussions	8	17.4	12	26.1	46	100	19	41.3	46	100
Web search engines	21	45.7	21	45.7	46	100	4	8.7	46	100
Ability to use databases	17	37	17	37	46	100	12	26.1	46	100
Social networking	16	34.8	17	37	46	100	12	26.1	46	100
Video conferencing	6	13.0	12	26.1	46	100	12	26.1	46	100
Internet security	8	17.4	15	32.6	46	100	18	39.1	46	100
Website design	9	19.6	21	45.7	46	100	11	23.9	46	100

Source: Field Data (2022)

The implications of the above findings are twofold. First, the study highlights the need for targeted interventions and training programmes to enhance digital literacy skills related to online databases and video conferencing. Providing individuals with the necessary knowledge and resources to effectively use online databases can empower them to access accurate and reliable information for research and decision-making purposes. Similarly, improving proficiency in video

conferencing can enable individuals to effectively communicate and collaborate in remote settings, facilitating virtual meetings, online learning and remote work opportunities. Second, the findings emphasize the importance of continuous digital skills development and lifelong learning. As technology rapidly evolves, individuals must stay updated and adaptable to new digital tools and platforms. Ongoing education and training programmes can equip students with the skills needed to navigate the digital landscape effectively, fostering digital inclusion and participation. This is in line with a study by Lwehabura (2018) who reported that there is a need of developing students' ability in searching, evaluating and utilising online sources of information.

Digital skills needed to exploit online resources

The respondents were requested to rate their digital skills level in exploiting online resources (See Table 3). The findings show that 15 (32.6%) respondents had skills in the use of the e-learning platforms, 16 (34.8%) had skills in online discussion and online charting, 21 (45.7%) had skills in downloading online files whereas half (23.50.0%) of respondents had skills in internet literacy. Furthermore, less than half 21, (45.7%) of respondents had information search skills, 22 (47.8%) had good skills in the use of Google Scholar for their studies, 20 (43.5%) had average skills in using commercial subject databases, 20 (43.5%) were poor in the use of Skype to keep in touch with people and 14 (30.4%) were good in filtering large numbers of search results quickly. Similarly, 14 (30.4%) were poor in filtering large numbers of search results quickly, 19 (41.3%) were good at using advanced search options to limit the searches and 16 (34.8%) had good skills in choosing the right tool to find information.

Table 3: Digital skills needed to exploit online resources (n=46)

Category of responses	Excellent		Good		Average		Poor		Total	
	F	%	F	%	F	%	F	%	F	%
The ability to use the e-learning platform	9	19.6	15	32.6	15	32.6	7	15.2	46	100
Taking part in an online discussion group and chatting	4	8.7	16	34.8	16	34.8	10	21.7	46	100
Downloading files from the internet or WWW	21	45.7	15	32.6	8	17.4	2	4.3	46	100

Internet literacy	8	17.4	23	50	14	30.4	1	2.2	46	100
Information search skills	21	45.7	18	39.1	7	15.2	0	0	46	100
Use Google Scholar for your studies	18	39.1	22	47.8	6	13	0	0	46	100
Ability to use commercial subject databases	6	13	13	28.3	20	43.5	7	15.2	46	100
Used Skype to keep in touch with people	2	4.3	5	10.9	19	41.3	20	43.5	46	100
Filtering large numbers of search results quickly	5	10.9	14	30.4	13	28.3	14	30.4	46	100
Using advanced search options to limit your search	7	15.2	19	41.3	14	30.4	6	13	46	100
Choosing the right tool to find information	11	23.9	16	34.8	14	30.4	5	10.9	46	100

Source: Field Data (2022)

These findings indicate that about half of the respondents had digital skills that would enable them to exploit online resources for a large number of students. Perceived ease of use had a relation to perceived usefulness which consequently students to increase their ability to exploit online resources by believing that the use of digital literacy skills makes them free from using efforts.

Furthermore, researchers held an in-depth interview with the second library staff who had the following remarks:

> *"… the most important digital skill imparted to library users at our library to exploit online resources remotely during COVID-19 was to make sure that every enrolled student in the University can use the digital platforms. This was possible by conducting information literacy programmes involving teaching the library users searching techniques such as simple search and advanced search to provide awareness to students. Also, provision of such credentials as username and password to enable accessing information in the library subscribed databases".*

The support of digital literacy skills to learning in HLI's

The establishment of the way digital literacy skills could support learning is one of the objectives mentioned by the researchers in this study. In determining how

digital literacy skills support the learning of MU students, the researcher provided questions and options of answers to be selected to the questions by the respondents, to extract information related to the support of digital literacy skills as follows:

The extent to which students use technology to develop digital literacy skills

The results show that 22(47.8%) respondents used the technology frequently, 18 (39.1%) used it sometimes, 4 (8.7%) of the respondents never used it and 2(4.3%) always used technology to develop their digital literacy skills (See Figure4). The findings imply that slightly less than half of the respondents frequently used technology to develop digital literacy skills. Perhaps, this is because orientations about digital literacy programmes were frequently conducted at the University. These findings are in congruence with that of Stahl (2015) and JISC (2016) in which it was reported that the development of technology increases student engagement, enhances independent learning and opportunities to practice skills and strengthens knowledge and understanding by accessing learning resources.

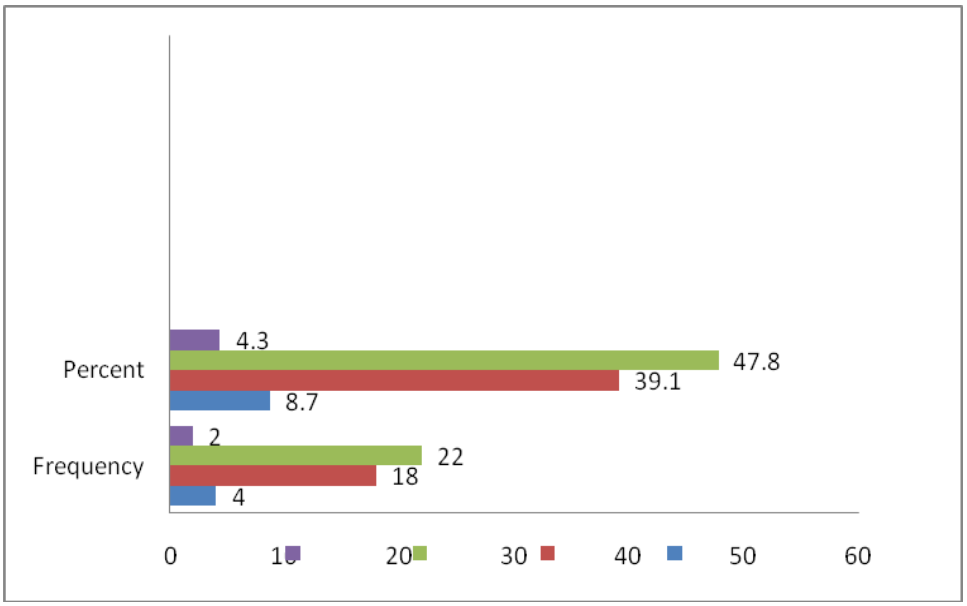

Figure 4: The use of technology to develop digital literacy skills (n=46)
Source: Field Data (2022)

In one of the interviews with a librarian, the following comments were captured:

> *Students are encouraged to use the created short video clips (uploaded YouTube tutorials) which contain content to enable them to acquire information and skills.*

Also, there are some links and addresses whereby clicking the link sends the user directly to a place to ask a librarian for a help.

Distribution of respondents' level of skills in Internet usage

Respondents were asked to rank their level of skills on internet usage (See Figure 5). The findings indicate that a total of 5 (10.9%) respondents said that they were very skillful in Internet usage, 34(73.9%) said they were skillful and 7(15.2) said they were a novice.

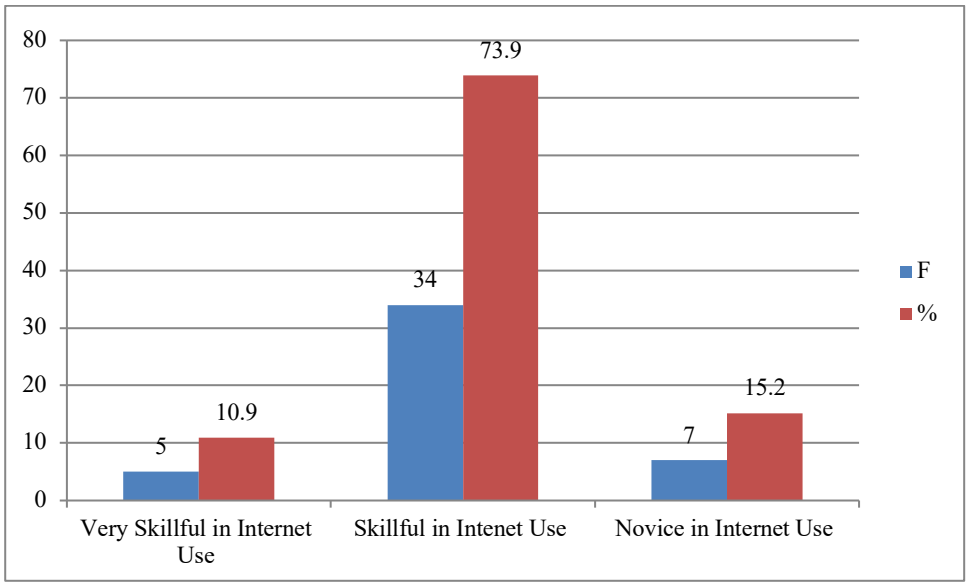

Figure 5: Level of skills in Internet usage (n=46)
Source: Field Data (2022)

The distribution of skill levels in Internet usage in the findings has one major implication. The library needs to recognize the varying skill levels among its target user base. This understanding can inform the design and delivery of digital products, services and platforms to ensure usability and meet the needs of different skill levels. In summary, the findings highlight the diversity of skill levels in Internet usage among the respondents. Recognising the existing gaps and addressing them through targeted interventions can lead to a more inclusive and digitally empowered society.

Barriers inhibiting the use of digital literacy skills

Possessing digital literacy skills is a difficult task as it requires knowledge and skills in application. Therefore, the researcher considered it necessary to find out whether respondents get difficulty with digital literacy skills (See Table 4). The

findings indicate that the most commonly reported barrier inhibiting the use of digital literacy skills is information explosion, with 18 respondents (39.1%) identifying it as a challenge. Information explosion refers to the overwhelming abundance of information available in digital formats, making it difficult for individuals to filter, process and make sense of the vast amount of data. This barrier suggests that respondents may struggle with information overload, affecting their ability to effectively locate, evaluate and utilize relevant digital information.

Technophobia is another significant barrier, as reported by 17 respondents (37%). Technophobia refers to the fear or anxiety associated with using technology or digital devices. It suggests that a considerable proportion of the respondents may experience discomfort or lack confidence when engaging with digital technologies, hindering their ability to develop and apply digital literacy skills. Overcoming technophobia requires support, training and familiarity with digital tools to build confidence and competence in using technology effectively.

The economic status of individuals emerged as a barrier for 8 respondents (17.4%). Economic status refers to financial limitations that may prevent individuals from accessing necessary digital resources, such as computers, internet connectivity, or software applications. Limited financial resources can impede the development of digital literacy skills and restrict individuals' participation in the digital world. This finding highlights the importance of addressing digital inequalities and ensuring equitable access to digital tools and resources.

Lastly, lack of training was identified as a barrier by 7 respondents (15.2%). This suggests that a significant portion of the participants may not have received sufficient training or educational opportunities to develop and enhance their digital literacy skills. Lack of training can limit individual's ability to effectively navigate digital platforms, utilize digital tools and leverage technology for various purposes. The findings emphasize the need for comprehensive and accessible digital literacy training programs that cater to individuals' diverse needs and skill levels.

Table 4: Barriers inhibiting digital literacy skills (n=46)

Category of Responses	Strongly Agree		Agree		Disagree		Strongly Disagree	
	F	%	F	%	F	%	F	%
Poor internet accessibility	6	13.0	12	26.1	15	32.6	13	28.3
Lack of training	7	15.2	10	21.7	19	41.3	10	21.7
Technophobia	14	30.4	17	37	12	26.1	3	6.5

Category of Responses	Strongly Agree		Agree		Disagree		Strongly Disagree	
	F	%	F	%	F	%	F	%
Information explosion	16	34.8	18	39.1	8	17.4	4	8.7
Poor literacy skills among lecturers	2	4.3	15	32.6	17	37	12	26.1
Miss-information	5	10.9	11	23.9	16	34.8	14	30.4
Inadequate/lack of power	1	2.2	12	26.1	19	41.3	14	30.4
Family economic status	8	17.4	16	34.8	18	39.1	4	8.7
Lecturers' attitude toward digital literacy skills	5	10.9	13	28.3	16	34.8	12	26.1

Source: Field Data (2022)

These findings are contrary to the study conducted by Semerci and Semerci (2021). The authors reported that inadequate technological infrastructure, lack of technical knowledge and skills and inability to access the internet where poor internet connectivity or low bandwidth may hinder users to use digital literacy, inability to cooperate over the internet, the absence of people using technology in the environment, the use of too many foreign words as the major barriers which hindered the use digital literacy skills. An in-depth interview with the library staff yielded the following remarks:

> *"… Sometimes it is difficult to promote digital literacy to students due to low internet accessibility, especially during the period of imparting digital literacy skills, fear of students about technology, sometimes poor attendance of students to orientation programmes relating to digital literacy and lack of staff interest in the use of digital facilities".*

The implications of the above findings are multifaceted. Firstly, addressing information explosion requires strategies and techniques to enhance individuals' information literacy skills. Providing training and support in information management, critical evaluation of sources and effective search strategies can help individuals navigate the overwhelming digital information landscape.

Secondly, addressing technophobia is crucial for promoting digital inclusion. Initiatives that focus on building digital confidence, reducing anxiety and fostering a positive attitude towards technology can empower individuals to overcome their fears and engage actively in digital environments. This can be achieved through user-friendly interfaces, user-centred design and inclusive digital learning opportunities.

Thirdly, the impact of economic status on digital literacy highlights the need for policies and initiatives that bridge the digital divide. Efforts should be made to ensure affordable access to digital infrastructure and resources, particularly for marginalized or economically disadvantaged individuals. Promoting digital inclusion through community centers, public libraries and subsidized internet connectivity can help mitigate the economic barriers hindering the development of digital literacy skills.

Lastly, addressing the lack of training requires the establishment of comprehensive digital literacy programs that cater to individuals' specific needs and skill levels. These programs should be accessible, ongoing and tailored to different age groups, professions and digital literacy levels. Collaboration between educational institutions, libraries, community organisations and government agencies can contribute to the effective implementation of such

Conclusions

The outbreak of COVID-19 posed many challenges with regard to the provision of services in academic libraries all over the world, including those in Tanzania. In this context, university libraries in Tanzania started responding boldly by looking for alternative ways in which both students and staff could continue accessing library services which included the efforts of initiating more subscriptions to additional digital databases to supplement those available under the COTUL. Furthermore, the team was also appointed to improve the library website by adding lib guides, chart services and email contacts of subject librarians for easy provision of library services through an online platform.

Recommendations

This study recommends the followings:

i. There is a dire need for educational policymakers to consider mainstreaming issues related to Digital Literacy Skills in curriculum development. This can be done by creating a compulsory course on Digital Literacy Skills for all students in Tanzanian higher learning institutions.
ii. The Ministry of Health should continue to emphasise increasing social and health security during the COVID-19 pandemic and focus on digital literacy for citizens. This might enable students to acquire online services while they are at home and expand the quality of education as well as broaden online engagement.
iii. Library management should organise orientation programmes and seminars to educate students and create awareness of digital literacy and

its importance. It will be of particular importance if library management concentrates on offering digital literacy training frequently to library users to enable them to access and use resources within and off campus.

iv. Tanzania Communications Regulatory Authority (TCRA) should conduct training for students on the correct use of social networks to help them select the right information from the networks. This will help students become change agents for encouraging others to do the same.

v. Libraries in Tanzania need to review their library policies to accommodate new practices and new circumstances to serve the patrons and abide by social-distancing standards because COVID-19 has left us all in a state of shock. Libraries must develop Standard Operating Procedures (SOPs) for staff and library users to abide by social distancing standards during and after the COVID-19 pandemic.

vi. It also seems important to increase or re-prioritise library budgets to increase the e-resources and e-services. Libraries need to invest in getting new technologies, infrastructure, systems and staff development to be able to serve their users in emerging online environments.

vii. Capacity building for both patrons and librarians is key to ensuring that library service provision is not disrupted.

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Systematic Review of Open Education Resources Repository: A Gateway for Scholarly Communication in Developing Countries

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Abstract

Development in information technology has universally led to an increase of the importance of the Open Education Resources Repository. This has been of great help in achieving the sustainable development goals on the promotion of quality education and supporting innovation in the community. The technology of open education resources repository has been prominent since 2010 and comprehensively adopted in developed countries. However, it has been dynamically improving in developing regions though its performance fairly convinces appreciations on the invested initiatives. This paper establishes the need to examine the users' awareness of the repository, performance and influencing factors on the performance of open education resources repositories in developing countries. A systematic review of literature was employed in which 25 research papers were investigated. The papers were searched from four aggregate tools, namely Google Scholar, ResearchGate, OpenPraxis and Refseek. The Excel computer application software was used to analyse quantitative data whereas qualitative data were subjected to content analysis. Among other things, higher learning institution open education resource repositories in developing countries are becoming common among the academic community. Their performance is significantly remarked in erratic context between regions and diagnostically hampered by varying factors, including technological and infrastructural aspects, financial disputes, environmental and institutional issues. On this, the institutional management support committed to creating open access resources. These resulted to minimal satisfaction on the contribution of the repositories among the scholars. Such open education resources repository guidelines including policy, procedures and standards impacted the repositories performance. The paper encourages on the need for improving information resources acquisition, efforts on raising awareness, dissemination, advocacy, marketing, management and user support services. However, open education resources

repository policy needs to be improvised for quality control and procedures for backup to enhance security, intrusion and mitigation of the effects of potential disasters and fostering sustainability of the open education resources repository.

Keywords: Open access repository, open education, open access policy, distance learning, systematic review, scholarly communication, developing countries

Introduction

Development in information and communication technology has universally led to an increase in importance of the Open Education Resources Repository (OERR) in achieving the Sustainable Development Goals (SDGs4) on the promotion of quality education and supporting innovation in society (Mwalubanda, 2021). The OERR is a new phenomenon that uses internet to provide a gateway for scholarly communication in higher learning institutions (Miracle, 2020). The introduction of the OERR in higher educational system is significant and potential for improving quality and efficiency in teaching and learning; it minimizes costs and removes geographical barriers to the scholarly communication (Pounds & Bostock, 2019; Miracle, 2020). In light of this, scholarly communication has been a panacea to networking through collaboration, exchange, sharing and support among scholars that have common interest (Garcia-Vera *et al*., 2015). In the context of digital dynamics, scholarly communication focuses on sharing insights, strategies and information resources in multimedia approaches across the globe among higher learning institutions, organisations, public and private sectors and ultimately increases efficiency and impacts education (Koutsileou *et al*., 2019). The OERRs are electronically developed to provide free access to information resources on a public domain and are protected by copyright and licensed under Creative Common (CC) (Mwinyimbegu, 2018). The open education resources support teaching and learning and are obviously accessed through the higher learning institutions portals. The emergence of open education resources has contributed to developing interest among higher learning institutions over the universe. As a result, they have rendered global scholarly communication as they offer not only access but re-usability in various formats (Miracle, 2020). The OERs include but not limited to audios, texts, videos, animations and graphic resources; they provide legal rights to any scholar to copy, use, share and re-share (Mwinyimbegu, 2018). Librarians in higher learning institutions have a role of managing the OERs

and have to be engaged in providing scholarly resources at free and expertise on the OER through the OERR.

Background to open education resources repository

Globally, initiatives for the OERR begun in the United States of America (USA) in 2001 by the Massachusetts Institute of Technology (MIT). The institute managed to make all the courses, teaching and learning resources freely accessed online by any scholar over the universe (Zaid & Alabi, 2020). All the resources are made open to various scholars based on curriculum and its access is controlled by open access license. The resources were put and available on Open Courseware (OCW)[1] platform. Subsequently, in 2008, advanced initiatives on the OERR resulted to a global OCW Consortium (OCWC) which incorporated more than 260 higher learning institutions and affiliated organisations from more than 30 nations across the globe (Lesko, 2013). From this effect, massive movements and proliferation of the OERR became paramount, a significant mechanism and considered as a digital framework of the modern higher learning institutions. The framework provides for digital preservation, management, maintenance and dissemination of education resources among the scholars and a given community (Garcia-Vera *et al.*, 2015). On one hand, the United Nations Educational, Scientific and Cultural Organisation (UNESCO) joined efforts with the MIT in 2002 in making this endeavour evenly established over the universe (Belikov & Kimmons, 2019). In general, OCW is a high quality multimedia and digital educational resources publication that provides freely and openly licensed service that offers online scholarly communication to anybody over 24/7/365 without geographical location and cost barriers. A Massive Open Online Course (MOOC) Model is a good example of the OCW (Wordu & Nwaizugbu, 2021). The introduction of the OERR enabled the integration of the modern ICT in meeting the right of access to information among the scholars and the community at large. It ultimately became the dominant right in the information and knowledge age. In this regard, scholars are potentially involved in the global information based on socio-economic and political activities (Ivwighreghweta, 2012).

The growth of the OERR has been very remarkable in the northern as well as in some of the southern globe. Since 2010, there has been the OERR growth in

[1]Massachusetts Institute of Technology (MIT) OCW - https://ocw.mit.edu/

South regions of the United States of America, Eastern Europe especially in Poland, East Asia, Germany, Austria and United Kingdom (UK); after which Japan and some African countries followed (Orsu, 2019; Adam & Kaur, 2022). During the period, some countries including France, Italy and Spain have maintained steady growth on the OERR whereas other countries particularly China, Russia and most of the African countries have experienced limited growth (Stagg *et al.*, 2018). In the UK there have been initiatives of higher learning institution OERR collaboration through the Scottish open education declaration (Gyasi, Corletey & Frempong, 2010). The government of the UK collaborated with the Joint Information System Company (JISC) which provides network and information technology services and digital resources. The joint efforts assisted in managing 65 OERR projects of the UK higher learning institutions between 2009 and 2012 (Stagg *et al.*, 2018). Furthermore, the Chinese Ministry of Education gathered traction to the OERR and established the open source platform – Xuetang Online in 2015 that shared over 20,000 open courses and the resources accessed under Chinese license. However, awareness levels among scholars and Chinese higher learning institution communities remained low to seize this opportunity and the foregone investment (Stagg *et al.*, 2018).

In Africa, the establishment of the OERR and use of the OCW has been founded by various entities, including the African Virtual University (AVU) under Multinational Project 1 in 1997. Through this project, 12 African higher learning institutions from 10 African countries were collaboratively engaged in establishing the OERR. In light of this, 219 modules in various courses were made freely available online to the respective institutions through the AVU's platform. Report indicates that from December 2010 to August 2011 more than 300,000 scholars from different locations including the USA, France, Brazil and Portugal accessed the AVU portal in mainly three languages of English (50%), French (30%) and Portuguese (15%) (Lesko, 2013; Stagg *et al.*, 2018). On the one hand, further initiatives have been contributed by Teachers Education in Sub-Saharan Africa (TESSA) and the OER Africa[2]. The OER Africa in collaboration with the respective African higher learning institutions, for the first time in 2019 joined efforts with the University of Michigan to establish a project for the health OERR to a number of higher learning institutions in Africa (Lesko, 2013). In

[2] OER Africa - https://www.oerafrica.org/oer-initiatives-africa

Tanzania, the Open University of Tanzania (OUT) was the first higher learning institution in East Africa to establish the OER. The university mainly offers distance education and thus much of its collaboration with the university students and the community is conducted through the OER (Samzugi & Mwinyimbegu, 2013; Nunda & Elia, 2019).

Despite the multilingual characteristics of the OER, the copyright and license issues on the educational resources, still the higher learning institutions have a role to strike the balance to provide effective scholarly communication. The resources in the repository have to be contented with the main 5Rs rights which are: retainment which provides scholars with a right to make and manage content, reusing the OER content widely and by any means, revise through modification of the OER content in various format and language, remixing which provides the right to create new content from different OER contents and redistribution that the scholars have a right to share and disseminate the OER content on the original format, in a revised and or remixed format (Peneder & Walcher, 2020). In respect to these rights, the institution and its community are aware of the OERR; thus, they increase its visibility, improve quality of the OER content and scholarly communication across the universe and ultimately impact on economic development (Narayan & Luca, 2017). However, the widespread implementation of the OERR across the developing countries is significantly earmarked though it is not extremely spreading because of various hurdles related to institutions strategies, external and internal environmental issues (Dlamini & Snyman, 2017; Oguche, 2018). Based on this ground, this paper specifically intended to systematically review the literature on the awareness of the OERR and factors influencing the performance of the OERR in scholarly communication in developing countries toward its prominence to the open education resources access from 2010 to 2022. This paper, therefore, intended to answer the following questions:

i. To what extent are the developing countries aware of the OERR for scholarly communication?
ii. What is the level of performance of the OERR in scholarly communication in the developing countries?
iii. What are the factors influencing performance of OERR in scholarly communication in the developing countries?

Methodology

A systematic literature review based on Search, Appraisal, Synthesis and Analysis (SALSA) Framework and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) criteria were used to study the phenomenon underpinning the study. The SALSA approach provided the reviewers an ability to minimise the factors of subjectivity. It is pointed as one of the most appropriate measures which identify, evaluate and systematise literature (Amo *et al.*, 2018) and guarantee precision and completeness of the methodology used in the systematic review (Grant & Booth, 2009). In addition to this, the PRISMA statement ensures accuracy and completeness of the study at hand (Moher *et al.*, 2009). The PRISMA statement provided a preliminary and evidence based list of organised information for establishing a comprehensive and combined report of meta-analysis and the systematic review (Sam *et al.*, 2020). In light of this, a systematic review is obviously an audit of a deliberate inquiry that consumes precisely and unambiguously the strategies to measure and scan data from the collected search studies that comprises the review (Sam *et al.*, 2020). The SALSA framework subsequently led the reviewers to the PRISMA criteria. Table 1 presents the framework for the systematic literature search and review in this study.

Table 1: SALSA Framework for Systematic Literature Search and Review

Stage		Description
Search	Key actions:	Keywords identification; search data sources
	Study scope:	Limited to studies related to the OERR in developing countries. The limitation on the selected studies provide major insights in order to appraise and synthesise the phenomenon underpinning the study
Appraisal	Key actions:	Studies selection through the PRISMA approach
Synthesis	Key actions:	Data extraction and categorical organisation
Analysis	Key actions:	Data analysis, findings comparison and conclusions

Source: (**Amo *et al.*, 2018)**

A systematic literature search was conducted to four aggregate data sources which included: Google Scholar, ResearchGate, Refseek and OpenPraxis as well as backward citation track which provided other search results on the study. A combination of search key terms was employed to obtain the data sources from 2010 to 2022. These subject search terms were: "Open education resources" + "scholarly communication" + "Developing Countries" and "Open education repository" + "Developing countries". The search resulted to an attainment of 105 articles. The articles were evaluated and the PRISMA statement

recommendations for the selection of the articles were followed. The criteria for inclusion of the articles involved the article's keywords being in the title, as well as the abstract and the article published by the scientific and peer reviewed publisher. The exclusion criteria of the search results were on papers from the conference proceedings, editorial letters, non-English articles and articles which were not primarily research based. In this, six (6) non-based research papers, six (6) non-English articles and others as shown in Figure 1 were excluded from the content analysis of the 105 articles, 21 articles were combined for inclusion in the study as they met the inclusion criteria. A snowball method was used for backward citation track for other articles which were not found during the search. Four (4) additional articles were obtained and ultimately ended with 25 articles that were relevant to the OERR for scholarly communication in developing countries. Content analysis was applied for the 25 articles obtained from the search. This is an indicator that either the use of the OERR for scholarly communication in the developing countries is not an area where researchers want to investigate or the area of study is not familiar in many parts of the developing countries. Lee *et al.* (2021) explain that content analysis is a highly applicable and flexible research approach applied in library and information field with varying research themes and objectives. It is a fairly focused method to perform; it can be done conveniently and with less attention on ethical issues. Figure 1 presents a flow of information for the search results which are relevant to this study.

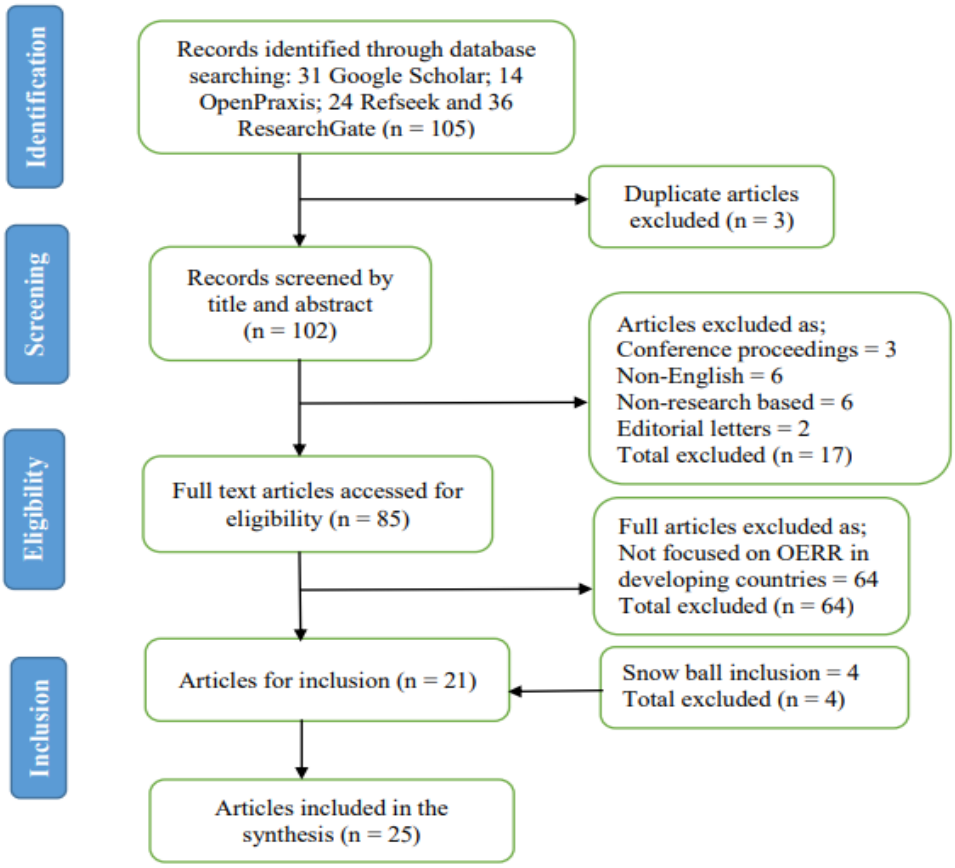

Figure 1: Flow of Searched Information (PRISMA Statement)

The articles included for further analysis were extracted and categorised based on the study objectives. The next section provides the detailed analysis of the included articles.

Analysis Process

The analysis of the articles included in the study was based on research questions. Content and Microsoft Excel computer application software was used to achieve the analysis. The selected articles were coded to simplify the review process and subject to research questions. Descriptive statistics in the form of tables, pie charts and graphs were used to present the review analysis. As indicated in Table 2, the spreadsheet provided the valuable and appropriate information about each article, such as the author, the title and the database where the articles were retrieved together with the year of publication.

Table 2: List of articles included in the systematic review (n=25)

Code	Author	Title	Database	Year
OER1	Mwinyimbegu, C. M.	The role of libraries and librarians in open educational resources in Tanzania: The case of selected public university libraries	Google Scholar	2018
OER2	Miracle, N.	An assessment of open educational resources by students in selected academic institutions in Southwest, Nigeria	Google Scholar	2020
OER3	Muneja, P.S. & Ndenje-Sichalwe, E.	Institutional repository initiatives in Tanzania: Opportunities and challenges	Google Scholar	2016
OER4	Nwokedi, V. C. & Nwokedi, G. I.	Open access institutional repositories in academic and research institutions in Nigeria: A review of benefits and challenges	Google Scholar	2018
OER5	Nyambi, E. & Maynard, S.	An investigation of institutional repositories in state universities in Zimbabwe	Google Scholar	2012
OER6	Peneder, M. & Walcher, F.	Open education resources: Current limitations and challenges and its usage in developing countries	Google Scholar	2020
OER7	Samzugi, A.S. & Mwinyimbegu, C.M.	Accessibility of open educational resources for distance education learners: The case of the open university of Tanzania	Refseek	2013
OER8	Kassahun, K. & Nsala, C.	The awareness of academic librarians towards open access resources to support reference services: A case of private institutions of higher learning in Gaborone, Botswana	Refseek	2017
OER9	Kuri, R. & Singh, M.	Indian Institutional Repositories (IRs) reflected in the Directory of Open Access Repository (DOAR): A case study	Refseek	2020
OER10	Mtebe, J. & Raisamo, R.	Investigating perceived barriers to the use of open educational resources in higher education in Tanzania	Refseek	2014

OER11	Upneja, S.K.	Contribution of library professionals and libraries in open educational resources in Indian scenario	Refseek	2020
OER12	Enakrire, R.T. & Ngoaketsi, J. M.	Open access practices: Roadmap to research paper publications in academic institutions	ResearchGate	2020
OER13	Ezema, I.J. & Okafor, V.N.	Open access institutional repositories in Nigeria academic libraries: Advocacy and issues in scholarly communication	ResearchGate	2015
OER14	Igwe, K.N.	Open access repositories in academic and research institutions for the realisation of Nigeria's vision 20: 2020	ResearchGate	2014
OER15	Ofoegbu, O.T., Asogwa, U.D. & Ogbonna, C.S.	Open Educational Resources (OERs) and courseware development in dual-mode universities in Nigeria	ResearchGate	2021
OER16	Cox, G., & Trotter, H.	Factors shaping lecturers' adoption of OER at three South African universities	OpenPraxis	2017
OER17	Flor, A.G.	Exploring the downside of open knowledge resources: The case of indigenous knowledge systems and practices in the Philippines	OpenPraxis	2013
OER18	Gandhe, S.K.	Quality assurance in open and distance learning in India	OpenPraxis	2010
OER19	Loglo, F. & Zawacki-Richter, O.	Exploring OER awareness and engagement of academics from a global south perspective - a Case Study from Ghana	OpenPraxis	2019
OER20	Lesko, I.	The use and production of OER & OCW in teaching in South African higher education institutions: Case Study	OpenPraxis	2013
OER21	Jayatilleke, B.G., & Kulasekera, G.U.	Forty years of distance education: Challenges and implications at the Open University of Sri-Lanka	OpenPraxis	2020
OER22	Hodgkinson-Williams, C.	Benefits and challenges of OER for higher education institutions	OpenPraxis	2010

OER23	Tlili, A., Altinay, F., Huang, R. *et al.*	Are we there yet? A systematic literature review of open educational resources in Africa: A combined content and bibliometric analysis	OpenPraxis	2022
OER24	Pete, J., Mulder, F., Neto, J.D. & Omollo, K.L.	Differentiation in access to and the use and sharing of (open) educational resources among students and lecturers at technical and comprehensive Ghanaian universities	OpenPraxis	2018
OER25	Padhi, N.	Acceptance and usability of OER in Indian higher education: An investigation using UTAUT Model	OpenPraxis	2018

Source: Authors' Construction (2022)

Table 2 indicates that majority of the publications on the OERR for scholarly communication in developing countries were published in the year 2020 equals to six (6) articles while in 2018 and 2013 four (4) and three (3) articles published respectively. In addition, two (2) articles each were published in 2010, 2014 and 2017 whereas one (1) article each was published in 2012, 2015, 2016, 2019, 2021 and 2022 but none for 2011. This is generally to say that from 2010 to 2022 there were publications in the area and this is quite impressing based on the fact that the OERR has been crucial in scholarly communication in developing countries. It is alarming to find that none of the publications were published in 2011. But this is not the scope of this study to analyse the reasons as to why no publications are observed in this time. However, a significant number of publications were in the year 2020 which imply that the OERR became a prominent innovation in most developing countries during the year 2020. Figure 2 presents the graphical distribution of the OERR publications from 2010 to 2022.

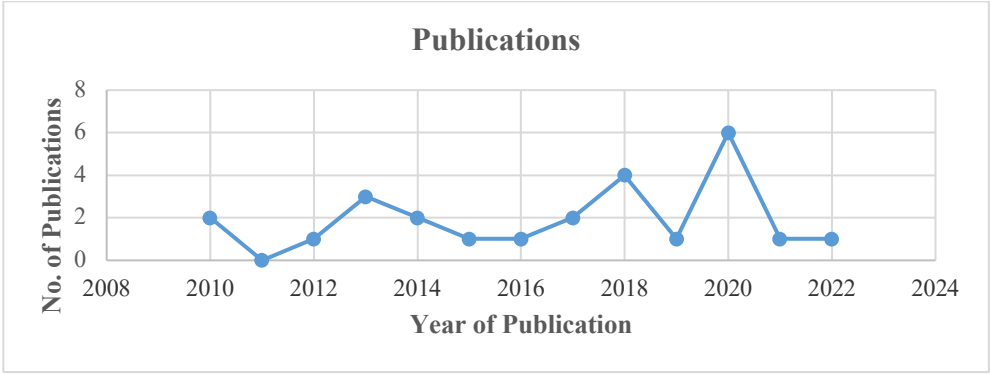

Figure 2: Publications in Different Years from 2010 to 2022 (Authors' Computation, 2022)

In terms of the aggregate data sources, OpenPraxis had 11 included articles while six (6) articles were from Google Scholar; five (5) included articles were from Refseek and only four (4) articles were from the ResearchGate aggregate tool. In this regard, OpenPraxis was the most prominent aggregate tool for resources in respect to the OERR for scholarly communication in developing countries. This might be contributed by its prominence and being based on housing knowledge related to research and innovation in open, distance and flexible education. The distribution of articles included for the synthesis of this study is presented in Figure 3.

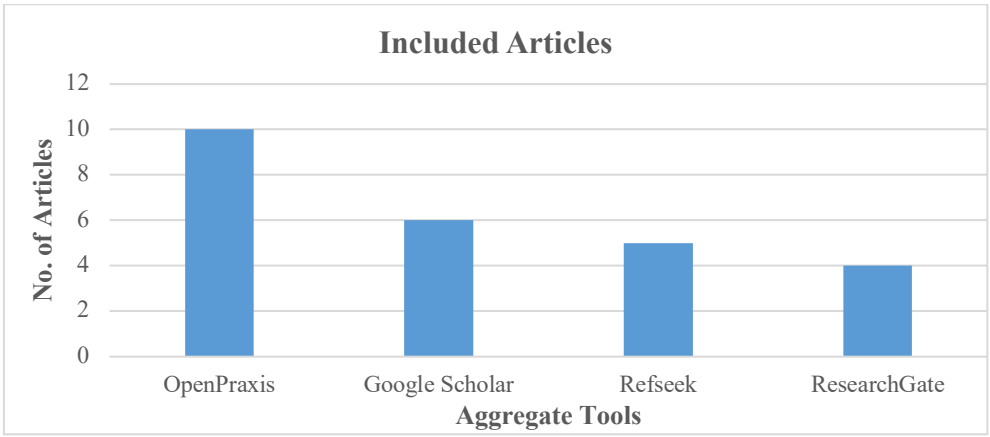

Figure 3: Aggregate Tools with their Included Articles (2010 to 2022), (Authors' Computation, 2022)

Results and Discussion

This section covers the results and discussion of the systematic review based on the research questions that were developed to review the essence of the OERR in scholarly communication in the developing countries.

Awareness to open education resources repository in developing countries

The northern globe has been in use of the OERR for scholarly communication for over a decade today. Given the benefits of this innovation in higher learning institutions has developed interest and motivated the southern globe to become aware of the OERR for institution visibility, reaching the mass through scholarly dissemination of information and at a cost-effective means (Belikov & Kimmons, 2019). Among others, awareness to the OERR in India higher learning institutions was remarked in 2002 where through the Bangalore Declaration of 2006 on open access movement, an OERR policy for developing countries was established (Biswas & Roy, 2013). In this, the Indian Institute of Science in Bangalore was the first to establish the OERR in 2004. It was from this lens that, the institute conducted training workshops and various professional and expertise assistance to the rest of the institutions in India that aimed to raise awareness and capacity building on the OERR for scholarly communication (Kuri & Singh, 2020). Furthermore, Mwinyimbegu (2018) insists on the fact that, awareness to the OERR in higher learning institutions of the developing countries is paramount and for it to be effective it has to be integrated with the library collection platform. In light of this view, training workshops and capacity building programmes shall focus on the librarians. Awareness on the OERR to librarians

is potential as they are the people involved in describing resources, managing open access resources, sharing and dissemination of digital content, digital literacy training, managing intellectual property rights, subject based guiding and promoting appropriate open licensing (Mwinyimbegu, 2018).

In Philippines, awareness on the OERR among institutions was potentially put forward by various efforts of the government and the funding agencies such as the International Development Research Centre (IDRC). The centre funded higher learning institutions in Philippines to raise awareness among librarians between December 2008 and July 2009 on the OERR for scholarly communication (Flor, 2013). The African higher learning institutions became aware of the OERR following the contribution of the OER Africa, TESSA and African Virtual University (AVU) (Pounds & Bostock, 2019). For instance, the Nigerian higher learning institutions became aware of the OERR in 2009 through the collaborative efforts with the OER Africa (Oguche, 2018). Despite the African efforts on raising awareness to the OERR, Ghana has remained an active member in a number of consortia and projects involved with open, distance and e-learning initiatives and thus higher learning institutions have a significant experienced on the OERR. In this, Ghana is a member state of AVU and has improved its distance learning through two open university colleges of Laweh and West Africa established in 2014 where much of the scholarly communication is conducted about the OERR (Pete *et al.,* 2018).

Zagdragchaa and Trotter (2017) opine that the Mongolian higher learning institutions have been aware of the application of the OERR for scholarly communication ever since 2010. Considering the importance of the OERR, the Mongolia Government in 2014 conducted a series of national forums, training workshops and projects for open education resources awareness and adoption. Different international advocacy groups assisted in building a critical mass support for the OERR and ultimately established a Creative Commons Mongolia licensing for open access to the education resources.

Generally, awareness to the OERR among the academic community, on the one hand, improves interactions with the platform. On the other hand, it assists in identifying the strengths and weaknesses of the platform through recommendations and suggestions from the users. The results indicate that countries such as Nigeria, India, Tanzania, Philippines, Mongolia and Ghana have considered awareness services to the OERR to be crucial for improving scholarly

communication and its sustainability. Awareness to a given technology or invention is a kind of return to the invested resources. In light of this view, researchers from these countries have developed interest of researching on the ways this technology influences the performance of the OERR in scholarly communication. Moreover, awareness to this technology contributes toward the visibility, technology absorption and currency, transparency, time and other resources management, reaching the mass through open access, satisfaction and effective performance of the higher learning institutions in developing countries.

Performance of OERR in developing countries

The OERR technology has transformed the processes of teaching and learning in developing countries. The countries that have considered the OERR important have tremendously and remained sustainable in this endeavour. In the Central Asia, the higher learning institutions in Mongolia and Kyrgyz Republic have ever since 2014 adopted the OERR technology and advanced to as many partners across the educational institutions. Efforts have been in place to ensure that training programmes are conducted for expertise and use among the academic community. Various projects are performed at the institutional level for improvement and management of the OERR. In this, the focus of the projects was to establish digital platforms for the OER, enhance awareness campaigns, establish discussion forums for the performance of the OERR and grant issues to support sustainability of the OERR (Walz & Bekbalaeva, 2018). However, Padhi (2018) and Pounds and Bostock (2019) opine that in Asia, the Indian higher learning institutions were the earlier adopters of the OERR technology in 2002. Nevertheless, they have been facing some challenges including the OERR click rates, little studies being conducted in regard to the OERR technology and thus influenced the management of the platform and hence the expected sustainability. Furthermore, the Open University of Sri Lanka (OUSL) adopted the OERR in 1980 and progressively advanced in harnessing the emerging trends for improving distance education through open access approaches. The OUSL has become the famous institution in Sri Lanka for open and distance learning services and much of the programmes offered are conducted online (Jayatilleke & Kulasekera, 2020).

On a different note, the African continent despite the initiatives of a number of organisations and higher learning institutions collaboration for improving the performance of the OERR, the implementation and performance levels varies significantly among its countries. In making the OERR sustainable, some of the higher learning institutions such as the Africa Nazarene University in Kenya,

Botswana Open University in Botswana, Kwame Nkrumah University of Science and Technology in Ghana, the National Open University of Nigeria, the University of Cape Town in South Africa and the University of South Africa established the respective national policy for guiding the performance of the OERR. The policy states the OERR management principles and support the use, creation and scholarly dissemination of the open education resources under open license (Raju *et al.,* 2015; Tlili *et al*., 2022). For instance, in South Africa higher learning institutions' librarians and instructors have been playing role at ensuring that the use of the OERR is insisted among the students and that what is uploaded for scholarly communication must comply with the quality standards to provide for accuracy, completeness and rigor (Cox & Trotter, 2017). In Ghana, higher learning institutions use the 5R principles of retain, reuse, revise, remix and redistribute for improving performance of the OERR. The academic community was well informed and thus made aware of the technology which ultimately improved capability to use the platforms for scholarly communication and content redistribution. Practices on educational resources recovery, acquisition, revise and remix complemented the performance of the OERR (Loglo & Zawacki-Richter, 2019).

Miracle (2020) observed that the Nigerian higher learning institutions adopted the OERR technology and progressed in using it to date. Librarians and instructors are involved in developing guides for the academic community and particularly students on how best they can interact with the platform. Similarly, in Tanzania, Samzugi and Mwinyimbegu (2013) point out that, the Open University of Tanzania (OUT) being the famous institution in offering open distance education has enormously used the OERR and performed progressively for scholarly communication to meeting the academic community needs and satisfaction despite the users' location and time for access. Among others, the OUT has invested much on promoting the OERR through the institution's website and collaborative efforts with the African Virtual University courseware which supports in strengthening the quality of resources and expertise. Similarly, the MIT courseware collaborates through provision of multimedia information resources to the OUT OERR for improving distance learning and networking. Another collaborative OER initiative with the OUT is the TESSA that provides a broad spectrum of the OER to support scholarly communication and the performance of the OERR.

In totality, the performance of any innovation has to be determined by various factors. The factors include but not limited to provision of declarative knowledge to the community, imparting informative procedures on how to use the technology at place, motivating users and expertise on using, monitoring and evaluating the platform, investing on the innovation for efficient maintenance, repairing and sustaining, building strong relationship with users and creators of the OER and advancing self-leadership ability on the innovation. Findings from the systematic review of literature indicate that higher learning institutions in the developing countries are putting significant efforts in improving the performance and sustainability of the OERR. The institutions offering open distance education such as the OUSL and OUT in Sri Lanka and Tanzania respectively are struggling in making this endeavor sustainable. The approaches deployed by these institutions have to be adopted by other universities for proliferation, performance and remaining relevant on open access initiatives.

Factors influencing the performance of OERR in developing countries

The performance of the OERR in developing countries' higher learning institutions is not sufficiently promising in comparison with their counterparts. Common internal and external factors related to economic, environment, technology, infrastructures, political, policy issues, social, language, digital literacy and the institutions' perception have contributed towards the proliferation of the OERR (Mwinyimbegu, 2018; Peneder & Walcher, 2020). For instance, in Sri Lanka higher learning institutions are facing issues related to institutional management commitment, inventions for sustainable development of the OERR, visionary leaders, issues of infrastructures and resources (Jayatilleke & Kulasekera, 2020). On the one hand, Pounds and Bostock (2019) and Upneja (2020) concurred that the performance of the OERR in Indian higher learning institutions has been influenced by reluctance of the institutions' management in addressing the barriers pertaining to sustainability of the OERR. Other factors are technical know-how, awareness to the OERR, availability of information technology facilities, the OERR policy, institutional management support and interest towards the OERR inventions.

In Africa, despite the remarkable initiatives of investing in the OERR, the continent's higher learning institutions have always been influenced by funding aspects, policy issues, management of the OERR, acquisition of current open educational resources, infrastructures, training and re-training programmes on the OERR. Similarly, internet connectivity and high management costs have been

earmarked to influence the performance of the OERR in various African higher learning institutions including among others, Kenya, Tanzania, South Africa and Uganda (Enakrire & Ngoaketsi, 2020; Peneder & Walcher, 2020). Furthermore, Tlili *et al.* (2022) categorised the factors influencing the performance of the OERR in African higher learning institutions into six categories of the OERR policy and copy right issues, infrastructures, financial issues, pedagogies, personal aspects and language barriers. These categories were similarly observed by other scholars in South Africa and particularly at the University of Cape Town (Hodgkinson-Williams, 2010; Lesko, 2013).

Ofoegbu *et al.* (2021) identified, among others, that factors related to technology, socio-economic issues, relevance of the OERR, higher learning institutions and national aspects influenced the sub-Saharan African institutions in performing and sustaining the OERR. These findings corroborate with the earlier ones on barriers of the OERR's performance in sub-Saharan African higher learning institutions observed by Peneder and Walcher (2020) on the fact that the institutions were constrained by being reluctant in raising awareness on the OERR, policy establishment, issues of support and interest to the invention. However, few institutions of the sub-Saharan Africa had an OERR policy but was not implemented and resulted to 82 per cent of the lecturers being not aware of the OER license (Creative Commons) for scholarly communication.

In West Africa, particularly in higher learning institutions of Nigeria and Ghana, studies indicate that the performance of the OERR in these countries has been influenced by various factors which are not limited to users' awareness to the OERR, support from the institution management, copyright and other legal issues and relevance of the OER. Other factors include the sustainability setbacks, quality of the OER, availability of ICT infrastructure, internet connectivity, financial issues, advocacy of the OERR, intellectual property rights, technological skills and knowledge on the OERR (Igwe, 2014; Ezema & Okafor, 2015; Nwokedi & Nwokedi, 2018; Oguche, 2018; Pete *et al.,* 2018; Loglo & Zawacki-Richter, 2019; Miracle, 2020; Ofoegbu, Asogwa & Ogbonna, 2021). Similarly, Nyambi and Maynard (2012) and Kassahun and Nsala (2017) in Zimbabwe and Botswana respectively observed that knowledge and technical know-how, quality of the OER, political issues, communication, legal and copyright aspects, government and higher learning institutional support and availability of subject based librarians influenced the performance of the OERR in these countries.

Moreover, a number of studies on the OER have been conducted in the United Republic of Tanzania (URT) and indicate that both public and private higher learning institutions have been influenced by different factors toward the proliferation of the OERR. In this, Samzugi and Mwinyimbegu (2013), Mtebe and Raisamo (2014), Muneja and Ndenje-Sichalwe (2016) and Mwinyimbegu (2018) observed the constrains related to Internet connectivity, infrastructures for the OERR, issues of awareness, digital literacy among the OER users, geographical location of users, the OERR policies and intellectual property rights, curriculum compatibility with the OER, skills to create and use the OER and quality issues of the OER. On the one hand, factors related to the aforementioned issues, availability of expertise, support, commitment and interest of the institutions' managements and sustainable resources including man power and financial aspects were mentioned to influence the performance and sustainability of the OERR in higher learning institutions of the United Republic of Tanzania. Factors influencing the OERR performance in higher learning institutions of the developing countries are broadly the same throughout the reviewed literature. It is imperative that the identified factors are critically taken into account to ensure that the establishment the OERR does not suffer the consequences of technology lapse and the value for the efforts and resources invested in is appreciated. On a serious note, higher learning institutions have to ensure that attention on the OERR is given through proper planning with tangible strategies, resources and knowledge for promoting effective management, application, integration, preservation and dissemination of the OER to the community. However, human resource capacity building, financial resources, infrastructures, commitment, innovativeness, advocacy and marketing of the OERR are paramount in improving performance and sustainability. The academic community may find the OERR useful to their career provided that the quality of the OER is comprehended for relevance and acceptability. The OERR policy has to be established and updated for quality control and procedures for backup to enhance security, disaster management and protection of the legal rights including the intellectual property rights and open licensing.

Conclusions

The aim of this paper was to undertake a comprehensive assessment of previous research studies on open education resources repository for scholarly communication in the developing countries. This is an essential evaluation that is conducted to discover how higher learning institutions in developing countries

dealt with the issue of Open Education Resources Repository in scholarly communication and visibility in this region of the world. The inquiry begins with a brief explanation of the current advancement of technology in general and the introduction of the Open Education Resources Repository in particular for scholarly communication and knowledge management. This was purposefully done to comprehend the significance and background of the underpinning phenomenon. It also included a discussion of the notion of open education resources in its broad perspective. Various literatures on the essence of Open Education Resources Repository for scholarly communication in higher learning institutions of the developing countries were reviewed and classified into three major themes. The themes included Open Education Resources Repository awareness among users, the level of performance and factors influencing the performance of the Open Education Resources Repository in developing countries. In the discussion section, explanations of the key subjects discussed as well as the primary prospects for future inquiry were provided. It can be concluded that the research into open education resources for scholarly communication in higher learning institutions in developing countries is increasing; Various researchers are investigating issues in this area following the changing technology and user needs of the academic community. This is justified by a number of studies accessed from four different aggregate tools. The fact that studies on Open Education Resources Repository in developing countries' higher learning institutions are increasing, signifies that the relevance and importance of the open access tool for promoting scholarly communication or researchers' interest on this area is going up.

Limitations and Areas for Further Investigation

The present study, like every review study, was hampered by a variety of limitations. For example, from 2010 to 2022, all of the publications analysed were about Open Education Resources Repository for scholarly communication in developing countries' higher learning institutions and were sourced from Google scholar, ResearchGate, OpenPraxis and Refseek aggregates. As a result, this research does not include Open Education Resources Repository for scholarly communication in other areas of the universe. A systematic review in this study was employed and thus other studies should undertake a meta-analysis on Open Education Resources Repository in the developing nations. As a result, a meta-analysis study to find how often and significant elements on effective Open Education Resources Repository for scholarly communication in the developing

nations is widely anticipated. It is also said that Open Education Resources Repository for scholarly communication is a growing trend, particularly in the developing nations; thus, other researchers should undertake studies utilising more powerful statistical data analysis techniques. This is because the bulk of the studies examined did not go beyond descriptive and inferential statistics for data analysis.

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The Digital Era Trials and Tribulations of Professional Librarians in Selected Tanzania Accredited Technical and Vocational Institutions

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Abstract
This study explores the predicament professional librarians' face in the academia in the digital era. The National Council for Technical and Vocational Education and Training (NACTVET) influences the removal of academic librarians' cadre in institutions it accredits catapulting UTUMISHI towards removing it from scheme of services leading to the demotion of librarians or re-categorisation as administrative or faculty staff, respectively, losing their professional recognition. The study used a qualitative method research design to obtain data in eight selected Tanzania's institutions. Data were collected using interviews with eight librarians comprising senior/managerial positions in these studied libraries; two UTUMISHI officials and two library professional association leaders. Data were analysed thematically and discussed based on the research objectives and emerging issues. The results show that some librarians had academic status whereas there was no such a cadre in other institutions. As such, most of the librarians were re-categorised as faculty members whereas some were demoted to administrative positions due to changes in the UTUMISHI system. Other institutions were unaffected as they did not have the academic cadre. Most librarians were dissatisfied with the job and experienced low morale after being re-categorised, which forced some to seek transfers to universities. Besides, the other librarians had to pivot career wise to fit in with faculty requirements whereas others were left in dilemma promised special salaries. All the hopes are on professional associations to see what can be done to restore the academic cadre as individual efforts are futile. Librarianship still supports low status in Tanzania and librarians cannot continue with the assumption that stakeholders know their importance; they must demonstrate it through marketing of the profession. This might involve restoration of the academic status cadre in NACTVET institutions through collective bargaining using professional associations. This will be of great help in ensuring professional sustainability, research output and status of librarianship in higher learning institutions and continual survival.

Keywords: Professional librarians, digital age, status of librarians, LIS professional associations, Tanzania

Introduction

In the digital era, the library, as a knowledge hub, has been exposed to tremendous developments that have necessitated transformations from traditional libraries as originally constructed with movable and tangible materials to hybrid libraries in many African countries and Tanzania in particular. As a result, most modern libraries accommodate a virtual space with electronic resources. Towards this end, Information and Communication Technology (ICT) developments have resulted in unprecedented levels of creation, distribution and accessibility of information, which has made information explosion inevitable. Consequently, both libraries and librarians face daunting challenges in managing both information management and the stress associated with overwhelming information scenarios. These hurdles and effects that ICT and the digital technology have engendered for libraries notwithstanding, librarians have continued to adapt. The libraries have done so for the benefit of humanity and embracing new technologies and changing how information is accessed in their respective libraries to remain relevant and serve their users.

This phenomenon, however, has raised questions pertaining to the status of academic librarians regarding their relevance in the digital era. On the other hand, the question has arisen on whether users survive and get information without the assistance of professional librarians. These concerns are even much more acute for the National Council for Technical and Vocational Education and Training (NACTVET) in Tanzania which precludes the engagement of academic librarian cadres in the libraries of all tertiary institutions they have accredited.

In a larger context, NACTVET is a corporate body established by the National Council for Technical Education Act, 1997 (Act No. 9 of 1997). The Act provides a legal framework for the Council to co-ordinate the provision of technical education and training in addition to establishing an efficient national qualifications system aimed at ensuring high quality products from technical institutions who are responsive to changing needs as well as unfolding technological innovations. In all, 453 tertiary education and training institutions fall under the umbrella of NACTVET. The institutions deliver courses at the technician, semi-professional and professional levels for the awards of certificates, diplomas, degrees and other related awards.

Apart from exploring how librarians provide services in the digital era and demonstrating their relevance, this paper also seeks to address the status of librarians in NACTVET accredited institutions by exploring their increasingly problematic status as information professionals as well as their trials and tribulations in the resource-poor context of Tanzania. Moreover, it explores the need for collective bargaining to ensure the survival of the profession amidst ongoing and even unstoppable changes in eight selected academic libraries in a bid to achieve the set objectives and make recommendations pertaining to the need to revise the scheme of service and status of librarians in NACTVET institutions in Tanzania.

Despite the roles that librarians play in academic institutions, advancements in ICT have resulted in changes and a paradigm shift affecting individuals, groups and organisations without forgetting academic libraries and the birth of 'dotcom' users (Mwilongo & Kotoroi, 2021). Nevertheless, librarians have continued to find innovative ways of providing services to users through the adoption of embedded librarianship, incorporation of social media to engage users and installation of modern ICT equipment in libraries for them to remain relevant in the digital era (Muneja, 2013; Mushi, Mwantimwa, &Wema, 2020; Kyumana, 2022). Paradoxically, the country's Civil Service Establishment, popularly known as UTUMISHI in Kiswahili, in 2021 rendered the academic librarian cadre in all NACTVET accredited higher learning institutions 'obsolete' and removed the cadre completely from the scheme of services applicable to these institutions that previously employed these librarians. This seemingly draconian move resulted in frustration, confusion and job dissatisfaction amongst librarians. Yet, there has been no end in sight to this dilemma in NACTVET phenomenon, hence a need for research to explore the problem in-depth. This paper, therefore, explores this gap by seeking to achieve the following research objectives:

i. To determine alternative status for librarians in NACTVET accredited institutions in the selected academic libraries in Tanzania.
ii. To examine challenges that librarians face in service provision in their new contestable positions in NACTVET accredited institutions in the selected academic libraries in Tanzania.
iii. To establish the roles that Librarians' Professional Associations can play through collective bargaining to ensure the sustainability of the profession in NACTVET accredited institutions.

Literature Review

In the twenty-first century, most of the libraries are morphing into digital libraries. They now focus on the delivery of diverse services through a digitised form. In fact, the library in the digital era comprises collections, services and infrastructure aimed at supporting lifelong learning, research, scholarly communication and preservation (Digital Libraries, 2022; Hussain, Mahmood & Shafique, 2008). In higher learning institutions, academic libraries centripetal to their operations as they serve as a gateway to knowledge for scholars and students. With massive development in ICT and the growth of digital content coupled with social media, both libraries and librarians have had to adapt to the changes and transform the way they operate and the services they provide (The Library of the Future, 2022).

Jennings (2013) contends that these changing technologies would force libraries and librarians to wither away and die unless they did something about it and accommodated the change. The question of how is answered by Foo *et al.* (2002), Muneja (2013) and Mwilongo and Kotoroi (2021) who insist on libraries and librarians to keep pace with the unfolding changes in technology. Specifically, academic libraries have to adopt digital reference services using email, online reservations and renewal of library materials is becoming an integral part of the automation systems, electronic service provision to multiple resources with the overall hybrid library with reference, reserve and circulation facilities (Mushi, Mwantimwa, &Wema, 2020; Kyumana, 2022). In the midst of technological advancements and changing user needs and information seeking behaviour, the biggest challenges for librarians in such academic libraries in the twenty-first century is staying relevant to their information users considering that the internet and Google have irreversibly changed librarianship (Jennings, 2013). In addition, Oakleaf (2010) noted that the university librarians can no longer rely on their stakeholders' beliefs in their importance; rather they must demonstrate their value.

Schalak, Corral, & Bracke (2021) argued for a significant mind-shift among academic libraries and librarians for them to regain their place at the heart of the academic enterprise. Muneja's (2013) reflection on the role of Tanzanian librarians in the digital era noted that librarians have increasingly embraced new technology and ICT by updating their skills, incorporating ICT infrastructures for effective service provision despite financial challenges and sustainability issues coupled with the lack of management support to embrace changes and keep pace with the digital era.

Furthermore, Corrall's (2012) analysis of the role of librarians observed that the digital era required managing data alongside other information and knowledge resources that libraries traditionally manage or provide for their communities. Besides, at a university level, librarians were increasingly developing services or getting involved in projects and providing support to researchers aimed at meeting their research needs and access requisite data. Chukwu *et al.* (2018) further contend that librarians have become information experts in the digital age as opposed to their traditional role of book custodians in addition to promoting and providing access, guidance and training for both physical and electronic materials housed outside and in an online environment. Implicitly, librarians are still relevant and are, in fact, redefining their relevance in the face of changes in technology and information explosion. Allen (1984), who critically analysed the image and reality of academic librarianship, noted that the explosion of knowledge and ICT developments have prompted many individuals in the academia increasingly to become specialised in comprehending subjects, hence the idea of a "narrow specialist librarian" is becoming almost derogatory.

The discussion on the relevance of librarians in university libraries enjoys unique status and recognition, which also determine their relevance (Salaam & Onifade, 2009; Adio & Popooa, 2010; Ibegbulam & Jacintha, 2016; Ajiduhan, 2021). Allen (1984) contends that the issue of the status of librarians and other occupational groups in the workforce had been a source of a grave concern for librarians for a long time to push for equal or comparable status with those of other institutions/universities engaging in teaching and research. In Africa, Ajiduhan (2021) noted that many libraries on the continent and particularly in Nigeria where the study was conducted categorise librarians as academic/faculty specifically in the service category within academia as opposed to faculty members who belong to teaching.

Bell (2016) further contends that in the digital age, academic researchers increasingly refer to online resources to kickstart their research journey and not turn to a librarian or library as in the olden days. Consequently, they place demands on the librarians evolving their roles to keep pace with a shift in the information users and research behaviour. Regardless of the changing roles for librarians and the continual dedication to keep pace with the digital era advancements, Chukwu *et al.* (2018) argue that the public perceptions of librarians are still tied to the outdated understanding of librarians as keepers of books.

In Tanzania, studies on the status of academic librarians in higher learning institutions are few and sparse. Many of them tend to focus on service provision in the digital era with little effort going to exploring status and sustainability of librarians in the digital era. Newa (1989), who had examined the status of university librarians in Tanzania, affirmed that there was, indeed, a struggle for recognising librarians in the university communities in Africa generally and Tanzania particularly. Previously, Darch (1975) had noted that little value was placed on librarians in African universities. This resulted into comparatively tenuous and contestable status for librarians and faculty members. Moreover, Nawe's (1995) exploration of human resource issues and problems for library and information services in Sub-Saharan Africa established that in Botswana and Tanzania, the library profession had low status due to the lack of awareness amongst many information users regarding what constitutes librarianship. In a similar vein, Kyumana's (2018) exploration of the librarians' job satisfaction in four of Tanzania's academic libraries found that most of the librarians were dissatisfied with their job status in the libraries under review. The reason for their dissatisfaction was that the library profession was denigrated and accorded a low status cadre in many higher learning institutions, with their roles reduced to simply organising books on the shelf.

Theoretical Framework

The study explored the theory of professions and occupational identities. The theory focuses on the relationship between occupational groups, theoretical knowledge and the possibilities for practitioners to apply exclusively that knowledge within their occupational practice. In general, the theory distinguishes traits that entail the starting point in the systematic theory, recognition of the occupational group within its domain, practitioners' work in accordance with ethical codes and the professional body controls its own training programme (Sundin & Hedman, 2005). In the context of the Library and Information Science (LIS) profession, the theory has placed significant interest and efforts towards studying the strategies different groups use to achieve a certain social status as a 'profession'. The theory in relation to LIS explores changes in librarianship over time, advancement in its body of knowledge and the profession relations with other groups (Sunden & Hedman, 2005; Broady-Preston, 2010).

On the other hand, Broady-Preston (2010) applied the professions and occupational theory to explore futuristically the information profession and concluded that the LIS profession was undergoing profound changes in relation

to the qualifications base; yet competition from the ICT profession, low recognition, poor image and qualifications levels coupled with barriers to career development were 'blurring' the lines and making the profession much more elusive. Specifically, they noted:

> *The key question is not 'what is a profession', but rather how do professions position themselves and respond within the context of: the changing nature of professions; relationships between professions at the macro level and at the micro level; and relationships between professionals and society, including issues of individual social identity and self-esteem (Broady-Preston, 2010: 67).*

Issues that this paper seeks to explore and explain focus on examining the problematic status of academic librarians in Tanzania's NACTVET accredited institutions.

Methodology

The study used the qualitative method research design. Gray (2009) insists that this method suits small samples of respondents, cases, or phenomena nested in particularised contexts. To select respondents, the study used purposive non-probability sampling. In this regard, semi-structured interviews were held with librarians from eight (8) selected NACTVET accredited institutions with senior/managerial positions in their libraries in a bid to explore the problem through phone or face-to-face interviews, two (2) officials from UTUMISHI and two (2) from the librarians' professional associations to gain deeper insights into their stance on the status of academic librarians and associated challenges following their unceremonious removal as the academic librarians cadre from the operational structure of their respective institutions.

The academic institutions were selected purposively to include Mwalimu Nyerere Memorial Academy (MNMA), the Tanzania Institute of Accountancy (TIA), College of Business Education (CBE), the Institute of Finance Management (IFM), the Centre for Foreign Relations (CFR), Bandari College, the Institute of Accountancy Arusha (IAA) and the Institute of Rural Development Planning (IRDP). The data obtained were analysed thematically and organised based on the research objectives of the study as well as emerging issues in accordance with the same objectives.

Findings and Discussion

Respondents' profile, status accorded to librarians in researched institutions

In all, 12 participants participated in the study. These comprised of eight (8) librarians with managerial/senior positions from the eight higher learning institutions under review; two (2) officers from UTUMISHI; and two (2) key leaders from Librarians' professional associations i.e. Tanzania Library Association (TLA) and the Consortium of Tanzania University and Research Libraries (COTUL).

When librarians were asked about their status prior to the changes in the scheme of service, some noted that their respective institutions had the academic librarians' cadre. Thus, all the librarians employed were categorised accordingly and for those who went for further studies, promotion criteria adhered to grade point unit (GPA) achievement of either 3.8 in their undergraduate degree programmes and 4.0 in their master's degree. This served as the benchmark or publication points obtained in senior positions. If one failed to meet these requirements i.e. GPA acceptable points, then they could automatically be re-categorised to administrative posts. These institutions included the IFM, the MNMA, the CFR and the IAA.

In other institutions, it emerged that their respective schemes of services had no academic librarians' cadre at all. As a result, they had titles based on those available in their respective institutions. At some point, many urged their respective management to consider adding such cadres to their job portfolio but they were reluctant to do so. As a result, many were categorised as administrative whereas others assumed faculty titles even though their work remained in the library, for example, at the CBE. The CBE has established programmes in librarianship that allow such cadre to teach and continue conducting research.

Additionally, many institutions under NACTVET did not have an academic cadre in their schemes of service and neither did they consider accordingly faculty status because of the smallness of their institutions. Instead, their librarians ended up falling under the label of administrative staff with good salaries and fringe benefits irrespective of their GPA attained during either the undergraduate or postgraduate training. These institutions include Bandari College, the TIA and the IRDP as summarised in Table 1:

Table 1: Status Accorded to Librarians in their Academic Institutions

Institution	Status		
	Academic	Administrative	faculty
Tanzania Institute of Accountancy (TIA)		✓	
Bandari College		✓	
College of Business Education (CBE)			✓
Institute of Rural Development (IRD)		✓	
Mwalimu Nyerere Memorial Academy (MNMA)	✓		
Institute of Finance Management (IFM)	✓		
Centre for Foreign Relations (CFR)	✓		
Institute of Accountancy Arusha (IAA)	✓		
TOTAL	**4 (50%)**	**3 (38%)**	**1 (12%)**

Source: Field Data (2022)

Although some had tried to broach the subject of academic librarians' cadre up, they also noted that management support was so minimal. Worse enough, human resource officers did not give them any indication that they would consider let alone work on it. Finally, most of them chose to stay mum and forfeited their dream of progression. The issue of the status for librarians in academic institutions remains debatable and sometimes contestable without any sustainable consensus. In turn, many of these institutions opted to either offer librarians the faculty status they craved whereas others did not. In cases where NACTVET—the regulator intervened and decided for them, most of the institutions abandoned the librarians affected to fight the status battle individually with their own management. Allen (1984) notes that librarians in many cases are defined by 'industry' rather than 'activity':

> *Public Service librarians are equated with Public Service architects, chemists, engineers etc., municipal librarians with municipal administrative grades; school librarians with school teachers. In private industry librarians are still not formally covered by special awards, no doubt because this is a relatively unorganised and scattered segment of library workers. Also, in academic institutions librarians have been further divided industrially, both between different institutional or within the one institution (Allen, 1984 p.7).*

This is also evident in a statement of an UTUMISHI official explaining the confusion that arose on why the cadre were being removed from the structure of the NACTVET:

> *Academic librarians are only to be [found] in universities and institutions accredited by Tanzania Commission for Universities [TCU] but in institutions under NACTVET this cadre is no longer there and is not supposed to be there. Those were directives that we received.*

Thus, most of the universities still confer the academic status upon their librarians, a privilege that has since been removed from NACTVET institutions. A librarian at MNMA noted:

> *We were told by our human resource officer that our job titles no longer appear in the system, hence we will need to be re-categorised as administrative staff; however, since we have a library programme that the library manages in the Institute, it was easier to convince management to re-categorise (librarians) under academic/faculty staff cadre. After all, we were employed with similar qualifications of meeting GPA requirements. Thus, we received titles of tutorial assistants for those who were librarian trainees, assistant lecturers for those who were assistant librarians and lecturers for those who were librarians.*

Librarians at the IFM, IAA and CFR pursued similar options. At the IFM, librarians met resistance from management, noting that an academician must not only teach but also conduct research and consultancy besides having a favourable GPA. Even though many librarians at the IFM were already engaged in these activities associated with scholarship yet resistance was apparent. One official from UTUMISHI said:

> *Professional librarians are categorised as faculty/academic staff, yet many are neither doing research nor conducting consultancies. And yet they want to be academicians. It's absurd. I don't know why they were given academic status in the first place and I don't see why they should have academic status at all.*

However, subsequently the IFM, IAA and MNMA retained such a status for their librarians. The CFR librarians, on the other hand, were not as fortunate as the head of the library revealed during an interview:

> *At our Institute the news was received with almost joy and relief as many including the management, human resource officers and others never understood why librarians had similar status and salaries as faculty staff. So, no wisdom was used despite recommendations from Human resources personnel from UTUMISHI asking them to categorise us (librarians) as faculty staff. Instead, the library has lost its departmental status and has now been reduced to a unit.*

> *We have not been given letters officially as to which cadres we belong. However, the management has requested for special salaries for all of us who qualified to be re-categorised as faculty but were left in limbo. This development has destroyed our morale for work, love for the profession and even dreams for career progression for many of us.*

In a study on librarianship and the chronic struggle for professional status Garcia and Barbour (2018) noted that professionalising the occupation should strive to convince the public and policymakers of their distinctiveness and legitimacy. Moreover, librarianship as a profession shall sustain this continual struggle as the professional relevance remains complicated, debatable and questioned because of technological advancements, political and economic threats without forgetting its struggle to protect and improve its image and status that has been researched upon for years (Garcia, 2011; Hicks, 2016; Kyumana, 2018; Fraser-Arnott, 2019).

Challenges librarians face in NACTVET accredited institutions

After the removal of the librarians' academic cadre, library staff in these NACTVET institutions have faced several challenges at both the personal and professional level. In the long run, the decision for the removal of the cadre would not only affect librarians in these institutions but also universities, professional associations and long-term sustainability of the library profession would be in jeopardy. To begin with, most of the librarians experienced job dissatisfaction and low morale on the job because they were qualified but without faculty status. Meanwhile, those who had certificates and diplomas in librarianship were drained of all hope of ever rising to the rank of academic librarians in their respective institutions, which appears to be the fate of library staff in NACTVET institutions as the cadre will no longer be included in the official scheme of work.

Moreover, the low status that the profession still endures in Tanzania results in decisions regarding the future and sustainability of the profession being made based on the emotions and not merits. Management in many of these institutions had misconceptions that the librarians were ill-equipped to be academicians despite the provision of evidence by many who had published the research and scholarly work in reputable international and local journals whereas others provide consultancies and training in information literacy and electronic resource management. Others have even established LIS courses and teach in their respective institutions. Yet, doubts persisted rendering librarians at the scrutiny of their value and professional relevance.

Furthermore, the lack of professional sustainability and growth in the long-run were evidenced by two avenues both in professional training and research output. To begin with, even with professional training the promotion of one categorised as an administrative staff depends mostly on experience and not publication or research findings in reputable peer-reviewed scholarly journals. Subsequently, such lack of the required mobility would lower the librarians' thirst for further education, hence likely reducing enrolments and matriculations in universities offering librarianship programmes at the masters and doctoral levels. Furthermore, the research output that such cadre can generate could suffer as they would advance in their respective institutions without recourse to academic publications.

Furthermore, enrolment in librarianship programmes could take a hit in the long-run particularly for those who have been re-categorised as faculty members in institutions where LIS courses have yet to be established. For instance, the IFM would be required to grow in areas of interest to their institutional needs as opposed to the librarianship background that they possess. Consequently, the professional status of librarianship could continue to diminish as the academic cadre available gave the profession its lofty standing in the academic community. In fact, its removal and non-recognition in these institutions would lower even professional standard and stance in academic institutions as libraries would no longer be the heart of an academic institution. Even professional sustainability would be in danger since the remaining few in the professional would suffer from the sheer weight of non-recognition and non-progression in NACTVET institutions.

Professional associations

The Tanzania Library Association (TLA) has been an active professional association in Tanzania since 1973. Its mandate is to safeguard the interests of all library and information personnel in the country. The association strives to bring together all persons in the library/information profession by convening conferences and meetings for discussing matters affecting libraries and information institutions, their regulations, management, or otherwise. Moreover, it seeks to encourage the promotion, establishment and improvement of library and library services in Tanzania and promote bibliographical study and research (TLA, 2004). Significantly, the role of the TLA enumerated in its objectives is to "improve the standard of librarianship and the status of the 1ibrary profession in the United Republic of Tanzania" (TLA, 2004; Wema, 2012). The TLA is not the

sole membership body for library and information profession in Tanzania. Arguably, there is the Consortium of Tanzania University and Research Libraries (COTUL), which is a formal association of academic and research institutions aimed at engaging them in joint information provision activities, particularly in the acquisition of electronic information sources, research, training, consultancy and others deemed critical in the attainment of academic excellence in learning, teaching and research in academic institutions. Even though the COTUL does not directly deal with the welfare of librarians, it needs librarians to serve as its liaison between institutions to obtain funds for electronic resource acquisition, participate in training and promoting local content preservation, archival, dissemination and management using Free and Open-source Software (COTUL, 2022).

Most of the librarians who were affected by the removal of the cadre expected these two library associations to make a statement and, eventually, fight for the academic status of librarians in NACTVET institutions. However, that did not materialise since each institution had been left to negotiate the issue of the status of its librarians on its own through their management, something that has proven futile. Many of these management remained sceptical about the librarians and their professional status. In this regard, one librarian reported that when the issue was too heated and frustration engulfed the librarians as they worried about their future, they reached out to the librarians' forums specifically the TLA through their WhatsApp group, urging the association and other members to intervene but encountered resistance:

> *Where did that information come from? We were asked. We can't be dealing with rumours and feelings as an association. We need a formal communication that was given. This is news that hasn't been heard of in universities and neither has it reached any of us leaders.*

Indeed, when the researcher followed up the issue with management members from both the TLA and COTUL, it was established that both associations had heard about the issue from other librarians. However, they had yet to receive formal communication from either UTUMISHI or NACTVET. One librarian also lamented:

> *This situation has been handled professionally. When we were told that our cadre no longer exists in the UTUMISHI system of employment and, eventually, we were removed from scheme of service, alternative job titles were provided for us by*

> *UTUMISHI. When we demanded official letters from our respective institutions, our pleas went unanswered. In turn, UTUMISHI human resource officers told us they had already issued directives to our officers to either give us the new titles of place us under faculty titles since we had [the required] qualifications. We had no written evidence to fight with. We were left hopeless.*

When such grievances as these arise, professional associations should investigate especially when it affects the image, value and status of the profession regardless of how it was handled. Yet, no action had been taken by either the TLA or COTUL. This is contrary to what Ossai-Ugbah's (2013) study had suggested on the role of professional library associations and institutions aimed at providing opportunities for librarians to meet, share experiences, learn from each other and defend the principles of freedom of information. Additionally, the chairman of the TLA said during a phone interview:

> *We took office in 2022 when this matter was already implemented so we didn't know where to start. But it should be noted that an academic status is not just given…its earned. We fought at the University of Dar es Salaam while I was still at Ardhi University for this status with the university management and we succeeded. But when you look at institutions under NACTVET, some of them are small, hence not deserving of an academic status whereas others have librarians who are not performing core functions of an academician. It's a very hard situation. Perhaps, during either the COTUL or TLA general meeting, this issue should be brought up so that all members can discuss and we can come up with a consensus.*

Notably, the Tanzania Library Service Board (TLSB) is another entity in the librarianship profession in Tanzania which is a public institution under the Ministry of Education, Science and Technology. This institution was established by Parliament Act No. 39 of 1963 known as the Tanganyika Library Services Board. In 1975, the Act was amended where a new Act of Parliament No. 6 of 1975 was created and led to the name of the Institute changing from Tanganyika Library Services Board to the Tanzania Library Services Board. The main goal of the creation of the TLSB was to provide opportunities to all citizens without discrimination of any kind, to use public libraries to get education, knowledge and various information that will help in getting rid of poverty and ignorance and also to get entertainment and maintain culture. The director of the TLSB noted that:

> *The TLSB has heard challenges that librarians faced especially in Institutions accredited under the NACTVET yet they did not have any proof since no official letter was provided prior to implementation of the removal of the academic cadre in these institutions. However, the board noted that its working on it and the issue will be presented to the ministry. Additionally, amendments of the 1975 law are underway and a bill will be presented in parliament soonest, hence librarians shouldn't worry as things will be looking up for the profession, opportunities will increase and the status restored.*

Research shows that most librarians, in particular, when asked about why they joined their respective professional associations, they cited having professional identity since professional associations have wider latitude and influence that could uphold the interest of librarianship and contribute to its improvement in addition to fostering retention, tenure and promotion (Broady-Preston, 2006). As individual efforts to fight for the librarians' status in the NACTVET institutions have proven difficulty, professional associations should try and come up with ways to fight for the academic cadre removed from the official structure of these institutions to be restored and in other institutions to have this cadre so that librarians can fill these positions on merit. Doing so could raise the status and profile of the profession something that the TLSB swore it will do and uphold in the near future in collaboration with professional associations.

Conclusions and Recommendations

Librarians in most of the NACTVET accredited institutions are accorded the administrative staff status in their respective institutions due to their size as some are small colleges whereas others were accorded academic and faculty status. Yet, the decision by UTUMISHI to remove the academic cadre from scheme of services in these institutions resulted in dissatisfaction and the death of a dream that most institutions were fighting for to include librarians with acceptable GPA qualifications into academic status in higher learning institutions to support effectively and efficiently the teaching, research and consultancy functions of most of higher learning institutions in Tanzania. With the changes brought about by the removal of the academic librarians' cadre in the NACTVET institutions, most of the librarians contented with challenges, which include being re-categorised as administrative staff, hence losing the academic benefits that some had hitherto enjoyed, which had included teaching and conducting research. The other effects included the loss of morale for the job as most were dissatisfied with the decision yet there was nothing else they could do. At the same time, those

who had been accorded faculty status lost their professional identity and standing as in some institutions had no librarianship programmes on offer to warrant such designation. Hence, many were required to teach non-specialised subjects that cut across all the courses, for instance, development studies and research methodology. Finally, other institutions were reluctant to support academic librarians to pursue further education in librarianship since such cadre in those institutions had been officially 'outlawed'. Hence, this resulted in either changing career course to suit faculty needs or request for transfer into universities where the cadre still exists that they can progress career-wise.

In the light of these challenges and status dilemma, most of the librarians recommended a unified voice in fighting for the restoration of academic status cadre in the NACTVET accredited institutions. Moreover, they called for the professional association to expand their coverage to the provision of professional certification for librarians which in turn could raise the profile and status of the profession, marketing and educating the public about librarianship. At the moment, ICT professionals seem to be more attractive to employers with the hopes of being assisted to access digital contents better than librarians ever could. Finally, the COTUL and TLA should revert to collective bargaining to re-negotiate with UTUMISHI and the NACTVET for the academic librarians' cadre to be restored for those with requisite qualifications to be rewarded accordingly. This course of action is imperative for the sustainability of the librarianship profession in the academic contexts of the NACTVET. At the same time, the TLSB should speed up the amendments of the law (i.e. Act No. 6 of 1975 which established the TLSB) process to give it more mandate. This will enable the TLSB to create its own accreditation board which in turn will raise the profile of the profession in Tanzania and give it a lofty standing in the academic community and the country at large.

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University Students' Motives and Challenges in Utilising Institutional Repository Resources

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Abstract

One of the core functions of an academic institution is to generate knowledge, disseminate to the intended audiences and preserve it for future use. Academic institutions are now establishing Institutional Repositories (IRs) to collect produced resources to facilitate accessibility, dissemination, utilisation and management of intellectual materials that are produced within an institution. The purpose of this study was to assess postgraduate students' motives for utilising IR resources and also the challenges they encounter when utilising IR resources at the University of Dar es Salaam. This study was conducted using a descriptive study design whereby it used both qualitative and quantitative research approaches. The population of this study comprised postgraduate students, librarians and ICT personnel from the University of Dar es Salaam. A sample of 102 respondents was drawn conveniently and purposively for this study. Data were collected through questionnaire, interview, as well as a review of documentary sources. Quantitative data were analysed through a Version 16 Statistics Package for Social Science (SPSS) and qualitative data were analysed using content analysis. The findings indicate that access to full-text documents, the relevance of IR resources and easy searching of the materials in the repository system motivate the utilisation of IR resources. However, several challenges impede the utilisation of these resources including unreliable internet access, inaccessibility of full-text and lack of guiding policy have been revealed as the major challenges toward utilisation of IRs resources. The study recommends training postgraduate students on the general use of IRs. Also,

the University management should develop an IR policy that will guide the utilisation IR resources.

Keywords: Repository, Institutional Repository, scholarly resources

Introduction

The utilisation of information material mostly depends on how it is displayed, presented, or marketed to the intended group to ensure its use (Omeluzor, 2014). The need for scholarly and other informational resources among postgraduate students is indispensable as far as learning and research are concerned (Kaggwa & Sekiwu, 2017). The emergence of IRs has been significant in facilitating access, dissemination, utilisation and management of scholarly information (Omeluzor, 2014). Academic institutions through their libraries have been increasingly establishing institutional repositories to support the utilisation of scholarly informational materials generated by researchers in the respective institutions (Saini, 2018). Therefore, the purpose of establishing institutional repositories is to foster the utilisation of scholarly materials produced by members within an academic and research institution (Russell & Day, 2010). The establishment of institutional repositories has been amplified by the advent of Information and Communication Technology (ICT). The rapid advancement of internet technology and the adoption of open access movement have influenced changes on how researchers conduct and share their research findings locally and internationally (Tandi Lwoga & Questier, 2014). Institutional Repository (IR) refers to an online database used to archive important educational and research works (Ukachi, 2018).

Background to the Problem

In the past few decades, scholarly output generated by institutional members and students were just kept in university libraries which were made accessible only by patrons who visit the library hence, limiting their utilisation (Wangui, 2018). The advancement of the World Wide Web coupled with Open Science (OS) initiatives has led to the establishment of systems such as repository software which are used by academic and research institutions to harvest and disseminate locally produced intellectual materials. Digital copies of research materials produced by students including theses and dissertations are made available through institutional repositories to enhance their visibility hence, utilisation (Kato, Steinhauer, Kisangiri, & Kaijage, 2021). However, literature has indicated that the utilisation of IR resources is still low. For example, the statistics of the University of Dar es Salaam (UDSM) library repository that was pulled between November

2020 and April 2021 indicated that usage statistics for six months show that only 479 materials from business school abstracts were viewed while 787 from the college of social science, 637 from the school of education to mention the few (UDSM research repository, 2021). Comparing the population of the UDSM, the numbers of views are extremely low.

It is an undeniable fact that before the advent of Information and Communication Technology (ICT), access to scholarly materials was limited. As a result, users encountered difficulties in accessing scholarly materials, which lead to under-utilisation of the contents (Mnzava & Chirwa, 2018).

The establishment of IRs in higher learning institutions' libraries was believed to mitigate the problem of access and utilisation of locally produced informational materials of an academic institution. According to Muneja and Ndenje-Sichalwe (2016), the adoption and use of repositories in Tanzania can be traced back to 2008 when the initiatives of establishing IRs began through sensitising librarians and information professionals to establish IRs in the country whereby the first IR was launched in 2012 by the Open University of Tanzania (OUT), followed by Ifakara Health Institute (IHI) in 2012. Other repositories followed were hosted by Muhimbili University Health and Allied Science (MUHAS) in 2012, Aga Khan University 2013, Sokoine University of Agriculture (SUA) in 2015 and UDSM in 2016. By 2020, Tanzania had registered 14 IRs on Sherpa Romeo https://v2.sherpa.ac.uk/romeo/. The drive for establishment of IRs in Tanzania was influenced by the need to accessing locally produced scholarly contents. Not only that buut also it was triggererd by the need of preserving massive informational resources produced by members of the institution as well as repositories being considered as an avenue for supplying the research community with scholarly materials (Isibika & Kavishe, 2018).

Other materials archived in the repositories include but are not limited to meeting proceedings, course materials, knowledge management tool, research assessments and showcasing an institution's research output (Fasae, Esew, & Holmner, 2017). However, with all the effort made to operationalise repositories, evidence shows that they are still underutilised. In the study conducted by Makori, Njiraine and Talam (2015) on the practical implementation of institutional repositories at the University of Nairobi, research output produced in Africa are underutilised compared to those from developed countries. Also, in their study usage of SUA IRs among academic staff showed that many repositories in higher learning institutions like SUA IRs had not succeeded in terms of the utilisation of its

available local scholarly resources. Therefore, it is important to assess the utilisation of institutional repository resources.

Literature shows that many academic institutions are adopting and maintaining IRs to archive, preserve and share scholarly and other informational materials among researchers and students (Mnzava & Chirwa, 2018). Similarly, the UDSM established an IR for the same purpose of sharing/disseminating scholarly materials to the global research community. With all the efforts and strategies to establish and adopt IRs in academic institutions, literature has revealed low utilisation of IR resources among academics and researchers in higher learning institutions. Considering IRs as one of the very important tools for facilitating access to scholarly materials, this shows that it has not yet played the expected role in facilitating the access and utilisation of scholarly content at the UDSM. This study, therefore, uncovers the factors that motivate postgraduates to use the repository and the obstacles the users may face while utilising the IRs.

Objectives of the Study

The general objective of this study was to assess the utilisation of IRs scholarly resources by postgraduate students at the UDSM. Specifically, the study intended to:

i. To find out the factors motivating the utilisation of IR resources among Postgraduate students at UDSM
ii. To identify challenges facing postgraduate students' utilisation of IR resources.

For users to effectively utilise IR resources, several factors need to be considered including making users aware of their availability, types and mode of uploaded information materials to facilitate their academic and research activities (Kodua-Ntim & Fombad, 2020).

Literature Review

Factors that motivate utilising Institutional Repository resources

The purpose of establishing an IR is to meet the demands of users. However, there are several factors that motivate users to use utilise IRs. Different scholars have studied motivational factors for the utilisation of IRs from an empirical and theoretical point of view. Rifai and Hasan (2016) conducted their study using the Unified Theory of Acceptance and Use of Technology (UTAUT) model. They came up with a conclusion that the fulfilment of expected results in utilising an IRs is one of the motivational factors for utilising them. The UTAUT model,

when a user is able to access the available IR resources, she/he gets motivated and for this case, the user will continue utilising the repository (Puspitasari, Firdaus, Haris, & Setyadi, 2019).

A study conducted by Gunasekera (2017) on motivational factors for researchers' contribution to IRs and their awareness of open access publishing revealed that factors such as consistent assurance of remote access and availability of full-text content motivated the utilisation of IR resources. A study conducted by Abdelrahman (2017) on the use of University of Khartoum IRs by postgraduate students reveals that regular sensitisation of IRs motivated users to utilise IRs that has led to libraries in respective institutions to implement the sensitising programmes to ensure continuity of IR utilisation.

A study conducted by Mnzava and Chirwa (2018) on the usage of SUA IRs in Tanzania reveals that the availability of reviewed local scholarly information from known reputable scholars is a factor that motivates users to utilise IR resources. Furthermore, findings documented by Shuhaiber (2016) revealed that free access to information has been one of the factors that motivate students to use scholarly resources including those available in their respective repositories. The study about IRs adoption and use in higher learning institutions in Tanzania found that good and enriched scholarly information which fulfils academic needs motivates users to utilise IR resources (Nunda & Elia 2019). Observations made in the reviewed literature suggest that there are different factors that motivate users to utilise IR resources. The literature has revealed such factors as access to scholarly materials especially full-text documents, availability of materials in the IRs from renowned authors and publishers, free access to IR materials and timely training. All factors are important in facilitating the utilisation of IRs.

Challenges facing postgraduate students' utilisation of IR resources

Despite the importance of IR scholarly resources in facilitating teaching, learning and research, there are observed challenges in accessing and utilising such IR scholarly resources as poor advocacy of librarians towards users, failure of lectures to assign students direct to repository resources, wrong perception towards repository materials, insufficient information searching skills and poor internet connection. In that regard, Adedapo (2020) revealed that the access process of the IR scholarly resources is hindered by the lack of sufficient information about IR scholarly resources, inadequate ICT infrastructure,

copyright breaching issues and media deterioration which in one way or another lowers effort towards effective use of IR scholarly resources.

Vardakosta and Kapidakis (2017) argue that accessibility to IR scholarly resources by postgraduate students is affected by housed collections and poor technical support facilitates access to resources. Jabbar, Saqib and Muhammad (2020) studied awareness and use of open-access resources among the library users of Cochin University of Science and Technology (CUSAT). They found that library users including postgraduate students face challenges in accessing IR scholarly resources. The challenges include difficulties in repositories' interface resolutions, lack of enough instructional programmes and lack of training as well as poor searching skills. Swanepoel and Scott (2018) carried out a study about Canadian and South African scholars' use of IRs, ResearchGate and Academia.edu. They revealed that few scholars, postgraduate students inclusive, actively need to access IR scholarly resources because they had little knowledge, inadequate time and copyright infringement issues have been challenging.

Furthermore, Samir (2017) researched about open repository in Algeria, Morocco and Tunisia. The author indicated that inadequate knowledge on the presence of IR scholarly resources among students is attributed to the lack of informed ideas about access to scholarly information due to the lack of policies that guide access to scholarly resources and open publishing in general. A study by Yonah (2014) indicated that the pace for the adoption and use of IR materials in Tanzania is still not satisfactory since it is reported to be low as compared to the number of institutions that have repositories due to poor advocacy of information professionals in raising awareness towards users. Nunda and Elia (2019) did a study about adoption and usage of IRs in developing countries and found that, among others factors, poor searching skills and poor internet connectivity were highly observed as delay to IR resources utilisation. They further noted that the lack of awareness of the offered services, limited technical expertise as well as lack of enough resources hindered the utilisation of IRs.

Joo, Hofman and Kim (2018) examined challenges in academic IRs based on a survey of academic librarians and found that inadequate budget and staff and poor management support were the challenges to the full utilisation of IRs. Abrizah *et al.* (2015) examined motivating and impending factors in IRs based on a survey of 47 library and information science faculty who had prior experience contributing resources to an IR. Findings show that the lack of guidance policy

and signed agreement or permission to use research outputs of its students and institutional members led to fear of being held accountable or charged for uploading them to repositories for access.

Ukwoma and Ngulube (2019) assessed the obstacles to the utilisation of IRs by academics in higher education in Nigeria. The findings showed that the key barriers to the utilisation of IRs which were the lack of enough infrastructure, lack of institutional repository scholarly resources knowledge and lack of frequent sensitisation programmes. In a similar context, Ashraf and Haneefa (2017) indicated the scholarly use of open-access resources by research scholars such as postgraduate students due to the inadequate hand on support as well as dominant knowledge of IR scholarly resources.

On a further note, (Kotoroi, 2018) revealed that postgraduate students' the lack of intention to share the research output has also been a challenge towards the utilisation of IR scholarly resources. Since the presented challenges are more institutional-based, this study further examined postgraduate students' challenges towards the utilisation of IR scholarly resources. Revealing users' challenges assist in balancing the contributing factor to challenges facing the utilisation of resources in most IRs.

The above reviewed literature presented different challenges that hinder intensive utilisation of IRs such as for advocacy of information providers in creating awareness, wrong perception towards IR, unwelcoming internet availability and speed revealing that it is more institutional challenges than users'.

Methodology

This study used a descriptive study design whereby both qualitative and quantitative research approaches were used. The population of this study comprised postgraduate students, librarians and ICT personnel from the UDSM. A sample of 102 respondents was drawn conveniently and purposively for this study. Primary data were collected using self-administered semi-structured copies of questionnaire which were distributed and collected data from ninety-six (96) postgraduate students at the UDSM main campus. Interviews were conducted with six (6) UDSM staff, namely four library staff and two ICT personnel. Interviews were conducted with the selected individuals since they are key informants to the study and therefore, they provided detailed insight into the study variables. Secondary data were collected through reviews of information including but not limited to articles, journals, policies and reports.

Qualitative data were arranged thematically and analysed using content analysis while quantitative data were analysed quantitatively through the aid of Statistical Product and Service Solution (SPSS) version 23. Analysed data were presented using tables, figures and graphs in which frequencies and percentages were shown.

Results and Interpretation

This section presents the findings based on demographic data and the objective of the study that investigated motivating factors for utilising IR resources and the challenges faced by postgraduates students for that purpose. The findings are interpreted followed by the discussion in the subsequent section. Demographic information of the respondents is presented based on gender, age, education level and school/college where the respondent is affiliated. The findings in Figure 1 reveal that majority of 63 (61.8%) respondents were male whereas female were 39 (38.2%) respondents.

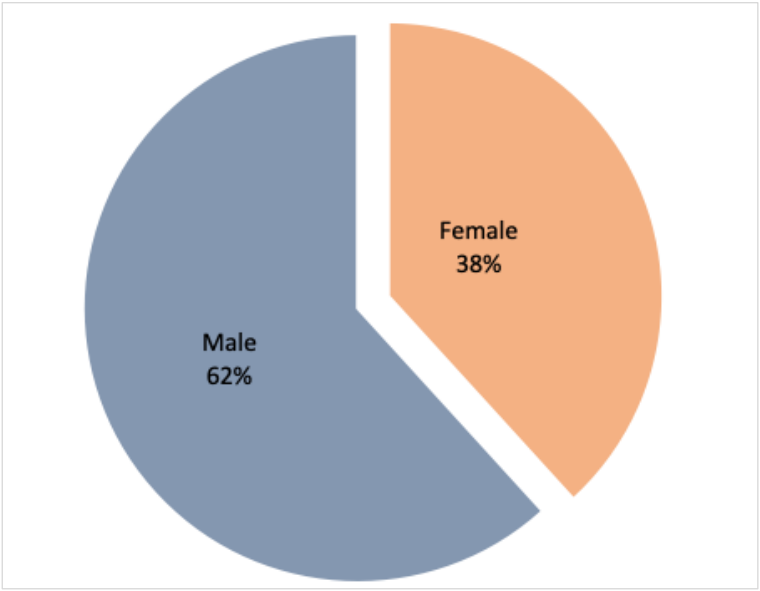


Figure 1: Distribution of respondents by gender (n=102)
Source: Researchers Field Data (2022)

The findings show that there were more male postgraduate students compared to female. The findings correspond Adebayo, Ahmed and Adeniran (2019) who also had more male postgraduate students (75 %) than female. Adedapo (2020) observed that male students have more chances to pursue postgraduate studies

compared to female students. Findings indicate that students who manage to climb the radar of education up to postgraduate level are mostly male students compared to female ones. This can generally be explained by the fact that gender roles and responsibilities influence the participation into postgraduate studies.

Distribution of respondents by age

Respondents were requested to indicate their age ranging from 20 years old to 50 years and above. The endings as indicated in Table 1 show that majority of respondents 48 (47.1%) were in the age group of 30 to 39 years. They were followed by 29 (28.4%) of respondents who were in the age group of 20 to29 years, 23 (22.5%) respondents were in the age group of 40 to49 years, while only 2 (2%) of respondents were in the age group of 50 years and above.

Table 1: Distribution of Respondents by Age (n=102)

Category	Freq.	%
20 - 29 years	23	22.5
30 - 39 years	48	47.1
40 – 49 years	29	28.4
50 and above	2	2
Total	102	100

Source: Researchers Field Data, 2022

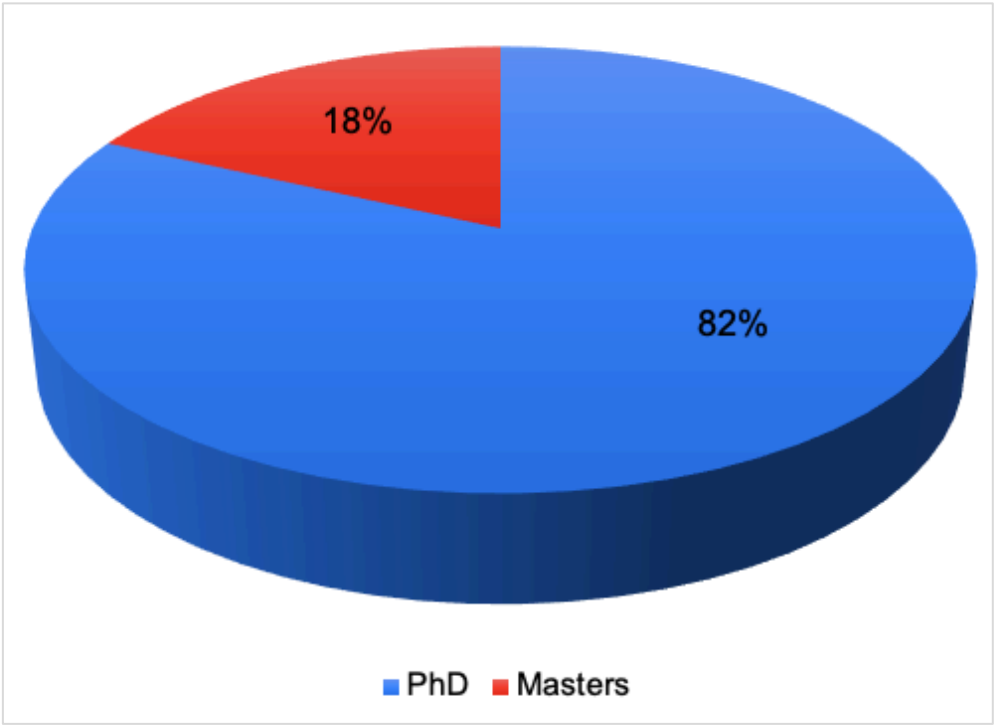
Findings in Table 1 reveal that most of the postgraduate students involved in this study were youths below 40 years. These findings can be justified with the education in Tanzania whereby the formal schooling system requires students aged around 25 years old to be enrolled in the University education in which 3 to 5 years training period is required to accomplish bachelor studies before they joins postgraduate studies at an age of around 30 years (Weaver, 2011). However, it is not surprising to see that there are a few who may join postraduate studies in their 50s as it is difficult to get permission from most employers to undertake long term studies as the remained age for serving in that particular institution is much less and therefore the output of needed postgraduate education cannot be realised (Napathorn, 2021).

Distribution of respondents by level of education

Since this study involved postgraduate students, it was important to identify the specific level of postgraduate studies to which each respondent belonged. The

Findings reveal that the majority (82%) respondents were pursuing a Master's Degree while only (18%) of respondents were pursuing a PhD, as presented in Figure 3.

Figure 2: Distribution of respondents by level of study (n=102)



Source: Researchers Field Data (2022)

The findings in Figure 2 indicate that most respondents were in the master's level and only few were PhD students. This could be because most postgraduate students who pursue their studies at the master's level at the UDSM undertake their studies both in coursework and dissertation. Therefore, they are readily available at the University premises as opposed to PhD candidate's studies who pursue their degrees by thesis which allows them to be on campus occasionally. On another note, the number of PhD students corresponds to the education pyramid that the higher study level you go, the smaller number of students it becomes. This could also be aligned to what Fasae *et al.* (2017) established that financial constraints, lack of qualifications, lack of access to mentor-ship and appropriate support are some of the factors that determine PhD studies.

Motivating factors for utilising IR resources

This study intended to find out motivating factors that determines utilisation of IR resources among postgraduate students at the UDSM. The respondents were requested to indicate the motivating factors for the utilisation of repository resources. The findings show that 86 (84.3%) respondents indicated that access to full-text materials from the repository was one among factors that mostly motivated the utilisation of repository resources. The findings are similar to what interviewee R3 said:

> *In our Institutional Repository, we upload abstracts only since the rules do not allow us to upload full text. This has been disturbing students when they search and find good documents but only available in abstract forcing them to come to East Africana psychically to search for that document in hard-copy.*

In addition, 86 (84.3%) respondents felt that relevance of IR materials to their studies is one of the motivational factors on utilisation of IR resources. This is supported by the interviewee number (R3) who said:

> *Our repository contains relevant materials which reflect the study topics offered by the University and therefore whenever the postgraduate students search for scholarly information materials, they find related materials to the study topic although no full text content. Therefore, relevant material plays the big roles in supporting utilisation of repository resources.*

Apart from that, 80 (78.4%) respondents indicated accessing IR materials off-campus/remotely as a factor that motivates them to utilise them. Furthermore, 83 (81.4%) the respondents mentioned easy searching and retrieval of the scholarly content as the factor motivating the utilisation of repository resources. Besides, 75 (73.5%) respondents mentioned regular updates of new materials for reference as the factor motivating utilisation of repository resources. Furthermore, 73 (71.6%) respondents mentioned user friendliness as the factor motivating the utilisation of repository resources as indicated in Table 2.

Table 2: Factors influencing utilisation of IR resources (n=102)

Factors	Frequency Yes %		Frequency No %	
Access to full-texts IR materials	86	84.3	16	15.7
Relevance of IR resources to postgraduate studies	86	84.3	16	15.7
Easy searching and retrieval of the scholarly contents	83	81.4	19	18.6
Accessing IR resources off-campus/remotely	80	78.4	22	21.6
Regular updates of new IR materials	75	73.5	17	22.5
Repository user friendliness	73	71.6	29	28.4

Source: Field Data (2021)

Rating the factors that influence utilisation of UDSM IR resources

Respondents were asked to respond to the five statements on how they apply to them in the course of interacting with UDSM repository: I get access to full-texts from IR, I access to IR resources remotely, IR materials are relevance to my studies, there is easy searching and retrieval and the resources are regularly updated. Reactions to the statement were rated using Likert scale from 1. Strongly agree to 5. Strongly disagree as indicated in Table 3. The findings show that 67 (65.7%) respondents disagreed that they had access to full-text materials from the repository. Accessing IR remotely could not get much popularity as it was rated below average on either those who agreed or disagreed. Over half of all respondents that is 52 (51.0%) agreed that the content accessed through the IRs was relevant to their studies while 58 (56.9%) respondents disagreed that searching for IR materials was easy and user friendly. Furthermore, 61 (59.9%) respondents disagreed that IR materials were regularly updated.

Table 3: Rating the factors that influence utilisation of UDSM IR resources (n=102)

Factor	Strongly agree		Agree		Neutral		Disagree		Strongly disagree	
	F	%	F	%	F	%	F	%	F	%
I get access to full-texts from IR	6	5.9	25	24.5	4	3.9	37	36	30	29.4
I access to IR resources remotely	9	8.8	36	35.3	13	12.7	21	21	23	22.5
IR materials are relevance to my studies	12	11.8	40	39.2	10	9.8	24	24	16	15.7
There is easy searching and retrieval	7	6.9	22	21.6	15	14.7	33	32	25	24.5
The resources are regularly updated	9	8.8	17	16.7	8	7.8	15	15	53	51.9

Source: Field Data (2021)

Challenges of utilisation of IRs

The respondents were requested to identify the challenges they face them when IR resources. The study findings shown in Table 4 reveal that 82 (82.8%) respondents indicated that the UDSM internet was slow. Besides, 82 (82.8%) of the respondents said that they could not get full text documents. At the same time, 70 (70.7%) respondents indicated that they had little knowledge on how to retrieve repository resources, whereas 70 (70.7%) respondents indicated that resources took long time to open. Moreover 59 (59.6%) respondents said that they had never came across any repository policy at the UDSM whereas 44 (44.4%) respondents indicated that materials were not relevant to their studies.

Table 4: Challenges facing utilisation of IR resources (n=102)

Challenges	Frequency Yes %		Frequency No %	
The internet is always slow	82	82.8	20	17.2
I don't get full-text document	82	82.8	20	17.2
I have little knowledge on how to retrieve IR resources	70	70.7	32	29.3
The resources take long time to open	70	70.7	32	29.3
Lack of IR policy	59	59.6	43	40.4
Materials are not relevant to my study	44	44.4	58	55.6

Source: Researchers Field Data (2022)

Unreliable internet connectivity was also cited by an interviewed librarian (R4) who said:

> *Internet problem has been on and off each working time and sometimes it is embarrassing every time students face us asking for internet solution. There is a serious need to improve the availability and speed of internet towards effective the*

> *utilizstion of repository resources and other online services as the current internet is not always available and not speedy as well.*

The lack of access to full-text in the repository was also a concern of R4 who said:

> *The absence of full texts documents in the UDSM IRs has been a challenging issue to most users as they get disturbance to make physical visits to the library (East Africana) to find the same materials which were seen as an abstract in the digital repository.*

Ways of overcoming IR resources utilisation challenges

The respondents were requested to indicate ways that could be used to overcome challenges for the utilisation of repository resources. The findings as indicated in Table 6 show that the majority 95 (94.1%) respondents mentioned training on how to access repositories, 91 (90.1%) respondents mentioned improving internet availability, while 89 (88.1%) respondents mentioned link to repository should be displayed openly. On the other hand, 81 (80.2%) respondents mentioned the provision of trainer guides could remedy the problem of the utilisation of IR resources.

Table 5: Ways of overcoming IR resources utilisation challenges (n=102)

Proposed Issues	Frequency Yes %		Frequency No %	
Training on how to access IRs	95	94.1	7	5.9
Improve internet availability	91	90.1	11	9.9
Links to repository should be displayed openly	89	88.1	13	11.9
Trainer guides	81	80.2	21	19.8

Source: Researchers Field Data (2022)

The findings indicate the lack of IR sensitisation programmes that the building capacity of postgraduate students to equip them with skills to effectively interact with IR systems. The findings were also similar to R3 who said:

> *Training on how to access repository resources could be of much help among the UDSM users as for current we have no programmed sessions that we can teach users on the appropriate utilisation of repository resources except during new year's orientation time only. The orientation training on available resources is not ideal time to teach students on information resources especially Institutional Repository resources since during that period they are new to university life and*

has not settled for studies it become difficult for them to understand and capture the training of such new terms.

Discussion

This study has revealed that access to full-text documents, relevancy of IR resources to postgraduates' studies and ease of searching materials in the repository were perceived to be the major factors that influence the utilisation of IR resources. However, other factors such as accessing IR resources remotely, accessing regularly updated repository materials and user-friendliness of the repository system were also considered important. The need for accessing full-text materials by postgraduate students in the repository indicates their curiosity to explore information which can be useful in their studies. The findings are similar to Armstrong (2014) who observed that one of the factors that motivate users to utilise IRs is the access to full texts as opposed to the provision of metadata only which inhibits users' active the utilisation of repository resources. A study conducted by Robinson (2019) revealed that access to full text attracts more users in utilising IR resources, while the opposite disappoints them.

Having materials in IRs which are relevant to a specific group of researchers is also important. Postgraduate students would probably wish to access research materials vital in their own areas of specialisation. In this study, respondents cited the relevance of repository resources as their motivational factor for the utilisation of repository resources. This is relevant to Shiweda (2018) who assessed the usability of institutional repositories by postgraduate students in Namibia and observed that the relevance of IR materials motivates postgraduate students to use those resources. Likewise, Ogenga (2015) indicated that the relevance of institutional repository is organised according to the courses offered. Therefore, it is an intuitive factor for the utilisation of the respective repository. This is true to Wangui (2014) who found increased usage of IRs by postgraduate students at St. Paul's University as the materials they accessed were useful to their studies.

On a similar note, easy searching and retrieval of scholarly content have been noted as another important factor for the utilisation of repository resources. This has something to do with the way the IR system organises its contents hence making it easy to search and retrieve contents from the repository. The findings are in support of Isibika and Kavishe (2018) who observed that easiness of access to local scholarly resources has been a motivating factor for the utilisation of repository resources among users. This is in line with the findings that reveal that

accessing IR materials while off-campus motivates users to utilise repository resources. The findings imply that the nature of studies that postgraduates undertake requires accessing IR resources remotely as it is convenient in utilising the information regardless of the geographical location at any time as long as they are connected to the internet. Findings are consistent with Nyakweba (2016) who revealed that University students including postgraduates are motivated with accessing electronic resources including repository materials while off-campus and therefore fostering the utilisation of such resources. It further shows that accessing repository resources remotely is preferred by postgraduate students as they are not bound to be stationed at the University's main campus to access them. Generally, there are several factors that motivate postgraduate students to utilise IR resources. This calls for decision-makers to pay attention to these factors to design repository systems which are responsive to the required services by postgraduate students and other users to optimise the utilisation and impact of IR resources.

The findings have further revealed several challenges that hinder the effective utilisation of IR resources including unreliable internet networks, inability to access full-text and lack of repository policy as major obstacles that hinder effective utilisation of IR resources. Unreliable internet connectivity has been cited as the most challenging issue that affects the utilisation of IR resources. The study about challenges in access and retrieval of electronic resources at UDSM by Mbwana (2019) revealed low internet connectivity that accounts for 2 megabytes per second dedicated to users that cannot accommodate a massive number of available students at the University. On a similar note, Samzugi (2019) conducted research on information users' preference for the use of print and electronic resources in selected Universities in Tanzania and noticed that poor internet connectivity was among the challenges in the utilisation of electronic resources.

The inability to access full text is one of the challenges that postgraduate students face when accessing IR resources. This is because most of the available materials only have abstracts, hence impeding their urge for the materials they need. The provision of abstract only demotivate users to the utilize repository resources. The lack of a repository policy that guides the implementation of IR was said to be one of the factors impeding the utilisation of IR resources at UDSM scholars. The findings have indicated a lack of IR policy or if it is there it is not well-communicated to users. As a result, rules and conditions for utilising IR resources remain unknown. Samzugi (2019) documented a similar observation, who

observed the lack of IR policy at UDSM. Therefore, the lack of a repository policy is the issue that the University needs to address to make its repository useful to users including postgraduate students.

Conclusions and Recommendations

This study has revealed various factors that motivate users to utilise IR resources including access to full-text, the relevance of IR resources and easy searching and retrieval of the materials. However, several challenges impeding utilisation of IR resources; they include unreliable internet access, access to full text and lack of guiding policy. These have been revealed as the major factors. The sensitisation of how users including postgraduate students can effectively utilise IR resources is inevitable. The creation of a mechanism to facilitate access to full-text IR resources is considered to be one of the solutions. Also, the University ought to increase and improve internet access to optimise the utilisation of IR resources. Furthermore, the establishment of an IR policy will provide guidelines on the implementation and use of the repository making it useful to all users at the University and beyond.

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Digitisation of Theses and Dissertations in Academic Libraries in Tanzania: Lessons Learned from the Muhimbili University of Health and Allied Sciences Library

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Abstract

Digitisation projects are becoming increasingly popular in academic, public and special libraries. Libraries are either digitising previously acquired hard copies or building digital libraries or institutional repositories by submitting electronic copies to the repositories. Thus, digitisation of library materials is critical to increasing material visibility and accessibility. Digitisation has received attention with the goal of allowing greater access. Nevertheless, it is sometimes hampered or limited by a number of factors; they include existing policies, structures, skills and financial capability. The goal of this paper was to gain a better understanding of the strategies, challenges and issues involved in the digitisation of theses and dissertations through lessons learned from the Muhimbili University of Health and Allied Sciences (MUHAS) library. This study sought to determine the successes as well as the difficulties encountered during the digitisation of theses and dissertations at MUHAS library and to recommend possible way-forward strategies. This paper used a mixed-methods approach, including participatory observation and in-depth interviews to highlight the challenges and successes of the MUHAS digitisation project. Purposive sampling was used to identify key informants who were previously and currently involved in MUHAS digitisation activities. In this study, six former project employees and eight current project employees were interviewed. The MUHAS Institutional Repository (IR) has 2,590 publications, 1,492 of which were theses and dissertations, accounting for 58% of all publications uploaded to the IR. On the other hand, hard-bound theses and dissertations converted to digital form accounted for 55% of all theses and dissertations. The project was the first in Tanzania to establish an institutional repository and the first to develop and implement an institutional digitisation policy. Nonetheless, the project significantly aided in raising the university's research profile, as MUHAS was ranked first in the country in 2016. The lack of skilled personnel, slow internet connectivity, negative perceptions of library staff and insufficient equipment and facilities hampered the project. Nearly 85% of the institutional collection of theses and dissertations were successfully digitised by the MUHAS digitisation project. Regardless of the difficulties encountered, the project gained valuable experience on how to mitigate the ideal difficulties and issues.

Introduction

Digitisation projects are becoming increasingly popular in academic, public and special libraries. Libraries are either digitising previously acquired hard copies, or building digital libraries or institutional repositories by submitting electronic copies to the repositories. Thus, digitisation of library materials is critical to increasing material visibility and accessibility. Digitisation has received attention with the goal of allowing greater access, but it is sometimes hampered or limited by a number of factors. These include existing policies, structures, skills and financial capability (Kipaan, 2012). Given the fact that lending restrictions in libraries have significantly impacted access to theses and dissertations, digitisation of these library materials offers a great opportunity for libraries to build collections with unrestricted access. Tanzania is rapidly digitising printed library materials (Muneja, 2010). However, this move has received a lot of attention and importance in academic libraries in Tanzania, where most digitisation projects are being carried out. Most academic libraries have prioritised digitising theses and dissertations among other library materials. At the Muhimbili University of Health and Allied Sciences Library (MUHAS), the digitisation project began by focusing on the conversion of print theses and dissertations in 2012. Many other academic libraries in Tanzania have embarked on digitisation projects. Nevertheless, little is known and documented about challenges and accomplishments experienced along the way.

Practical experiences from the MUHAS library digitisation project are highlighted in this paper. These include how it has evolved since the project's inception in 2012. This paper attempts to contribute to the body of knowledge regarding the challenges and opportunities associated with digitisation of such research materials as theses and dissertations, as well as presenting strategies for successful digitisation.

Study Objectives

The general objective of this paper was to gain a better understanding of the strategies, challenges and issues involved in the digitisation of theses and dissertations through lessons learned from MUHAS.

Specific objectives

This study specifically aimed at:

i. determining the successes in the digitisation of theses and dissertations at MUHAS library;
ii. ascertaining the difficulties encountered during the digitisation of theses and dissertations at MUHAS Library; and

iii. recommending strategies and prospects for digitising theses and dissertations in Tanzanian academic libraries.

Literature Review

Current issues and problems in digitisation

Information from governments, private sectors and scholars is increasingly appearing online and being demanded electronically. This creates a new environment and posing new challenges to the library and archival profession (Asogwa, 2011). It increases the pressure on information professionals; it also creates an urgent need to keep up with developments in the global archival environment. Many African libraries are still occupied with materials recorded in physical formats. Traditional librarians are in charge of acquiring, organising and preserving print documents, as well as assisting readers in finding the information they need (Asogwa, 2011). This movement has changed rapidly in developing countries as a result of advancements in computer technology. Physical materials are gradually giving way to electronic print; online repositories are replacing the need for users to visit library or archive buildings to access their collections. Therefore, digital archiving and creation of digital archives have emerged as a new practice in the library and archival profession. This is made possible by technological advancement, which provides more opportunities and challenges to librarians, archivists and information professionals.

Approaches to African digitisation projects

The majority of African digital initiatives are collaborative in nature. The Digital Imaging Project of South Africa (DISA), for example, is a collaboration of South African librarians, archivists and scholars. Another example is Kwetu.Net which has brought together African governments and universities as partners to create an East African full-text database (Amollo, 2011). The University of Nigeria launched a digitisation project to preserve its intellectual property. This includes research theses, conference proceedings, seminar papers, colloquia, research publications and inaugural lectures (Ezeani, 2009).

According to Asogwa (2011), the success of digital projects in Africa is dependent on good project management rather than expensive technology. Technology should not drive digital projects; rather, goals should be established first, followed by the selection of appropriate technology. When embarking on digitisation projects in developing countries, certain factors must be considered. These include such factors as planning, setting goals, developing digitisation policies, legal/copyright issues, selection criteria and metadata quality, among others.

Digitisation can be done in-house or outsourced. Digitising in-house implies that an institution's department captures the images, providing hardware and software, trained personnel and overhead. Outsourcing entails contracting with a vendor who will receive the images, convert them and return the originals as well as the necessary digital files. When embarking on a digitisation project, both in-house and outsourced options should be considered (Note, 2011). The scope, nature, fragility and uniqueness of the materials, the project budget and institutional resources will all influence whether digitisation is done in-house or outsourced

Note (2011) asserted that information professionals take their roles as overseers of the collections entrusted to them seriously; they have to ensure that information assets are safe and accessible to users. The increased demand for online access to collections, combined with limited fiscal and staff resources, makes balancing the two a constant challenge. Defining explicit goals at the start of a digitisation project will ensure its success and sustainability. Before beginning the project, staffing and financial resources must be assessed and the project's goals must be realistic in relation to the resources available.

Africa's digitisation challenges

Several studies have affirmed that only a few university libraries in Africa, particularly in Tanzania, have embarked on digitising their information assets (Baro *et al.*, 2013). The primary goal of the existing digitisation projects is to increase global access to local content. However, digitisation projects face such challenges as unstable internet connectivity, lack of funding, erratic power supply, gathering materials for digitisation, lack of IT personnel, lack of digitisation policies and copyright issues (Amollo, 2011; Asogwa, 2011; Eke, 2011; Ezeani, 2009). Digitisation has the potential to revolutionise how libraries access, store, disseminate and preserve information. Academic libraries digitise their collections to increase public awareness, education and research initiatives.

Scientific literature exists in South Africa, Nigeria, Togo and Uganda, as a result of several studies on the digitisation of theses and dissertations in Africa. According to a South African study (Nyide, 2014), the University of KwaZulu Natal digitisation project lacked a guiding digitisation strategy and policies. Furthermore, there were no clear communication lines, resulting in unexpected project delays. This is consistent with Schöpfel and Soukouya's (2013) assertion that despite the global nature of open access, the challenges and solutions are local. Another study conducted in selected tertiary institutions of learning in South Africa, by Kagoro *et al.* (2017) found that library dissertations and theses

digitisation lacked adequate staff, funding, sponsors and effective government support. In Tanzania, academic libraries are running their own digitisation projects. However, Muneja (2010) asserted that the predominant challenges associated with digitisation projects are lack of digitisation skills, digitisation policies, awareness about Intellectual Property Rights (IPRs) and long-term strategic plans. As a result, this study aimed at providing practical experiences and evidence undergone in digitising theses and dissertations through the MUHAS library digitisation project, which was founded in 2012 and is still ongoing.

Study Methodology

This paper adopted a mixed methods approach coupled with participatory observation and in-depth interviews to highlight the issues and successes of the MUHAS digitisation project. Purposive sampling was used to identify key informants who were previously and currently involved in the digitisation activities at MUHAS. This study interviewed six former project employees and eight current project employees. The study is more qualitative than quantitative.

Results and Discussions

Tanzanian country profile of the digitisation project

Tanzania has 34 universities and 15 university colleges, but only 14 registered institutional repositories have been established in the country. These findings suggest that many institutions of higher learning have yet to embrace the open access initiative, which aims at making institutional research outputs freely accessible and disseminated online. Thus, the findings of this paper focus on the path to take and the challenges that institutions may face as they embark on digitising such research materials as theses and dissertations.

Profile of MUHAS library digitisation project

The MUHAS is Tanzania's largest and oldest medical higher learning institution, training health professionals in various cadres. It began in 1963 as the Dar es Salaam Medical School. The MUHAS library now receives around 200 dissertations per year from postgraduate students enrolled in various postgraduate programmes. Being Tanzania's first and best public university for health sciences, it was also the first higher learning institution to recognise and embrace the open access movement and technological opportunity to establish a digital repository aimed at improving access to library resources, research reports and publications. It was also expected to raise the University's profile by exposing research outputs online, including thesis and dissertations produced by postgraduate students. MUHAS believed that its institutional repository (IR) would help in increasing citation rates and the impact of its research. The

repository, however, is not intended to replace but rather to supplement traditional research publishing channels. The IR was established with the goal of providing secure, stable and long-term storage of information materials. The MUHAS IR has 1492 dissertations, which account for 58% of all IR research publications. A total of 828 hardbound theses and dissertations between 1968 and 2012, were converted into digital copies and submitted into the IR. From 2013 to 2021, the MUHAS IR policy reinforced postgraduate students to submit electronic copies of their theses and dissertations which later were uploaded into the IR. In this case, a total of 664 theses and dissertations were entered into the IR. This means that hard bound dissertations digitised accounted for 55% of all dissertations entered into the MUHAS IR.

In 2013, a total of 912 publications were submitted in the IR, of which 461 were theses and dissertations and 452 were journal articles. Among other years, 2013 was considered the most successful year for populating the MUHAS IR. The MUHAS IR currently has 2,590 publications, 1,492 of which are theses and dissertations, accounting for 58% of all publications uploaded to the IR. The library has a total of 1,754 print theses and dissertations. This indicates that the project was successful in digitising 85% of the total collection of theses and dissertations.

Human resources of the digitisation project

The MUHAS library digitisation involved a total of nine staff members, six of whom were volunteers who scanned hardbound theses and dissertations and uploaded electronic copies. Two of three library employees were involved in reviewing and approving uploaded theses and dissertations before they were made public online. The digitisation pace was slowed significantly by a staff shortage that began in 2015, when the majority (6) of volunteers stopped working with the MUHAS library. Currently, eight staff members from the ICT section in the Directorate of Library Services manage the MUHAS IR populating activities.

Table 1: Distributions of theses and dissertations by communities in MUHAS IR

S/N	Name of the Community	Total Number of Theses and Dissertations
1	ICT & Information Science	2
2	Institute of Traditional Medicine	43
3	School of Dentistry	33
4	School of Medicine	791
5	School of Nursing	70
6	School of Pharmacy	70
7	School of Public Health & Social Sciences	483
	GRAND TOTAL	**1,492**

Source: MUHAS IR (2022)

The findings show that the majority of the theses and dissertations uploaded in MUHAS IR were from the School of Medicine. This accounted for 53% of all theses and dissertations uploaded into the MUHAS IR. This could be due to the fact that the School of Medicine is the mother (oldest) of all schools and the largest at MUHAS. This school also has the largest number postgraduate enrolments compared to other schools. This has resulted in the production of many theses and dissertations at the university.

Trends in the number of theses and dissertations submitted to the MUHAS IR

The study sought to determine the trends in populating the IR with theses and dissertations. It was determined that knowing the progression from when the MUHAS library began its digitisation project to where they are now was critical. This highlights what occurred during the execution of the entire project activities, as well as where they fell short and where they succeeded.

Table 2: Trends in populating TDs in MUHAS IR

Year Submitted to the IR	School of Medicine	School of Public Health	School of Nursing	School of Pharmacy	School of Dentistry	ITM	ICT & Info. Science	Total TD in Yearwise
2012	27	0	2	8	6	0	0	43
2013	216	187	22	20	13	2	1	461
2014	44	8	3	1	0	17	0	73
2015	108	29	3	17	3	9	0	169
2016	44	50	5	5	2	7	0	113
2017	0	0	0	0	0	0	0	0
2018	67	17	7	0	2	1	0	94
2019	42	33	5	10	1	1	0	92
2020	1	1	0	0	0	0	0	2
2021	210	109	22	7	6	6	1	361
2022	32	49	1	2	0	0	0	84
Total	**791**	**483**	**70**	**70**	**33**	**43**	**2**	**1492**

Source: MUHAS IR (2022)

Based on these findings, the year 2013 had the highest (461) number of theses and dissertations uploaded to MUHAS IR, followed by the year 2021. According to these findings, no theses and dissertations were submitted in 2017 and the year 2020 saw the lowest submission of only two publications. These findings are supported by the fact that in 2017, the MUHAS IR experienced an indexing error that prevented staff from uploading theses and dissertations and the IR was unavailable for most of that time. These findings also revealed that the first five years of the digitisation project (2012-2016) accounted for more than half (58%) of total MUHAS IR submission activities for theses and dissertations.

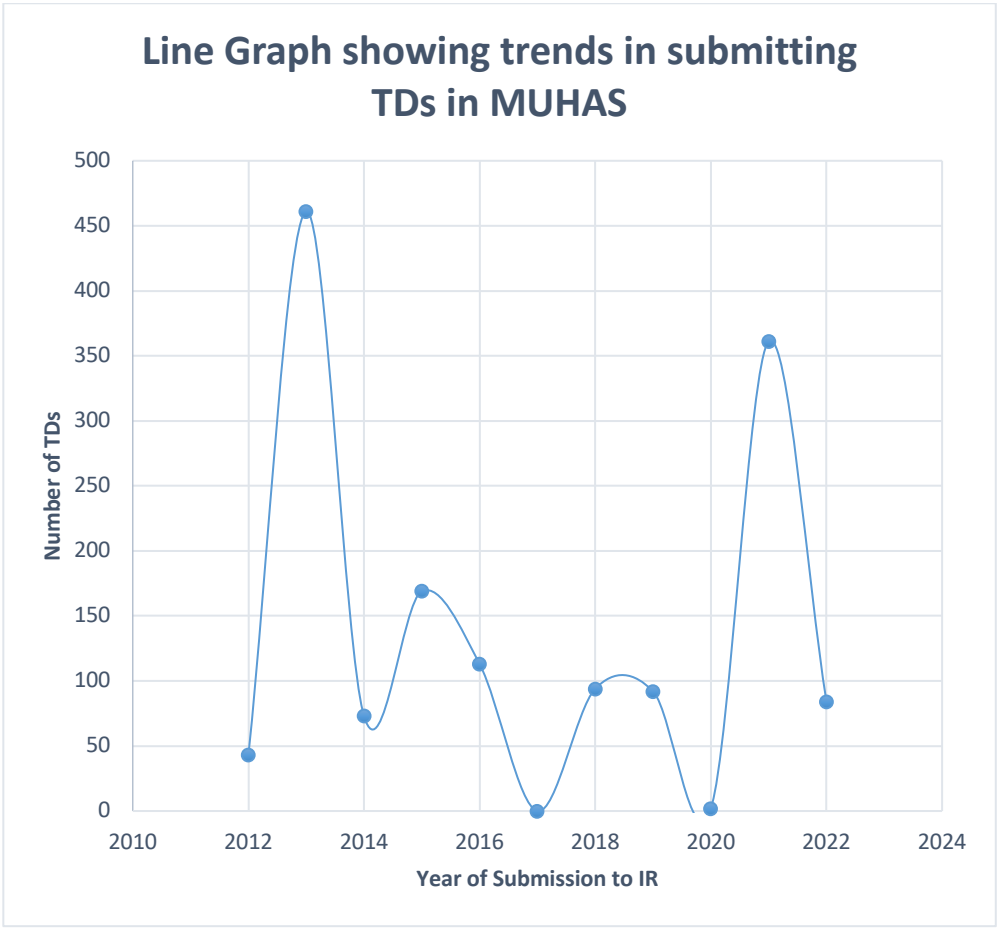

Figure 1: The year in which theses and dissertations were produced and uploaded to MUHAS IR

The time in which these research publications were produced and uploaded to the IR was found to be necessary; the goal was to ascertain the trends in which there have been more output of theses and dissertations at MUHAS. This will assist in forecasting the increased workloads to plan for the sustainability of its digitisation project.

Table 3: The year that theses and dissertations were produced and uploaded to MUHAS IR

Years Range	School of Medicine	School of Public Health	School of Nursing	School of Pharmacy	School of Dentistry	IT M	ICT & Info. Science	Total TDs in Years Range
1968-2000	122	16	3	5	0	9	0	155
2001-2010	172	165	14	9	12	2	1	375
2011-2022	497	302	53	56	21	32	1	962
Total	791	483	70	70	33	43	2	1492

Source: MUHAS IR (2022)

These findings indicate that the majority of theses and dissertations uploaded to the MUHAS IR were produced between 2011 and 2022. This has made up 64% of all theses and dissertations archived in the IR. These findings indicate that there were more postgraduate graduates than in previous years at MUHAS. This is a major concern for higher education institutions and library staff involved in digitisation projects. They should expect and plan for increased workloads in archiving these important research publications in their repositories. This might require more human and financial resources to succeed. This is due to the fact that higher learning institutions, including MUHAS, continue to enrol more students in postgraduate programmes than ever before.

Success stories from the library digitisation project

In 2012, the MUHAS IR was one of the first institutional repositories (IRs) established among Tanzanian higher learning institutions. The establishment of the IR was a library initiative, as the library pioneered its conception the way up to the top institutional management of MUHAS.

Furthermore, the MUHAS library pioneered development of the institutional repository policy. The policy serves to provide a framework for digitising MUHAS research publications including theses and dissertations. In line with the study findings, the policy is the first one in Tanzania that has been developed at the institutional level to guide activities, aspects and issues relating to digitisation initiatives. One of the IR accomplishments was in 2016, when it helped to raise the visibility of MUHAS research outputs to the point where MUHAS was ranked the first among Tanzanian higher learning institutions (SCImago University Ranking, 2016).

Increased accessibility of theses and dissertations at MUHAS

The digitisation project has increased the accessibility of theses and dissertations to the MUHAS community and the general public, particularly scholars. Since theses and dissertations are now available online, students and researchers can access and use them whenever and wherever they want. This is because access to and use of these library collections were previously restricted due to strict lending rules that required hard bound theses and dissertations to be used within library compounds.

Improved services provision at the MUHAS Library

The online availability of theses and dissertations has significantly reduced students' plagiarism practices when embarking on research endeavours at MUHAS. Given that they exist online, they can be detected easily by most of the anti-plagiarism software widely available today. As a result, students can now conduct real research projects and write high-quality theses and dissertations. In support of this, MUHAS recently acquired Turnitin anti-plagiarism software license, which mandates faculty and students' research proposals and publications to be checked for plagiarism. This has been deemed necessary to ensure academic integrity in research publications.

Reduction of theses and dissertations mutilation practices

The digitisation of theses and dissertations has significantly reduced students' mutilation of these library resources. Previously, library users were reported to have a bad habit of tearing up some pages of theses and dissertations; this could have been due to their limited use, which was reinforced by strict lending rules. One library staff commented that "having these resources available online had contributed to a very large extent to the preservation of hard bound theses and dissertations for other reference purposes at the library". These findings point to

the significant accomplishment of the MUHAS library digitisation project in enhancing long-term preservation of these important library resources for learning and research purposes.

Challenges encountered in the digitisation project

Limited skilled personnel for digitising the theses and dissertations

It happened that the MUHAS library had to outsource the staff who were supposed to digitise theses and dissertations under the SIDA library/ICT project. Nevertheless, after the project ended in 2015, it was not possible to keep the staff who were temporarily employed for digitisation activities. This significantly reduced the project's staffing, which had impact on project implementation.

Limited infrastructure

Many participants reported that one of the major challenges that hampered the digitisation of theses and dissertations was frequent IR downtime. The system was frequently unavailable for uploading scanned hardcopies as well as electronic copies submitted by students as required by the MUHAS IR policy.

In addition, another infrastructure bottleneck that the MUHAS digitisation project encountered was server instability due to the lack of a dedicated server for hosting the IR system. As a result, the IR system was frequently moved to another server portion. This resulted in its unavailability and indexing errors that halted the uploading of theses and dissertations for the whole year in 2017.

Slow internet connectivity- low bandwidth

The majority of participants reported that low internet bandwidth slowed the submission of digital copies of theses and dissertations. According to one participant: "There are times when uploading a document in IR takes nearly 10 to 20 minutes to complete the processes, thus affecting the digitisation project to a large extent because the submission process took a long time"

These findings imply that the issue of internet connectivity should be carefully considered when it comes to digitisation projects. In this way, there should be a dedicated internet connection with high speed to facilitate the submission processes of publications into the IR system. This is evident by the fact that the scanned pages of a complete theses and dissertations typically take up a significant amount of storage space. This requires a fast internet connection when submitting such a large file into the IR system. It was observed that the storage capacity of a complete file of scanned theses/dissertations ranged from 30MB to

120MB. This necessitated a stable and fast internet connection when being uploaded into the system.

Inadequate equipment and facilities

It was reported that the university administration purchased one heavy duty overhead scanner and two normal scanners. These were purchased for scanning and converting hard bound theses/dissertations to digital copies for uploading into IR. It was discovered that library staff were often competing for scanners due to few available scanners when compared to the number of staff involved in the project. The majority of staff complained that this made scanning theses and dissertations take longer. One library staff said: "there were times when we had to wait for colleagues to finish the scanning, which could take up to 3-4 hours"

This demonstrates that the limited scanning devices slowed the digitisation of theses and dissertations significantly. When it came to uploading the scanned theses and dissertations into the IR system, there was also a limited number of networked computers to accommodate all project staff.

Poor perceptions of library staff

The study's findings revealed that library staff believed that the heavy-duty scanner purchased for scanning hard-bound theses and dissertations could be harmful to their health. This discouraged them from using the heavy-duty scanner because they feared it would harm their health. The library administration informed them that the heavy-duty scanner is not harmful to their health because it uses standard laser technology as the photocopier machine; so they should not be concerned about any health effects. However, this study revealed that the heavy-duty scanner was not operational, implying that the staff's negative perceptions remained.

Prospects for effective implementation of digitisation project

Strategic planning

Digitisation projects necessitate extensive strategic planning. A digitalisation project is a complex system of interconnected tasks in which each decision influences the next, rather than a linear process in which one task follows another. Due to the high rates of change inherent in digitisation projects, the complexity of digitisation processes and the level of staff training required, digitisation necessitates close management and planning.

Adequate staffing and ongoing training

Digitisation projects are labour intensive requiring specialised knowledge and are organisationally and logistically complex. This necessitates a long-term commitment to ongoing maintenance, migration and updating. As a result, along the way in project execution, staff should be trained on a regular basis to ensure they have the technical skills and competency to handle digitisation activities effectively. Staff at the MUHAS library, for example, were trained more frequently and one-on-one trainings were tailored based staff's level of skills and competency. The MUHAS library digitisation is currently being integrated into the library's normal operation through the ICT section. It is staffed with eight personnel and oversees and manages digitisation activities, including having the technical expertise to solve technical problems with access to the core server portion dedicated to library systems.

Appropriate funding allocation

Start-up and infrastructure costs, as well as project running costs, must be considered into digitisation projects. These projects typically require adequate funding to ensure the smooth implementation of such project activities as material selection, preparation and conservation of original source materials, metadata creation, digital capture, the purchase of hardware, software and peripheral equipment; image and metadata quality control, technical infrastructure maintenance, which includes hardware maintenance and network costs and ongoing maintenance of images. Having sufficient funding allocated to the digitisation project ensures the availability of necessary infrastructure, equipment, facilities and staffing for the smooth and effective execution of project activities. For example, at MUHAS, the digitisation project was integrated into the library/ICT sub-program of the SIDA Swedish project with MUHAS, which funded a large percentage of the project. Nevertheless, the problem was its sustainability after the project's support ended in 2015.

Quality Control

To ensure the integrity and consistency of the image files, quality control is an important component in each stage of a digital imaging project. The conditions for digital image quality necessitate the identification of the desired end result and production goals. Scanning requirements differ depending on the source media. Information professionals should define acceptable levels of digital image quality based on the characteristics of the source image and the capability of the digital

imaging system to be used, against which the digitisation process output can be judged.

Quality control decisions include determining the percentage of images to be evaluated, selecting an evaluation methodology, controlling the environment for quality control, including configuring the hardware, evaluating system performance, documenting procedures and creating an inspection form and performing the assessment itself. Evaluation guidelines should be incorporated into the project documentation so that future images meet the same standards and are created in the same manner as the originals.

Conclusions

The MUHAS digitisation project is a huge success, especially in terms of archiving theses and dissertations. It managed to digitise nearly 85 per cent of the institutional collection of theses and dissertations. A small percentage remains for those that could not be digitised due to faults in student-submitted CDs or poor conditions of some hardbound theses and dissertations. Despite the fact that the project faced several challenges in terms of staffing, infrastructure and technical constraints, a good experience of how to mitigate the ideal challenges and issues was obtained. For example, the project is now adequately staffed with skilled personnel. A dedicated server portion has been secured for library systems. Besides and the library ICT section has been granted root access to the server in the event of resolving technical issues. Therefore, this has reduced technical dependence on the university's ICT directorate. Given the fact that it was the first to be established and its IR policy developed and institutionalised, the MUHAS library digitisation project is widely regarded as a model for other libraries' digitisation in Tanzania.

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Evaluation of APA Citation and Referencing Style for Dissertations Uploaded in the Mzumbe University Institutional Repository

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Abstract

Citation and referencing are paramount aspects of any scholarly and scientific writing. They are part of indications that the authors have done justice to the works of others and are one of the ways of avoiding plagiarism. This study was conducted to examine the extent to which postgraduate students at Mzumbe University adhere to the APA citation and referencing style in their dissertations uploaded to the Mzumbe Institutional Repository (MUIR) platform for the year between 2013 through 2019. This study employed a cross-sectional research design, which enables data to be collected at a single point in time. A mixed approach was used as the data collection method. A random sampling technique was used to select 128 dissertations from a population of 1056 dissertations uploaded in the MUIR between 2013 and 2019 for content analysis. A purposive sampling strategy was used to select a total of five postgraduate students and three lecturers who were involved in the interviews. Five research methods course outlines were also purposively selected to check if they contain topics or sub-topics on citation and referencing. Microsoft Spreadsheet was used to analyse quantitative data while qualitative data were analysed through content analysis. The findings show that a total of 70; 54.7 per cent of dissertations uploaded in the MUIR for seven years adhered to in-text citation APA style guidelines whereas 58; 45.3 per cent of dissertations did not adhere to the APA citation and referencing style. Major irregularities identified were unnecessary capitalisation, poor insertion of punctuation marks, incorrect use of 'et al' and lack of uniformity in writing the lists of references.

The findings also showed that only one out of five postgraduate programme course outlines had a sub-topic on citation and referencing instructions. This study concludes that there was poor quality of in-text citations and referencing among postgraduate dissertations submitted to the MUIR between the years 2013 to 2019. This calls for serious intervention. The study calls upon responsible university units to employ strategies which will help in enforcing students' compliance with dissertation writing guidelines. To ensure compliance, supervisors and external examiners should pay adequate attention to citation and referencing styles when supervising and examining theses and dissertations. There is a need of reviewing postgraduate research methods courses to add a topic on citation and referencing styles. University should also subscribe and sensitise postgraduate students on the importance of using reference management tools for improved citations and referencing styles in academic writing.

Keywords: Citations, referencing style, dissertations, postgraduate students, institutional repository and Mzumbe University

Introduction

Referencing and citation are the most common academic practices in which an author acknowledges the use of the works of others when writing scholarly work(s). Citation is the presentation of a source of work in the body of the text whereas references are the complete list of all sources used in a work which is presented at the end of the work using a given style (Neville, 2012). All sources and resources used in any research and scholarly works need to be acknowledged. The ability to cite and organise references of the sources used in writing scholarly works is one of the skills that postgraduate students and other scholars must learn as they become part of the academic and scholarly community (Vardi, 2012).

Prior studies (e.g. Muzata & Banja (2019; Pentang & Bautista, 2022) reported that referencing helps authors to achieve three important objectives: Firstly, the authors admit that he or she has used works belonging to others. Secondly referencing is the justification that the work is supported by the works of other scholars. Thirdly citation and referencing enable readers to locate the sources of information they used. Kargbo (2010) adds that referencing and citation used by the authors verify other scholars' views of facts in their work and they serve as proof that one has worked ethically and honestly in his academic writings. Uzuegbu and Onyenachi (2015) summarised the need for citation and referencing as follows: it proves that scholarly works are substantial and are based on facts, shows the theoretical foundation of the work, allows readers to track and follow the cited works and it is a proof that the author has avoided plagiarism.

Mzumbe University (MU) is one of the public universities in Tanzania where many dissertations and theses are generated by postgraduate students every year. The University has a publication policy (MU, 2014), operational procedures and postgraduate theses and dissertations writing guidelines (MU, 2022). These are the necessary tools for guiding both students and lecturers on how to prepare research works and publications. Furthermore, all postgraduate students' programmes have a module on "Research Methods" where citations and referencing ought to be taught. Despite the fact that the University has in place all these vital tools for guiding postgraduate students to make proper citations and referencing styles, yet there is a great concern as to whether these tools are adequately used which will consequently lead to the production of adequate quality postgraduate students' scholarly works. It is against this backdrop this study was conducted to examine the extent to which postgraduate students at Mzumbe University adhere to the APA citation and referencing style in their dissertations uploaded to the MUIR platform for the years 2013 to 2019.

Research Questions

Specifically, the study seeks to answer the following research questions:

i. What is the extent to which postgraduate students observe rules of citing and referencing using APA style in their dissertations at Mzumbe University?
ii. What are the common errors committed by postgraduate students in listing references using APA style at Mzumbe University?
iii. How can proper citation and referencing styles are improved by the postgraduate students at Mzumbe University?

Literature Review

Major citations and referencing styles used in academic works

There are many citations and referencing styles used worldwide such as American Psychological Association (APA), Harvard, Chicago and Modern Language Association (MLA) among others. These different referencing and citation styles have different rules for in-text citations and reference list entries. There are many factors that dictate the choice of citation and referencing style such as areas of specialisation. For example, if one is writing a humanities paper or dissertation/thesis with a lot of quotations, the MLA style will be a good choice to cite page numbers without interrupting the flow of arguments. If one is writing a scientific paper which requires citing a lot of studies APA or Chicago is

recommended as the best style. However, MU publication guideline mandates the use of the APA style.

Challenges encountered when using citations and referencing styles

Scholarly works on citation and referencing have indicated that authors experience difficulties in organising citations, references and bibliographic sources (Kendall, 2005). On the other hand, Neville (2012) noted that despite citation and referencing being an important element in scientific and scholarly writing, it has been one of the most neglected areas. Muzata and Banja (2019) report that lecturers and language editors do accord little emphasis on issues related to citations and referencing when marking and editing students' scholarly works. Madhusudhan (2016) posits that many students come to universities with little skills or no understanding of citation and referencing style formats, as such, they make a lot of errors. Kargbo (2010) highlights that postgraduate lecturers have unrealistic expectations that their students can properly cite references in their theses and dissertations and as such, they leave them to use any format they think are appropriate.

Common errors in citation and referencing

Citation and referencing are very important parts of scientific publication and they must be done correctly. Mehregan (2022) points out that one of the misconducts done by students in the publication is the manipulation of the citations. COPE (2019) adds that citation and referencing manipulation is where authors falsely cite references that were never used in their publications or works. A work by Baas and Fennell (2019) reveals that authors particularly academics manipulate citations to increase their online research citations. A study by Rivkin (2020) indicates that some postgraduate students were found grouping together citations at the end of the sentence or paragraph instead of citing them next to the statement they support. Other authors including Habibzadeh (2013) and Bavdekar (2016) report that the majority of students fail to follow such citation and referencing instructions as the proper use of punctuation marks, italic text, abbreviations, names and titles of resources that have been cited. On the other hand, Yap (2020) reports that postgraduate students commit numerical errors which involve publication date, volumes number, issues number, pagination and edition number when using APA style in their works.

Students lack the skills required to properly cite references and seek assistance from their colleagues and librarians. Students are under the mistaken impression that the only motive behind citing references is to avoid plagiarism and to earn good marks. While others remarked that citing references is only a requirement to show the titles of sources consulted in writing their academic works (Lamptey & Atta-Obeng, 2012). Such remarks reveal that postgraduate students face difficulties in properly citing references in their academic works. Betts (2020) mentions that one of the most common errors committed is missing references and citations; a citation within a text needs a reference in the reference list or bibliography. Some students forget to cite sources or create a reference list for an in-text citation. Another error is that references are not organised in alphabetical order. Every style requires the author to put his/her reference in alphabetical order by the first element of the citation. This can be an author's name, title, or corporation.

Another error committed by authors is the use of outdated resources in their citations and list of references. It is important to ensure that the sources used are current, relevant, authoritative, accurate and purposeful. Also, the incorrect use of *et al.* is a common error committed by students (Betts, 2020). *Et al.* is used when you have multiple authors for a source. However, *et al.* is not just used every time you have more than one author. In APA referencing style, *et al.* is used when there are more than two authors in one source (Betts, 2020).

Improving referencing and citation styles

Managing a list of references or citations for a written academic work can be a frustrating and lengthy process if academics are not conversant with referencing and citation tools/software. Fortunately, there is a solution. To improve one's reference and citation skills, one should learn how to use online citation and reference management tools/software. Reviewed literature including those of Gilmour and Cobus-Kuo (2011), Francese (2013) and Pathak and Johnson (2018) identify the benefits of using online referencing and citation as follows: it saves researchers time and helps them to work more efficiently; helps scholars to create and manage reference lists of their scholarly works; organises citations into specific formats for the preparation of manuscripts and bibliographies; facilitates sharing of information and knowledge among academics; synchronises data across multiple machines as well as offering the advantage of sharing research with others. Furthermore, it facilitates direct importation of publication citations from free sources; subscribes to bibliographic databases and other web pages;

helps manual recording of bibliographic information and then copying the information of sources used in the research process. Not only that but also, it helps in acknowledging someone's ideas and works and avoids serious academic dishonesty, including plagiarism and violation of copyrights, thus boosting up academic integrity of authors and institutions to which they are affiliated to.

Roles of the librarian in improving referencing and citation

Librarians are often generalists rather than specialists, although subject librarians tend to work more specifically with staff and students in particular disciplines. Consequently, the role of assisting students to develop their capabilities in referencing and citing has become both shared responsibility and an increasingly grey area for both faculty staff and those providing centralised services for students (Marsh & Campion, 2018). Librarians have a role to play in improving citation and referencing. Librarians foster critical and technological literacies in research and education (Havemann & Mackinnon, 2002). In addition to responding to reference desk and online inquiries, librarians offer discipline-specific research skills and co-teach online legal research skills. Librarians provide advice and assistance to students by performing both immediate and reference and in-depth research for their academic works. In other parts of the world, online citation and reference management software manuals are linked to the university websites and they have also created a special unit responsible for citation and reference management in their libraries (Sarrafzadeh & Khaleghi, 2017). This is contrary to the situation in Tanzania where citation and reference management software pieces of training are in a limited form and no specific profession is there to address it.

Conceptual Framework

This study is guided by a conceptual framework designed by researchers. The conceptual framework assumes that the appropriate use of APA citation and referencing style (dependent variables) is a result of five interrelated independent variables with the intermediate variables (See Figure.1).

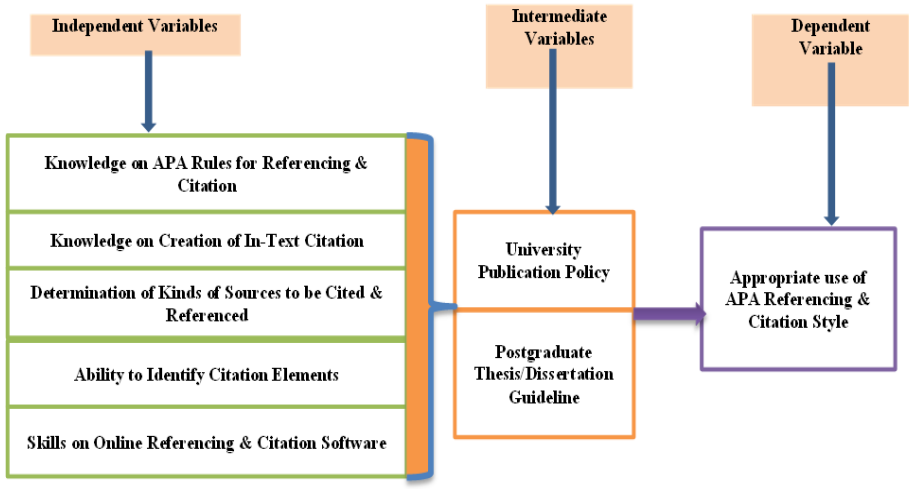

Figure 1: A study conceptual framework
Source: Researchers' Construct (2022)

Methodology

This study employed a cross-sectional research design, which enables data to be collected at a single point in time. It also used a mixed approach in data collection. The mixed approach entails conducting research that involves collecting, analysing and integrating quantitative and qualitative approaches on the same topic (Cresswell, 2013). Postgraduate dissertations uploaded in the MUIR for a period of seven years that is between the years 2013 to 2019 formed a unit of analysis for content analysis. This referenced period of time from 2013 through 2019 was purposively selected because this is the period in which milestone achievements and important events were marked in the history of the IR platform at MU. The year 2013 was selected because it was the time when the IR platform was established by the University for uploading her scholarly works for visibility. Likewise, 2019 was purposively selected because it was the year when there was a temporary pause to upload scholarly works in the MUIR for monitoring and evaluation of related issues. The sample size of 128 dissertations was drawn from a population of 1056 dissertations uploaded in the MUIR (http://scholar.mzumbe.ac.tz) between 2013 to 2019. This sample size was 12.12 per cent of the population of the dissertations uploaded in the MUIR for seven years. According to Wimmer and Dominick (2011), a sample size between 10% and 25% is recommended as an acceptable one when determining sample size in content analysis.

Using a purposive sampling strategy, data for this study were obtained from two faculties and one school which were involved in this study. The study picked 18 (14.1%) dissertations from the Faculty of Social Sciences (FSS), 48 (37.5%) dissertations from the School of Public Administration and Management (SOPAM) and 62 (48.4%) dissertations drawn from the School of Business (SoB) (See Table 1). These schools and faculty were purposively selected for inclusion in this study because of their long experiences in offering postgraduate studies. On the other hand, other faculties, institutes and directorates such as the Faculty of Law (FoL), Faculty of Science and Technology (FST), Institute of Development Studies (IDS) and the Library Services Directorate (LSD) were excluded from this study for various reasons as follows. One, the APA style does not conform to the discipline of law. Two, postgraduate programmes in FST and IDS in the year 2013 were not established or they were at an infant stage to warrant the availability of an adequate number of dissertations in the MUIR. Similarly, LSD does not offer any academic programme thus making it less than ideal to be included in this study.

All dissertations selected for this study are publicly available online at http://scholar.mzumbe.ac.tz/ . Each of the 128 dissertations was evaluated and analysed based on the following elements: Author - Who?, Date - When?, Title - What?, Source - Where?

Table 1: Distribution of sample sizes across schools/and faculty

S / n	Faculty/School	Total No.of Dissertations	Sample size Selected	Percentage
1	FSS	145	18	14.1%
2	SOPAM	389	48	37.5%
3	SoB	522	62	48.4%
Total		**1056**	**128**	**100%**

Source: http://scholar.mzumbe.ac.tz / March, Wednesday 30, 2022.

The study also involved face-to-face interviews with five purposively selected postgraduate students and three lecturers drawn from two schools and one faculty. Discourse Based Interviews (DBIs) were used to extract information from the eight respondents. According to Jomaa and Bidin (2017), these types of interviews are an effective research methodology that is used to explore writing choices in the performance of writers towards their works. Microsoft Spreadsheet was used to analyse quantitative data while qualitative data were analysed through content analysis procedures.

Results and Discussions

The findings in Table 2 indicate that in the year 2013 there were 78 (61%) dissertations, 2014 had 8 (6%), 2015 had 16 (12.5%) dissertations, 2016 had 4 (3%) dissertations, 2017 had 6 (5%), 2018 had 4 (3%) dissertations and in 2019 there were 12 (9.4%) dissertations. There were many dissertations in the MUIR in 2013 because it was the time at which the contents were uploaded to the MUIR for the first time after the establishment of the IR platform. Hence, much attention was paid to populating the IR platform in 2013 using postgraduate dissertations which were produced in previous years.

Table 2: Distribution of dissertations uploaded in the MUIR between 2013 and 2019

Year	Number of dissertations (n=128)	Percentage (%)
2013	78	61.0
2014	8	6.0
2015	16	12.5
2016	4	3.0
2017	6	5.0
2018	4	3.0
2019	12	9.4
Total	**128**	**100**

Source: http://scholar.mzumbe.ac.tz/ (2022).

Postgraduate student's adherence to APA style when writing dissertations

The first specific objective of this study was to examine the extent to which postgraduate students adhered to APA in-text citation style in their dissertations (See Table 3). To achieve this, 128 dissertations uploaded in the MUIR were selected for content analysis.

Table 3: Level of adherence to APA style in-text citations

S/N	Level of adherence to APA style	No.of publication	Percentage
1	Adhered to in-text citation APA style	70	54.6875
2	None adherence to in-text citation APA style	58	45.3125
	Total	**128**	**100**

Source: Field Data (2022)

The findings show that a total of 70; 54.7 per cent of dissertations uploaded in the MUIR for the year 2013 to 2019 adhered to APA in-text citation style

guidelines whereas 58; 45.3 per cent of dissertations did not adhere to APA guidelines at all (See Table 3).

An in-depth interview was carried out with one of the postgraduate student respondents to get their views for non-adhering to the APA style. The respondent had the following remarks:

> *…Poor adherence to the APA citation and referencing style is caused by a lack of seriousness from the side of students who rush to complete their work without bothering on the need to follow the guidelines. Furthermore, students lack proper guidance from their lecturers as well as dissertation supervisors. Sometimes our supervisors concentrate much on other contents of our work and they pay little attention to citations and referencing style* ***(FSS Postgraduate student, April 2022****).*

Another in-depth interview was carried out to find out why postgraduate students are less competent in using the APA style. The responses are as follows:

> *…Poor referencing and citation is caused by poor prior knowledge on referencing, citation and poor research habits. Our lecturers have wrong conceptions when they assume that students are already vested with skills in citations and referencing before joining postgraduate studies because there are very few institutions that seriously teach citations and referencing to undergraduate students (****SoB Postgraduate Student, April 2022).***

The findings corroborate Madhusudhan (2016) who posits that many students come to universities with little skills or a low understanding of citation and referencing style formats. Consequently, they make a lot of errors in their academic writings. An in-depth interview with a SOPAM postgraduate student yielded the following comments:

> *…Postgraduate students' supervisors do not pay much attention to citations and references written in postgraduates' dissertations. Also dissertations external examiners have a tendency of ignoring referencing style used. With these shortfalls, one should not expect postgraduate students to pay prerequisite attention to the citation and referencing style in their academic writings.*

One lecturer was of the view that: …Poor citations and referencing are caused by poor use or inability to subscribe to the reference management tools such as Zotero, Mendel and Endnote by student (Lecturer, April 2022).

A total of five MU postgraduate research method course outlines were reviewed to ascertain whether they had contents on citations and referencing styles. The findings indicated that only one-course outline named PUB 620 had a sub-topic on a bibliography but the depth of coverage was not also shown. The rest of the courses did not indicate any topic or sub-topic on referencing, citations, or any idea of inviting resource persons like librarians to assist on the issue. In some universities, librarians are normally invited as guest speakers to train students on how to go about referencing and citation issues. Surprisingly, at MU no course outline has such a method of delivery (See Table 4).

Table 4: Selected MU research method course outlines

S/N	Course nomenclature	Course Code	Faculty/School/Institute	Librarians Involvement	Observation
1	Research Methods in Education	EDU 602	FSS	Nil	No, any topic on referencing & Citation
2	Social Science Research in Development Studies	DST 680	IDS	Nil	No, any topic on referencing & Citation
3	Business Research Methods	BUS 5032	SoB	Nil	No topic on referencing & Citation
4	Social Science Research Methods	PUB 620	SoPAM	Nil	Has a sub-topic in the bibliography. However, the extent of coverage has not been shown.
5	Advanced Qualitative Methods for Public Policy	C1	SoPAM	Nil	No, any topic on referencing & Citation

Source: Field Data (2022)

These findings imply that there is a need for the inclusion of referencing and citation topics in research method courses offered at MU. The MU librarians should take the responsibility of arranging for library users' training on referencing and citation styles.

Common errors committed by postgraduate students when using APA referencing style

The second specific objective of this study was to identify common errors which are normally committed by postgraduate students in listing references using the APA style. There are several common errors involved; they include such errors as poor insertion of punctuation marks, capitalisation errors, poor layout arrangements, misinformation about some authors and publishers and improper usage of *et al.* (See Figure 2).

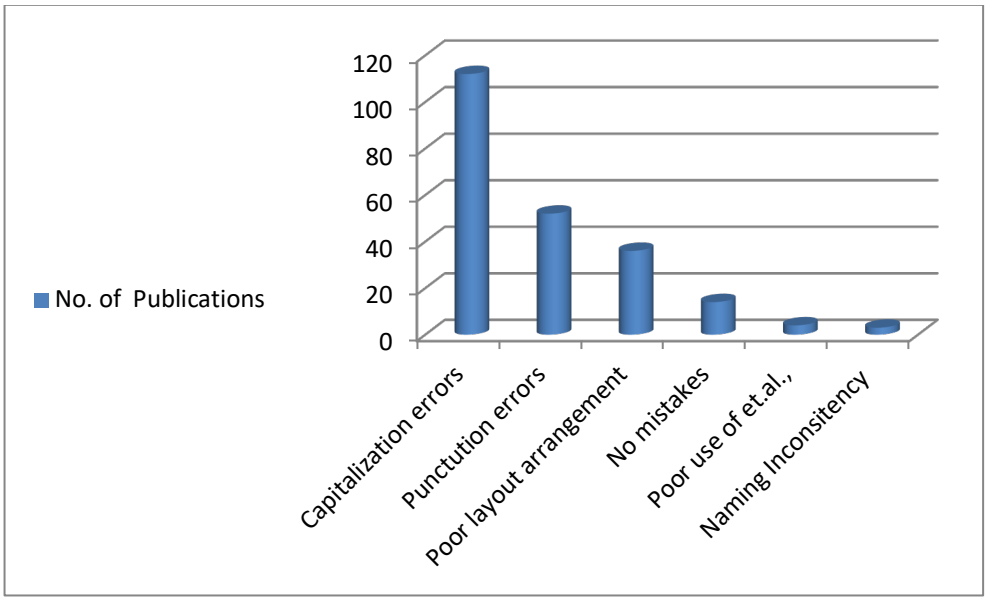

Figure 2: Common errors in listing references
Source: Field Data (2022)

Capitalisation errors

The findings show that a large number (112; 90.3%) of dissertations drawn from MUIR between 2013 to 2019 contained obvious capitalisation errors. This is an indication that the majority of postgraduate students committed capitalisation errors when listing references in their dissertations. APA style uses two kinds of capitalisation to format reference titles, title case and sentence case. APA title case refers to the capitalisation style in which most words are capitalised while sentence case refers to a capitalisation style in which most words are lowercase. Title case is used for titles of references when they appear in the text of an APA paper. In contrast, sentence case is used for titles of references when they appear in reference list entities (Lee, 2012). Capitalisation errors appear in reference lists

of dissertations because most postgraduates are not aware of the capitalisation format used in APA style when listing references. It is important to be aware of capitalisation rules and be careful to capitalise words that should be capitalised such as names, countries, proper nouns and the first word at the beginning of any sentence and not otherwise. The findings in this study indicate that most postgraduate students capitalised every word included in the titles of the sources they referenced.

Punctuation errors

Findings show that slightly less than half (52; 42%) of the authors of dissertations in the MUIR failed to insert proper punctuation marks in their reference lists. Skimming exercise to these dissertations indicates that there was incorrect use of the period, comma, semi-colon, or colons which consequently made the whole reference list completely wrong. Some postgraduate students used more than one punctuation mark at the same time. For instance, for the title that ends with a question mark, they do not need a full stop but in some dissertations, they inserted periods after writing a title ending with a question mark. In some dissertations, a period (.) was inserted after the author's name. Authors are individuals whose names are listed in the format of surname and first initials. Initials naturally include punctuation that is period (.). However, some postgraduate students did not insert the period (.) after the author's surname and first initials. Improper use of comma was also observed. Students inserted a comma (,) after the year of publication instead of using a period (.). In addition, students tended to confuse punctuation marks to be used at a specific place and end up punctuating them incorrectly. This might have been caused by the lack of seriousness on the side of students in adhering to the publication guidelines.

Poor layout arrangements

Findings indicate that slightly more than a quarter (36; 29%) of the dissertations uploaded in the MUIR for the said period of the study had poor layout arrangements. Each entry in the reference list must have a hanging indent so that the first line of the entry flushes with the left margin, but all other lines are indented. However, this was not the case with the dissertations found in the MUIR as some of the dissertations had reference structure errors which ended up having some faulty arrangements (See Examples 1 & 2).

Example: 1
Bennett, S., Creese, A., Monasch, R. (1998). Health insurance schemes for people outside formal sector employment (ARA Paper No. 16). Geneva: World Health Organisation.

Example: 2
Neo, M et al. (2000). Human Resource Management: Gaining Competitive Advantage, 3rd ed. Boston, McGraw-Hill

Furthermore, some dissertations did not follow the layout of listing references in APA style where they started with the authors' name, year of publication, the title of the source, edition, publisher then place of publication. Normally the place of publication is supposed to start before the publisher's name (See Example 3).

Example 3
Martin, K, (2004). Consumer Behavior (second edition), New Age International (p) Ltd Publishers, New Delhi.

Other errors which were found committed in the MUIR uploaded dissertations include improper use of *et al.* and failure to indicate publishers' and authors' name initials. *Et al.* is used when one has multiple authors for a source. However, *et al.* is not just used every time one has more than one author. In one of the dissertations, it was found that *et al.* was not used when it was necessarily needed to do so (See Example 4).

Example 4
Barnett, M., Lord, C., Strauss, E., Rosca, C., Langford, H., Chavez, D. & Deni, L. (2006). Using the urban environment to engage youths in urban ecology field studies. *The journal of environmental education*, 37 (2), 3-11.

In this case, there are 7 authors in this reference material. APA referencing style mandates that 5 authors' names should have been written followed by the word *et al.* to save space in the reference list. Betts (2020) reported that errors committed by students in referencing include incorrect use of *et al.*, not including authors' initials and improper use of punctuation marks. In other dissertations, publishers' names in some of their references in reference lists went missing. References should have the name of publishers responsible for publishing sources cited in the research. This might be attributed to the author's inability to locate and identify publishers of a certain source used (See Example 5).

Example 5:
Kothari, C. R (2006). Research Methodology: Methods and Techniques, 7th Edition, New Delhi, India

In the listed references, the name of the author is supposed to start with the surname followed by first name initials but for some dissertations. This format was not adhered to and instead the whole names of the authors without using the initials were written (See Examples 6 & 7).

Example 6
Conner Brannen, (2010). An Impact Study of the Village Savings and Loans Associations (VSLA) Program in Zanzibar, Tanzania. [Unpublished Master of Arts in Economic thesis]. Mzumbe University

Example 7
Ezra Anyango (2007). Village Savings and Loan Associations in Zanzibar, Tanzania. [Unpublished Master of Arts in Economic thesis].

Improving citation and referencing by postgraduate students at Mzumbe University
In-depth interviews were carried out to heed recommendations for improving students' ability to adhere to the APA citations and referencing style. One postgraduate respondent replied: "…Mzumbe University should conduct regular pieces of training aimed at helping us to know how to cite and list references properly using APA referencing style in our academic writings"
(Postgraduate student responses from FSS, April 2022)

Another respondent was quoted as saying: "… Lecturers should mark references listed in academic works when they supervise and guide supervisees on how to make citations and write references properly by following all rules and guidelines altogether." **(Responses from SoB Lecturer, April 2022)**

Another lecturer emphasised that: "… Mzumbe University should establish courses that will teach our postgraduate students about referencing and citations using APA referencing style during the first semester of each academic year. This will equip our graduates with the necessary skills to become good writers of scholarly works." **(Response from SoPAM Lecturer, April 2022)**

On the other hand, only 14(11.3%) of all dissertations uploaded in the MUIR for the period of seven years were not found to have committed common errors in

the list of references. This is equivalent to only 2 (1.6%) of all dissertations uploaded in the MUIR per year. Perhaps, this is attributed to the efforts of the authors of these publications aimed at ensuring they seriously adhered to the set publication guidelines for ensuring good quality publications are produced by University postgraduate students to the MUIR.

Conclusion

The purpose of this study was to examine postgraduates' level of adherence to APA referencing and citation style at MU. The study has shown that postgraduate students' level of adherence to the APA style is yet to meet the APA guidelines and set rules. Thus, more efforts aimed at providing citation instructions to all postgraduate students at MU are highly needed to promote better citation behaviour and lessen academic crime incidences. Poor citations and academic crimes will consequently obstruct the visibility and tarnish the image of the authors as well as that of the University.

Recommendations

Based on the findings and conclusions made in this study, the following recommendations are made:

i. MU needs to plan for more advanced training for postgraduate students on referencing using the APA style.
ii. MU should introduce compulsory courses that focus on citation and referencing style meanwhile making emphasis on the APA style. These courses should be taught in the first semester of postgraduate studies.
iii. MU postgraduate students' lecturers should invite librarians as guest speakers in classes to train students on how to make in-text citations and how to prepare a list of references and cite using APA referencing style.
iv. Lecturers and supervisors at MU should show the importance of using the APA referencing style by paying much attention to students' academic writings.
v. The need for collaboration between lecturers and librarians is of particular importance. Their collaboration can enhance better referencing and citations in the students' academic writings.
vi. There is a need to organise workshops for postgraduate students during their second year on how to cite references. Besides librarians are required to establish a course or a module devoted to citations and referencing and they can also create a LibGuide devoted to common errors in APA citations and references.

vii. Universities should subscribe to reference management tools such as Mendel, Endnote and Zotero. They should also employ efforts to ensure students can use them in their academic writings.

viii. Postgraduate students at MU should be keen on adhering to the set guidelines when preparing their dissertations/theses.

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Use of Subscribed Electronic Resources by Undergraduate Students at Sokoine University of Agriculture, Tanzania

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Abstract

This study assessed the use of subscribed electronic resources by undergraduate students at Sokoine University of Agriculture (SUA). The study aims at determining the students' awareness, access and use of subscribed electronic resources and to examine determinants of the use of subscribed electronic resources. The study used a cross-sectional research design to collect data from 120 respondents using structured questionnaire as the data collection tool. Data were coded on Statistical Package for Social Science (SPSS). The researchers calculated the frequencies, percentages and linear regression. Findings reveal that majority (90%) of respondents were aware of the availability of subscribed electronic resources. Furthermore, the most used e-resources were e-journal and e-books while the least used was e-dictionary. Furthermore, the results found that perceived usefulness and attitude significantly influenced students' use of subscribed electronic resources. The study reveals that age and year of study influenced students' use of subscribed electronic resources. The study concludes that usage of subscribed e-resources by undergraduate students was moderate. It is recommended that librarians in academic institutions should create regular creation of awareness on the subscribed e- resources to the library users. The study recommends that librarians, information science and educators who intend to promote electronic resources should ensure that they are useful. Moreover, creating awareness on the usefulness of electronic resources to change their attitude is another important factor. Marketing the electronic resources through outreach programmess and information literacy are necessary for all the students.

Keywords: Subscribed electronic resources, perceived usefulness, perceived ease of use, attitude, socio-demography and Sokoine University of Agriculture

Introduction

Rapid evolution of electronic resources has increased their production and reliance on them. This, in turn, demands in sustained effort in identifying and acquiring them in libraries world-wide (Raphael, 2020). Due to the advanced technology, most libraries have adopted the use of electronic resources. Electronic resources can be defined as digital resources that can accessed through computers or other electronic devices directly connected to the computer. This might include such resources as CD ROM drive or the internet infrastructures used in the creation, processing, storage, distribution of information and various services rendered (Okey-Okafo & Echedom 2022). An electronic resource includes e-books, online journals and electronic magazines (Singh & Mukherjee, 2018).

Changes in the traditional ways of documenting delivery services, from print to electronic, have come about speedily; hence, information services and libraries have changed significantly so that they can deliver this new technology efficiently to academics (Odede, 2018). These advantages include the fact that electronic resources are often quicker than accessing print indexes, especially when searching retrospectively and they are straight forward when wishing to use combinations of keywords (Muthurasu & Kannan, 2019). Also, to the remoteness learners or those who have inadequate time to access physical libraries, there is availability of searching materials and different information from the library through library access databases. Furthermore, various range of reading experiences is given to students to support literacy and reading, access to a stable range of resources for students and teacher (Akuffo & Budu, 2019). Subscribed electronic resources are those resources that have been implemented and made available for a certain institution to access for different materials by students, academic staff and researchers.

Subscribed electronic resources are one of the key elements which support the process of teaching and learning to students and research activities (Mawere & Sai, 2018). However, there is low usage of subscribed electronic resources among the undergraduate students in higher education institutions in Tanzania (Isibika & Kavishe, 2018). The consequence of low use of subscribed electronic resources to students is failure to get the relevant information relating to their information need. It narrows the possibility of getting various different access points instead of depending only on printed sources. Not only that but also wastage of time will be witnessed to search for information if electronic resources are not used. Besides, it might lead to failure to get broader information about the topic related

for information need. Therefore, this study intends to assess awareness and frequency of using subscribed electronic resources and the determinants of use of subscribed electronic resources as an influencing factor that can either cause low utilisation or high utilisation of subscribed electronic resources.

Technology acceptance model

Technology Acceptance Model (TAM) proposes that the three factors which influence adoption of technology are perceived usefulness (PU), perceived ease of use (PEU) and behavioural intention (BI). Perceived usefulness refers to the degree to which a person believes that the use of the system will improve his or her performance whereas perceived ease of use is the degree to which a person believes that using the system will be free of effort (Roy *et al.*, 2018). The attitude towards adoption depicts the prospective adopter's positive or negative orientation and/or behaviour towards adopting a new technology (Venkatesh & Davis, 2000). Usage could also be influenced by an individual's perception of the ability to use the technology (Yen & Wu, 2016). User attitude determines actual system use and is influenced by two major beliefs (PEU & PU). PEU has a direct influence on PU. Therefore, PEU and PU were hypothesised to be directly influenced by the system designed characteristic. The discussed theory is integrated in the study variables. The study hypothesised that PEU, PU and attitude do directly influence students' use of subscribed electronic resources. This study included only individual and institutional factors because the reviewed literature has shown that socio-demographic characteristics of the respondents act as control.

Methodology

Cross-sectional research design was used to collect data from 120 selected respondents at SUA, both from Edward Moringe Campus and Solomon Malhangu Campus. SUA is selected because it is one of the higher education institutions in Tanzania. Therefore, it provided a good setting for the study. Questionnaire was used as the main data collection tool from the selected respondents. The questionnaire contains questions on respondents' responses according to the study objectives.

A determinant of usage of subscribed electronic resources was measured by the respondents responding to the factors using five likert scales. Respondents were requested to rate their level of agreement on the items of each dimension using the scale strongly agree, agree, neutral disagree and strongly disagree. They were later scored as 5, 4, 3, 2 and 1, respectively for positive statement while 1, 2, 3, 4

and 5 for negative statement. Each respondent's self-assessment score was obtained by summing up all the information items for each dimension to get the total score for each determinant. The higher values indicated high level while low values indicated low level.

To assess the reliability of the research tool, the researchers conducted a pilot study with 20 respondents. The Spearman-Brown split-half Cronbach's alpha was calculated and it was 0.84 which is higher than 0.7. Hence, the research tool was reliable as per the recommendations by Hair *et al.* (2010). Quantitative data were coded on Statistical Package for Social Sciences (SPSS). The researchers determined frequency, percentages and multiple linear regression. Reliability analysis was conducted to assess the correlation among the items for of each study variables. A Cronbach's of 0.7 or higher indicates a reliable scale. In this study, a Cronbach's α obtained was 0.711 for PU, 0.750 for PEOU and 0.81 for attitude.

The Exploratory Factor Analysis (EFA) was carried out to determine validity of the study variables. Prior to perform EFA, the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test were conducted to determine whether it was appropriate to conduct factor analysis. The Kaiser-Meyer-Olkin score 0.830 which is significant means that data were appropriate to perform exploratory factor analysis. Furthermore, the Bartlett's test of spherically (1259.00, df=120 and p=0.001) means that correlation was not the same for all factors (Shrestha, 2021).

The validity of the research instruments was assessed using the Principal Components Analysis (PCA). The PCA was employed to reduce 23 statements into three dimensions. The study adopted an orthogonal rotation (Varimax rotation) which maximises variation in the matrix system. Also, the data was suppressed at 0.4 factors loading. Furthermore, the multiple regression equation used for analysis was as to analyse the determinant influencing the use of subscribed resources which were:

$Y = \beta_0+\beta_1X_1+ \beta_2X_2+\ldots+\beta_nX_n + \varepsilon,$

Where;

Y= Electronic resources usage score

β= Regression Coefficients

β_0= Intercept

i. Sex (1-Male, 0-Female)
ii. Age of the students was measured as respondent's age in number of years
iii. Year of study(1=First, 2-second, 3-Third, 4-Fouth, 5-Fifth)

iv. Attitude total score
v. Perceive easy to use total score
vi. Perceive usefulness score

Results and Discussion

Demographic characteristics of respondents

Both male and female respondents participated in this study. The results showed that more than half (51.7%) of the respondents were male while less than half (48.3%) were female (See Table 1). This indicates that the majority of the respondents in this study were male respondents. This disproportional sex composition is due to the nature of the population at the study area which was dominated with more male students. These results are similar to study by Nkebukwa (2016) which revealed that male form majority of respondents in higher learning institutions.

The results showed that majority (83.4%) of the respondents belonged to ages ranged between 18 and 26. This implies that young respondents dominated the sample. High number of young respondents could be influenced by the reason that most of the undergraduate students' higher institutions in Tanzania are likely to access e- resources in their daily activities. Most of young adults spend much time on the internet either for academic use or any other activities. Furthermore, the study revealed that 27.7 per cent, 30.5 per cent and 31.7 per cent were first, second and third year while four and fifth year were 10% and all the respondents. Low number of fourth and fifth year was due to number of course with offered with the duration of four and five years at the study area.

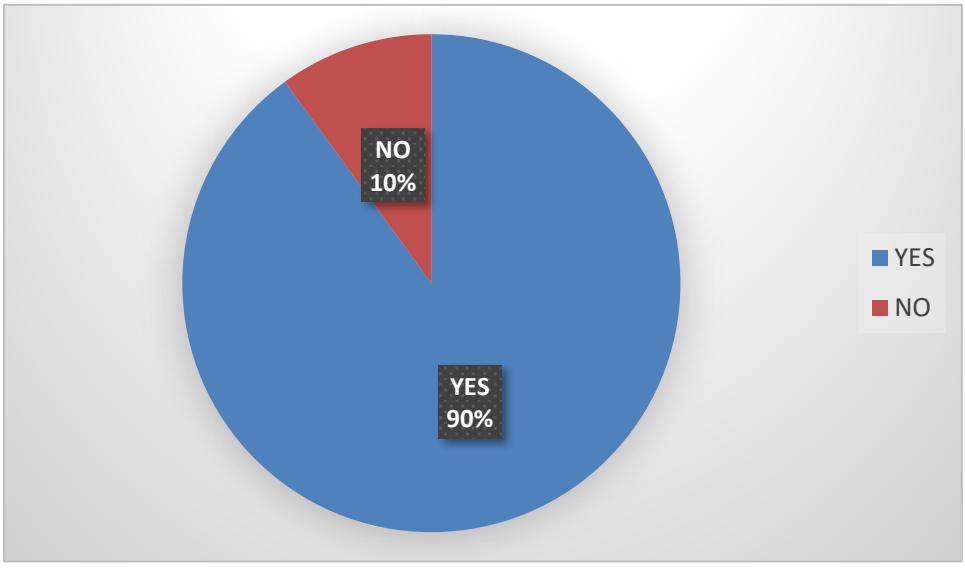
It was revealed that majority (97.5%) of the respondents owned the ICTs devices. It was found that most of the respondents owned such devices as smartphones, computer devices and tablets. Likewise, it is expected that ownership of ICTs devices may enhance students' access and use of subscribed electronic resources. This is in line with the study by Mwamasso and Onyango (2020) who revealed that ownership of ICTs devices among students in higher learning institutions is high.

Table 1: Socio-demographic characteristics of students (n=120)

Variables	n	%
Sex		
Male	62	51.7
Female	58	48.3
Age categories		
18-20	5	4.2
21-23	36	30.0
24-26	59	49.2
27-29	17	14.2
30- Above	3	2.15
Year of study		
First year	33	27.5
Second Year	37	30.8
Third Year	38	31.7
Fourth Year	6	5.0
Fifth Year	6	5.0
Ownership of ICTs devices		
Yes	117	97.5
No	3	2.5

Awareness on the existence of subscribed electronic resources by undergraduate students

Table 1 below shows the awareness of the undergraduate students on the existence of subscribed electronic resources. It indicates that majority (90%) of the respondents were aware of existence of subscribed electronic resources at the



University library. Only few students (10%) were not aware of the existence of the subscribed electronic resources. This is similar to the study by Bwalya and Ssebbale (2017) which revealed that most of the respondents were aware of the existence of subscribed electronic resources at the University. Moreover, this is in line with Isibika and Kavishe (2018) whose study revealed that many respondents were aware of the availability of electronic resources at the University library. From the findings, one can point about clearly that there were no good strategies that were used to create awareness on the available electronic resources for the users.

Figure 1: Responses of the respondents on awareness on the existence of subscribed electronic resources at the study area

Types and frequency of using e-resources

The respondents were asked to indicate the types of subscribed electronic resources they used. Furthermore, the results showed that majority (73.3%) of the respondents used subscribed e-databases. Additionally, the study sought to examine the frequency of using the mentioned e-resources used by respondents. Figure 2 summarises the responses obtained.

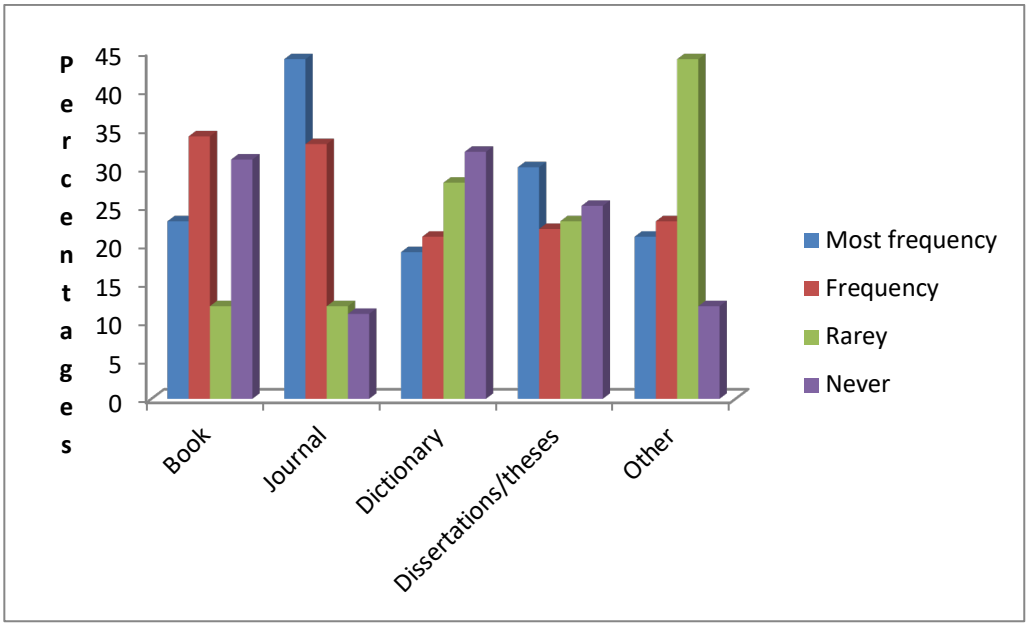


Figure 2: Types and frequency of using e-resources

The results indicate that most of the respondents used different types of open access electronic resources. The most used were e-journal followed by e-books and dictionaries. In addition, about one quarter (25.2%) of the respondents never accessed and used dissertations. The study's findings imply that the respondents used subscribed electronic resources to accomplish their academic activities. Journals were found to be used more frequently than other resources. This is contrary to a previous study by Mollel and Mwantimwa (2019) which found that there were low usages of subscribed electronic resources among the academic community.

It was revealed that e-book which is considered as the most important tool for academic purposes was the second most useful resource. This could be influenced by the reason that in subscription resources, users' choices were limited to the e-databases and resources their institution could afford while there is a wide range of open access resources available through search engines such as Google (Lwoga & Sukums, 2018). In addition, the type of the electronic resources utilised might depend much on the need for usage on academic purpose. Most of the students when doing research consult the most current and frequently published information. In this regard, journals are the good sources of information. Therefore, there is a need to create awareness on available e-books which may be accessed through the subscribed electronic resources by students to access the current and published books which are available on subscribed e-databases.

Determinants of use of subscribed electronic resources by the undergraduate students

Prior to performing multiple linear regression, PCA was performed to assess the construct validity. Table 2 shows the mean score of the 14 items while Table 3 shows the results from PCA. All the six factors explained more than half (59.46%) of the total variation. The first principal component (PC1) accounted for 40.87 per cent of the total variation. The first principal represents statements related to the perceive usefulness (See Table 3). The statements under this component include respondents perceive usefulness of using subscribed electronic resources on students' performance and relevancy of information. The mean value of four items associated with the first principal component is close to 4.2. This means that most of the respondents indicated that they agreed that subscribed electronic resources were useful in improving students' performance. The second principal component accounted for 10.20 per cent of the total variation. It comprised of the statements related to attitude towards using subscribed electronic resources.

The mean score for all the items related with this component is higher than 4.0. This implies that most of the students had positive attitude towards the use of subscribed electronic resources. The third principal component accounted for 8.39 per cent of the total variation; it contained statements related to perceive easy of using electronic resources. The mean score was generally near 4.1; this implies that respondents agree with the items.

Table 2: Descriptive statistics for the responses on the use of subscribed electronic resources

Items	Mean	Std. Deviation
I find that subscribed electronic resources are very useful in my studies.	4.48	.622
I can properly access and retrieve relevant information when using subscribed electronic resources.	4.21	.152
Using subscribed electronic resources enables me to get exact materials that I require.	4.12	.237
Using subscribed electronic resources improves the quality of my work as well as academic performance.	4.13	.773
Using subscribed electronic resources in sharing information would make my works more interested.	4.02	.680
Use of subscribed electronic resources for accessing information is a good idea.	4.03	.787
I have a generally favourable attitude towards using subscribed electronic resources in sharing information.	4.00	.766
Use of subscribed electronic resources for sharing information is easy for me.	4.12	.818
I have a generally negative attitude towards using subscribed electronic resources.	4.10	.123

It is difficult to access and share information through subscribed electronic resources.	3.29	.216
I find it user-friendly to use subscribed electronic resources	4.08	.872
Learning to use the subscribed electronic resources is easy for me.	4.09	.756
I find it easy to access information by using subscribed electronic resources.	3.21	.639
Use of subscribed electronic resources for sharing information is easy for me.	3.36	.654

Table 3: Factor loadings for various Principal Component Analyses of statements

Items	**PC1 (40.87%)**	**PC2 (10.20%)**	**PC3 (8.39%)**
I find that subscribed electronic resources are very useful in my studies.	.845		
I can properly access and retrieve relevant information when using subscribed electronic resources.	.795		
Using subscribed electronic resources enables me to get exact materials that i require.	.735		
Using subscribed electronic resources improves the quality of my work as well as academic performance.	.746		
Using subscribed electronic resources in sharing information would make my works more interested.		.823	.501
Use of subscribed electronic resources for accessing information is a good idea.		.817	

I have a generally favourable attitude towards using subscribed electronic resources in sharing information.		.697	
Use of subscribed electronic resources for sharing information is easy for me.		.662	
I have a generally negative attitude towards using subscribed electronic resources.		.814	
It is difficult to access and share information through subscribed electronic resources.		.806	
I find it user-friendly to use subscribed electronic resources.	.501		.755
Learning to use the subscribed electronic resources is easy for me.			.694
I find it easy to access information by using subscribed electronic resources.			.680
Use of subscribed electronic resources for sharing information is easy for me.			.530

PC1-First Principal component (Perceive usefulness ness)
PC2-Second Principal component (Attitude)
PC3-Third Principal component (Perceive ease of use)

Table 4 shows a regression model of the determinant of use of subscribed electronic resources by the undergraduate students. Six factors were included in the model: age, sex, year of study, attitude, perceive usefulness and perceive ease of use. The results showed that the Variance Inflation Factor (VIF) for all variables in the model ranged from 1.111 to 1.488 and met the VIF as stipulated by Pallant (2011) which states that the minimum VIF should be less than 10. Furthermore, the Durbin-Watson's d tests were used to test for auto-correlations. The results showed that the Durbin-Watson's is 1.744 which falls within the values of $1.5 < d < 2.5$ (implying that there was no auto-correlation) (Kutner *et al.,* 2005). Hence, there was no auto-correlation in the multiple linear regression data.

Furthermore, the multiple R and coefficient of determination of the model were 0.611 and 0.387, respectively. This implies that the predictors in the model accounted for at least 38.7 per cent of the use of subscribed electronic resources. The multiple correlation of 0.611 implies that there was moderate, positive association between study independent variables and dependent variable.

Table 4: Determinants of using subscribed electronic resources by the undergraduate students

Determinants	Unstandardised Coefficients		Standardised Coefficients	t	p	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	.263	.932		.282	.779		
Age	.007	.077	.008	.090	.928	0.900	1.111
Sex	.211	.075	.214	2.760	.112	0.818	1.222
Year of study	.407	.075	.458	2.760	.007	0.863	1.159
Perceive usefulness	.135	.166	.088	.813	.041	0.823	1.215
Perceive Ease of use	.056	.155	.040	.360	.719	0.709	1.410
Attitude	.420	.216	.192	1.940	.051	0.672	1.488

Multiple R=.611; R Square=.387; Std. Error of the Estimate=4.62715; p=0.000; Durbin-Watson=1.744

Table 4 shows that age had a beta coefficient of .007. This meant that as age increased by one year, it increased the use of subscribed electronic resources by 0.007. This implies that younger respondents had lower chance of using subscribed electronic resources than adult ones. However, the variable was not statically significant ($p>0.05$). This is contrary to the study by Swain (2010) which found that there was statistical difference of the usage of subscribed electronic resources among the different age groups.

Likewise, a beta coefficient for sex was 0.211. This meant that male had a 0.211 more usage score of using subscribed electronic resources than female. However, the variable was not statistically significant ($p>0.05$). This implies that sex was not the factor influencing the use of subscribed electronic resources. These results are contrary to the study by Ford *et al.* (2001) which revealed that female tended to have low usage of finding information on-line. The results imply that gender gap relating to usage of electronic resources had been shrinking. A previous study found that there was a gap on usage of the internet among male and female students and that sex was among the determinants of internet use and attitudes. It was found that male seemed to enjoy browsing on the internet than females (Ono & Zovodny, 2003).

Furthermore, Table 4 shows that the year of study of the respondents did influence their use of subscribed electronic resources. It had a beta coefficient of 0.407 and was statistically significant at $p< 0.05$. It implies that one unit increased in education produced 0.407 increase score on the likelihood of using subscribed electronic resources. This implies that the respondents with higher education level had higher chances of accessing and using subscribed electronic resources. It could be explained by the fact that increases in education level increased respondents' awareness on the use of subscribed and gain skills on how to use the subscribed electronic resources. This conforms to a study by Ogbonnaya *et al.* (2011) who found that respondents with higher education levels had higher chances of using electronic resources. Students with higher education are likely to gain high level of internet skills which might influence utilisation and non-utilisation of electronic information resources in libraries.

Moreover, Table 4 shows that perceived usefulness was positive by 2.574 and it is significant ($p=0.041$). This implies that an increase on the perceived usefulness score of the respondents by one unit also it increased the usage of subscribed electronic resources by 2.573 score. This means that the respondents who had high perception on the usefulness of the subscribed electronic resources had high usage of it. This is similar to the study by Salloum *et al.* (2019) which found that perceived useful was the determinant of electronic resources. The use of subscribed electronic resource depends on its usefulness to the user. Mawere and Sai (2018) in their study found that for perceived usefulness, it showed a significant relationship to usefulness of electronic information resources among the students.

In addition, Table 4 shows that perceived ease of use was positive by 0.056. This implies that increase of the perceived ease of use score of respondents by one unit also increased the usage of subscribed electronic resources by 0.056. This means that the respondents with high perceived ease of use of the subscribed electronic resources had high usage of them. However, the variable was not statistically significant. This implies that perceived ease of use was not the determinant influencing factor for the usage of subscribed electronic resources.
Lastly, Table 4 shows that the attitude towards subscribed electronic resources did influence their use of subscribed electronic resources. It had a beta coefficient of 0.420 and was statistically significant at $p< 0.05$. This meant that one unit increase in attitude score increased 0.420 increase score on the likelihood of using subscribed resources. It implies that respondent's positive attitude had higher chances of using subscribed electronic resources. This could be explained by the

fact that positive attitude towards subscribed electronic resources is one of the strongest correlates of usage of electronic resources. People who value the technologies in their minds, there are likely to use them. Positive attitudes are fundamental in implementing new technologies including subscribed electronic resources. This conforms to a study by Nyemezu (2022) who found that respondents with higher positive attitude had higher chances of using electronic resources.

Conclusions and Recommendations

It is well-known in the literature that subscribed electronic resources are useful among the students pursuing higher education. However, its adoption and use in higher education institution among undergraduate students is low. This study assessed students' use of electronic resources by undergraduate students using the TAM. It incorporated additional constructs such as demographic characteristics of students to determine factors influencing the use of subscribed electronic resources. Using multiple linear regression, the study found that the predictor of actual use of subscribed electronic resources was year of study, perceive usefulness and attitude. The study results provided important understanding for the library management on what determine students to use subscribe electronic resources. For example, educators who intended to promote electronic resources should ensure that it is useful. Moreover, creating awareness on usefulness of electronic resources to change their attitude is another important factor. Likewise, marketing the electronic resources through outreach programmes and information literacy are necessary for all the students.

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Investigating the Use of Artificial Intelligence in Transforming the Academic Libraries into Smart Libraries

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Abstract
The advent of modern technologies, for example, artificial intelligence (AI) calls for innovations in the way information is accessed, stored and used. The librarians have long been conducting a variety of library-related activities like borrowing, locating and access of books in the library manually. AI offers support to some of the library activities through automation thereby reducing human workload and challenges. The reports from studies in emerging economies like Tanzania regarding the use of AI in libraries are nevertheless scarce. The availability of physical and wireless internet has eased and facilitated the change in how libraries should operate smartly. One of the innovations which can be tapped in our libraries is the use of security in securing library resources using radio frequency identification (RFID) technology. The new technologies are in many ways transforming the activities of libraries providing users with access to library resources from any place and anytime without being physically in the libraries. The suggested conceptual framework provides a platform for more debates and studies on the attaining of smart libraries using AI.

Keywords: Artificial Intelligence, library transformation, smart library

Introduction

Libraries constitute a place which promotes cultural and scientific institutions, with holdings, book stacks, reading rooms, physical and virtual or online learning spaces, as well as virtual hubs of knowledge consumption and production. They play a role in education and information literacy. In the past decade, there has been the influence of new technologies prompting changes in the way different activities are being done in societies. The societies include business organisations, academic institutions, industries and many other sectors. Artificial intelligence (AI) is one of the technologies leading in transforming different sectors (Sharipova, 2021; Borgohain, Bhardwaj & Verma, 2022). The libraries in academic institutions have found themselves in the middle of inevitably starting to use technologies in serving the distribution of information, books, articles, journals, etc.. The technologies promote the library into being a smart library. A smart library is the kind of library that is equipped with unique intelligence of providing the kind of services that allow library users, for example, to have access to the services at any time and from anywhere. The smart library has realised the digital space intelligence from where the information resource (knowledge) organisation intelligence, service mode intelligence and information management provide the users with information from anywhere and anytime. According to Yu *et al.* (2019), the methods of intelligence in the library include the internet of things, big data, cloud computing, RFID technology, AI, virtual reality and other new technologies. AI is the kind of technology that enhances the already established smart library concept to be extended for development issues as explained by such scholars like Mohammed, Thabit and Azeez (2019) in doing such activities as descriptive cataloguing, technical services, collection development, subject indexing, reference services and database searching and document delivery (Asemi & Asemi, 2018). The main objective of this was to find out how AI technology can be used to transform academic libraries in emerging economies like Tanzania into smart libraries. The study was guided by the following research question:

i. How artificial intelligence (AI) technologies can be used to transform academic libraries into smart libraries?

Research Methodology

Secondary data analysis was used for this study. Several studies were read and analysed to understand the extent of information regarding the use of AIin smart libraries. The analysed data were collected from variety of studies under the

themes: smart library, AI, library transformation using technologies and a conceptual framework was suggested.

Smart library

According to Schöpfel (2018), the outline of a new concept of the smart library can be described in four dimensions, i.e., smart services, smart people, smart place and smart governance. This implies that as far as a smart library is concerned, users expect the library to have a conducive environment for reading, good services from the library staff (smart people) and reliable access to all library services. The smart library strives to provide users with more efficient and high-quality services, build a more attractive information interconnection environment and create a more diversified information-sharing space.

A study (Liau, 2019) shares how the adoption of robotics and automation technologies has transformed library operations and improved customer experiences in libraries. The study was conducted in Singapore whose libraries use robots and automatic machines to help library staff and volunteers with sorting and returning books, shelf reading and transportation of library materials. A study by Bi *et al.* (2022), narrated that in a smart library environment, obtaining the books only involves concise steps via a smart terminal device whose tasks could involve confirming and making an appointment for the intended books, fetching the books under the smart guide and devices furnished by the library, e.g., the optimal schedule for the borrowing process. The smart library aims at introducing modern scientific and technological means to increase readers' experience and enhance readers' services (Yu *et al.*, 2019). There are many successful cases in the smart library environment (Yaman *et al.*, 2020). The inventory of books in university libraries utilises technologies for improving their inventory and access. For example, the ultra-high-frequency RFID technology intelligent book inventory robot of Nanjing University Library in China mainly uses automatic identification technology and RF phase technology in RFID technology, as well as machine automation technology to realize the automatic library book counting function (Yu *et al.*, 2019).

In a study report explained by Mohammed, Thabit, & Azeez (2019). Smart libraries are linked to the enhancement of sustainable development practices in the sense that libraries are, therefore, educational institutions with a clear impact on society They seek seeks to promote sustainable development by providing environmentally friendly services, reducing practices that waste time, natural

resources and increasing the amount of waste and harmful emissions. In a study done by Yaman *et al.* (2020) a method for ultra-high frequency radio frequency identification (UHF RFID)-based book positioning and counting developed for smart libraries was proposed. In the experimental setup created, RFID tags placed in books were automatically detected using three RFID antennas. This provided a flexible way to count, locate and access a book in a library and, therefore, save time.

In elaborating on what is meant or expected in a "smart library" a study done in Nigeria by Orji and Echezonamanyira (2021) narrated that the components of smart libraries are encapsulated in the acronym "S.M.A.R.T." for "Service, Methods, Automation, Resources and Technologies"". Being smart, enables libraries to align with developmental trends and innovations in education delivery in the digital age. This calls for the inevitable use of technologies in a library to be called a smart library. Out of many emerging technologies, one of them is AI.

Background to Artificial Intelligence (AI)

Artificial intelligence (AI) refers to the use of computers and information technology to create machines that can mimic human beings' cognitive abilities. AI is a comprehensive discipline developed by computer science, control science, information science, cognitive science, neuroscience, neurophysiology, psychology, linguistics, brain science and other disciplines (Andreu-Perez, 2017). Its essence is to study the production of intelligent machines or intelligent systems, simulate human intelligence activities and extend the science of human intelligence.

AI is associated with intelligent machines, especially computer programmes that foster intelligence as opposed to dumb terminals. It is related to the study and creation of computer systems that show some forms of intelligence: the system that can learn new ideas and a variety of tasks, systems that can reason and draw useful conclusions about the data and environment, systems that can understand a natural language or perceive and comprehend a visual scene and systems that perform other types of feat that relate to human types of intelligence (Carter, 2007; Ezrachi &Stucke, 2017).

AI, therefore, is the application of computer systems and utilisation of computer-based output in the performance of different operations and functions or the provision of various services and production of output products. Automation related to AI implies a degree of mechanisation where the procedures and

accessible jobs or operations are left to be performed by machines with little or no intervention by human beings. The lesser the degree of human intervention the greater the degree of automation. This does not mean that automation does away with human beings. On the contrary, human beings are relieved of routine responsibilities giving them more time for the tasks which require their intelligence (Carter, 2007; Ezrachi & Stucke, 2017).

AI in libraries transformation

Organisations like universities are changing their teaching, learning and research models to influence students' strategic upgrading in response to the emergence of ever-changing new technologies (Okunlaya, Syed Abdullah & Alias, 2022). The issue is related to providing the kind of services that offers smooth operations of libraries operations that favours both librarians and library users. AI is an adequate means to enable library users to access library resources without restrictions in the face of any disruption. AI technology usage in the library can allow library resources to be virtually reimagined. This reimagination can help the library explore new ways to meet customer needs and support academic activities for anyone from anywhere. In libraries, the activities like cataloguing, indexing, information retrieval, reference and other purposes have been well enhanced by the use of among other technologies AI (Asemi, Ko and Nowkarizi, 2020).

A study on the application of AI in libraries done in Nigeria (Okpokwasili, 2019) measured two variables, namely: the use of AI in libraries and user satisfaction. The study found and concluded that there was a high level of roles played by AI in the delivering of libraries services and high level of satisfaction by the users of AI in the libraries of higher institutions in Nigeria. Among other things, the study recommends that libraries should intensify efforts in adopting AI in the delivery of libraries services for libraries users to gain very high-level satisfaction.

Today's technology applications in the business world continue to improve decision-making efficiency and the overall transformation of business operations. Business management and activities are in a data era, which shapes business operations' day-to-day processes (Sharipova, 2021). AI seeks to transform and leverage the existence of expansive data to encourage the decision-making of business intelligence using advanced algorithms that are used to oversee the insight into imminent business processes, consumer behaviour and market trends and to encourage management-informed decision-making, giving companies a competitive edge over other competitors.

Today, AI is taking over business intelligence applications due to both small-scale and large-scale businesses' easy access to technology. By allowing the automation of production processes, AI continues to disrupt industries, for example, limiting the number of workers in an organisation. Because of their ability to automatically produce highly accurate computations and reports, AI apps are being used in financial services, industries, agriculture and many other sectors. Modern library and business decision-making have been greatly improved and transformed by AI. Previously, leaders relied on unreliable and imperfect knowledge that was still in its rudimentary stages from business intelligence systems. Big data can be chopped into AI software and broken down into possible actionable insights that can be used to help executives make more informed decisions.

A good score of studies has reported on the role technology revolution in the transformation of libraries into utilising this technology for physical space intelligence, information resource organisation intelligence and service mode intelligence (Yao, Zhang, & Chen, 2015; Yu *et al.*, 2019; Bi *et al.*, 2022). Consequential to the arrival of new digital transformation technologies, institutions of higher learning have found novel means to get a competitive advantage through, for example, using AI (Abbattista, Semeraro, & Bordoni, 2003). The transformation of libraries and their operations are not only based on the online access to library resources, but rather considering also other factors, for example, the identification of the location of the books in the library, browsing the available resources before a physical visit, the security, the management of space and resources and the self-borrowing and return of books (Yao, Zhang, & Chen, 2015). Indeed, library transformation takes a variety of forms and stages to allow the library environment to be easily managed and automated as compared to the traditional library system.

Adopting AI in academic libraries in the Tanzanian context

Academic institutions in Tanzania have their libraries equipped with systems that allow access to a variety of education and other related resources of information. They are equipped with internet infrastructure whereby the access to information is and can be both physical (a visit to the library) and online. Such infrastructure enhances the wider range of educational resources to be obtained abundantly and at any time (Mwandosya *et al.*, 2020). On the other hand, the developments in mobile technologies (wireless internet and mobile devices) have prompted the accessibility of education resources anywhere and at the users' flexibility (Oyelere *et al.*, 2018) and the students extend the learning to self-regulated learning for them to learn at their own pace (Mwandosya, Mbise and Oyelere, 2019).

The development in technology and technology use has been a pillar in the enhancement of the activities in organisations that are being done. AI has been one of those constantly being used technologies to enhance activities in different sectors, for example, health, military and education, just to mention some of them. AI use in libraries, for example, has been reported in many studies (citations) but the same has not been reported in the Tanzanian context despite its usefulness. A study by Vijayakumar and Sheshadri, (2019) reports on the way AI can be used in enhancing the activities of academic libraries worth mentioning. The summary of the findings of (Vijayakumar & Sheshadri, 2019) work is seen in Table 1.

Table 1: The summary of the application of AI in transforming the academic libraries.

SN.	AI Element	Related Library Application
1.	**Expert Systems**	Application of expert systems in libraries where dialogue between staff and users, users and databases are promising. The expert system will help the librarians to understand the need for productivity improvement. A well-programmed expert system will also improve the quality of library services.
2.	**Natural Language Processing**	Natural Language Processing in Library Services when we think of the term NLP, which is the ability to speak or write a complete sentence and have a mechanical process of requesting and speaking. NLP can apply to many disciplines, including libraries. When we apply to the field of library and information science, more specifically, to search databases such as the Online Public Access Catalogue (OPAC), indexing is the basis of document retrieval. The purpose of the index is to improve the precision of retrieving parts of the relevant documents and to reduce the proportion of recalls and related files retrieved in libraries.
3.	**Machine Learning**	One specific challenge that is ripe is the improvement of library metadata generation. Libraries, through various vendors as part of the purchasing and acquisitions process, acquire thousands of pieces of metadata for print and digital resources made available to their library users. In cases where an e-book platform does not include metadata, libraries generate their own. For the increasing majority of born-digital resources, machine learning provides an array of possible tools to help libraries generate metadata for digital resources, allowing cataloguing to not only increase the speed of metadata generation but also vastly improve the depth and breadth of subject terms.

SN.	AI Element	Related Library Application
4.	**Robotics**	The robot is "A reprogrammable, multipurpose manipulator, automatically controlled, programmable in three or more axes, which can be fixed on the location or portable for use in automation applications". Libraries providing an increased variety of services and resources for digital libraries are still acquiring a great number of printed documents. This combined pressure to provide electronic and printed resources and services has caused serious space constraints for many libraries, especially academic libraries and research. The objective of CAPM (comprehensive approach to printed material) is to build a personalised robotic scanning system based on a series, which allows the browsing of imprints in real-time via the web interface. The user includes a CAPM system that, in turn, starts a robot that recovers the item requested. This item is delivered to another robotic system, which opens the item and rotates pages automatically.
5.	**Intelligent Interface**	Online access to databases is still difficult for many potential users. The user may need to know different communication protocols, master language control, search techniques, database file structures and terminological terminology. The intelligent interface aims to facilitate access to the construction of some of the necessary knowledge in the front-end software used to test the online search system. This goal does not coincide to create an intelligent search system. The interface of access to existing online systems, with all their limitations and disadvantages, so it can be equally successful as an online search system. The interface does not solve the problem of restructuring the database, but rather allows the search system itself to make the approach more intelligent.

The conceptual framework for AI adoption in Tanzania's smart library

Literature on the importance of AI in transforming academic libraries has been well reported. However, in the Tanzanian context, the literature on the use of AI in academic libraries is less written although there are several examples of the importance of utilisation of technologies in the access, use and download of educational resources by the users. Stepping from the explanation of the transformation of AI in libraries and from the works of (Vijayakumar & Sheshadri, 2019) and (Schöpfel, 2018), the following conceptual framework is suggested.

The AI elements as explained by Vijayakumar and Sheshadri (2019) are five but may not be possible to implement all of them in a single project in a given

academic library. So, there is a need to define the requirements of a specific academic library (See Figure 1). The current requirements will determine the kind of AI to be employed to acquire some or all levels of the smart library which are smart services (quick, accurate and on time), smart people (highly knowledgeable and expert in the field), smart places (the library is neat, well arranged and comfortable) and governance.

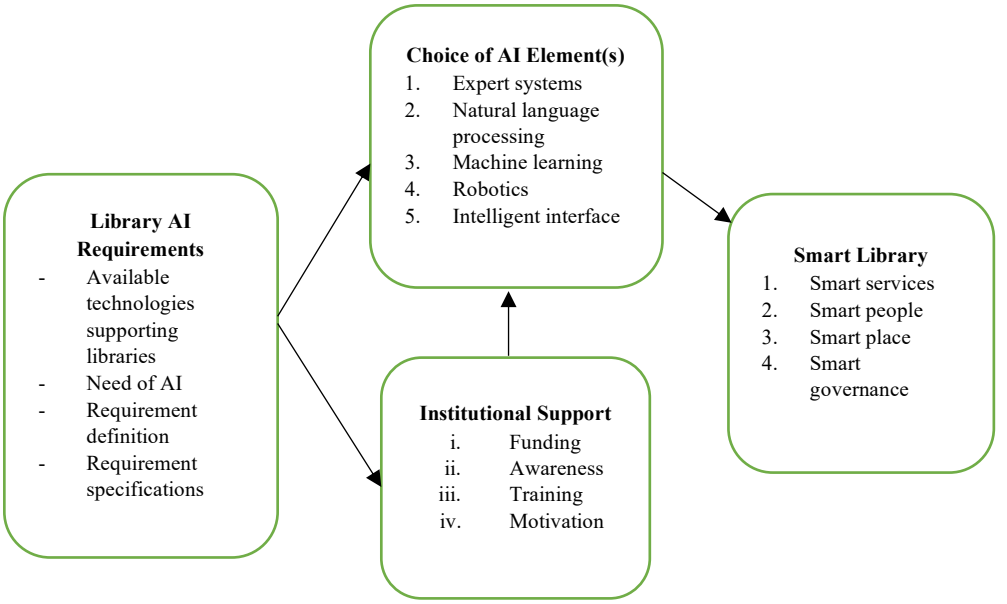

Figure 1: A conceptual framework for transforming academic libraries in Tanzania.

Source: Researcher (2022)

Conclusions

AI as explained by a good number of authors has been used as one of the technologies in transforming libraries into smart libraries. There are a good number of possible applications of AI implemented and they have been creating a positive impact on libraries. This has proved that applications of AI save time and money in almost all sectors of society. The application of AI in academic libraries has been increasing at a very high speed. As the author of this paper discussed that the implementation of AI in libraries has triggered the discovery of many new ideas and has changed the way libraries have been working. Smart library transformation provides one of many academic excellences whereby a library contributes.

AI systematically tops popular lists of the most imperative emerging technologies. With mixed feelings of fear and eagerness, readers seem to agree that AI shapes future libraries. With the smart library technology described in this study, such operations as book scanning, borrowing, returning and counting books are carried out easily for library employees and users. The counting, borrowing, returning and book security of books are done more successfully by using RFID tags which brings efficiency to library functions. The conceptual framework explained in this study is suggested for the environment in emerging economies like Tanzania as a starting point and can be easily updated accordingly depending on the needs and the available technologies.

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Assumptions of the Future Application of Artificial Intelligence in Tanzanian Academic Libraries: A Review of Literature

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Abstract

This paper insight into the assumptions, opportunities and challenges of the use of interactive and engaging applications of Artificial Intelligence (AI) in academic libraries in Tanzania. It determines assumptions and pitfalls inherent and the debate whether the technologies have effectively replicated academic libraries, library resources, services and operations in Tanzania. The inclusion criteria of the literature were assumptions, opportunities and challenges towards AI in academic libraries. The literature was searched from databases including Sage, Taylor and Francis, Emerald, Google Scholar, Research Gate and PDF Drive. The results were analysed, evaluated, compared, contrasted and discussed through the lenses of UTAUT theory. The results revealed that AI brings the world together in which people work and network in the integral function of providing library resources and services to library users. AI is an enabler for academic libraries to create library spaces, store, process, preserve, conserve, access and retrieve library resources and services timely with fewer costs. Also, AI lessens the inadequacy of funds to purchase printed materials in academic libraries, the lack of digital devices and limited spaces in libraries. AI has transformed the complex attitude and behaviors of library staff and users. Though, AI has created fears about employment opportunities for workers and library staff in particular. Besides, it was realised that library staff are mismatched with the AI in academic libraries due to the lack of awareness, inadequate qualifications and limited infrastructure in academic libraries. This review contributes to the practices, knowledge, theory and literature on the use of AI in academic libraries. The study proposed that there should be step by step towards interventions to introduce AI in academic libraries. The process should consider the environments, needs and socio-economic developments of the developing countries and Tanzania in particular.

Keywords: Artificial Intelligence, academic libraries, emerging technology, university, education, Tanzania

Introduction

The 4th Industrial Revolution (4IR) is a transformation of digitisation that invented a new paradigm in the real world. Artificial Intelligence (AI) is among the 4IR with broad applications in the fields of human life and is more prominent in academic libraries. AI is a computational science that replaces operations that would be attended to or controlled by human beings or digitally programmed (Ajakaye, 2022). It can be programmed remotely with autonomous to perform activities controlled in a fixed location or portable application (Vijayakumar & Sheshadri, 2019; Han & Conti, 2020). AI invention follows the central question if humans can utilise available resources, reason and decide to address problems why cannot AI do so (Anyoha, 2022).

Overview of Artificial Intelligence in academic libraries

AI is traced to 1920 out of Rossum's Universal Robots play by Karel Capel. It is a Czech word 'Robota' referring to drudgery or boring but must be accomplished. AI was designed in the fields of law, electrical engineering, mechanical engineering, computer science, common language processing, speech recognition, expert systems and fuzzy system (Gade & Singh, 2016). Other scholars view that the AI field was invented in the 1950s regarded as fiction used in film making and book writing (Anyoha, 2017; Ajakaye, 2022). Whilst today AI is coined in the daily lives of people implicated in numerous fields including law, health, commerce education, transport, pharmaceuticals, housekeeping, rescuing, manufacturing, finance, public services and industries. AI was adopted in the 1990s to detect and understand behavioral patterns and respond to operational activities in academic libraries (Ajakaye, 2022).

AI is an important virtue transforming library fields through concerted and coordinated international information-sharing phenomena. It brings together the world in which people work together and network to learn organisation and provision of library products and services to library users. AI has enabled academic libraries to remotely perform library scheduling, budgeting, collection development, referencing, storage and retrieval (Vijayakumar & Sheshadri, 2019). In particular, libraries can preserve, conserve, access and retrieve information in a friendly and sophisticated manner. AI helps librarians in creating awareness among library users to improve the utilisation of library products.

The study by Khanzode and Sarode (2020), on the importance of AI in libraries, pointed out that it facilitates dialogues between the library users and robotics,

directs the library users to specific locations as per their needs, addresses queries and scanning system through Comprehensive Access to Printed Materials (CAPM) for academic achievement and lifelong learning of the library users. Thus, AI complements the core mission of academic libraries to provide resources and services for society's development.

The importance of AI in academic libraries reinforces human beings adapting it in academic libraries to fit into the modern world. The study by Adejo and Misau (2021) conducted in Nigeria views that AI could be applied in academic libraries to perform tasks to include reference services, indexing, acquisition and behavioural pattern recognition. The study by Asemi *et al.* (2020) on the use of AI in academic libraries found possibilities to apply AI to improve the provision of library resources and services. Besides, Mei, Chen, Jiang and Cheng (2017) proposed a framework to align AI in academic libraries. An extant study by Okunlaya, Abdullah and Alias (2022) shows that several academic libraries establish AI centers in Malaysia. Thus, academic libraries should embrace finding novel means for AI applications for competitive advantage (Hamidi & Jahanshaheefard, 2019). They should endeavor to envision AI for prospective change in academic library operations and services. However, AI has proven a breakthrough in academic libraries in developed countries. Whilst, in developing countries and Africa in particular, AI is still a new emerging technology posing challenges that how can humans work with AI in the light of ethical issues and security consciousness between them (Bostrom & Yudkowsky, 2022).

In recent years, AI raised debates on the application of AI in education and academic libraries in particular (Okunlaya, Abdullah, & Alias, 2021). This is because AI is more than imitating human intelligence to add value to academic libraries and enhance teaching and learning processes (Zhang, Li & Zhang, 2015). Despite endeavours, there are few studies to incorporate AI in academic libraries in Tanzania. The study by Adejo and Misau (2021) confirms that there is decimal or no literature or documents on the application of AI in academic libraries in developing countries. Besides, the incorporation of AI in strategic plans is yet to be realised by academic libraries (Wheatley & Hervieux, 2019). In addition, the proposed framework by Mei, Chen, Jiang and Cheng (2017) is still inadequate to guide a critical gap in how academic institutions can apply AI in academic libraries (Okunlaya, Abdullah, & Alias, 2021).

Information stakeholders are not aware of AI's contribution in light of opportunities and challenges (Okunlaya, Abdullah, & Alias, 2021). There is a missing link between academic libraries and AI incorporation in strategic plans (Wheatley & Hervieux, 2019). Academic libraries lack consciousness of AI's significance which brings about a critical gap (Wheatley & Hervieux, 2019). This situation necessitates embarking on the study of Assumptions of the Future of AI in Tanzanian academic libraries. Therefore, this study is guided by the objective to determine the application of AI in Academic libraries in Tanzania. This study gears to fill the gap toward innovative academic libraries compliant with AI. Also, the study establishes an intimacy, awareness, unforeseen assumptions, opportunities and challenges in the use of AI in academic libraries. Also, the study enlightens alternative innovations through the lenses of technologies for the survival and thriving of academic libraries for the necessary measures for them to remain relevant in the global system.

Methodology and Scope

This study surveys and examines empirical literature as a review method on the assumptions of the use of AI in academic libraries in Tanzania. The surveyed literature includes books, journals, theses, electronic databases (Sage, Taylor and Francis, Emerald, Google Scholar, ResearchGate among others) and reports. The literature search employed various terms such as "technologies", "robotics", "artificial intelligence" and "academic library". In addition, keywords were combined to search for the literature such as "technologies and academic libraries", "robotics and academic libraries" and "artificial intelligence and robotics". The literature related to "assumptions, opportunities and challenges of the use of interactive and engaging applications of AI in academic libraries" the world over was selected. The literature reviewed was analysed in the light of UTAUT variables and constructs in tandem with four patterns of "technologies", "robotics", "artificial intelligence" and "academic library" compared and contrasted to build the gaps for further studies. The study presented a practical application of technologies, robotics and intelligence in academic library operations and services. Content analysis of the collected literature was used to present the related phenomena under the study objective in a narrative form.

Theoretical Framework

There are several theories and models which can be used to inform studies related to AI in libraries. These are as Innovation Diffusion Theory (IDT), Technology Acceptance Model (TAM), Theory of Reasoned Action, Model of Personal

Computer (MPC), Social Cognitive Theory and Theory of Planned Behaviour (TPB) (Dwivedi, Rana, Jeyaraj, & Williams, 2017). This study is underpinned by the Unified Theory of Acceptance and Use of Technology (UTAUT). The fact that in 2003, Viswanath Venkatesh, Michael Morris, Gordon Davis and Fred Davis consolidated IDT, TAM, TRA, MPC, SCT and TPB into the Unified Theory of Acceptance and Use of Technology (UTAUT). It was believed that the consolidation would appropriately explain and predict the use of technologies. In comparison, other theories/models have 60 percent while UTAUT has 70 per cent of application variation and behavioural intention for the individuals to use technologies (Attuquayefio & Addo, 2014).

UTAUT theory is believed to be widely used to inform many studies related to the use of AI. These include studies by Thomas, Singh and Gaffar (2013) on 'The utility of the UTAUT model in explaining mobile learning adoption in education', Attuquayeflo and Addo (2014) on 'Using the UTAUT model to analyse students' ICT adoption' and Han and Conti (2020) on 'The use of UTAUT and post-acceptance models to investigate the attitude in education settings. Therefore, UTAUT is believed to be more useful to underpin the use of AI as it predicts behavioural patterns in academic settings (Han & Conti, 2020). UTAUT's variables include performance expectancy, efforts expectancy, social influence and facilitating conditions in tandem with such constructs such behavioural intention and actual technology used to determine whether individuals use technologies or not. Other UTAUT relationship moderators are age, gender, experience and volunteerism (Venkatesh, Thong, & Xu, 2016). Furthermore, the study by Al-Qeisi (2009) on; 'Analyzing the use of UTAUT model in explaining online behavior' observes that UTAUT though initiated in the western countries, its variables and constructs are applicable in other countries to include developing countries with slight variations.

UTAUT variables and constructs and the use of AI in library settings

The application of UTAUT theory into the library settings is based on the acceptance and use of AI by the library staff and users. UTAUT states that individual attitudes toward technologies determine individual behaviours. In reciprocity, it predicts intentions and acceptance of the use of technology (Dwivedi, Rana, Jeyaraj & Williams, 2017). Performance expectancy, social influences, innovativeness and effort expectancy determine behavioral intentions toward the use of technologies and innovations (Slade, Dwivedi, Piercy & Williams, 2015). This study explains technologies in the context of substantive

antecedents for individuals to accept and use robotics and AI technologies in academic library environments. Through its variables, the model forms integral patterns for to use of robotics and AI technologies in academic libraries.

UTAUT integrates variables and constructs to the attitudes and behaviors which are the most influential for individuals to use AI in academic libraries. UTAUT's variables such as performance expectancy, social influence, efforts expectancy and facilitating conditions tandem with constructs such as behavioural intention build up the intrinsic and extrinsic motivation to use AI in academic libraries. They enable academic librarians and their users to adapt and use AI to access library resources and services. This increases the acquisition of knowledge, skills, experiences and information for their academic endeavours and lifelong learning. Figure 2 presents the UTAUT model.

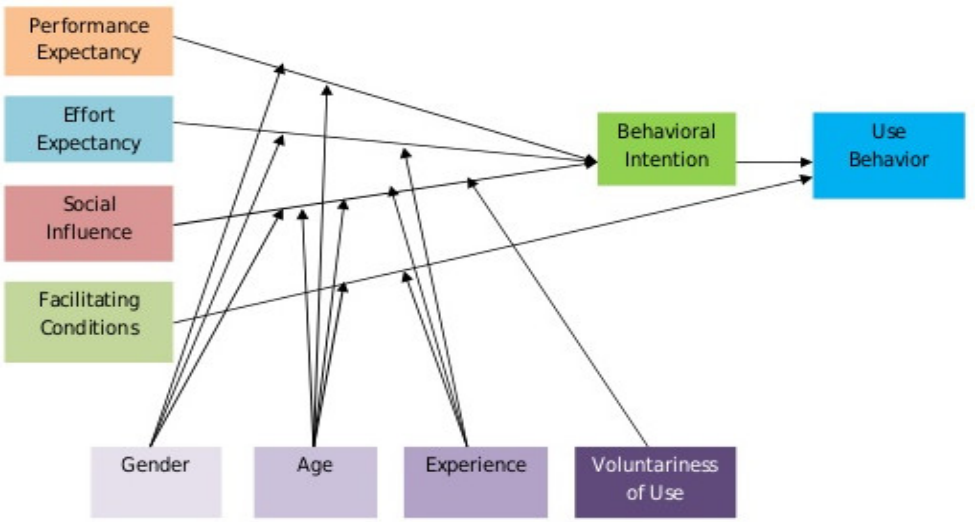

Figure 1: UTAUT Model (Venkatesh et al., 2003)

Figure 1 demonstrates UTAUT's variables and constructs as enablers of the use of AI in academic libraries. They are in line with the assumptions that the use of AI in academic libraries is a process that involves individuals' beliefs that there are benefits in using AI (Attuquayeflo & Addo, 2014). It entails that the use of AI is not determined by the gender or age of the library staff and users. The scenarios create positive attitudes and behavioural intentions and repetitions of individuals to actual (practical) use of AI. It recognises the process as an as

interrelated attitude and behavioural patterns and intentionally directed motivations that lead to permanent repeated use of AI in academic libraries. The outputs process of the UTAUT theory variables and constructs are conversely to the perceived usefulness and the actual coordinated practice. Hence, library staff and users observe the extent to which other people perceive the usefulness and benefits of AI in academic libraries and devote time to volunteer to use AI as part of behavioural patterns.

Results

Assumptions of the application of AI in academic libraries

Assumptions of the application of AI in academic libraries AI has grasped the use of computers and networked infrastructures to control various activities intelligently like human beings. For instance, robots are predominantly used to perform activities as they are electronically controlled by mirroring the competencies of human minds (Adejo & Misau, 2021). With AI, it is possible to precisely keep operating records and analyse all the actions performed by the user. AI reflects the programming and development of hardware and software that intelligently perform human tasks through speech recognition, decision-making, visual perception, language translation, talking and emotional feelings (Adejo & Misau, 2021). In this regard, AI accredits planning ability, learning processes, reasoning ability, problem-solving, mobility and creativity. This endeavour has not yet been realised in most academic libraries of developing countries where Tanzania is inclusive.

Cox (2022) considers AI as an umbrella terminology for multiple technologies. In this, broad and core interconnected AI technologies are involved. These include business analytics and data science, natural language processing, speech recognition and text-to-speech, machine and deep learning, computer vision, neural networks, machine reasoning, decision-making and algorithms, robots and sensors (Vijayakumar & Sheshadri, 2019; Cox, 2022). The interconnected AI technologies among other fields are presumed to play role in academic library reference services, technical services, indexing, acquisition, natural language processing, pattern recognition and robotics functions (Adejo & Misau, 2021). Figure 2 presents the general components of AI.

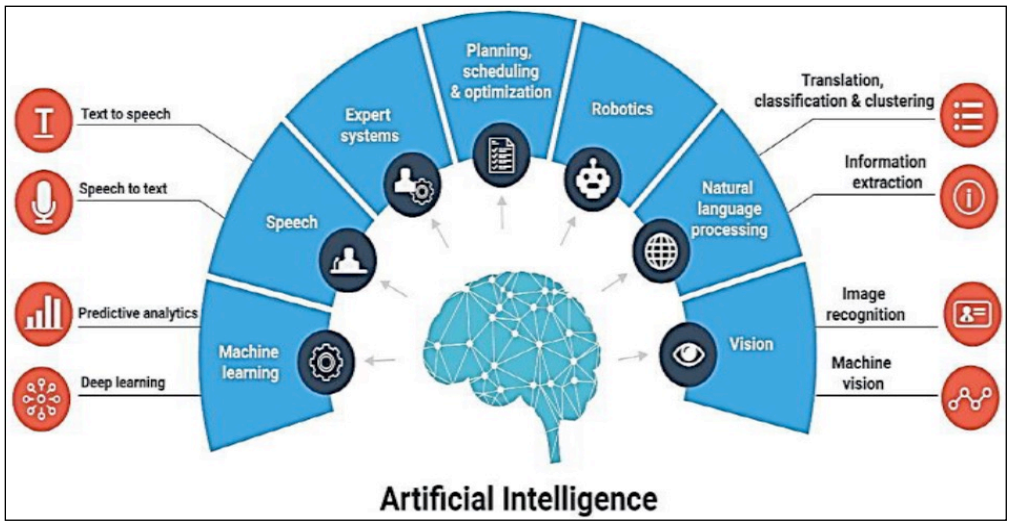

Figure 2: Artificial Intelligent Components (Vijayakumar & Sheshadri, 2019)

An expert system refers to a computer-based framework that simulates human decision-making. The system can be integrated with any information system for the quality, accuracy and performance of information services. In light of this, developed academic libraries or smart libraries have in place the Expert System Librarian (ESL) for smart information services (Asemi, Ko & Nowkarizi, 2020). The expert system operates as a gateway or an interface through which the academic libraries and particularly the reference service section can be able to provide access to the database and obtain relevant information. In this system, functions related to expert advice, decision-making and solutions to different problems are addressed. The system is, therefore, composed of an integrated knowledge base, inference engine and user interface for interaction (Vijayakumar & Sheshadri, 2019; Adejo & Misau, 2021). Currently, technology has advanced to the extent that natural language can be processed by a computerised system to bring meaningful phrases and speech for understanding. AI has provided a built-in natural language interface with limited vocabulary and syntax for translation (Echedom & Okuonghae, 2021).

Among others, a computerised AI is composed of the main elements of a natural language processing interface which can be able to synthesise a speech and translate the language a person uses, understands and that which is generated. It is similarly composed of linguistic services, information recovery, extraction and speech recognition (Vijayakumar & Sheshadri, 2019). The application of robots in academic libraries has contributed to facilitating reference services. It involves

carrying out automated tasks through AI technology which can be directly controlled by librarians or through predetermined programs. Mostly, wheeled, legged or humanoid robots are common in providing reference services to users (Chibuike & Emeka, 2021). However, such few African countries as South Africa and Nigeria have shown such initiatives of using these robots in reference services and the technology which in Tanzania's academic libraries is not well comprehended.

Plate 1: Legged Robot in a library (Chibuike & Emeka, 2021)

The expert system comprises AI that can assist in supplying users with recommended sources for reference. It aids in improving reference skills to reference librarians, users and information specialists. It has a pointer for directing users to reference resources also online reference assistance which provides for directional transactions on library location and online services such as computer-assisted instruction modules and knowledge-based systems (Adejo & Misau, 2021). Answerman is a knowledge-based system that forms a component of an expert system that provides answers to the users' questions on a given topic. It is regarded as a consultation system or a front end to external

databases and CD-ROM reference tools. Furthermore, the expert system consists of plexus a referral facility that aids in providing knowledge about the reference processes, a subject-based information retrieval guide, information about reference sources and most information about patrons (Vijayakumar & Sheshadri, 2019; Adejo & Misau, 2021).

Further endeavours of an expert system are visualized in classification and cataloging processes. In classification, the system bears a Coal SORT AI tool that provides for searching or indexing. The tool composes the frame-based semantic network which forms the expert knowledge and the software for portions display of the searched or indexed item. The BIOSIS facility of the expert system uses the knowledge-based of items to automatically assign them to a given category of subjects or topics (Chibuike & Emeka, 2021). It operates as an indexer assistance tool. Furthermore, the expert system has an Environmental Pollution Expert (EP-X) which performs in line with Coal SORT to enhance interfaces through a knowledge-based approach. The expert system provides opportunities for cataloging services (Echedom & Okuonghae, 2021). It has two interfaces for cataloging. A human-machine interface provides for capturing the intellectual efforts and processes them between the intermediary and support system to provide a catalog package. The second interface provides a full cataloging capability that links to the e-publishing system where an e-text is captured and processed through the knowledge-based system for cataloging with less concern for the intermediary efforts on intellectual inputs (Vijayakumar & Sheshadri, 2019; Adejo & Misau, 2021).

The expert system finds other AI applications in indexing. The system identifies concepts and translates them into verbal descriptions. The latter are further selected and assigned controlled terminologies that are conceptualised to equate the verbal descriptions. Indexing with an expert system improves consistency and quality of intellectual aspects. The expert system consists of a med-index interface embedded with the knowledge-based system for the function it performs (Vijayakumar & Sheshadri, 2019; Adejo & Misau, 2021). Furthermore, AI applies to speech recognition.

The artificially intelligent system is installed with special machines which can be able to convert spoken words into text format. In libraries, for instance, audio-books can be collected and managed by LibriSpeech, a transcription database on which the artificially intelligent system can transcribe to text format (Zhang *et al.,* 2022). On the other hand, AI provides a further use of machine learning where

the system is enabled to automatically learn and improve from experience without being explicitly programmed. In this, the system has to be configured in such a way that it can access data and use it to learn about itself. Robots, pattern recognition, text data mining, chatbots and big data are among the examples of machine learning tools (Ali, Naeem, & Bhatti, 2020). The machine learning tools assist in organising the library collection and provide logical extension and accessibility so that library users can navigate the entire collection in the shortest time possible rather than searching a library catalog to locate the individual item (Cox, 2022).

Deep learning forms a category of machine learning where large amounts of data are dealt with at once. It incorporates artificial neural networks and algorithms inspired by the human brain. With deep learning; interconnected, unstructured and diverse data sets are made possible and complex issues on these data can be solved. Natural language processing, image processing and neural networking are the operational tools in deep learning. Natural language processing is important in subject index designing, bibliometric and information retrieval from various databases and thus finds crucial in library digitisation (Ali, Naeem & Bhatti, 2020). The user can use natural language for information retrieval from any database and in the end, deep learning through the natural language processes transcribes to the communicable language (Asemi, Ko & Nowkarizi, 2020).

Furthermore, the library collection is assigned accession numbers or barcodes from which the pattern recognition closely related to AI and machine learning that operates through data mining and knowledge discovery from various databases assist in securing information resources and in library users check in and out with a single sweep. Pattern recognition is further integrated with Radio Frequency Identification (RFID) which replaces the security gates in protecting library resources from theft and vandalism (Ali, Naeem & Bhatti, 2020).

Opportunities of AI in academic libraries

The opportunities for the adoption and application of AI technologies in developing countries including the African region academic libraries are proliferating, but the policy response to this endeavour is in the preliminary stages (Echedom & Okuonghae, 2021). As it is revolutionary in the industrial sector, it is most likely that academic libraries have the opportunity to dynamically advance to the 4th Library Intelligence Revolution (4LIR). The universal trends in librarianship demand deployment of the advanced technologies which incorporate emerging endeavours where among others AI stand to remain the

future opportunity throughout its existence in the modern environment (Gwagwa *et al.,* 2020). Academic librarians have visualised the fact that AI is a new technological opportunity to the driving force for the development of the intelligent library.

The libraries are positioning themselves to take advantage of the application of cognitive computing in general and AI in particular for their potential effectiveness as a tool for refining the quality of library services (Adejo & Misau, 2021). The intensive pressure on librarians to provide high-quality services to library users due to the information explosion in our present society has led to the incorporation of modern technologies. AI has found its way into the library as a panacea in various information resources management and services. With AI, opportunities of replacing human power with machines find a way to the quality of library services and information management. Similarly, there are possibilities of the opportunity to influence the connectivity of information technology for active and reliable information used throughout the universe (Vijayakumar & Sheshadri, 2019; Adejo & Misau, 2021).

The World Economic Forum in Africa is pioneering at ensuring the region is moving up to the global through AI and keeping pace with the 4IR and in other fields including education. In 2018, the forum through the European Investment Bank funded 19 African countries for technological start-up projects in Artificial Intelligence (See Figure 3). Tanzania is among the benefited countries with 75 million USD while Kenya was privileged to 348 million USD, followed by Nigeria with 306 million USD and South Africa funded with 250 million USD (World Economic Forum, 2019).

Unfortunately, with this opportunity for African countries yet their efforts on AI and skills development are not directly featured in the global penetration statistics (See Figure 4) (Zhang *et al.,* 2022). The United Nations Educational, Scientific and Cultural Organisation (UNESCO) was surveyed in 2020 to realise the deployment opportunities and use of Artificial Intelligence for African national development plans. The survey indicated that out of 32 African countries, only 21 deployed and use AI for development. Globally, the top five African countries featured in the 2020 global Government AI Readiness Index. These countries are Mauritius ranked the 45th followed by South Africa - 59th, Seychelles - 68th, Kenya - 71st and Rwanda - 87th. The United Republic of Tanzania did not feature in the global readiness index despite the support invested in AI initiatives (Gwagwa *et al.,* 2021).

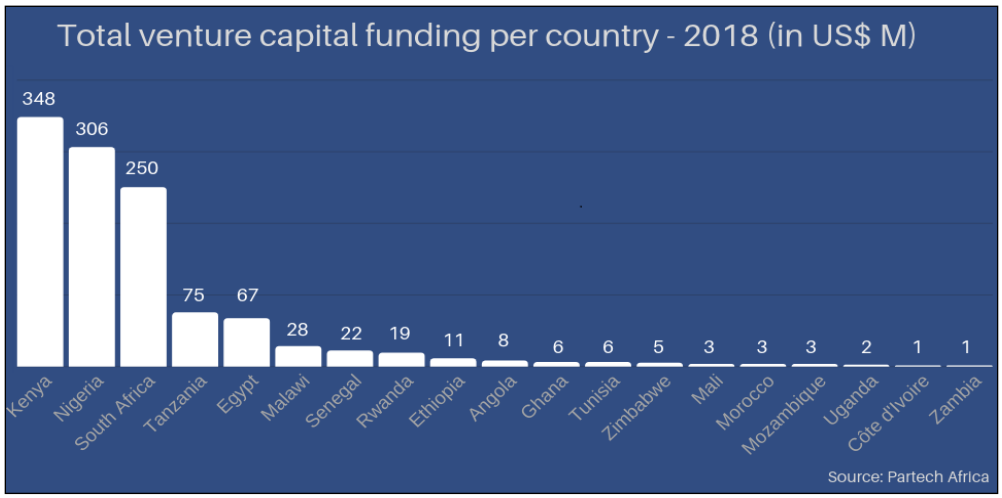

Figure 3: Total venture capital funding per country (World Economic Forum, 2019)

The Indians and the United States of America indicate advancement in the use of AI in various fields of the region's economy. The regions have invested in developing AI skills among various occupations and thus contributed to the skills penetration. The latter describes the intensity with which employees use AI in their duties (Zhang *et al.,* 2022). The AI skills penetration rate is globally compared by measuring the sum of the penetration of each artificial skill across occupations in a given country or region, divided by the global average across the same occupations in a given time frame. In Figure 3, India led the globe at a rate of 3.09 times the global average from 2015 to 2021 (Zhang *et al.,* 2022).

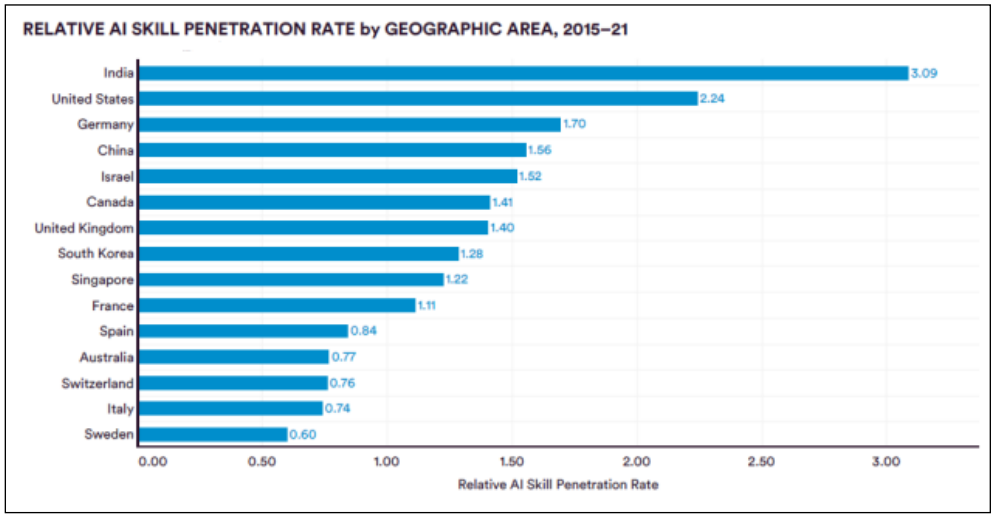

Figure 4: Relative AI skill penetration rate by geographical area (Zhang et al., 2022)

The African regions including the United Republic of Tanzania had this opportunity of adopting and raising AI skills. Nevertheless, surprisingly enough, the sum of the penetration of each artificial skill across occupations such as Librarians was not indicated for global measurement and comparison. This is a very important area for further investigation of the contribution of AI in Tanzania.

The AI assumption and opportunities in Tanzania academic libraries

Efforts on AI in Tanzania academic libraries are not significantly addressed but rather fairly earmarked in some sectors related to health and agricultural services. For instance, e-Shangazi is a knowledge-based platform coupled with AI technologies for educating, informing and advising youths on Sexual Reproductive Health Rights (SRHr). On the other hand, an Agrobot is a famous platform incorporated with AI technologies to assist farmers' access to information and advice concerning agricultural facilities and farm management. The platform provides Chatbot and Short Messaging Services (SMS) (Sahara Ventures, 2019). Higher learning institutions including the University of Dodoma under the College of Informatics and Virtual Education (CIVE) in collaboration with other stakeholders such as Parrot AI and Pythontz have been working to integrate most of the institution databases with python, machine and deep learning tools, probabilistic machine learning and projects related to machine learning approaches. However, these efforts have not yet been realised in the academic library of the institution (Sahara Ventures, 2019; Masanja & Mkumbo, 2020). Furthermore, St. Joseph University of Tanzania (SJUIT) despite its efforts on promoting AI has similarly advanced by initiating a policy that guides issues related to AI development. Efforts have been in establishing intelligent robots that could be used in health sectors on improving the diagnosis and treatment performance of heart-related diseases (Masanja & Mkumbo, 2020). Similarly, some initiatives are earmarked with higher learning institutions in teaching courses related to AI but also in solving challenges and problems through AI technologies. For instance, the University of Dodoma and Dar es Salaam have devoted themselves to the provision of non-financial resources such as facilities, IT infrastructures and experts for AI initiatives (Masanja & Mkumbo, 2020).

The UTAUT model on the assumption of AI in Tanzania academic libraries

The Unified Theory of Acceptance and Use of Technology (UTAUT) benchmarks the best approach an AI technology is harnessed for information management and quality library services. The determinants of the behavioral

intention of AI are controlled by understanding the drivers of AI technology acceptance. The drivers assist in proactively designing interventions that include planning for adopting the AI technology and training the information professionals and library users on the deployed technology (Venkatesh *et al.,* 2003). As discussed earlier on, Tanzania academic libraries seem to not yet have thought of incorporating AI technologies for library functions, even though this invention has been rarely practiced in other sectors such as agriculture and health services (Masanja & Mkumbo, 2020).

However, in achieving the dream of AI technology, academic libraries have to consider the indirect and direct determinants that entail the usage of the technology. The indirect determinants are postulated by the performance and effort expectancy and social influence whereas the direct determinants are based on the usage behavior controlled by intention to use and facilitating conditions. The moderating variables of gender, age, voluntariness and experience determine both the direct and indirect determinants of the information professionals on the usage behavior of AI technology (Venkatesh *et al.,* 2003). Always the indirect determinants build the interest of information professionals towards AI technology usage. However, as indicated in the reviewed literature, the majority of academic library information professionals have little knowledge and skills in the application of AI technologies in information management and library services (Venkatesh *et al,* 2003; Kripanont, 2007; Sahara Ventures, 2019).

Performance expectancy or perceived usefulness is the degree to which information professionals believe that the deployed AI technology assists in achieving the intended goals in information management and quality services. Unfortunately, plans for deploying AI technology in academic libraries are not strategically contented and have contributed to information professionals unaware of the technology and ultimately poor performance expectancy. Venkatesh *et al.* (2003) describes effort expectancy as the degree of easiness to use the deployed AI technology in academic libraries. Suppose information professionals are successfully trained on the newly deployed technology, they are most likely to develop an interest in technology usage provided that it is also easy to use.

However, the effort expectancy of the information professionals on AI technology is unmarked as to date there are fewer documented AI technology initiatives invested in Tanzania academic libraries. On the other hand, social influence explains the degree to which information professionals perceive AI

technology and its opportunities as more important than any other one could imagine the technology (Venkatesh *et al.,* 2003). In other words, information professionals' intention to use AI technology is expected to be high if such professionals expect their peers to look positively at them if they use the technology successfully. Again, the social influence of this endeavor is fairly realized as much of the AI technology and the related opportunities are rarely addressed in Tanzania academic libraries.

Moreover, Kripanont (2007) and Venkatesh *et al.* (2003) define facilitating conditions as the degree to which information professionals believe in the fact that academic libraries and technical infrastructure exists to support the use of the deployed AI technology. On this, the information professionals postulates that the usage of AI technology depends on the availability of an empowering environment for its application. However, the issue of academic libraries' infrastructures, human capital in terms of expertise, financial resources and institution management impedes the facilitation of new technologies in Tanzania academic libraries.

Challenges of AI deployment in academic libraries

AI has transformed the scope of resources, services, operations, formats, accessibility, preservation and retrieval systems in academic libraries. Nonetheless, AI in academic libraries pauses several challenges to academic libraries the world over. The challenges of AI adoption and use in academic libraries vary from country to country. Whilst in some incidences there are similarities reflected in the environments, cultures, traditions and policies of the countries. Library staff, users and other informed stakeholders around the world are scared of the 4IR and AI in particular (Hussain, 2020). They fear that AI in academic libraries will replace their employment and leave them miserably jobless. They assume that all library operations prior done by the library staff will now be taken over by the AI. Likewise, employers will prefer AI devices as they save the running costs of salaries and other benefits in comparison. This is a reality in many sectors (Hussain, 2020) and it is believed that half of the paid activities could be replaced by AI. The report by Sahara Venture (2019) conducted in Tanzania revealed that 57 per cent of the respondents view that AI would take over their jobs. In the health field, the radiologists to check cancer symptoms related diseases would be replaced by AI (Mühleisen, 2018).

In the library context, it means that library operations, circulation services, classification, cataloging, shelving and shelf-reading are going to be replaced by

AI technologies in robotics. The scenarios create fear that AI-embedded technologies will take over jobs that were previously done by human beings. This is because AI has the advantage to sort out complex tasks faster and easier, in a short time with a high success ratio and efficiency with less space, size and minimal errors than human beings (Khanzode & Sarode, 2022). The study by UKEssays (2018) conducted in Tanzania identifies challenges of adapting AI in libraries including AI illiteracy, awareness, inadequate funds in academic libraries to purchase AI devices and expertise, to train library staff and users, infrastructure in a majority of academic libraries, bandwidth, qualified library staff and limited resources. Other challenges are negative attitudes and behavioural patterns of library stakeholders towards AI. This leads to library staff and users distancing themselves from getting involved with AI in libraries.

Khanzode and Sarode (2022) view that AI poses challenges to apply in librarianship as it demands lots of time and funds to adapt, limits human creativity and feelings, promotes laziness and increases technological dependence. In the health sector, the report by Sahara Ventures (2019) conducted at the University of Dodoma in Tanzania affirms that 53 percent of the respondents revealed that they would prefer human doctors to AI robots. In context, people including library staff are reluctant the adaption of AI in their daily lives. There are negative remarks about AI in libraries attracting a lot of attention and unsolicited statements. This might be because of the AI incompetence of library staff to the technical know-how of dissecting AI in an academic library. Library staff and users find it difficult to grasp AI and it is slowly adapted in Africa and Tanzania in particular.

It seems that extant studies deal with the development of AI in libraries, but opportunities and challenges of AI in libraries are not in priority. Furthermore, organisational management in many cases including library management is very slow and strict on the policy which jeopardises attempts of libraries to stay abreast with AI (Kaal & Vermeulen, 2017). There is a need to consider the protocols to meet regulatory challenges in the areas of human-robot collaboration, robot monitoring and AI driverless machines in academic libraries. Other challenges include failure to recognition of copyright, information ethics, human creativity, behaviors, attitudes and motivation of library users towards AI in academic libraries (IFLA, 2018).

However, there is still room for library staff and users to address the challenges of the application of AI in academic libraries in Tanzania. There are endeavours

to use AI in various fields including academic libraries in Tanzania. The report by Sahara Ventures (2019) shows that AI is being adopted in some strategic sectors in Tanzania such as health and agriculture. This is a shred of evidence that the AI application process is promising in the future. Library staff and their users should endeavor to acquire the necessary skills in big data and organisms to apply AI in librarianship (Arlitsch & Newell, 2017). This would actively support and improve easing information search and provision to address the needs of library users. Conversely, the opportunities and challenges of applying AI in libraries should lead to more investigations to align the traditions, cultures, environments, employment creation and policies in our country Tanzania with the use of AI in academic libraries. There should be step-by-step strategies and interventions for the library staff and users to adopt. This should be an endless intervention until knowledge, skills and significance are realised by the stakeholders of libraries. The process would bridge partnerships between human beings and AI in academic libraries.

Conclusions

This study presented an overview of the key phenomena including assumptions, opportunities and challenges of AI in librarianship. In particular, academic libraries have adapted AI in at least all areas of library services, information delivery, marketing library products and assessment and evaluation of library services. In reality, AI has benefited libraries in terms of saving time and costs in the course of the provision of library resources and services. There are challenges as 'Librarianship is at stake' being replaced by digital devices and loss of the value of the profession. This created mixed feelings to include the end of librarianship against 4IR. However, Echedom and Okuonghae (2021) opine that challenges such as the lack of adequate infrastructure and the erratic power supply still hinder many academic libraries to employ AI in developing countries. These challenges in reciprocity explore discoveries and new areas for further studies. In tandem, the study realised that AI in academic libraries informs the future of librarians to work collaboratively to complement each other in academic libraries.

Recommendations

Based on the literature reviews, this study makes the following recommendations:

i. Academic libraries should determine the expertise, skills and knowledge that library staff are supposed to possess to work with AI in Tanzania.
ii. Library associations should introduce AI in academic libraries curricular to engage all sectors for national development.

iii. There should be the inclusion of librarianship in the development and implementation of cross-sectoral agenda on AI (IFLA, 2018).
iv. Academic libraries should introduce AI in all operating systems for easy library operations and effective resources and services delivery;
v. Academic libraries and library associations should train and retrain library staff and users on the application of AI in academic libraries;
vi. Academic libraries should allocate budgets to ensure the application of AI in academic libraries.
vii. There should be interventions on budgetary allocations to purchase AI expertise and devices (Adejo & Misau, 2021).

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Examining the Use of Mobile Technologies in Providing School Library Services in Zanzibar

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Abstract

This paper aims at examining the use of mobile technologies in the provision of school library services in Zanzibar. The paper seeks to address the following questions: to what extent are the teachers, students and library staff familiar with mobile technologies that support teaching, learning and library services? What are the common mobile technology services offered by libraries? How do these technologies help libraries to enhance services? and What are the challenges facing libraries in providing mobile technology-based services? The study was conducted in Zanzibar whereby 22 innovation hubs and 22 surrounding schools were involved. The study used a cross-sectional study design and a mixed-method approach was used to collect and analyse data. A purposive sampling technique was used to select 88 library staff. At the same time, a simple random technique was used to select 110 students and 88 teachers for this study. Data were collected through semi-structured questionnaires and face-to-face interviews. The results indicate that few libraries used WhatsApp groups to interact and share information with users while remarkable personal access to learning materials through educational mobile applications was found to have a positive impact among respondents. However, mobile-based library services were not provided by the hubs as well as the school libraries due to various reasons including the shortage of funds for purchasing mobile gadgets and bundles and inadequate skills for navigating mobile applications. The study recommends that school libraries need to adequately utilise emerging mobile technologies and take them as positive and useful in improving the standards of library services.

Keywords: Mobile technologies, mobile applications, innovation hubs, school library, library service, Zanzibar, Tanzania

Introduction

Recent developments in mobile technologies have heightened the need for education stakeholders including libraries to adapt and implement them for enhancing educational services. With this respect, Dei (2020) affirmed that in recent years, mobile technologies have been embraced by academics including libraries as a medium that can offer convenient library services to users. Mobile technology has also become the key to the journey of moving from traditional to modern services for all types of libraries.

Mobile technologies have made communication and information access very convenient and timely to users from the comfort of their own homes and from wherever they are while on the move with their smartphones. Today, many people use smartphones as their primary interface for surfing the Web, listening to music, watching videos, reading books and communicating with friends. Similarly, Nowlan (2013) observed that educational mobile apps play a crucial role in teaching and learning and can add a great deal of value to supplement traditional school library services in a modern way.

According to Saravani and Haddow (2017), the increasing availability and affordability of internet-enabled handheld devices have affected people's mode of searching, receiving and interacting with information. Similarly, in the wake of these developments, Dukic, Chiu and Lo (2015) argue that library users have also resorted to the use of mobile devices to access the internet and forcing many libraries to introduce mobile communication technologies into their services. This confirms the assertion that any move by libraries to enhance the quality of their services and closely connect with patrons cannot be completed without considering the use of mobile technologies (Kumar, 2014).

Kumbhar and Pawar (2014) assert that mobile technologies have introduced the 'Libraries in hand' trend and they suggested that since libraries are currently creating digital content accessible on computers, such digital collections could be also made available on mobile platforms. The consideration of how to make library services available on mobile platforms has gained recognition both in literature and in practice by virtue of its benefits. The mobile-based library services initiative is said to bring with it interactive capabilities, easy access to information, time-saving, personalised services, user participation as well as limitless access (Pope *et al.,* 2011).

As far as this study is concerned, the concept of mobile-based library services as suggested by Paterson and Low (2011) are services that make use of smartphones and other mobile devices to present novelty and opportunities for libraries and information centers to provide digital services for their remote users. These services, according to Walsh (2012) and El-Namour (2018), include SMS alert service, instant messaging for reference service, the possibility of suggesting a purchase, library instructions and virtual tours, OPAC on mobile phones, in-house search, research consultation and instruction, journal finder applications, news and events, reference service, new title preview and institutional repositories. These services can be expanded with the additional use of such social media tools as Twitter, WhatsApp, Instagram, Tiktok and QR codes to promote the library services.

Globally, mobile technology has opened countless new opportunities for students, teachers and librarians and has brought a very open approach to learning where students are no longer depending on their instructors' notes or textbooks as their only sources of information. Mobile technology, according to Clyde (1995) Todd (1997) and Sekyere (2011), has several benefits as it allows cost-effectiveness in accessing and using both teaching and learning information resources. Moreover, with mobile technology in trend, mobile technology widens the horizon of students further than their local boundaries in terms of information searching. Students are not anymore limited to what is physically available in their libraries or may not wait for borrowing and returning of library information resources. As a result, these opportunities, according to Olatokun (2008), promote reading habit and improves understanding as well as reading skills, which in turn supports students' academic performance.

Current literature in the field of librarianship shows that many libraries in developed countries have adopted and integrated mobile technologies to provide innovative services to users. Chang (2013) and Zha, Zhang and Yang (2016) mentioned North Carolina State University library, Amsterdam University Library and Cambridge University Library, as some examples of libraries providing a variety of mobile technology-based services to users. The services range from an online catalog to access to unlimited electronic information resources.

In the African context, few studies have been conducted on mobile technology applications in libraries. A good example are the studies by Paul and Mavuso (2012) as well as Chaputula and Mutula (2018) which noted the adoption of mobile technologies in some African universities. They include the University of Pretoria, University of Swaziland, Kwazulu-Natal and the University of Free State. There is also a positive story as noted by Dulle, Minish-Majanja and Cloete (2010) and Mgonzo and Yonah (2014) about the use of OPACs, institutional repositories, adoption of e-learning and access to electronic resources through mobile devices among academic library users in Tanzania. Mtebe and Raisomo (2014) and Shemahonge and Mtebe (2018) mentioned the University of Dar es Salaam, Mzumbe University and The Open University of Tanzania that have been offering online undergraduate and postgraduate programmes.

The increased rate of internet penetration and mobile technology has been noted by GSMA (2022) that mobile connections in Tanzania were equivalent to 86.2 per cent of the total population in January 2022. Data show that there were 53.81 million cellular mobile connections in Tanzania at the start of the year 2022. Probably, this is because some make use of more than one mobile connection. Further, GSMA data indicated that apart from voice calls and short message services, mobile phones in Tanzania are primarily used for internet surfing and mobile money services, provided by telecom operators like Airtel, Tigo, Halotel, Vodacom and Zantel.

However, as in many African countries including Tanzania, internet penetration and the use of mobile technology by teachers, librarians and secondary school students are hampered by numerous factors. Some of them as noted by Sife (2013) include limited library support from the government, inadequate ICTs infrastructure in secondary schools, inadequate budget for the adoption of technologies in secondary schools and limited knowledge of mobile technology use among library staff. Similarly, Asongwa and Ezema (2012) observed that many East African countries, especially in rural areas do not have power supply which, as a result, makes it difficult for secondary schools in those areas to have a sustainable or encouraging technological atmosphere appropriate for mobile services provision.

Despite the availability of cheap internet services provided by telecommunication companies and the growing usage of mobile devices among library users, many libraries in Tanzania are yet to fully exploit the available opportunity through

mobile technologies. Moreover, the reviewed literature shows that most studies on the topic of mobile technology have focused much on the use of mobile services in academic libraries. Hence there is, however, the lack of remarkable research that has ascertained how mobile technology-based library services can be adopted and enhance school library services in Tanzania. This fact provides room for a more and in-depth investigation to fill this knowledge gap, particularly in Zanzibar.

Objectives of the Study

The general objective of the study was to investigate the use of mobile technologies in the provision of school library services in Zanzibar. In specific terms the study intended:

i. To examine the awareness of teachers, students and library staff on the available mobile applications that support teaching, learning and library services
ii. To find out the common mobile-based services offered by school libraries
iii. To evaluate the impact of using mobile applications in enhancing school libraries services
iv. To examine the challenges facing school libraries in providing mobile-based services

Research Questions

The paper seeks to address the following questions:

i. To what extent do teachers, students and library staff familiar with the available mobile applications that support teaching, learning and library services?
ii. What are the common mobile-based services offered by school libraries?
iii. What is the impact of using mobile applications in enhancing school library services?
iv. What are the challenges facing school libraries in providing mobile-based services?

The study findings may provide some important insights to policymakers and education officers on the need for enhancing the capacity of school library services by introducing regulations and guidelines for the effective use of mobile-based library services. The Ministry of Education Zanzibar in collaboration with the Zanzibar Library Services Board and other professional organisations may use this study to review or introduce the school library guideline by considering the

provision of mobile-based library services. In addition to that, this study will provide an exciting opportunity to advance our knowledge and raise awareness of the need for serious utilisation of mobile-based library services in Tanzania and Zanzibar in particular.

Profile of the Zanzibar innovation hubs

The establishment of Innovation hubs is a sub-project under the Zanzibar Improving Students' Prospects (ZISP) Project funded by the World Bank to improve the quality of instruction and learning environment of the Zanzibar education system. According to the Zanzibar Ministry of Education (2015), the project involved the construction of 22 innovation hubs and equipping them with adequate and modern facilities including ICT labs, science laboratories, language labs and libraries. The construction of learning facilities was planned for 22 existing secondary schools located in 11 districts of Zanzibar with each site expected to serve as a hub for neighbouring schools.

The project is structured into the following three main components: first is to support activities to enhance teaching and motivate teachers; the second is to equip schools with autonomy, resources and incentives to improve the quality of instruction and student support by improving the overall learning environment of the school; and the third component is to support the provision of learning facilities/resources for improved Math, Science and English achievement. The implementation of this component involves building and equipping 159 additional rooms and learning spaces in existing schools to reduce overcrowding, improve learning conditions and promote Math, Science and English learning (MoE, 2020).

Literature Review

The concept of mobile technology

Hamad, Farajat and Hamarsha (2018) define mobile technology as handheld information devices, that can fit in a pocket and that encompass hardware, software and communication which help us to be connected at all times. Examples of some popular mobile devices include smartphones, tablets, e-readers, mp3 players, smart watches, voice recorders, portable digital assistants and integrated wireless solutions. The term can also be defined as technology that uses the radio frequency spectrum in any band to facilitate the transmission of text data, voice, videos, or multimedia services to mobile devices with freedom of time and location limitations (Kim, Mims, & Holmes, 2006).

Mobile technologies extend the way people access, receive and interact with information and they provide new channels for collaboration and communication (Hamat, Farajat, & Hamarsha, 2018). To Hamat *et al.* (2018), these new technological advancements provide faster access to an increasing volume and variety of information. Sabah (2016) opined that mobile technology (specifically cell phones and tablets) has already proven effective in all aspects of daily life. Users are increasingly relying on mobile devices as the most important means of performing many daily activities such as web navigation, e-mail access, reading books and social media engagement with friends.

Mobile technologies provide easy-to-use technologies and immediate access to vital information. It is considered a contemporary technology with enormous benefits to individuals, educational institutions, corporate organisations and government agencies. Mobile devices provide a transportable way to access data across borders, areas and institutions (Singh & Mahajan, 2014). To Saxena and Dubey (2014) mobile technologies provide a mobility central interface for individuals to access and share information anywhere anytime.

Mobile technology-based library services

Several studies, for example, West, Hafner and Faust (2006) and Lippincott, *et. al.* (2010) has found that libraries have extensively embraced the concept of mobile device applications. Libraries have done so to provide numerous innovative services to meet the needs of their users. According to Paterson and Low (2011), mobile-based library services are the use of smartphones and other mobile devices to present a novelty and opportunities for libraries and information centers to provide digital services for their remote users. Today, with mobile library technologies, patrons can search for a library's catalog, view upcoming events, make a reservation for library facilities, text for reference inquiries and renew borrowed materials.

In the views of Choy and Goh (2016), mobile technology-based library services include mobile online public access catalogs, mobile e-journals, mobile databases, short messaging services (SMS) for reference services, mobile collections (e-books and audio materials), mobile digitised thesis and mobile library tour/instruction. Mansouri and Soleymani (2019) provided some additional library mobile services such as integrated mobile library management databases and mobile reference services or as known as 'ask a librarian'.

As far as this study is concerned, mobile technology refers to mobile applications which have been created to support educational activities including library services. It is apparent that there is a good number of domestic and international educational mobile applications developed for teachers and learners. In Tanzania, several mobile applications have been created for different purposes to help teachers and students and facilitate the teaching and learning process. The apps were created to provide different services ranging from scholarship information, educational tips and discussion platforms to access teaching and learning materials including texts, audios and videos and e-learning platform. Some examples of these domestic made applications according to the Citizen (2019) are the shule direct app, maktaba tetea, mtabe app, soma app, tesea app, myelimu app, Tzshule app, the learning hub, tHL app, Elimutube, TZ past papers app, akili app, ubongo app, etc.

Literature in Africa concerning the use of mobile-based library services in all types of libraries does not provide a satisfactory report. It was observed by Asongwa and Ezema (2012) that many libraries in Africa are not utilising the benefits of this technology in their information delivery. However, there is somewhat a positive story in Tanzania's academic libraries where some of them are embracing digital access to professional and academic articles and full-text e-journal articles, e-books and e-thesis (Mgonzo & Yonah, 2014; Nunda & Elia, 2019). Yet, school libraries have been reported to be very slow to respond to the pressure for mobile technology adoption in their programmes (Dulle, 2010).

Access and use of mobile technology in the academic environment

Mobile technology is one of the many sources students and teachers may use in searching for online information. With the rapid change in technologies, many people are now using their mobile phones to access the internet rather than using computers. No individual can now argue that it is a luxury to possess a smartphone as it is a prerequisite as these devices are now used not only for communication but also to access the internet and other applications.

Several previous studies have found that students and teachers are the majority of regular users of the internet through smartphones. Findings from studies by Mtega *et al.* (2014) and Dei (2020) showed that the majority of teachers and students who were using mobile services used them for accessing teaching and learning materials and assignment preparations. Their studies also indicated that most students felt that the use of mobile services was suitable and far much better

than their school libraries. Further, students established that mobile services as a source of general knowledge since they assisted them in their reading habits as well as improving their academic performances.

It has been noted by Chambo *et al.* (2013) that mobile technology in Tanzania has been intensively made much cheaper for everyone even students. In line with that, in trying to encourage students to use mobile technology, Tanzanian mobile phone service providers have been competing by offering university and secondary school students cheaper internet bundles with more Gigabytes for them to enjoy mobile services. As a result, the utilisation of mobile technology services in the education sector is used as an alternative way to fill the gap of inadequate physical resources in traditional school libraries.

Apart from using mobile services for academic purposes, the study by Sife (2013) and Mtega *et. al.* (2014) pointed out that many young students use mobile services to assist in social communication such as e-mail, interacting with social media and chatting. In the case of entertainment, youth use mobile services in providing platforms for downloading and listening to music, film watching as well as posting and viewing photos and videos.

Methodology

The study was carried out in Zanzibar and involved 22 innovation hub libraries and 22 surrounding secondary schools. These hubs and their surrounding schools were selected since they were under the pilot study of the World Bank project; hence the hubs were fairly equipped with modern library facilities. Therefore, the study intended to examine the provision of library services using mobile technologies. Schools were selected since they were nearby the hubs and they were expected to be benefited from the hubs' facilities and services. Five (5) form three and form four students were randomly selected from each school hence making a total sample size of 110 respondents. Simple random sampling was used to select 88 language and science subject teachers. Among them, four (4) teachers were from each school. A purposive sampling technique was used to select 88 library staff, two (2) from each library. This made a total of 286 sample sizes. Teachers were chosen for this study as they were expected to be good users of mobile technology-based library services and encourage their students to practice similar things. Students were chosen as they were expected to use mobile technology library services for their studies. Besides, librarians were chosen mainly because they were the providers of information services.

A cross-sectional research design was used and a mixed method approach was applied for data collection. In these ways, both a questionnaire-based survey and semi-structured interview schedules were used to language and science subject teachers, students and school library staff. A self-administered questionnaire was distributed to all respondents which were selected through the purposive total population sampling technique. Qualitative data were collected through an in-depth interview held with 6 library staff, 11 teachers and 22 students. The response was obtained from 30 innovation hub libraries, 20 school library staff, 70 subject teachers and 100 students. The total number of all questionnaire respondents was, therefore, 220 with an overall response rate of 76.92% as Table 1 illustrates.

After collection, the data were edited by means of checking and adjusting errors to ensure completeness and consistency before entering them into the database for analysis. As mentioned before, data in this study came from two sources: questionnaire data and interview notes. Interview responses were noted and data coding for the survey instrument was done via the online software tool and captured in a Microsoft Excel file. The researchers employed such descriptive statistics, as frequencies and percentages in data analysis.

Table 1: A response rate of the distributed questionnaire

Study area	**Study population**			**Total**
	Library staff	Teachers	Students	
Innovation hubs	44	0	0	44
School libraries	44	88	110	242
Total	88	88	110	286
	Response rate			
Innovation hubs	30	0	0	
School libraries	20	70	100	
Total	50	70	100	220
%	56.8	79.5	83.3	74.3

Source: Research data (2022)

Results

Respondent's awareness of the available educational mobile applications

The researchers first sought to find out whether respondents were aware of the available mobile applications. The applications were the ones which could be used to supplement traditional library services and/or facilitate access to teaching and learning material. The result shows that 98 (44.5%) out of the 220 respondents

were aware, followed by 55 (25%) who were somewhat aware. The number was decreased to respondents who were very familiar with educational mobile applications; they were only 40 (18.2%). Conversely, a small number of respondents 27 (12.3%) were not familiar. Table 2 summarises the data.

Table 2: **Respondents' awareness of the available educational mobile applications**

Response	Library staff		Teachers		Students		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Not familiar	2	2.27	9	6.3	16	16	27	12.27
Somehow familiar	9	10.22	19	12	27	27	55	25
Familiar	28	31.81	27	18.9	40	40	98	44.54
Very familiar	11	12.5	15	10.5	17	17	40	18.18
Total	**50**		**70**		**100**		**220**	**100**

Source: Research data (2022)

In this subsection, apart from awareness, the researchers were also interested in finding out whether or not respondents were using educational mobile applications. The results indicated that two-thirds 162 (73.6%) of respondents were reported to use mobile applications, followed by 34 (15.4%) respondents who did not use the applications. On the other hand, 24 (10.9%) respondents claimed to be not sure whether they were using the applications or not. These data provide evidence that the majority of respondents were using educational mobile applications for one reason or another.

Furthermore, as regards the use of mobile applications, respondents were asked to indicate how often they accessed educational mobile applications Majority that is 94 (42.7%) respondents said that they only used them whenever they needed to do so, followed by a quarter 55 (25%) respondents who used once a week while only 30 (13.6%) indicated daily use. What is surprising from these data is that 41 (18.6%) respondents pointed out that they had never used educational mobile applications. Table 3 summarises statistical data.

Table 3: Frequency of using mobile applications among respondents

Response	Library staff		Teachers		Students		Total	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Daily	6	6.81	12	8.4	12	12	30	13.63
Once a week	10	11.36	15	12	30	30	55	25
Whenever needed	24	27.27	30	21	40	40	94	42.72
Never used	10	11.36	13	9.1	18	18	41	18.63
Total	50		70		100		220	100

Source: Research data (2022)

Mobile application services offered by hubs and school library

One of the objectives of this study was to identify library services offered through mobile technology platforms at the selected libraries. With choices of Mobile OPAC, library website with a mobile interface, educational chat groups, mobile e-books collections, mobile library text SMS alerts, mobile e-resources databases, e-books application, mobile reference services, library social networking services and mobile library instructions, respondents were asked to indicate the mobile-based services offer by their libraries. Selection of multiple responses was allowed. Figure 1 summarises the data.

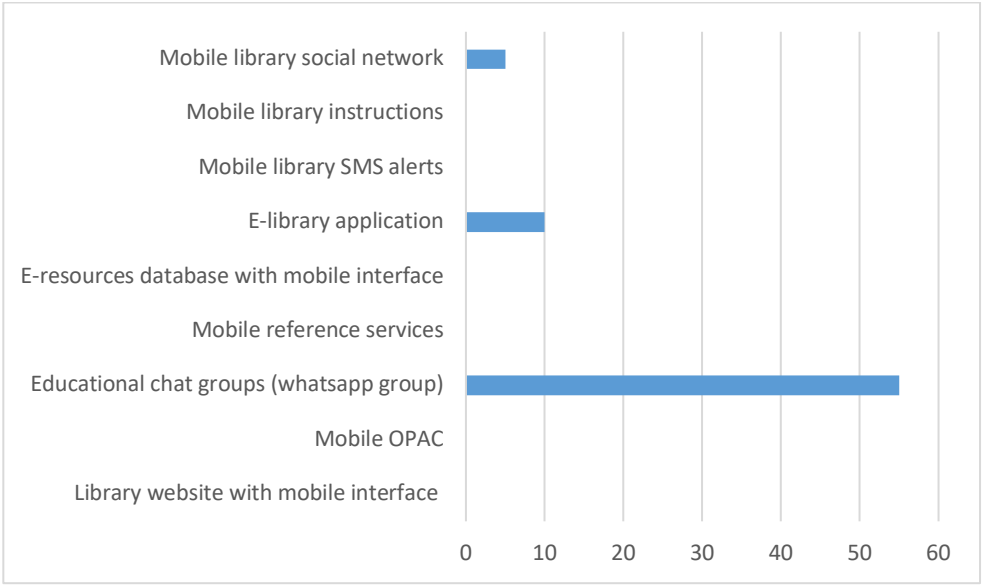

Figure 1: Mobile services offered by hubs and school libraries

Source: Research data (2022)

Data in Figure 1 indicate that the overall response to this question was poor and the majority that is 55 (25%) of those who responded to this item selected educational chat groups through the WhatsApp mobile application, followed by the mobile e-library application, recorded by 10 (4.5%), while only 5 (2.2%) indicated mobile library social network. This result is rather disappointing and it provides evidence that the libraries under this study were likely to not offer mobile services.

The educational mobile application used by respondents

In the current study, respondents were asked to indicate the educational mobile applications they were using to access teaching and learning material. A list of domestic educational applications was provided and respondents were asked to choose their answers from the list. Multiple responses were collected as summarised in Figure 2.

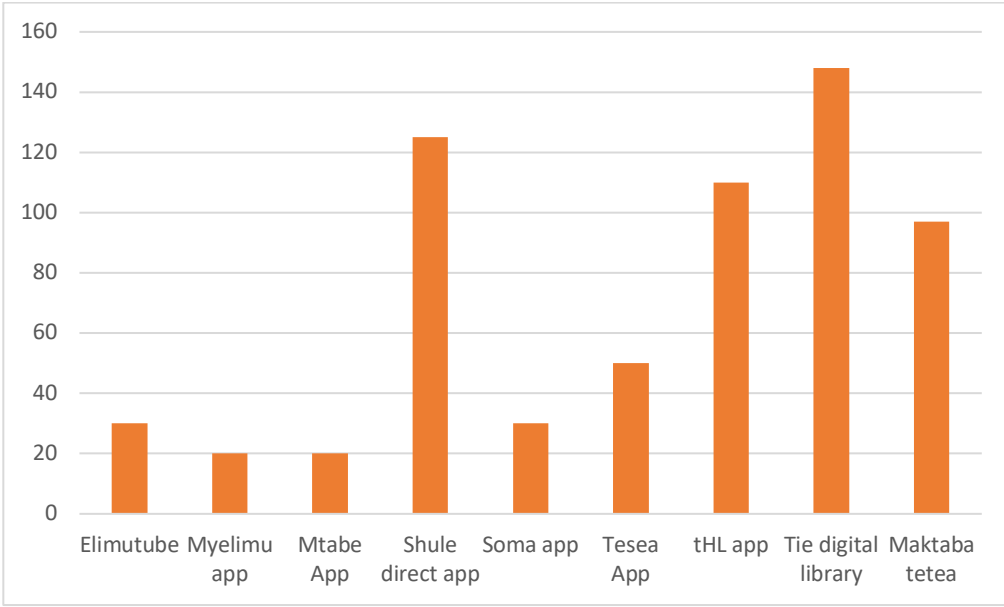

Figure 2: Educational mobile applications used by respondents

Source: Research data (2022)

Data in Figure 2 indicate that the majority of respondents, 148 (67.2%) were using the Tie digital library, followed by 125 (56.8%) respondents who used the shule direct application, followed by half of the respondents that is 110 (50%) who recorded to use tHL application. Furthermore, 97 (44%) respondents recorded

using the maktaba tetea application, followed by tesea and elimutube which were recorded to be used by 30 (13.6%) respondents, while the Mtabe app and myelimu app were recorded to be used by minority that is 20 (9%).

Reasons for using the educational mobile application

Respondents were asked to indicate the reasons why they used educational mobile applications. Multiple answers were provided and respondents were asked to choose from them. Findings are summarised in Figure 3 below.

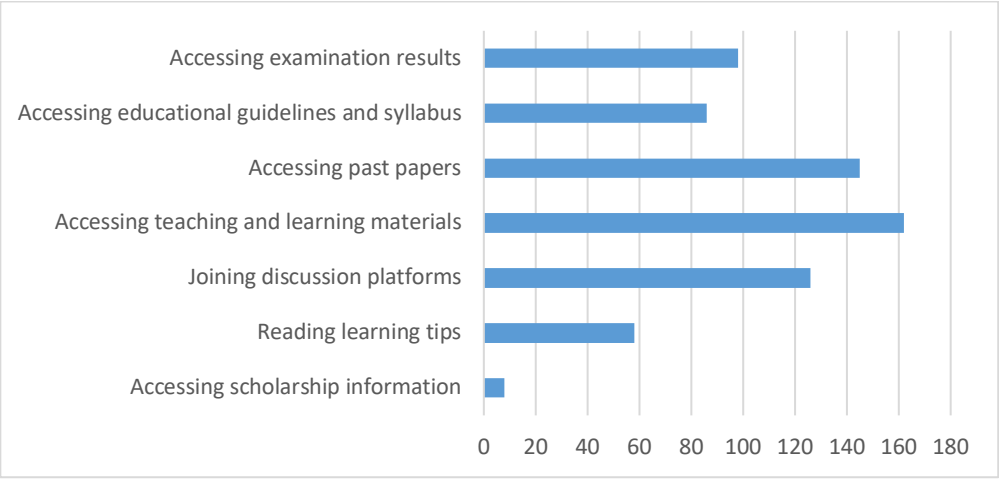

Figure 3: Reasons for using the educational mobile application

Source: Research data (2022)

The results in Figure 3 showed that a good number of respondents that is 162 (73.6%) used mobile apps for accessing teaching and learning materials. This was followed by 145 (65.9%) respondents who used them for accessing past papers and 126 (57.2%) respondents for joining discussion platforms. Furthermore, 98 (44.5%) respondents recorded using mobile apps for accessing examination results, followed by 86 (39%) respondents for accessing educational guidelines and syllabus. On the other hand, less than 4%, which is equal to 8 respondents used mobile apps for accessing scholarship information.

Benefits of using educational mobile applications

Respondents were asked to indicate the advantages of using educational mobile applications. Multiple answers were provided and respondents were asked to choose from them. Findings are summarised in Figure 4 below.

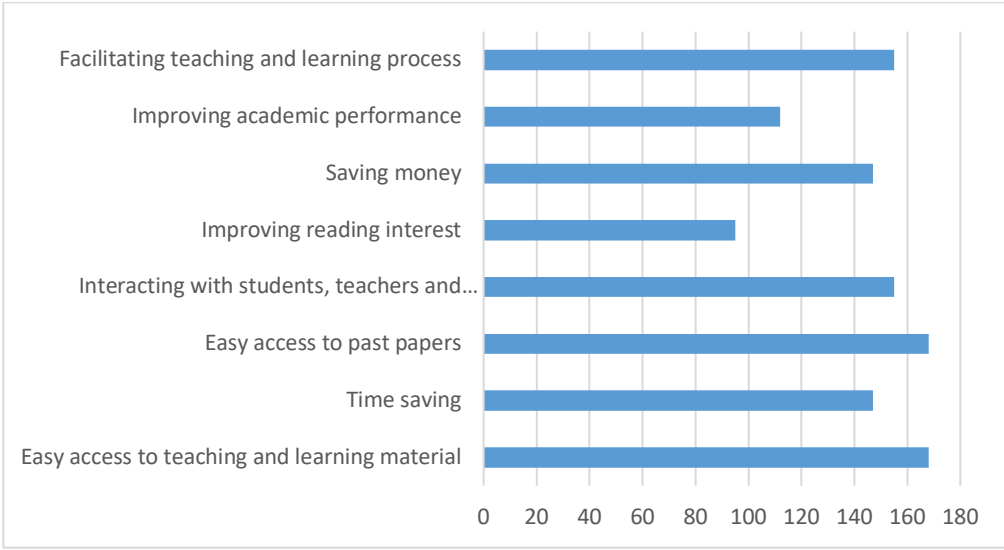

Figure 4: **Benefits of using educational mobile applications**

Source: Research data (2022)

Data in Figure 4 indicated that a good number of respondents that is 168 (76.3%) felt that the use of mobile applications leads to remote and easy access to teaching and learning material and past papers. This was followed by 155 (70.4%) respondents who indicated interaction with students and teachers and facilitate teaching and learning process. This was followed by 147 (66.8%) respondents who noted the help to time and money saving. Furthermore, 112 (50.9%) respondents indicated improving academic performance while only 95 (43.1%) respondents indicated that the use of mobile applications improves the reading interest of students. Table 3 provides summary statistics of these data.

Challenges that hinder the use of educational mobile applications

Finally, the study sought to identify potential challenges that may impede the use of mobile apps in innovation hubs and school libraries in Zanzibar. Respondents were asked to state if they were being faced with any problems in accessing their information needs through mobile apps. Figure 5 summarises the data.

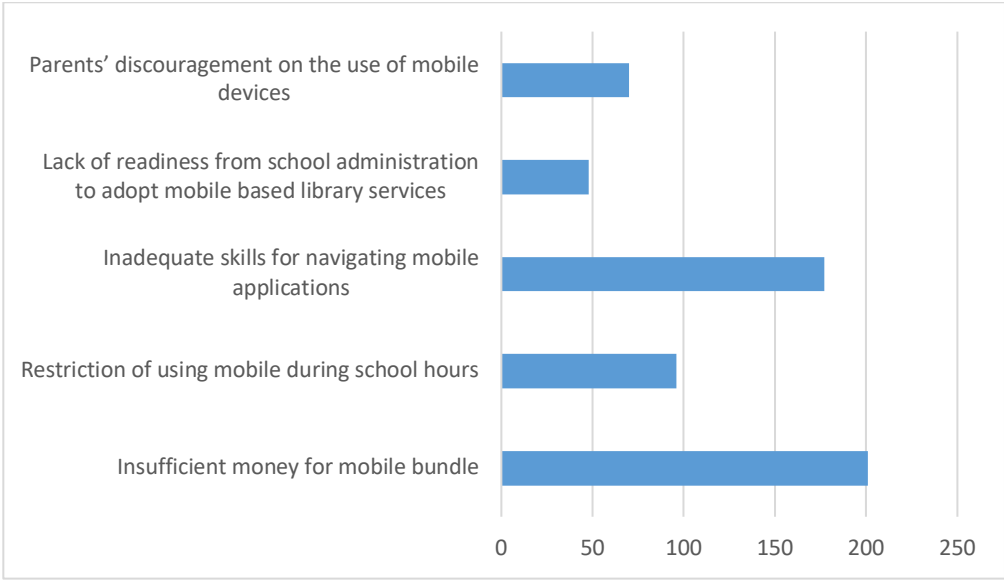

Figure 5: Challenges that hinder the use of educational mobile applications

Source: Research data (2022)

Data in Figure 5 indicated that, out of the 220 respondents, 201 (91.3%) stated that they had insufficient money for purchasing mobile bundles, 177 (80.4%) experienced inadequate skills for navigating mobile applications, 96 (43.6%) noted restrictions of using smartphones during school hours and 70 (31.8%) recorded to face parents' discouragement on the use of mobile devices. Conversely only 48 (21.8%) respondents mentioned the lack of readiness of school administration to adopt mobile-based library services.

Discussion

The present study was designed to examine the use of mobile technologies in the provision of school library services. The first question in this study sought to determine the awareness of respondents of the available educational mobile applications. The current study found that the majority of respondents that is 98 (44.5%) were familiar while 40 (18.2%) were very familiar with educational mobile applications. This can be used to supplement library services as well as to facilitate access to teaching and learning material. It can be said that having an understanding of these mobile applications is one step forward toward their use and an implication of this result is the possibility that respondents were using the applications. These results are in line with the findings of Washburn (2011) and Hamad *et al.* (2018) who reported a high level of awareness among library staff

and users regarding the use of the mobile application to support library services, teaching and learning.

With regard to the time spent by respondents in accessing educational mobile applications, it was found in Table 3 that despite mobile services in Tanzania being fairly cheaper for everyone even secondary school students as they can acquire megabits bundles for as cheap as 500 TZS per day, surprisingly, the results indicate that many respondents were spending very little time on accessing educational mobile applications and some of them did not even use them. When they were asked about ownership of a smartphone, interview data revealed that the majority of respondents that is 15 (68%) did not possess their own phones. However, they tended to borrow phones from their classmates who owned phones or from their parents.

With respect to the provision of mobile-based library services, the result of the current study is rather unsatisfactory, since, despite the existence of cheap and easy-to-use mobile technologies, the majority of libraries under this study were not offering mobile-based services. However, the use of WhatsApp chat groups was reported by just a quarter that is 55 (25%) of respondents. It is interesting to note that the use of social networks can be perceived as a step forward toward the full implementation of mobile-based library services.

The benefits of using WhatsApp in an academic environment have been articulated by many scholars. Arahony (2015) and Bitso (2018), for example, noted that WhatsApp features of document sharing, groups creation, video and voice call make it a very powerful application in digital transformation for library and information services. Further, previous literature (e.g., Aharony & Gizat, 2016; Bitso, 2018; Anwar & Zhewei, 2020) provide evidence that WhatsApp has become another means of communication with librarians; showing that '*WhatsApp a Librarian'* has become quite common in reference services particularly in many academic, school and research libraries. Similarly, Ahad and Lim (2014) indicated that with the ease of use and affordability provided by WhatsApp, students benefit in terms of discussing and sharing information related to study matters and also from everyday communication with their teachers, librarians and fellow students.

The probing question was asked through the interviews to examine the interest of respondents in the use of mobile applications to access library services. Data from the interviews indicated that respondents were interested in using their

smartphones to access mobile-based services if they would be provided by their libraries. These results are supported by the studies by Lippincott (2009), Smith et al. (2010) and Goh (2011) who opined that mobile reference services were extensively known to most students and they preferred to use the services to get reference assistance from the librarians. These results are a wake-up call for hubs and other school libraries in Zanzibar to redesign their services to meet the users' demands and expectations.

Turning now to educational mobile applications used by respondents, the findings of the current study indicate that a majority of respondents that is 148 (67.27%) were using the TIE digital library (https://www.onlineschoolbase.com/2021/12/tanzania-institute-of-education-tie.html). This platform was designed by the Tanzania Institute of Education (TIE) to provide online access to learning materials of all levels, especially for those who have no access to physical school libraries. The most interesting finding was that although mobile-based school library services were noted to be poorly offered, the majority of respondents were recorded to use several educational mobile applications such as the shule direct app, tHL app and maktaba tetea. All of these applications were designed to facilitate access to teaching and learning materials including recommended textbooks and past papers. This finding is in line with Mtega *et al.* (2014) who pointed out that smartphones have the potential of facilitating and improving the teaching and learning processes as the devices are affordable to many people including students compared to other computer-related devices.

Regarding the reasons for using educational mobile applications, it is clear from the results that the majority of the respondents that is 162 (73.63%) were using educational mobile apps mainly to access teaching and materials, especially the recommended textbooks. The findings of the current study confirm the study results by Pu *et al.* (2009) that teachers and students have a positive desire and prefer to use mobile apps for accessing teaching and learning resources as they are cheap, user-friendly and can be accessed anywhere anytime.

When library staff respondents were asked through interviews to comment on the advantages of the provision of library services through a mobile platform, they commented that mobile apps may help to facilitate interaction with library users, supplement the library collection and help to save the time of users. This result implies that the majority of respondents agreed that using mobile

technology had several benefits chiefly being easy and remote access to teaching and learning materials. The present findings seem to be consistent with the studies by Clyde (1995) and Todd (1997) which found that mobile technology allowed flexible, easy and cost-effective access to teaching and learning information resources. Similarly, Olatokun (2008) had the view that access to mobile technology helped to promote reading habits and improved reading skills which in turn supported students' academic performance.

Finally, the study sought to find out the challenges facing respondents when using educational mobile applications. The current study found that the majority of the respondents that is 201 (91.36%) had a challenge of insufficient money for subscribing to a mobile bundle. This result is consistent with those by Mtega *et al.* (2014), Kira and Mahumbwe (2015), Tarimo and Kavishe (2017) who noted the problem of the shortage of funds for purchasing mobile gadgets and bundles. In addition, the problem of inadequate skills for navigating mobile applications was noted by a good number of respondents, that is 177 (80.45%). A possible explanation for this result might be the lack of information literacy skills among respondents.

Furthermore, it is interesting to note that student respondents claimed that they were restricted to use mobile devices during school hours. These data must be interpreted with caution because the order of not using smartphones on school premises was issued by the Ministry of Education and of course there are some important reasons including the aim of controlling and preventing students from the misuse of internet. The ministry's assumptions might be true if students may misuse the internet as it has been noted by previous literature.

However, mobile applications can sometimes be used without internet connectivity. One significant issue which can be considered here is the safety and control of smartphone use by secondary school students to ensure that the technology is used for good. Such a challenge might likely be connected with another challenge of parents' discouragement of the use of mobile applications as noted by students' respondents. One of the issues that emerge from these findings is the need of educating parents on the importance of using mobile applications by students since they play a crucial role in facilitating access to learning materials. Furthermore, parents' engagement with mobile phones should be empowered with additional technical skills to monitor and guide their children on the proper use of technology. Additionally, there is a need of imparting

information literacy skills to secondary school students especially the skills on the ethical use of online information.

Conclusions

This research sought to ascertain the use of mobile technology in the provision of school library services in Zanzibar. The findings of the study established that there was a strong awareness of the availability of educational mobile applications and the majority of respondents reported using them regularly. Furthermore, the findings of the current study observed that some hub and school libraries offered mobile-based library services by using the WhatsApp application and social networks. However, the general use of mobile technology-based library services was reported to be very low. Concerning educational services that were offered by domestic mobile platforms, the majority of respondents were using the TIE digital library, shule direct app and tHL app to access teaching and learning materials. Through the use of these applications, respondents were reported to improve the teaching and learning process and hence improved students' performance. This study has also led to the uncovering of the potential challenges of the use of mobile application-based library services in innovation hubs and school academic libraries. If the challenges identified in the findings are properly addressed, they may be used as the foundation for the successful use of the educational mobile application as well as the implementation of mobile-based library services in innovation hubs and school libraries in Zanzibar.

Limitations

Although the present study successfully demonstrated that library staff, teachers and students in Zanzibar reported using mobile applications to access teaching and learning materials, the study had some limitations that need to be noted. First, it is unfortunate that the study did not include universal mobile applications that can be used for educational purposes. Second, the current study was conducted in Zanzibar which is just a small part of Tanzania. Thus, these results may not be generalised to the whole of Tanzania school libraries. Finally, the study did not focus on the safety, control and ethical use of mobile technology among secondary school students which is a significant aspect to be considered in future research.

Recommendations

Based on the findings of the current study, the following recommendations are put forward by the researchers for the successful adoption and implementation of mobile-based library services in hubs and school libraries in Zanzibar:

i. The Zanzibar education authority should develop a policy framework and guidelines for the adoption and implementation of mobile technology-based in innovation hubs and school libraries.
ii. The education authority in cooperation with Zanzibar Library Services Board (ZLSB) should provide training to school library staff on the effective use of mobile applications in the provision of library services.
iii. The hub and school libraries on another part should also train library users on the role played by mobile applications and the benefits of using them.
iv. The management of innovation hubs and secondary schools should allocate sufficient funds to support the integration and full realisation of the mobile technology deployment in their libraries.
v. COTUL should think of subscribing to e-resources that will support the teaching and learning process at the primary and secondary school levels.
vi. The Ministry of Education should think of embedding information literacy skills in secondary schools' curricula. This will help students to be equipped with information search skills as well as the ethical use of online information.

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Access to Library Information Resources by University Students during COVID-19 Pandemic in Africa: A Systematic Literature Review

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Abstract

The study examined access to library information resources by university students during the outbreak of the COVID-19 pandemic in 2020. Specifically, the study sought to identify the measures adopted by academic libraries to ensure the smooth delivery of library information resources to patrons, particularly students, identify technological tools that were employed by libraries to facilitate access to library information resources. Not only that but also, the study investigated the challenges faced by students in accessing library information resources. A systematic literature review approach following PRISMA guidelines was employed to investigate the findings of the relevant literature on the subject. The keyword search strategy was employed to search for relevant literature from four scholarly databases Scopus, Emerald, Research4life and Google Scholar. The relevant 23 studies were included fulfilling the set inclusion criteria. The presentation of the findings was arranged in a tabular form to provide a summary of each article to facilitate easy analysis and synthesis of results. The findings of this study revealed that the majority of the reviewed studies indicate that, during the COVID-19 pandemic many academic libraries in Africa adopted different approaches to facilitate access to library information resources by university students including expanding access to electronic resources off-campus, virtual reference services, circulation and lending services. To support access to different

library services and information resources academic libraries in Africa used various digital technological tools like social media, library websites, email and video conferencing. Moreover, the study revealed that limited access to internet services and ICT devices, inadequate electronic library collection and inadequate digital and information literacy were the major challenges faced by many university students in accessing library resources during the pandemic. This study recommends investment in ICT infrastructures and expanding electronic resource collections which are vital resources in the digital era.

Keywords: Access, library information resources, academic library, university students, COVID-19 pandemic, Africa

Introduction

Academic libraries are considered as the center of knowledge and innovation as they engage in collecting and disseminating knowledge both print and electronic resources (Martzouko, 2020). However, abrupt socio-economic changes negatively affect library service provision as well as the patrons. The world is currently recovering from a very serious COVID 19 pandemic that has had impact on all walks of life including libraries. The emergency of COVID 19 has had a serious impact on libraries as it forced them to close (Tammaro, 2020). The outbreak of COVID-19 posed challenges to academics, researchers and students in Universities following their closure to protect against further spread of the virus. Despite the disruption brought by COVID-19 that forced learners to adopt new learning environment, patrons expected their libraries to provide services to meet their information needs (Okonoko *et al*., 2020; Tsekea & Chigwada, 2020). Patrons expect the library to offer information services through digital communication technologies (Okonoko *et al*., 2020). For this case, even during the pandemic some libraries could provide access to digital content without distantly.

Literature Review

Information and Communication Technology (ICT) has brought the possibility of operating a library beyond the four walls of the physical library. In view of this, academic libraries with well-established technological infrastructure are capable of operating digital library services by providing students with access to digital content regardless of the prevailing challenges. However, academic libraries with unreliable technological infrastructure were completely forced to close their services during the COVID-19 pandemic (Chisita & Chizoma 2021; Dadhe & Dubey, 2020). The library with unreliable technologies will fail to provide

information access to its patrons (Chisita & Chizoma 2021; Ali & Gatiti 2020; Ifijeh & Yusuf 2020; Rafiq *et al.*, 2021).

Literature has revealed the way transition from traditional to online library information delivery of has affected academic libraries, especially in the low and middle-income countries including those in African continent (Ali & Gatiti, 2020; Chisita et al., 2022; Fase, Adekoya & Iwari, 2020; Tsekea & Chigwada, 2020). In many African countries, the state of information and communication infrastructures is not well established (Tsekea & Chigwada, 2020). In addition, academic libraries in Africa have been facing several social, economic and technological challenges prior to the COVID-19 pandemic as a result limiting the utilisation of digital technologies to enhance access to library information resources and services (Ashiq *et al.*, 2022). The current COVID-19 pandemic serves as a wake-up call to academic libraries in Africa to assess the way they can continue providing services to users including patrons during the time when physical libraries are inaccessible. Therefore, information on access to library resources provides useful insight into how academic librarians can restructure their services to support access to library information resources by university students during the closure of physical library services. On the other hand, this information will influence future research and policy makers' decisions to support access to library information resources by university students during the pandemic or any other future emergency.

Purpose of the Study

The study analysed the literature to ascertain the kind of information services that were provided by University libraries to their students during the outbreak of the COVID-19 pandemic in Africa. Specifically, the study focused on what types of services were adopted by academic libraries to facilitate the accessibility of library information resources by university students following the sudden closure of university campuses because of the COVID-19 pandemic. The study also set out to determine the digital technological tools used by academic libraries to facilitate the accessibility of library information resources and the challenges encountered by university students amid the global pandemic.

Significance of the Study

The findings of this study are anticipated to provide insights into academic libraries in Africa as regards to how to offer library services in a time of pandemic or emergency where students cannot pay physical visits to the library buildings as

well as the tools and technologies to be harnessed in facilitating student's access to library information resources and the challenge to overcome.

Research Questions

This study sought to answer the following research questions:

i. What types of library services are being offered by academic libraries to students during the outbreak of the COVID-19 pandemic?
ii. What are the digital technological tools being used by academic libraries to facilitate students' access to library information resources during the COVID-19 pandemic?
iii. What are the challenges being faced by university students in accessing library information resources during COVID-19 pandemic?

Research Methodology

This study employed a systematic literature review methodology to examine access to library resources by university students during the COVID-19 pandemic. A systematic literature review involves a systematic, transparent and reproducible synthesis of research findings obtained from different empirical findings on a given topic (Davis *et al.*, 2014). The reason for the choice of systematic literature review methodology is to provide a baseline information based on the accumulation of findings from a range of empirical studies which contribute to knowledge development and theory on a given topic (Snyder, 2019). It also uncovers new areas in which further research is needed (Transfield *et al.*, 2003). According to Ayeni *et al.* (2021) systematic literature review helps to combine previous studies that discussed and researched a particular topic and met certain inclusion criteria. Based on this fact the use of a systematic literature review in the current study provides an overview of information on how university students in Africa accessed library information resources during the COVID-19 pandemic as well as contributes to further research on the topic. Various studies were searched, retrieved and analysed systematically to ascertain the kind of services that were offered by libraries during the pandemic as well as the challenges they faced and the measures taken to remedy the situation.

Search strategy

The researchers conducted a thorough literature search on four databases (Scopus, Emerald, Research4life and Google Scholar) to identify relevant studies. The literature search was first conducted on August 16, 2022 and updated on December 7, 2022, to account for the latest articles. The custom range of 2020 through 2022 and sort by relevance were the key parameters during the literature

search. This custom range was used to cover current research related to the era of the COVID-19 pandemic. The researchers used five main keywords "university students", "academic library", "library information resources", "COVID-19 pandemic" and "Africa" to construct search queries to identify the relevant studies covering the objectives of the study. During the search, the researchers used the Boolean operator "AND" to narrow down research results and the Boolean operator "OR" for expanding the search query.

The search process in each database were as follows:

i. Researchers run a search query in the Scopus database using TITLE-ABS-KEY and then applied the following filters (year of publication 2020-2022; source type-journal; document type-article; language-English). This search resulted in 89 results.
ii. In the Emerald database, researchers just put the search query in a search box then applied the following limiter (search by relevancy, year of publication 2020-2022; source type-journal; document type-article; language-English). This search resulted in 652 results
iii. In Research4life, researchers put the search query in the search box and then refined the search by (The publication year 2020-2022; Scholarly peer-reviewed journal article; field of study-library and information science and language –English). The search resulted in 8 results.
iv. In Google scholar, researchers put the search query in the box and then applied the following filter (Custom range 2020-2022; sort by relevance, pear reviewed article; language- English. This search resulted in 784 results. The Overall results from all four databases were 1,533 records

Inclusion and exclusion criteria

The focus of the study was on covering access to library information resources by university students in the COVID-19 pandemic era in Africa. The inclusion criteria were:

i. Only articles published in peer review journals. The peer-reviewed journal articles were considered as the ones that maintain standards and enhance the quality of the work because they undergo a quality check mechanism which helps to strengthen the credibility of scholarly publications.
ii. Research articles published from 2020 to 2022 on access to library information resources by university students in Africa. Taking into consideration that COVID-19 began in December 2019, therefore, it is possible that immediately after 2019 research on this subject began.

iii. Research article published in the English language because English is the major research language in the field of Library and Information Science.
iv. Studies covering more than one aspect of access to library information resources by university students during the COVID-19 pandemic in Africa.

The exclusion criteria were based on studies not published in peer review journals, not published in the English language and not discussed access to library information by university students in the COVID-19 pandemic era in Africa as well as studies covering only one aspect of this study.

Selection of studies

A systematic review of relevant literature was conducted following the Preferred Reporting Items for the Systematic Review and Meta-analysis (PRISMA) by (Moher *et al.*, 2009). The PRISMA aims at helping authors to improve the reporting of systematic reviews and meta-analyses. It provides a checklist that guides the researchers in the identification of relevant material, screening, eligibility and included studies for literature review synthesis. The PRISMA assumes that the quality of the systematic review and meta-analysis depends on the scope and the quality of the included studies (Moher *et al.*, 2009). The PRISMA protocol for systematic review and meta-analysis has four stages which include identification, screening, eligibility and inclusion. In the first stage, a total of 1533 articles were identified from the four databases. In the second stage, the title and abstract of articles were screened by using the first stage of inclusion and exclusion criteria. The potential articles which fit in the study were identified and saved into Mendeley library where duplicates were removed. In the third stage, the full text of identified articles was screened for eligibility by using the second stage of eligibility criteria. A critical evaluation of the full text of the selected articles was performed to check whether they meet the objective of the study. The final stage presents 23 articles that were included for systematic review and analysis.

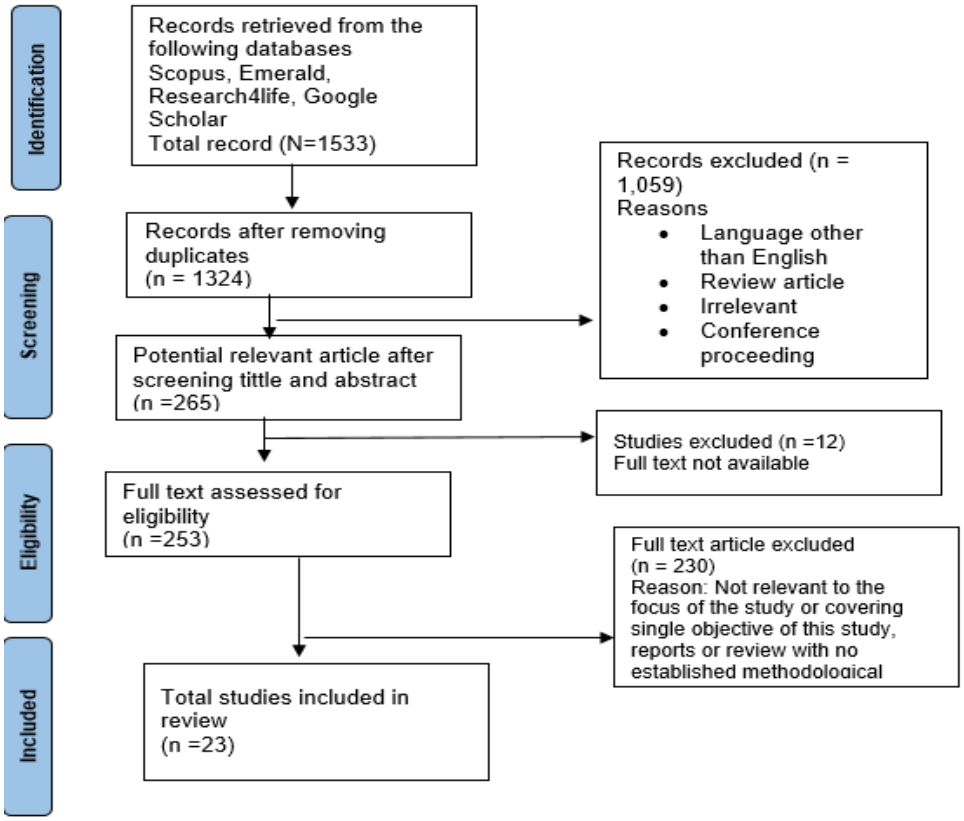

Figure 1: Four phase flow diagram of selection procedure of included studies

Data extraction: A tabular approach was used to provide a summary for each eligible study. Data extraction (See Table 1) which includes authors' names, the methods used, types of eservices offered by academic libraries during COVID-19, digital technological tools implemented and the challenges faced by students in accessing library resources was used to extract data summary from 23 reviewed articles.

Results and Interpretation

This section presents the summary of data extracted from 23 reviewed articles based on the specific objectives of the study. The section includes the synthesis of themes identified based on each specific objective and research question.

Objective 1: Types of services offered by academic libraries to support students' access to library information resources during COVID-19 pandemic

Table 2 presents different types of services which were offered by academic libraries in Africa to facilitate students' access to library resources during the closure of higher learning institutions following the outbreak of COVID-19 pandemic.

Table 2: Types of services provided by academic library during COVID-19 pandemic

Types of service provided	Frequency	Percent
Remote access to library resources	20	87
Virtual reference services	18	78
Circulation and lending services	8	35
Online user education programs	8	35
Research support services	5	22

These results show that the majority (87%) of academic library services were offered through remote access to library resources. In other words, remote access was preferred possibly due to the closure of universities and some precautions related to lockdown and social distancing. Apart from that, a significant percentage (78%) of academic libraries applied virtual reference services in offering library services to users. Other services offered by academic libraries during the pandemic include circulation and lending services, online user education programme and research support services.

Objective 2: Digital technological tools used by academic libraries to facilitate access to library information resources by university students during the outbreak of COVID-19

During COVID-9, academic libraries resorted to the application of different digital technology tools to optimise remote access to library information resources and services at the same time maintain social distance. There were numerous tools used by academic libraries in supporting university students' access to library information resources during the COVID-19 lockdown. Table 3 presents the findings on the digital technological tool used by academic libraries in supporting library information resources during COVID-19.

Table 3: Digital technological tools used by academic libraries to facilitate access to library information resources during COVID-19 Pandemic

Digital tools used to facilitate access during COVID-19 pandemic	Frequency	Percentage
Social media	14	61
Library website	13	57
Ask a librarian and live chat	8	35
Email	7	30
Library OPAC	5	22
Remotex and EZProxy	3	13
Video conferencing	3	13

These results show that majority (61%) of academic libraries used social media to support university students' access to library information resources. As such, application of social media mostly used by academic libraries as it allows a mode of communication without being physically attached. Besides, a significant percentage (57%) of academic libraries prefer usage of library websites in supporting university students' access to library information resources. Apart from that, other electronic tools that do not necessarily require physical presence in the library in accessing library information resources were applied such as Ask a librarian and live chat, email, library OPAC, Remotex and EZProxy and video conferencing.

Objective 3: Challenges faced in accessing library information resources during COVID-19 pandemic

Providing services to university students during COVID-19 faced myriad challenges. Table 4 presents various challenges faced by university students in accessing library information resources during COVID-19.

Table 4: Challenges faced by university students in accessing library information resources during COVID-19

Challenges	Frequency	Percentage
Limited access to internet services	19	82.6
Inadequate library e-resources collection	10	43.5
Inadequate digital and information literacy skills among students	9	39
Limited off-campus access to library e-resources	5	22
Lack of knowledge on library resources which can be accessed remotely	4	17
Limited interaction between librarians and students	4	17

These results show that the majority (82.6%) of reviewed studies indicate that limited access to internet service is the major challenge faced by students in accessing remote library resources during COVID-19. Apart from that, ten (10) out of twenty-three (23) reviews indicated that inadequate library e-resources collection was another challenge faced by university students in accessing library resources during the pandemic. This has been influenced by inadequate funds among academic libraries in Africa to subscribe to more e-resources to meet the increasing students' demand for e-resources. Also, inadequate digital and information literacy skills among students and limited off-campus access to library electronic resources hindered students' remote access to library resources during the COVID-19 pandemic. Lack of knowledge on library resources that can be accessed remotely and limited interaction between librarians and patrons due to social distance and lockdown each mentioned by four out of 23 reviewed studies.

Discussion

The study sought to examine access to library information resources by university students during the outbreak of the COVID-19 pandemic in Africa. Specifically, the study identified types of services offered by academic libraries to support university students' access to library information resources, identified digital technological tools employed by academic libraries and the challenges faced in accessing library information resources during the COVID-19 pandemic.

The findings of the study revealed that during an emergency that requires temporary closure of university campuses adjustment of physical library services to virtual library services and other innovative services is inevitable for academic libraries in Africa to facilitate off-campus electronic access to library resources to ensure students' continuity of access to library information resources. On this, remote access to library information resources such as newspapers, e-books, e-journals, past examination papers, institution repositories, online public catalogs, streaming media, research guides online databases, library electronic resources and other educational contents through various digital technological tools are pivotal during an emergency time like the case of COVID-19 (Chisita *et al.*, 2022; Tsekea & Chigwada, 2020; Mbambo-Thata, 2020). On the other hand, provision of virtual library services by academic libraries during emergency like COVID-19 pandemic is virtual. There has been a significant increase in the use of online reference services to sustain interaction with patrons and answer patrons' queries, to support remote access to library information resources (Mathabela, 2021;

Tsekea & Chigwada, 2020), to create awareness and promote library resources and services in a digital environment (Chisita & Chizoma, 2020; Chisita et al., 2022; Ifijeh & Yusuf, 2020; Abubakar, 2021).

Some libraries introduced online interlibrary loans and document delivery to support remote access to library resources, especially for students who were not able to access online information resources (Ifijeh & Yusuf, 2020; Chigwada, 2022; Magut, 2022). Other libraries extend the book loan period and waive fines to allow students to stay with books and other information resources during the lockdown period and avoid the accumulation of fines during the lockdown period (Mathabela, 2021). In exceptional ways, Curbside book pick up was another new service offered by some academic libraries in South Africa to facilitate access to print library resources for students who were not able to utilize digital facilities to access library resources during the lockdown (Mashiyane & Molepo, 2021). To return borrowed library information resources, some libraries used book drop boxes whereby students can return borrowed books and other library materials without physical contact with librarians (Tsekea & Chigwad, 2020; Chisita & Chizoma, 2020; Chisita *et al*., 2022).

On the part of the tool used to facilitate access to library information resources during the COVID-19 pandemic, the outbreak of the COVID-19 pandemic triggered a keen interest among academic libraries in Africa to adapt digital technology tools to reach users during the closure of physical library services. Digital technological tools have been used to allow students to access electronic library resources anywhere at any time following the temporal closure of library buildings. In this regard, Chisita *et al.* (2022) pointed out that the closure of libraries and lockdown create a physical barrier between librarians and patrons resulting in increased demand for digital technology tools to facilitate access to library services and resources to avoid total closure and suspension of services. These tools include social media, library website and email, ask a librarian and live chat, videoconferencing and other software like Remotex and EZProxy. The utilisation digital technology tools also helped to bridge the distance between library staff and patrons during lockdown. The findings of this study revealed that many academic libraries in Africa used social media tools like (Facebook, Twitter, WhatsApp, YouTube, Mayspace, Telegram and Blogs) to offer different library services and provide link to library e-resources. Virtual reference services were provided through several digital tools like social media, Lib-guide, chat facilities on website, phone number and email (Abubakar 2021; Ifijeh, 2020; Mbambo-

Thata, 2021). For instance, the University of Lesotho library provided reference services through chat facilities while subject specific queries were answered by subject librarians (Mbambo-Thata, 2021). On the other hand, different web conferencing tools such as Zoom, WebEx, BigBlueButton, Google meet, Microsoft team, instructional video guides on the library websites and social media have been used by academic libraries to facilitate delivery of online user education programs during lockdown Tsekea & Chigwada, 2020, Chisita & Chizoma, 2020; Chigwada 2022). To support this, Abubakar (2021) asserts that social media implementations and daily usage increasingly become among librarians around the global during the COVID -19 pandemic. On the other hand, Ifijeh and Yusuf (2020) emphasise that university libraries could leverage the use of social media to promote reference services during the COVID-19 pandemic.

Despite the initiatives made by academic libraries to provide support on access to library resources during the closure of the library following the outbreak of COVID-19, students in Africa faced a number of challenges that limited smooth access to information resources offered by academic libraries through various digital platforms. Studies have indicated that limited access to internet service and ICT devices is the major challenge that hindered students' access to remote online information resources during the COVID-19 pandemic. It was established that some university students in many African countries had challenges in having access to reliable internet services and computer facilities to support online access to library information resources during the lockdown. Nwosu (2021) asserts that access to the internet and other digital facilities for many university students in African countries is made available on their host university campuses, but limited access to physical library buildings presents a challenge for students to purchase their own gadgets such as laptops and computers to access the online library information resources and other digital services. Due to financial constraints, many students were not able to meet the cost of purchasing computer or laptop and meet data cost (Mbambo-Thata, 2020; Martizirofa *et al.* 2021). Furthermore, the findings of the study identified that inadequate library e-resources and limited off-campus access to electronic library information resources hindered students' access to library information resources during the pandemic period. As such, not all academic libraries in Africa managed to offer remote access to library resources during the COVID-19 pandemic due to continuous budget cuts and poor technological infrastructure to support off-campus access (Tsekea & Chigwada, 2020). Inadequate funding further deters technological tools for accessing library

information resources and the library collection. High electronic resources subscription costs resulted in the limited library collection, especially e-resources. Mathabela (2020) discloses that one of the challenges which contributed to the limited digital collection at the University of Eswatini was the lack of finance for e-resources subscriptions. Along with that, inadequate digital and information literacy skills among university students, lack of knowledge of the available library resources which can be accessed remotely and limited interaction with librarians contributed to difficulties encountered by university students in accessing library information resources during the COVID-19 pandemic.

Implications of the Study

Implication for practice

This systematic literature review provides insight into access to library information resources by university students during the COVID-19 pandemic in Africa. The study has revealed that like in other parts of the world, academic libraries in Africa have taken initiatives to facilitate remote access to library information resources and services through digital platforms to ensure that university students are not denied access to scholarly information resources needed to support their learning in a changing digital learning environment following the closure of university campuses due to COVID-19 pandemic. Despite the initiatives taken by academic libraries to support student's access to library information resources, actions need to be taken by library management and parent institutions management in Africa to improve ICT infrastructures, expand library electronic resource collections and impart digital literacy skills to both library professionals and students. Otherwise, access to library information resources will still be problematic in many academic libraries in Africa during the emergency even in the future.

Implications for policy

This study provides useful insights to organisational policymakers and academic library directors in Africa in the development of emergency and disaster preparedness policy which will guide academic libraries on how to provide access to library information resources and services to university students during the COVID-19 pandemic and other emergency or disaster in the future.

Limitations and Recommendations for Further Studies

The limitation of this study included the selection of databases, language, search strategies and quality assessment of the selected studies. Four scholarly databases (Scopus, Emerald, Research4life and Google Scholar) were selected to extract

data for this study. In addition, the gray literature such as conference papers, proceedings, dissertations, reports, discussions, etc was not included in this study. Therefore, it is possible that some potential records and studies published in other databases might be missed. Furthermore, selected keywords were used to construct search queries. It is possible some records did not be included due to missing keywords or limitations of a search query.

This systematic review recommends further studies should be conducted to assess access to library information resources and services by university students in a specific country accounting for geographical locations and language. This will help to provide a good understanding of the current status regarding access to library information resources and services by university students during times of health emergencies like the COVID-19 pandemic. Also, another study should focus on the post-pandemic experience of different categories of libraries regarding the provision of services to users.

Conclusions and Recommendations

This systematic literature review analysed access to library information resources by university students during the outbreak of the COVID-19 pandemic in Africa. Specifically, the study sought to identify the measures adopted by academic libraries to ensure the smooth delivery of library information resources to patrons, particularly students, identify technological tools that were employed by libraries to facilitate access to library information resources; also, the study investigated the challenges faced by students in accessing library information resources. It is evident that the outbreak of the COVID-19 pandemic has challenged traditional library services worldwide. To stay relevant academic libraries in Africa have to expand library services through digital technology platforms to ensure that library information resources are accessible to students despite the closure of physical library services. Some innovative services are required to be adopted by libraries in Africa to offer off-campus access to library information resources during the closure of physical library services at the same time promote the use of electronic resources more than it was before. On the other hand, academic libraries should put more emphasis on providing digital and information literacy training to students to impart them with the required skills to be able to navigate through the changing online information landscape brought about by the COVID-19 pandemic. Moreover, academic libraries should be well equipped to deal with emergency situations by investing in ICT infrastructure and expanding electronic resource collection to continue supporting students' access to library information resources during emergency times as in the case of the

COVID-19 pandemic. The government also should bridge the digital divide gap by supporting students' access to internet services and other digital facilities for students to be connected and access electronic information resources at home.

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Appendix

Appendix 1: Data extraction summary

S/N	Author(s)	Method used	Types of services offered	Digital technological tool used	Challenges
1	Mathabela, (2021)	Case study	1. Remote access to library e-resources (databases, articles, journals & e-books) 2. Virtual information literacy services like guidelines on how to search for e-books & use virtual library facilities 3. Circulation and lending services (waiver of fines) 4. Virtual reference services	1. Library OPAC 2. Library website 3. email 4. Circulation drop box	1. Lack of awareness on the available library resources 2. Limited access to ICT devices by students to access resources remotely 3 Limited access to internet services due to high cost of data 4. Limited interaction with librarians
2	Chisita & Chizoma, (2021)	Content analysis	1. Remote access to library resources through digital libraries 2. Virtual reference services (lending, literature search) 3. Research support such as access to digital repository of electronic theses, dissertation and open educational resources 4. Collaboration with publishers to offer free access and personalized collection to users	1. Online chat & messaging (Keep users abreast of available resources) 2. Drop box (to help students who do not have access to online facilities)	1. Restricted interaction between library staff and students due to social distance rules, 3. Limited access to ICT devices 4. Limited access to internet services 5. Limited computer skills and information literacy

			5. Circulation & lending services 6. Offer virtual information literacy		
3	Chisita et al (2022)	Interview	1. Remote access to library resources such as e-books, journals & past examination paper 2. Virtual reference services 3. Circulation and lending services 4. Collaboration with publisher to offer users free access to e-resources	1. Library's webpage, 2. Poprietary software RemoteXs & EZProxy used to facilitate remote logging authentication for e-books & journals 3. Social media like Facebook, WhatsApp, YouTube and Mayspace (used to close the physical gap between librarians and patron)	1. Limited library e-resource collection 2. Limited skills among students to navigate through the new information landscape 3. Limited library e-resource collection 4. Limited off-campus access to library e-resources 5. Limited internet connectivity and slow
4	Ifijeh & Yusuf, (2020)	Descriptive/ view point	1. Virtual reference services 2. Circulation and lending services (document delivery)	1. Library website 2. Social media like Facebook, YouTube, blogging WhatsApp, telegram & twitter	1. Limited library e-resource collection 2. Poor technological infrastructure 3. Lack of skilled personnel
5	Tsekea & Chigwada, (2020)	Survey	1. Remote access to e-resources 2. Virtual reference services (selective determination of information) 3. Open access services through collaboration with	1. Use of library website 2. Social Media like WhatsApp, Facebook, Twitter, Skype, YouTube, blogs and 3. Email list 4. Live chat 5. Moodle & Google classroom	1. Limited access to computer and internet services. 2. Limited off-campus access to library e-resources

			publishers e.g. checking reference from publishers and sharing with users 4. Virtual Information literacy services 5. Research support		
6	Chigwada, (2022)	Interview	1. Virtual reference services 2. Circulation and lending services (loan period extension & book drops) 3. Research support services 4. Off-campus access to library e-resources using digital platforms 5. Online user education programs 6. Access to free e-resource from publisher	1. Email 2. Social media (WhatsApp, Facebook, twitter), 3. Virtual platforms like live chat email, Zoom, Google meeting, BigBlueButton) 4. RemoteXs & Ezproxy	1. Lack of digital literacy skills 2. Limited access to computer devices 3. Power outage 4. Poor internet connection due to the locality of patrons 6. Limited library e-resource collection
7	Abubakar, (2021)	Content analysis	1. Virtual reference services 2. Remote access to library resources	1. Email, 2. Voice over Internet Protocol 3. Instant messaging 4. social media	1. Limited ICT & digital skills 2. Internet interruptions 3. Poor ICT infrastructure (non-functioning library website 4. Limited library e-resources collection 5. Low ICT performance 6. Poor internet access, high bandwidth cost, low bandwidth

					penetration & irregular power supply.
8	Mbambo-Thata, (2020)	Case study (University of Lesotho library)	1. Offer remote access to e-resources 2. Online information literacy 3. Collaboration with publishers to offer free access to e-resources to support teaching, learning & research 4. Virtual reference services	1. Website 2. Use of special URL which provide access to local produce content (Theses & article) and subscription e-resources (e-books & e-journals) 3. OPAC 4. Social Media such (Facebook & Twitter), 5. Remotex (provide off-campus access to e-resources)	1. Absence of online information literacy program, 2. Cost of data 3. Limited library e-resources collection 4. Limited access off-campus access to library e-resources
9	Kasa & Yusuf, (2020)	Survey	1. Virtual reference services 2. Remote access to e-resources	Telegram	1. Limited access to technological facilities among students at home 2. Limited internet services 3. Data cost,
10	Matizirofa et al (2021)	Case study (University of Pretoria library)	1. Remote access to library resources through virtual library 2. Virtual reference services	1. LibGuide 2. Ask a librarian 3. Chatting to the chatbot and Libby	1. Digital divide limited students remote access to library resources 2. Inadequate digital and information literacy skills 3. Limited access off-campus access to library e-resources 4. Limited library e-resource collection 6. Lack of awareness on the available-resources

					7. Limited access to electricity and power outage
11	Kumah et al., (2021)	Case study (7 selected Sub-Saharan African countries)	1. Virtual reference services 2. remote access to library resources 3. Online information literacy training sessions, 4. Circulation and lending services (online article request)	1. Ask a librarian & live chat 2. OPAC	1. Inadequate internet connectivity 2. Interrupted power supply interruption 3. Limited e-resources library collection 4. Inadequate training on virtual services 5. Lack of awareness on the available remote access resources
12	Shonhe, (2022)	Systematic review	1. Remote access to library resources 2. Virtual reference services	1. Social Media (Facebook, Twitter, Instagram, WhatsApp, Skype, Microsoft teams. 2. Use of Curb-side pick up	1. Inadequate ICT literacy 2. Inadequate ICT infrastructure 3. Power cuts 4. Data cost 5. Limited internet connectivity and low bandwidth
13	Omeluzor, et al., (2022)	Descriptive survey	1. Research support2. Provide access to e-resources (e-books, e-journals & online access to databases), access to newspaper cuttings & new rival 3. Virtual reference services	1. Ask a Librarian 2. library website 3. Social media (WhatsApp, Blogs) and audiovisual media) OPAC	1. Data cost 2. Inadequate power supply 3. Limited access to internet connection, 4. Limited off-campus access to library e-resources

14	Asimah, (2021)	Survey	1. Use digital library to offer remote access to e-books & other e-resources 2. Virtual reference services	University website	1. Power outage 2. Poor internet connectivity 3. Lack of access to ICT equipment 4. Limited ICT and information literacy skills
15	Thuo, (2021)	Mixed methods	1. Remote access to library resources 2. Virtual library services (provide access to e-books, e-journal & past paper)	1. Website, social media & digital repository 2. OPAC	1. Poor ICT infrastructure, 2. Slow internet connection 3. Limited interaction between library staff and students 5. Limited library e-resources collection and 6. Limited off-campus access to library e-resources
16	Mnzava & Katabalwa, (2021)	Content analysis (university library website)	Not reported	Library website	Limited interaction between librarians and students
17	Okonoko, Abba & Arinola, (2020)	Descriptive survey	1. Remote access to library e-resources and services (e-databases, e-zines, online newspaper, internet sources, e-journals-books & government special publications on COVID-19) 2. Virtual reference services	1. Email 2. Library social media platforms 3. Library website	Non reported

			3. Online user education programme 4. Research support services		
18	Magut, (2022)	Cross sectional survey	1. Remote access to e-resources (e-books & e-journal) 2. Circulation services such as online delivery of printed books in electronic format) 3. Virtual reference services	1. Email 2. Text messages 3. Social media & zoom to reach students off-campus	Non reported
19	Ogunbodede et al., (2021)	Descriptive survey	1. Remote access to e-resources 2. Virtual reference services	Not reported	1. Erratic power supply 2. Slow internet access 3. High cost of data subscription
20	Wosu, (2021)	Survey	1. Virtual reference services to meet information needs of users 2. Remote virtual access to library resources	1. Library website 2. Library social media pages	Limited library e-resources collection
21	Fasae et al., (2020)	Survey	1. Remote access to library resources	Social media	Not reported
22	Mashiyane & Molepo, (2021)	Survey	1. Remote access to library print resources 2. Lending of print books through curbside book pick-up services	1. Email 2. Telephone	Note reported
23	Gilbert, (2021)	Qualitative	1. Remote access to electronic library resources 2. Virtual reference services	1. Library website used to provide link to library e-resources and other open access resources	1. Limited e-resource library collection as only

				which can be accessed by students remotely	few students managed to access library e-resources 2. Students were no aware of available library e-resources 3. Limited off-campus access to library e-resources due to authentication which required use of password 4. Limited remote response to students request and queries from librarians 5. Limited access to ICT devises, internet services, as well as digital and information literacy among students 6. Electric power outage

Promoting Students' Interaction and Higher Order Thinking in an Undergraduate Health Information Literacy Course at MUHAS

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Abstract

Online learning environments have been adapted in higher education institutions around the world. However, it is not clear whether such adoption has yielded the expected effects on students' interaction and higher order thinking. The purpose of this research was to investigate whether the use of online discussion forum would promote students' interaction and higher-order thinking in an undergraduate health information literacy course. A total of 766 undergraduate students taking health information literacy course at MUHAS in a blended learning mode participated in the study. These students were engaged in five evidence-based practice topics using discussion forums - a moderate interactive learning environment as a pedagogical approach. Data included interviews and the content of online discussion forums. All qualitative data were analysed using ATLAS.ti software, Student t test was used to analyse the design effects realized over the three iterations and NetMiner 4- a social network analysis (SNA) software was used to analyze student interaction patterns. Results show that social interaction and students higher order thinking improved progressively over the three iterations. The changes in instructors' pedagogical strategies and the actions of students to learn from each other contributed to the marked students' social interactions and cognitive thinking. Thus, effective use of discussion forums in higher education can produce meaningful students learning interaction and higher order thinking.

Keywords: Interactive learning, higher order thinking, asynchronous design, social interaction,higher education

Introduction

The emergence of cutting-edge technologies has created much interest in e-learning investment in higher education. There are various online learning environments such as Google Class, Edmodo, Moodle, or Blackboard that can be used to share learning materials with students and promote collaborative learning. Some of these learning environments have been noted in the literature to extend students' cognitive abilities (Azevedo, 2005; Kim and Reeves, 2007; Lajoie, 2000). However, many of the online learning environments are limited to sharing instructional materials such as presentation files, links to websites and reading materials (Msonde & Van Aalst, 2014). These learning environments and their associated resources do not promote social and collaborative learning. This problem is internationally experienced. There has been an extensive use of e-learning environments in Tanzania higher education in order to help students develop scientific knowledge and required expertise. However, the learning effects so far have not been realised. It is important, in this context, to develop e-learning approaches that can be supported by technology to promote social interaction and metacognition (Azevedo, 2005). For example, students may harness the potential of social learning tools to share their ideas deeply during the learning process.

Online learning environments have widely been used in higher education institutions across the worldto improve teaching and learning (Cassidy, 2016). However, any positive student learning effects depend largely on authentic learning activities (Herrington, Oliver & Reeves, 2003) and the quality of cognitive interaction occurring within those learning environments (Woo & Reeves, 2008). Therefore, promoting deep learning and cognitive development can be achieved through social interaction (Mercer, 1994). As such, designing online learning environments that encourage interaction and collaboration can bring meaningful student learning effect. Some previous research reported that the use of online discussion forum rarely includes the concept of cognitive interaction and idea improvement (Niu & van Aalst, 2009). This research focuses on investigating whether using online discussion forum would progress past mere discussions to deeper inquiry and knowledge advancements (Scardamalia & Bereiter, 2007).

Thus, the research had two goals. The first goal was to assess the effects brought by a moderate designed social learning environment in promoting student interaction. This learning environment provided support for peer interaction via

asynchronous discussion forums. The design was simple in terms of bandwidth requirements compared with the range of possibilities that online learning environments offers. The second goal was to investigate the effects of a designed social learning environment in promoting students higher order thinking. Therefore, this study investigated the following research questions:

i. To what extent do the designed social learning environment and pedagogical approaches enhance student interactions?
ii. Do the designs of social learning environments and pedagogical approaches improve students higher-order thinking?

The effectiveness of the designed social learning environments was analyzed in terms of inquiry threads and messages wrote during an online health information literacy course to determine the interaction pattern and advances in student higher order thinking during learning process.

Theoretical Grounding

The concept of student learning has been changing from individual knowledge construction toward social and collaborative learning (Bereiter & Scardamalia, 2002). Assumptions about collaborative learning can be related with the concept that student thinking reaches saturation in a social learning environment (Mercer, 1994). Such an assumption reflects the connectivist concepts of MOOCs which emphasises collaboration and engaging students in online social learning discourse (Rodriguez, 2013). Thus, social learning involves knowledge construction in an inquiry stance in which learners have the opportunity to articulate ideas into coherent meaning (Garrison & Arbaugh, 2007; Linn & Eylon, 2011).

In other words, students develop deep learning in social discourse (Woo & Reeves 2007). Most of social learning tools have capability to create social learning environments that enable these social discourses to occur. Tools such as *discussion forums* among others have capability to create social presence, which enables students to develop knowledge collaboratively. Thus, online discussion forums are potent learning tools that promote social interaction and deep learning. Most previous research (e.g. Bassili, 2008; Hew, 2009; Ng'ambi & Lombe, 2012) lacks empirical evidence to verify whether the use of social learning tools in an online learning environment has a significant effect on student interaction, thinking and achievement. The current research seeks to determine whether the use of social learning tools and associated pedagogical

approaches especially in health information course would create meaningful student interaction and higher-order thinking, particularly in countries with low-bandwidth and limited resources.

Pedagogical Designs

The researcher designed a moderate interactive social learning environment, which was implemented and evaluated in an instructional unit using three cycles of educational design research (McKenney & Reeves, 2012; Msonde & van Aalst, 2017). The design used discussion forums in order to boost social interaction (Sun *et al.*, 2018), cognitive engagement (Zhu, 2006) and higher order thinking (Darabi *et al.*, 2013; Msonde & van Aalst, 2017). However, the literature shows that students do not necessarily respond to the ideas of others in an asynchronous learning environment (Hewitt, 2005; Wise *et al.* 2012). Nevertheless, there are various pedagogical strategies that may be used to boost student interaction and engagement in learning (Hew & Cheung, 2008). Therefore, the researcher asked students to discuss a given topic on evidence-based practice (EBP), read the views of others and give comments on ideas written, or compose thoughtful questions and or answers in order to improve the previous ideas. These pedagogical strategies focused on promoting student's social interaction and cognitive thinking.

Design and Data

Setting and participants

The study was conducted at a public health university in Tanzania. This university had a well-developed technological infrastructure with a local area network connected across all of the university teaching and learning areas. Two instructors who taught freshman health information literacy skills course participated in this research. All 766 undergraduate students who were registered for this course agreed to participate in the study that used discussion forum – a moderate social learning environment in order to foster student interaction and thinking. The researcher considered other research designs, in which students would experience more than one design. But it was realized that both instructors and students required more time to learn and develop their practices with a specific design. Given the time limit, the researcher found it worth to settle on the present research design. The use of discussion forums was not common, so it was necessary for the students to develop some expertise in using the tool effectively.

Data collection

Data were obtained from interviews and the content of online discussion forums. Fifteen students were selected for interviews. Each of these students was interviewed four times before the intervention and at the end of each unit. Each interview was audio-recorded and lasted for approximately 20 minutes. The audio recordings were transcribed verbatim and respondents were invited to review their interview transcript. Online discussions were also used as source of data. Five discussion forums were conducted with each discussion topic lasting for 2 weeks. The students' messages in online discussion forums were crucial source of data for determining the level of student interaction and attainment of higher order thinking during the process of learning.

Data analysis

All interviews were transcribed verbatim and entered into ATLAS.ti software for coding and analysis. The coding of interview transcripts helped to acquire a deeper understanding of the students' views about learning before and during the three iterations. The researcher coded all of the interview transcripts and generated a set of codes. A number of recurring codes were clustered into dimensions (main codes) and sub-codes. To establish coding reliability, the sub-code descriptions and associated examples were given to an independent coder for checking. The researcher and the independent coder agreed on 30 of the 35 different types of sub-codes. Inter-coder agreement was 0.819 (Cohen's kappa), suggesting excellent inter-coder agreement (Gwet, 2012). Discrepancies were resolved through negotiation. The researcher refined the sub-codes and re-coded all of the data using the refined coding scheme, which comprised three main codes: *teaching presence, interactivity and engagement*. Similarly, the researcher used NetMiner 4 social network analysis (SNA) software to analyse the online discussion forum log files, which generated patterns for post-writing efforts, network densities and interactions cliques (Scott, 2012).

Moreover, content analysis was applied to the online discussion log files to analyse advances in the students' thinking. The researcher read the messages in the sampled Moodle discussion forums in order to understand the conversational trends. Various themes across the three iterations were identified and organised into inquiry threads, which were entered into ATLAS.ti for coding. The researcher developed a coding scheme based on the Practical Inquiry Model (Garrison *et al.* 2001) which was used to analyse the messages in the inquiry threads. The four cognitive dimensions in the Practical Inquiry Model

(*triggering event, exploration, integration and resolution*) were adapted. The researcher developed most of the codes using data from discussion forum 1. He improved the code descriptions and organized them into main and sub-codes which were later given to independent coder for checking. The researcher and independent coder were in agreement on 22 of the 29 sub-codes. Statistical analysis using SPSS was carried out to determine the inter-coder agreement. The level of inter-coder agreement measured .816 (Cohen's kappa), which was statistically significant, at p <.0005. The Kappa value was above .7 (70%), suggesting excellent inter-coder agreement (Gwet, 2012*)*. The discrepancies between them were resolved through negotiation, then the researcher revised the coding scheme based on the agreement reached and re- coded all of the data.

Results

The results are presented in several subsections. First, data about the students' views about online learning before the intervention was presented followed by their views on it during the intervention. Next, the data on the students' social interaction and advances in student thinking were presented.

Students' views on learning before the intervention

The main themes that emerged from data in this phase were *interactivity* and *teaching presence*. The term *teaching presence* refers to the acts of instructors to connect and facilitate online discourse in order to promote the student's interaction and cognitive thinking. It was revealed that before the intervention, students had not experienced social learning in an online environment. Most of them harnessed the capability of the Internet to learn in isolation. As such, the students were uncomfortable with the absence of social contact. Since most students shared similar views, the excerpt below has been chosen to exemplify their perceptions.

I have never used the Internet for sharing ideas with others. Rather to search information that meets my learning needs. The reason is that most online courses provide only notes and you are left without any assistance from the teacher to guide you on what to be done. This kind of online learning leaves us with a lot of learning misconceptions. (P52:21; 32:32)

This except shows that the students had little experience to harness the potential of social learning tools in sharing ideas. They wanted more *interaction to share their knowledge* with each other and with the *teacher in an* e-learning course. As such, they relied on individual and isolative learning. These results were common and

consistent with previous studies (Msonde & van Aalst, 2014; 2017). What is interesting here is the willingness of the students to learn in an interactive online learning environment.

Students' views on learning during the intervention

The researcher analysed the interview transcripts in each iteration in order to obtain a clear picture of how the students perceived their learning and how this learning developed. Three main theme, teaching presence, student interaction and engagement with contents were realised throughout the three iterations. The results showed that the use of discussion forums helped students to develop social learningculture. The instructors in this learning experience played a vital role in facilitating and engaging the students in *social learning*:

> It was interesting to have various topics on evidence-based practice during online discussions. The instructors took time to guide the discussion. They encouraged us to share ideas and provide constructive arguments based on evidence. The critiques received from both the instructors and fellow students during online discussions helped us to reach into common agreement on the topic we were discussing (P75:35; 14:22).

This excerpt shows that the teaching presence during online discussion helped students to experience social learning (collaborative knowledge construction) which culminates to deeper learning. The actions of the instructors in encouraging the students to provide constructive arguments based on evidence deepened their level of inquiry, which resulted in higher-order thinking. The level of social learning developed progressively over the three iterations. The students' social interactivity and idea exploration and development changed gradually based on the teacher's pedagogical changes. The except below exemplify such views:

> The teachers provided some guidelines that necessitated us to become active and think deeper during our discussion. We were required to read extensively so as to get supporting evidence on what you want to argue before asking any questions or giving a comment to ideas from others (P75:110; 22:22).

It is clear from the above excerpt that students were explaining the effect brought by the instructors' pedagogical strategies used during online learning. Such instructional strategies resulted in the students' engagement in reading

extensively educational material that deepened their understanding of the lessons. They were also involved in social discourse (*interaction)* which helped them to create knowledge socially and achieve higher-order thinking.

Students' learning processes during the interventions

Students' learning process was analysed in terms of student interaction patterns. Social network analysis (SNA) was used to determine the students' interaction patterns: their efforts in post writing, network density for posts linking and clique analysis.

Student post-writing effort. Three of the five discussion forums (1, 3, & 5), one from each iteration, were randomly selected to demonstrate the student posts writing efforts. Results from a paired sample t-test, given in Table 1, show that there was a significant difference in mean for post-writing effort during iteration 1 (M=2.86, SD=1.49) and iteration 2 (M=3.17, SD = 1.31) forum discussions; t (68) =1.590, p=.007. Similarly, a significant difference in mean between iteration 1(M=2.86, SD=1.49) and iteration 3 (M=4.69, SD = 1.36) discussion forums; t (68) =3.913, p=.000.

Table 1: Inferential statistics of posts writing

Pair/iteration	Mean	Std. Deviation	t	df	Sig. (2 tailed)
Iteration 1	2.86	1.49	1.809	68	.075
Iteration 2	3.17	1.31	1.590	68	.007
Iteration 3	4.69	1.36	3.913	68	.000

Network density for post linking. The same discussion forums chosen were further used to analyze the student post linking patterns. Table 2 shows the coded written messages to establish the way students were *building on the ideas of others during online discourses.*

Table 2: Network density of posts linking

Iteration	Total written posts	Number of posts linked	% of linked posts	Density of linkedposts	Density of the whole network
Iteration 1	810	198	24.40	0.025	0.191
iteration 2	1350	445	32.93	0.046	0.303
Iteration 3	1452	709	48.84	0.087	0.409

The data in Table 2 show that there were improvements in idea linking during online discourse, such that student idea linking developed gradually over time. Such improvements were extensive during the second and third iterations as

depicted in Figure 1 of the resultant image of social network density of the linked posts of the whole network.

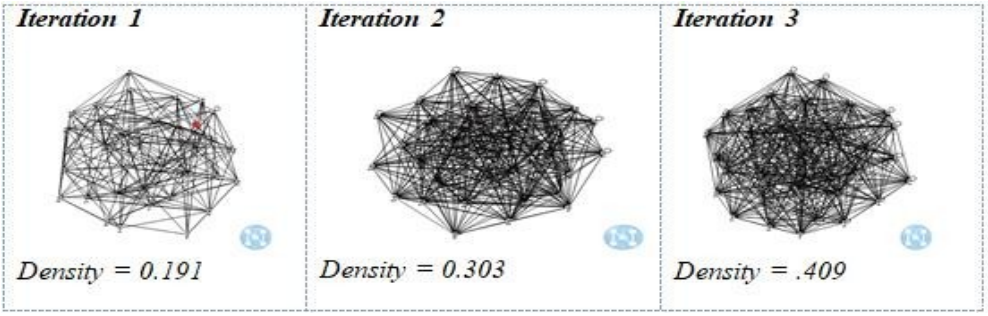

Figure 1: Social network density for idea linking

Clique analysis. This is a sub-set of a network in which members become closely tied to one another (Zhang *et al.*, 2009). Other scholar referred clique analysis as a social structure, which exists in an online learning community (Scott, 2012). Thus, cliques become more useful for determining interaction patterns. It reflects the collective cognitive responsibility occurring in online learning communities. Data presented in Table 3 show that there were few cliques in the first iteration with relatively high cohesion index. Such a situation implies that students demonstrated high levels of interactions within a clique.

Table 3: Clique analysis for idea linking

Iteration	Total cliques	Average size of clique	Number of cliques student belongs to	Number of cliques instructors belongs to	Mean cohesion index
Iteration 1	11	5	3	9	3.84
Iteration 2	28	6	16	14	2.16
Iteration 3	97	7	60	42	1.75

However, the number of cliques increased dramatically in the third iteration, which suggests that students had more interaction and collaboration during online discourse. Although there were increase in numberof cliques over the three iterations, but the corresponding cohesion index decreased. Such decrease implies that students demonstrated high community-wide interaction with a reduced closeness between students within cliques.

Characterising student thinking

The researcher conducted an inquiry-thread analysis to examine the way student developed their thinking. The question–answer or idea–comments exchanges from the sampled three discussion forums (1, 3, & 5) become crucial data for this analysis. The results presented in Table 4 show that students initiated 17 inquiry threads and wrote 3612 messages whereas instructors initiated 18 inquiry threads and wrote 242 messages that most of them were in form of questions. On deeper analysis it was noticed that the instructors asked students questions that provoked them to come up with ideas that addressed the problem under discussion. They also asked students to develop further their ideas in order to deepen their thinking. These kinds of questions were categorised as questions *for* ideas and questions *on* ideas respectively (Zhang *et al.* 2009; Msonde and van Aalst, 2017).

Table 4: Messages and instructors asked questions

	Threads		**Messages**		
Iteration	**Instructor initiated**	**Student initiated**	**Instructor**	**Students**	**Total**
Iteration 1	6	5	58	810	868
Iteration 2	7	5	64	1350	1414
Iteration 3	5	7	120	1452	1572
Total	**18**	**17**	**242**	**3612**	**3854**

	Categories of instructor's asked questions		
	Questions for idea	***Questions on idea***	Total
Iteration 1	13	17	30
Iteration 2	21	34	55
Iteration 3	10	50	60
Total	**44**	**101**	**145**

Moreover, data in Table 4 shows that there were few questions *for* ideas over the three iterations. However, the instructors asked more questions *on* ideas that were numerous in the second and third iterations. The *instructor presence* and the kinds of questions asked not only minimised the issue of student isolation but also deepened the level of student inquiry.

Advances in student thinking

The researcher analysed the same discussion forums 1, 3 and 5 messages to determine advances in student thinking. The results presented in Table 5 show that during online discourses the students made factual statements (60 coded

instances), provided assumptions on problems (76 coded instances), gave explanations (78 coded instances) and elaborations (72 coded instances) of what they were discussing.

Table 5: Advances in student thinking

Codes for exploration and idea improvement

Iteration	Facts to problem	Problem conjecture	Explanation statements	Elaboration statements	Explanation seeking questions	Clarification seeking questions	Total
Iteration 1	15	13	15	12	20	9	84
Iteration 2	16	26	30	27	50	42	191
Iteration 3	29	37	33	35	81	68	283
Total	**60**	**76**	**78**	**72**	**151**	**119**	**558**

They also asked questions seeking explanation (151 coded instances) and clarification (119 coded instances), using "what," "how," "why," and "what if" statements. These types of questions extended the students' thinking and were extensive in third iteration.

Knowledge integration and resolution

The researcher analysed messages in the discussion log file to identify students' activities that involved an act of integrating various ideas into coherent meaning. The term integration can be defined in terms of building on ideas of others, bridging statements as well as providing reflective statements (Linn & Eylon, 2011). Table 6 shows that students expanded on ideas of others (101 coded instances); provided bridging statements (70 codes instances); and made reflective statements (75 codes instances).

Table 6: Knowledge integration and resolution

Iteration	Building on others idea	Bridging knowledge	Provide reflective statements	Total
Iteration 1	12	11	3	26
Iteration 2	20	10	35	65
Iteration 3	69	49	37	158
Total	**101**	**70**	**75**	**249**

It is clear that knowledge integration increased over the three iterations. However, the students' knowledge exploration, integration and resolution were gradual and progressive albeit much higher in the third iteration.

Discussion

Findings of this research have been discussed in terms of the effect of the course design on (1) students' interaction and engagement and (2) advances in student higher order thinking during their learning process.

Student interactivity and engagement

Student interaction and engagement with contents in an online discourse play an essential role in promoting productive dialogue. Online learning environments that emphasise this kind of learning requires instructors to understand not only the way effective online instructions are designed (Moore, 2016), but also how to facilitate students achieve meaningful interaction (Martin & Bolliger, 2018). In this study, instructors created a moderate social learning environment essential for these dialogues to occur. Such enhanced dialogue led students to develop deeper learning (Woo & Reeves, 2007). A good example is where students become engaged in deeper dialogue in online discussion forum to explore ideas about PICO concepts and types of clinical questions. They did so through asking their peers productive questions as well as critiquing the ideas of others on how clinical questions can be asked using PICO format.

These findings are encouraging in that using online discussion forums can have a worthwhile effect in promoting student engagement with what they were learning which culminates to deeper thinking. However, such learning progress does not come by its own, rather the nature of instructional strategies used as well as the *instructor presence* contributed to enhanced interactions and student engagement with contents. The literature shows that instructor *p*resence in online learning environment has been considered as a promising mechanism for developing learning community (Shea, Li, & Pickett, 2006) and a powerful strategy that minimises the issue of student isolation. For example, duringan online discourse, instructors asked students higher level questions (Ertmer *et al.*, 2011) that required them to give ideas on their understanding of certain concepts under discussion. The instructors also wrote follow-up questions to students' written ideas on various inquiry problems. Such kind of questions deepened the inquiry and created students social and cognitive dynamics.

The growth of social and cognitive dynamics was useful for determining the student interaction patterns. Therefore, it can be argued that effective use of discussion forums in online learning environment can produce positive learning effects. Thus, instructors of higher education institutions in Tanzania need to harness the potential of discussion forum in order to bring about positive student learning effect compared with the acts of just posting contents to the online learning environments (e-learning platform).

Advances in student higher order thinking

The fundamental process for knowledge construction and student thinking occurs in a social learning environment. The findings from this research revealed that social and cognitive dynamics were evident over the three iterations. Students explored various inquiry problems and reached knowledge advances through social learning. The students managed to integrate knowledge and repertoire of ideas beyond the subject matter they were learning. This study used a modest online social learning environment (discussion forum) to deepen the inquiry problem leading to knowledge advancement and deeper thinking. These findings are contrary to some previous studies that showed the use of discussion forum rarely improved student ideas during learning (Niu & van Aalst, 2009).

In contrast, this study used online discussion forum to deepen inquiry problems that led students pursuing health information literacy course to acquire higher order thinking. They perceived learning to be much more interactive, collaborative and engaging, which developed their curiosity and contemplative ability. For example, the use of *questions on ideas and questions for ideas* deepened the level of that inquiry (Zhang *et al*., 2009) especially when students associated the PICO concept in formulating relevant clinical questions. During the online learning discourse, instructors invested a lot of time to support and facilitate the online discussions by asking students more questions on ideas. As such, the level of student higher-order thinking improved from the first iteration and continued to improve in subsequent iterations.

An interesting finding from this study is that enhanced students' interaction and thinking were associated with instructional strategies used during online discourse that led students to achieve meaningful learning. Based on these findings, it is surprising to see unrealized online learning effects while universities have sound technological infrastructure to allow effective pedagogical designs and practices (OECD, 2015). Therefore, instructors need to work out of

functional fixedness when designing efficient online learning environments using the available technology in order to help students acquire meaningful learning.

Limitations and Further Research

This study had some limitations. First, the study used only discussion forum – a moderate social learning tool to foster student learning. It would be useful for further research to use more social learning tools in order to realise the added educational benefits that can be brought using those tools. Second, to know more whether the design work well it was crucial to implement the design to multiple courses. Thus, further studies should involve more instructors teaching other courses or be implemented in different universities with similar contexts.

Conclusions

Findings from this research reveal that the design of a moderate social learning space improved student social interaction and thinking. They advanced from isolative learning to collaborative learning and progressively improved thinking over the three iterations. These advances were modest during the first iteration, but extensive in the second and third iterations. Since, the discussion forum is a low bandwidth, therefore, it is a promising direction for universities in Tanzania to take for promoting social interactions and meaningful learning.

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