Maria Frahm-Arp (Editor)

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Introduction

The Impact and Importance of the Fourth Industrial Revolution and Sustainable Development for Academic Libraries in Africa

Maria Frahm-Arp

University of Johannesburg

Abstract

Particularly in academic libraries in Africa the United Nations Sustainable Development Goals (SDGs) and the Fourth Industrial Revolution (4IR) are possibly the two most significant issues that need to be addressed by librarians in order to offer staff and students at their universities the support they need to flourish in the twenty-first century. This chapter critically examines some of the current literature exploring how academic libraries address the challenges and opportunities presented by these two factors. Five key areas are identified as being of particular importance in the current literature: the literacy rates and the academic reading ability of university students; accessibility of information to university students, researchers and communities in Africa; the impact, importance and limitations of open access information; the role of digital media to market libraries and the importance of teaching digital literacy in libraries; and lessons learnt from online teaching and learning during Coronavirus disease 2019 (COVID-19) which can help to enhance learning amongst students in the post-COVID-19 world. Overall, the chapter explores each of these five areas, showing how the 4IR tools, especially artificial intelligence (AI) and makerspaces can be used to address many of the concerns raised in the literature. It also shows how each of these five areas are avenues through which libraries are and can address SDGs in various ways. The chapter argues that libraries need to address the challenges they face without waiting for more government funding, but rather more innovatively use the funding they have. While admirable research has been conducted on the library needs of students at universities, much more work needs to be performed to understand the needs of researchers and how to support them.

Introduction

In the second decade of the twenty-first century the Fourth Industrial Revolution (4IR) and the United Nations' Sustainable Development Goals (SDGs) offer both challenges and opportunities for societies in Africa. Several countries in Africa are trying to embrace the technological advancements of the 4IR, often by leapfrogging advancement aspects of the Second or Third Industrial Revolutions. For example, most people in Africa currently have a mobile phone, although few landline phones were ever installed in homes in rural areas in Africa. The goals set by the UN SDGs offer enormous opportunities for countries in Africa, but with limited funding; many of these are difficult to implement, l*et al*one achieve. For example, the eradication of poverty in Africa is almost impossible without external funding and a change in the political will of many African governments and global neo-capital economic structures. Within this context, the 4IR and SDGs present interesting challenges and opportunities to libraries at universities and in communities in Africa. This chapter examines some of the key challenges faced by academic libraries at the beginning of the third decade of the twenty-first century. It offers an overview of the ways in which libraries in Africa have been addressing these challenges, as is discussed in detail in the chapters that follow in this book. The chapter is not an introduction to the chapters that follow in the book, but rather offers a critical reading of the scholarship on African academic libraries. It points to proposed ways in which the 4IR technologies, particularly artificial intelligence (AI) tools, can help libraries embrace contemporary technological opportunities in a way that may help them address SDGs generally and the SDG for access to information in particular.

This chapter examines five key issues faced by academic libraries in Africa as they aim to empower university staff, students and the communities connected to these universities. The first area is the literacy rate of students in Africa and students' ability to read complex academic articles and acquire new knowledge from these articles. Second are the SDGs and access to information as an important way libraries can help by providing the information people need to make more sustainable developmental decisions and choices. Third is open access to information and open scholarship and the positive and negative impact of these on scholarship in Africa. Fourth is the importance of digital media as both the way in which libraries can push information to clients and make catalogues and databases more easily accessible to clients. Fifth is the changing landscape of teaching and learning brought about by COVID-19 and affecting the post-COVID-19 world. In each of these five sections, addressing SDGs and exploring the role of the 4IR technologies, especially AI tools, is examined and key innovations are recommended for libraries in Africa, such that they could work with 4IR tools to positively impact societal change.

Literacy and Academic Reading

Literacy levels in Africa vary between countries, but on average are lower than those in the Global North. In South Africa, the poor reading abilities of learners has significantly hindered students' academic performance at university and more interventions are needed to support underprepared students (Pretorius, 2002; Bharuthram & Clarence, 2015; Millin, 2015). In Francophone Africa, child labour hampers the development of a reading culture and continues to lower students' reading abilities and academic success (Lee, Kim & Rhee, 2021).

Nkomo and Ngoepe's (2023) research on literacy in Zimbabwe points to the urgent need to develop a reading culture amongst high school learners. Their research found that due to social media, learners have become used to reading short bits of information and have little desire to read longer texts. They found that learners spent five hours a day on social media, leaving them little time for reading. The authors showed that there is a positive side to Web 2.0 platforms such as WhatsApp and Facebook, because through these, learners have downloaded novels and newspaper articles. If these platforms are embraced early on in schools, they could be used to develop a positive reading culture amongst learners helping to improve literacy rates. Gbenu, Njagi and Adegoroye's (2023) research on the role of public libraries points to the important role they can play in developing literacy and a reading culture by providing freely accessible, reliable information to citizens and offering literacy training and reading campaigns to strengthen cultures of reading. In South African academic libraries, Munzhedzi and Mukhwantheli (2023) show how many university students do not know what a library is, how to use it or how librarians can assist them. This is due to the lack of attention given to developing a reading culture amongst school children and the lack of libraries in public schools. They argued that libraries need to foster a culture of learning and reading amongst the current generation of students.

These varied solutions to the problem of student literacy in Africa will only be possible if governments make funds available for libraries to offer the most relevant information on various platforms to people, thus ensuring that everyone has access to the information they need to solve the challenges they face, develop their overall knowledge and help spark creativity and curiosity (Munzhedzi & Mukhwantheli, 2023, Nkomo & Ngoepe, 2023, Gbenu, Njagi & Adegoroye, 2023). Within the context of the impoverished state of national economies in Africa, calling for more funding from government, which many of the authors cited above do, is not a particularly feasible solution. Librarians and scholars working in the field of academic reading need to develop more nuanced understandings of what hinders reading amongst young people and how this can be creatively overcome. More attention should be given to the research on multi-lingualism and the students' abilities to read in English. As

Verhoeven (2011:661) points out, by 2042, through migration most of the world will have people working in a language that is not their home language. It is therefore imperative that within the education system ways are found to help students master globally dominant languages such as English (Verhoeven, 2011:678). In the English-speaking countries in Africa, a key challenge to reading is that students must read academic texts in English, which is often their third or fourth language. To improve the English reading speed and breadth of university students, interventions are needed that help students master academic reading skills in English. One such intervention could be for librarians to show students how to use the 4IR technologies so that they can use AI to read the text out loud to them and offer translations of words that students do not understand. This would be an immediately implementable and cost-effective way to begin to address this problem.

Sustainable Development Goals and Academic Libraries

One of the exciting developments of the 4IR has been the establishment of makerspaces in libraries, which can be a key way to address various SDGs, including access to information and access to work. Makerspaces which include robotics, 3D printing and laser cutting, are spaces which have been found to promote active community engagement (Koh, Abbas & Willett, 2018:17). They are also spaces that foster entrepreneurship, enabling students to become work-ready and possibly begin their own businesses based on the ideas they designed in university library makerspaces. Entrepreneurship in library makerspaces was also found in community libraries that had makerspaces both in urban and rural areas (Bergman & McMullen, 2020:811; Ensign & Leupold, 2018:1). Okuonghae (2019:49) found that both low-technology and high-technology library makerspaces enabled communities in Nigeria to explore new ideas and also fostered teamwork and problem-solving. Research has shown that makerspaces are also catalysts for better learning, as students can use multiple technologies to learn through doing (Colegrove, 2017:19). These examples all point to the impactful role that libraries can and should continue to play in helping countries in Africa realise many of the SDGs.

For countries in Africa to develop societal awareness of SDGs, public and academic libraries could play an important role (Ugwu & Ogunremi, 2019). Libraries are uniquely positioned to advocate for accessible information for learning, provide literacy training (Gbenu *et al.*, 2023) and computer literacy training (Adamu, Isah & Ajayi, 2023; Abata-Ebire, Adebowale & Ojokuku, 2018). The work of Hapel (2020) found that when libraries engage in these positive and valuable activities, they become nodes of social trust within communities. Nsibirano and Nsibirano (2023) argue that academic libraries need to play a role in making information accessible to communities outside of university. They focused their research on urban farmers in Kampala,

Uganda, and show that when these vegetable farmers were given access to up-to-date, relevant and reliable information from the university library, they were able to implement this information and improve their farming methods and practices. This was only made possible when the university under study changed the definition of library users to include the community beyond academic staff and students. Research found that the key issue blocking libraries from providing comprehensive support in the attainment of this goal is the lack of public funding for libraries, library services and library staff. While it is important that governments in Africa fund public libraries better, Agosto (2008) suggests that these libraries should generate additional income through actively pursuing grants and donations. An alternative could be making open access information easily accessible to communities in and around universities.

Open Access and Open Scholarship

In her research on open access and postgraduate students at four universities in Nigeria, Onwukanjo (2023) found that libraries played a critical role in helping these students find, navigate and use open access information effectively. While the move to open information is exciting and liberating for many in Africa who, for financial reasons, have been denied access to information, the wealth of information now available can be overwhelming. In light of this, libraries and the librarians who can help people navigate their way through the maze of digitally available open access information are now even more critical than ever before (Ayre & Craner, 2017:173-5). In some cases, libraries have begun to play the role of publishers through their institutional repositories that make open access information freely available. Research on open access information in Tanzanian academic libraries (Mwilongo & Kachota, 2023) highlights the importance of institutional repositories as a platform for the sharing of open access theses, dissertations, and scholarly peer-reviewed research. It is argued that governments should support these platforms far more and provide funding for all academic libraries to have well-functioning institutional repositories in which all the work hosted on these platforms is easily accessible.

While the idea of libraries as publishers promoted by the authors cited above is noble, they do not engage sufficiently in the negative side of open access publishing. Research reviewing thirty-two academic libraries that had library publishers showed that library publishing is a complex and often financially difficult undertaking. Key considerations highlighted by the study included training staff to be able to run a publishing enterprise that met with world-best publishing standards, creating a business plan that enabled the publishing enterprise to be financially sustainable and then both marketing and preserving the manuscripts that were published (Davis, Robertson &

Simser, 2018:1-4). Open access publishing and access to open information poses further challenges with the arsenal of misinformation available online, and librarians need to play a key role in helping learners, students and communities learn how to identify misinformation (Jaeger & Taylor, 2021:19). Lastly, more critique of the impact of pay-to-read open access models that significantly reduce the ability of academics in the Global South to publishing in expensive high-impact journals. While this model makes information accessible, it makes it very difficult for academics to publish their work because they do not have the necessary funds to pay high article processing fees.

Managing Digital Media and Fostering Digital Literacy

Academic libraries make use of various digital media sites such as Facebook, Twitter, LinkedIn, websites and student learning management systems to share information with university communities. A study of 15 academic libraries in Zimbabwe found that the key challenge faced by these libraries was updating and managing the content of their social media pages and websites (Tsekea & Chigwada, 2023). In South Africa, a survey I conducted in 2022 with five universities, found that libraries that had a dedicated person managing the library's marketing and website were able to offer up-to-date information, make changes to information quickly and continuously provide notifications about upcoming training effectively. At a few universities, the library provided better communication about university events than the general marketing teams of these universities. This had the effect of making these libraries the 'go to' places for students who felt that they could trust the libraries' information. Both studies found that libraries were able to offer effective marketing of their services to university communities when staff were given adequate training to use these varied platforms effectively.

Learning how to identify misinformation, disinformation and fake news in the digital space is one of the key digital literacy skills that librarians at academic libraries need to teach students. In Africa, authors such as Obinyan and Ikechukwu (2022) and Emiri (2017) address the increasingly urgent need for librarians to offer digital literacy training embedded in or as an extension of their information literacy training. As Baro, Obaro and Aduba (2019:172) found in a survey of several libraries in Africa, librarians rated their skills in 'database search skills, uploading documents to online platforms, skills in using different social media' as 'high'. Where librarians often needed more in-depth and comprehensive digital literacy training was in the use of platforms that make use of artificial intelligence in order to effectively train students and learners.

Libraries need to be or become places that teach integrated literacies, which include information literacy, digital literacy, media literacy and AI

literacy. Librarians with their particular skill set are well-placed to offer this type of training, but it will require them to learn new skills as they learn to use AI in the age of the 'data deluge' (Frederick, 2020:1). The research by Yoon, Andrews and Ward (2022:1893-4) showed that in America, librarians at academic libraries are well aware of the need to learn how to use AI and teach these skills to students, but in public libraries there was less engagement in AI by librarians. The research by Laybats (2018:168) showed that for academic libraries to be future-fit, their librarians will need to continually receive training so that they remain abreast of the latest developments in AI and other cutting-edge technologies. While the research shows that academic libraries in America in particular, ensure that librarians receive training in AI and other technologies, in Africa there is little research on the use and effective implementation of AI in academic libraries.

Teaching and Learning in Academic Libraries post-COVID-19

While there may not be the same level of training on AI in African academic libraries as there currently is in American academic libraries, the research published in this book points to the important work performed by librarians in Africa in teaching and learning during the COVID-19 pandemic and the numerous valuable lessons learnt, which they continue to implement. During the COVID-19 pandemic, online learning was the only way in which teaching and learning could continue. Many people found this mode of teaching very asynchronous, with little class engagement. One study found that when lecturers created 'virtual office hours' which were sessions led by the students, in which they brought their questions and concerns to the lecturer after having watched online videos explaining concepts and theory, student participation increased (Rupasinghe, 2023). Students reported that they found this mode very helpful and engaging. As these sessions were solely led by students, they were different to tutorials. This points to the importance of student-led learning in which students have a space in the curriculum and classroom to voice their own concerns and questions. It is argued that this practice should be continued, even when face-to-face contact sessions have resumed.

A study by Agyei and Adu (2023) on the ability of librarians at universities to connect with users during the COVID-19 pandemic showed that libraries were unprepared to connect with users online. The libraries had to implement platforms such as WhatsApp, Moodle, Zoom, Microsoft Teams, Google Meet and Skype, depending on what platform the university they were working for used. Many librarians did not find these platforms ideal and struggled to find the training they needed to use them effectively. The result was that in the Volta region of Ghana, where the study was conducted, most librarians were not able to remain in effective communication with their clients. In South Africa, well-resourced universities like the Universities of Johannesburg, Cape Town,

Pretoria, the Witwatersrand and Stellenbosch were able to easily pivot into the online space and librarians quickly learnt how to use the 'new' technologies. At less well-resourced universities, librarians struggled to connect with students, as they found it difficult to gain access to online systems and training on how to use these online learning systems[1]. This is further supported by Munzhedzi and Mukhwantheli (2023), who found that at universities in South Africa, librarians play an important role in the academic success of students, particularly by teaching students information literacy skills. In most South African academic libraries, student access to the most up-to-date materials via an online system significantly improved the academic success of students. The study highlighted the need for all libraries to transition to online spaces in which almost all material can be accessed online. In Nigeria, the research of Amao-Taiwo, Eki and Ekpe-Iko (2023) pointed to the effectiveness of online learning, particularly when both library staff and students had sufficient training in information and communication technology devices, software, and platforms. They suggest that libraries should continue to facilitate online learning and research communities to foster knowledge-sharing and self-directed learning.

While online access to resources anywhere, anytime, is ideal for students and academics at universities, it is not always practical or sustainable in many African countries. This is largely due to power issues and lack of resources. The offline Internet provides a good alternative in which users who are hampered by connectivity issues are able to continue to access information. Adie, Bisong and Obuop (2023) have created three taxonomies of offline Internet; completely offline, hybridised offline systems and offline servers. Their research found that schools and universities need to encourage students to bring their devices, such as tablets, smart phones and laptops to class and to use them in classes and lectures while they learn. Remote learning remains possible even when students are offline when various forms of offline Internet devices are used in conjunction with a student's own device. These types of offline learning platforms should keep students engaged and help self-regulated learning if they are to be truly effective (Adie *et al.*, 2023).

Conclusion

As the first chapter within this book has given a broad overview of the impact and importance of the Fourth Industrial Revolution and sustainable development for academic libraries in Africa. Using the lens of the 4IR and the UN SDGs as the two key issues impacting academic libraries in Africa at present, the chapter

1 Evidence for this was drawn from the preliminary unpublished CHELSA report on the effect of the COVID-19 pandemic on South African Libraries, (Neerputh, Satgoor & McCallum 2021).

highlights five areas that libraries need to focus on, address or overcome. In this chapter I have argued that there are five key issues which need to be addressed and developed further by academic libraries and librarians if these spaces are to be future-fit spaces of learning for students and development for research in the future. The chapter critically engaged with some of the most recent literature on these five issues highlighting where further research is needed, more nuanced thinking or problem solving is required, or a different approach might need to be taken.

Literacy levels in Africa remain an ongoing challenge and one of the key issues facing African countries is how to improve the literacy levels of citizens. Libraries need to find innovative ways to engage students in reading. The study by Nkomo and Ngoepe (2023) showed how social media can be a good entry point to reading for many students and learners. I have argued that relying on governments to provide literacy training and support is not a helpful suggestion, as most governments in Africa simply do not have the funds. Librarians need to address the reality that most students at Anglophone universities need to be competent in English, while in Francophone Africa, students need to be competent in French. Using AI tools, librarians could help students improve their literacy rates and command of these languages at very little cost and quite effectively. More research is needed to ascertain how best AI can be used to improve literacy rates of students.

The second key issue impacting libraries in Africa is the drive at many universities to actively work towards helping countries achieve the UN SDGs. Regarding this, the research cited earlier points to the importance of information literacy as a key skill which all students and citizens need to master in order to access the vast and ever-changing wealth of knowledge available online. What is not covered in this volume is the pivotal role that makerspaces in libraries can play to help address SDGs such as poverty eradication and employment for all. More research needs to be conducted to think through more effective ways for libraries to use their makerspaces and other resources to help not only students, but communities, to become better educated, thus empowering people to work towards their own and their communities' sustainable development.

Fostering digital literacy and helping people to identify misinformation, disinformation and fake news has become a central part of the changing landscape of information literacy. It is clear from the research that in Africa librarians still have not had access to comprehensive and ongoing digital and AI literacy training. For academic libraries in Africa to offer students world-class support, librarians will have to master digital and AI literacy in order to train both students and academic staff at their respective universities.

During the COVID-19 pandemic, librarians at African universities became proficient in training in the online space, although many of them were underprepared for this move to online learning. Some very important lessons have been learnt during the COVID-19 pandemic as to how to make online learning accessible to students. Given the high students-to-staff ratios at universities in Africa, online learning, if performed well, can offer a cost-effective way for librarians to train the large numbers of students who enrol at public universities each year, but as the research in this book shows, online learning in Africa needs to be performed working with both the online and offline use of the Internet so that the effects of limited power supplies in many African countries is managed. In the future, more research needs to be conducted to share how librarians are finding innovative ways to manage this while still offering a high standard of education to students.

Overall, this chapter shows how libraries and librarians are playing a pivotal role in the academic institutions and the communities around them. Most of the research focuses on the needs of students and communities around universities. An area of research that is not sufficiently engaged with in the literature is the role that libraries and librarians play in supporting academic staff at universities in Africa. As African countries continue to develop, more awareness, attention and research should be conducted to understand the critical role that libraries play in the ongoing sustainable development of Africa in the 4IR.

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A Framework for Embracing Web 2.0 Technologies to Nurture the Reading Habits of Secondary School Learners in Zimbabwe

Sifundo Nkomo[1], Mpho Ngoepe[2]

University of South Africa

Abstract

This qualitative study utilised a unified theory of acceptance and use of technology to explore how Web 2.0 technologies can be embraced to nurture the reading habits of secondary school learners in the Bulawayo province of Zimbabwe. The study employed a multiple-case study design with 14 focus groups with 210 learners as a data collection tool. Data was augmented through interviews with school librarians and analysed thematically according to objectives. The findings of the study revealed that learners are using different types of Web 2.0 technologies, including WhatsApp, Facebook and Wattpad. The findings showed that learners spent five or more hours on social media, negatively affecting their reading. However, there are positive effects of using Web 2.0 technologies, such as the availability of up-to-date reading materials that can be subsequently shared. The study concludes that if learners are guided well, they will use these technologies to nurture their reading habits. The study presents a framework that could be implemented to nurture the reading habits of learners.

Keywords: Web 2.0 technologies, reading habits, reading, learners, social media.

Introduction and background

The art of reading is one of the most important activities of life through which secondary school learners extend their knowledge, scope of experience and enjoyment. Reading is the foundation of much satisfaction in life. This is supported by Chettri and Rout (2013), who assert that reading provides

1 Sifundo Nkomo, Post-Doctoral Fellow: Digital Transformation and Innovation, Graduate School of Business Leadership, University of South Africa; nkomos@unisa.ac.za

2 Prof Mpho Ngoepe, Professor and Executive Director: Library and Information Services, University of South Africa; ngoepms@unisa.ac.za

an experience through which the individual may expand their horizons of knowledge, identify as well as extend and intensify their interest and gain a deeper understanding of themselves and others. According to Nkomo (2020), reading as a habit is a deliberate effort towards understanding and acquiring knowledge. The emergence of the Internet has created an extraordinary change in the reading environment. In the past few years, as new technology has developed at an alarming rate, reading habits have also changed. Hence technology has been a great instrument for the development of reading habits (Mullan, 2020; Nkomo, 2020; Ifeyinwa, 2022; Tiwari, 2022). Since the acceleration of technology, it has changed the reading behaviour of people, especially secondary school learners. Reading to the youth is not attractive compared with interactive activities on the Internet (Liu, 2005). The status of a 'reading habit' has declined amongst the learners. The declining interest in reading culture amongst children, especially those in secondary schools, is a cause for alarm and a challenge to all (Bamise & Akande, 2021).

On the African continent, the reading habit of children is waning. An example is a study conducted by Adeyemi (2020) in Osun State, Nigeria, which revealed that most students have developed into a non-reading society. This is also echoed by Bana (2020), who states that most Nigerian students cannot pronounce a word in each text nor write down the correct spellings of words that their teachers dictate. Zimbabwe is not exempted from matters of a poor reading culture. Voices from various media, academic and political authorities in Zimbabwe unanimously speak about the lack of reading habits amongst learners in secondary education, which impacts not only the educational standards but also the entire nation's welfare (Mabasa, 2014; Zimunya, 2014). The *Daily News* (2015) wrote that children in Zimbabwe lack a reading culture as most of them spend more time on WhatsApp, Facebook and other social media networks. This rhymes with Mlay *et al.*'s (2015) statement, which states that a poor reading habit retards a country's national growth.

Ngugi and Mbeira (2014) recommend that because of the new technologies, schools should now incorporate Web 2.0 technologies to nurture the reading habits of youths. According to the University of Melbourne, 'Web 2.0' is the term used to describe a variety of websites and applications that allow anyone to create and share information online (Thomson, 2020). For this study, Web 2.0 technologies will mean an online communication platform (social networking) that allows its members to share, collect and disseminate content, ideas and information about the topics of their choice. Web 2.0 technologies have proven to be universally addictive for secondary school learners who tend to spend considerable amounts of their time maintaining social connections, making new acquaintances and a broad base of friends during their years of study (Loving & Ochoa, 2010). The increased use of social networking sites amongst learners has no doubt negatively

affected learners' reading habits. Twenge, Martin and Spitsbergen (2018) found that in 2016, one in three United States (US) high school learners did not read for pleasure. In the same period, 82% of 12th graders visited sites such as Facebook, Twitter and Instagram daily for entertainment.

Consequently, the impacts of social media extend to include cutbacks in reading as a habit, studying, and attainment of knowledge because learners spend most of their time chitchatting and gaming. Given the factors outlined here, it seems clear that there is an urgent need to improve the reading habits of learners, as well as to harness new technology so that they can improve their reading habits. The study explored how Web 2.0 technologies can be embraced to nurture the reading habits of secondary school learners in the Bulawayo Metropolitan Province (BMP) in Zimbabwe. The objectives of the study were to:

- Ascertain the types and frequency of Web 2.0 technologies used by secondary school learners in the BMP in Zimbabwe.
- Find out the negative and positive effects of Web 2.0 technologies on the reading habits of the learners in the BMP in Zimbabwe.
- Develop a framework for embracing Web 2.0 technologies to nurture the reading habits of these learners.

The structure of this paper appears as follows: After the introduction, the literature review is presented in the second section, including the unified theory of acceptance and use of technology (UTAUT) underpinning this study. The research methodology features in the third section, followed by the findings and discussions in the fourth section. The fifth section is about the framework developed for this study. The conclusions of the study are presented in the sixth section.

Theoretical framework

This study utilised the unified theory of acceptance and use of technology (UTAUT) developed by Venkatesh, Morris, Davis and Davis (2003) in the article, "User acceptance of information technology: towards a unified view". The UTAUT model aims to explain technology acceptance and is based on eight technology acceptance theories or models. The acceptance of UTAUT has not been limited to one or a few cultures, but the model has been accepted and used cross-culturally in all continents of the world (Machimbidza, 2014). The theory holds that four key constructs: performance expectancy, effort expectancy, social influence and facilitating conditions, directly determine usage intention and behaviour (Venkatesh & Davis, 2003). The researchers considered the UTAUT relevant to this study as its key constructs were critical in addressing the objectives of the study. This model also

incorporated four moderators: gender, age, voluntariness and experience, to account for dynamic influences. These moderators are used to influence the dependent and independent variables of user acceptance. The UTAUT model was used to evaluate the success of new technology. Because the use of Web 2.0 technologies by Zimbabwean learners, especially those in the BMP, is relatively new, this model is applicable to understand the factors influencing the use of these technologies and determine whether they can be adopted in improving reading interests. This study examines Web 2.0 technologies that are introduced to the learners to improve their reading habits, and UTAUT, as a model guiding this study, was critical to map the way forward.

Literature review

Learners use different types of Web 2.0 technologies. The types and frequency of using Web 2.0 technologies by secondary school learners are linked with the UTAUT constructs of effort expectancy, facilitating conditions, the resultant user intentions and behaviour. The moderating conditions from the UTAUT model adopted were gender, experiences, and voluntariness for this research objective. The 'effort expectancy construct' and other facilitating conditions influenced the different types of Web 2.0 technologies used by secondary school learners. The issue of different types of Web 2.0 technologies is linked to facilitating conditions. Potential users can only use a technology that has been introduced to them (Ahmad Ismail & Abduljabbar, 2022). The evolution of Web 2.0 and social software alter how students communicate, collaborate, access, learn and seek new information (Capo & Orellana, 2011). Web 2.0 technologies are fundamentally reshaping and realigning many aspects of the communication loop: the people with whom teachers, students and parents communicate, how they communicate, what they communicate about, as well as where and when they communicate. Recent surveys show that although Web 2.0 tools such as Facebook, MySpace, wikis and blogs are part of nearly every student's home life, these technologies are barely used in schools (Lemke, Coughlin, Garcia, Reifsneider & Baas, 2009; Nakabayashi, 2018). Studies have revealed that Facebook is the most popular social tool used, where 85% to 99% of tertiary students use it for different purposes (Matney & Borland, 2009). In a study conducted by Kojo, Agyekum and Arthur (2018), they observed that out of 478 respondents, 145 (about 30% of the students) stated that the social media site they use most frequently is WhatsApp, with 123 being active on Facebook, while 88 indicated that they used Instagram and 122 did not specify.

Social media platforms such as Facebook, Twitter, LinkedIn, Google+ and Renren have the potential to become important disruptive technologies (Christensen, 1997). Capo and Orellana (2011) conducted a study with 11 to

16-year-old students to determine which Web 2.0 technologies they were using if they were using them at school and whether they were using them to support learning. The findings showed that a total of 30 different Web 2.0 sites were identified by the students, including social networking sites. The most popular sites were MSN (88.0%), Bebo (67.0%) and Facebook (59.0%). Students in school used each of these 30 sites, although Bebo was not used for learning. The students were asked to generate a mind map of their technology usage and include how they used these technologies. Furthermore, this study found the use of Web 2.0 technologies in schools to be poorly understood by both teachers and students. Students did not appear to be using these technologies for in-depth learning, and only a few students mapped the technologies for use as creative activities.

Blogging was not a particularly popular activity across the sample, but where it occurred, it often did so within the arena of the social networking site. Bebois was one site that enabled its users to post on blogs (Lenhart & Madden, 2005). In this sense, the blogs that belonged to social networking sites were perceived to be for communicating 'random stuff that you find funny' (Lenhart & Madden, 2005). Learners at one school described blogs as being quite popular to read, though not for production. For one learner, blogs were a way to find out about popular sites on the Internet, with specific reference to learning; this included history and geography projects (Luckin *et al.*, 2009).

The social media generation is always online, reading updates on trivial issues, rumours, shows, football news and celebrity gossip. However, the more they read, the more they fail. They become so knowledgeable in the things that do not matter and become so ignorant of things that matter (Nigerian Tribune, 2015). The analysis of the study conducted by Abidin and Pour-Mohammed (2011) in Malaysia shows that students spent one to three hours online daily. The findings also showed that students emphasised using the Internet for social media; although only (37.5%) of the respondents had computers at home with Internet access, most of them spent one to three hours online daily. The majority of the participants (65.8%) spent one to three hours online every day. Only 1.3% of the respondents spend more than six hours online.

There are negative and positive effects of Web 2.0 technologies on the reading habits of learners. These negative and positive effects are linked to the UTAUT construct of social influence, facilitating conditions and the resultant user intentions and behaviour. The moderating conditions from the UTAUT model adopted were gender, age, experiences and voluntariness. Literature suggests that several factors, particularly technological changes, are likely to positively and negatively influence the reading habits of children (Chettri

& Rout, 2013). The increased use of social networking sites amongst students has, without a doubt, negatively affected the students' reading interests. As Shabi and Udofia (2009) pointed out, the reading culture of learners has been washed down the drain because of the advancement of technology and the advent of social media. One of the principal causes for the dwindling speed at which students read is the invasion of social media (Shabi & Udofia, 2009).

According to Agwu and Kalu (2011), abusing new technologies contributes to students' poor reading. They opine that in this era of information and communication technology (ICT), the general orientation of young people has unconsciously changed from reading and the love of books to these new technologies. They further emphasised that students now live in the iPod, laptop, iPhone, Facebook, Twitter and blog generation. Hence reading has been literally sacrificed at the altar of modern technologies. Agwu and Kalu (2011) reported that in this age where Internet browsing seems to be the trend amongst Nigerian youths, reading a good book in a quiet corner of the school library or at home has become an archaic idea. Gómez-González *et al*., (2011) note that nowadays, nearly everyone belongs to social networking sites where they spend several hours per day posting their locations on Facebook and tweeting about personal daily lives. Marsh (2012) relents that social networking is time-consuming as students gradually become addicted. Students skip the time to engage in meaningful activities such as reading and utilising the school library and engage in social networking activities such as chatting and posting pictures and videos (Mbachu & Durdyev, 2011). Mbachu and Durdyev (2011) add that libraries have witnessed low patronage since the advent of the Internet. Some writers would posit that social networking is a form of distraction, and the act of multitasking has led to poor academic performance of students. Karpinski and Duberstein (2009) report that most students who use Facebook every day are under-achieving as compared to those who shun the site. Technology is slowly but very steadily taking over the control of adolescents' lives, and the cultivation of a good reading interest does not exist anymore; empty school and public libraries are silent witnesses of this dreaded picture (Thakur & Kumar, 2014).

However, as shown in a survey by Akanda, Hoq and Hasan (2013), the Internet could be a good place to read books, magazines and newspapers. Young people continue to be attracted to the Internet in larger numbers. It can be surmised that with different sources of information on the Internet, the Internet can play a supplementary role in increasing the reading interest of the students rather than diminishing it. For this to happen, students need to be guided by their teachers and guardians to use the Internet and its services constructively rather than spend long hours on the Internet playing games or engaging in other non-productive activities (Akanda, Hoq & Hasan, 2013). Electronic media has changed how people perceive reading and how

printed materials are utilised for reading (Abidin & Pour-Mohammed, 2011). According to Cumaoglu, Sacici and Torun (2013), printed resources have been replaced with electronic resources, and the habits related to newspaper, magazine and book-reading have undergone changes.

In developing a framework for embracing Web 2.0 technologies to nurture the reading habits of secondary school learners, some steps need to be followed. According to Matingwina and Raju (2017), some procedures are normally taken when developing a framework to be adopted. An important step in developing a needs-based information strategy is identifying the problem and its context. Problem identification involves three important steps: needs analysis, assessment of existing resources (information dissemination programmes) and readiness assessment (Matingwina & Raju, 2017). Goal-setting is an important step in developing a framework (Harmsworth, Turpin & TQEF National Co-ordination Team, 2000:1). According to the Jed Foundation (2011:20), a goal statement should articulate specific, measurable goals whose achievement can be readily observed and measured. Before implementing a framework, it is essential to explore whether a programme has strong empirical or theoretical support and addresses the unique problems of students. It is important to choose evidence-based practices to ensure that resources are invested in programmes likely to achieve positive changes (Matingwina & Raju, 2017). This stage involves the actual design of the information dissemination framework. This may be achieved by analysing the data that would have been gathered in the first stage, where the student needs understanding, resource assessment and readiness assessment. The data should be merged with findings in the literature and proposals by key stakeholders, such as administrators and school librarians, to develop a needs-based framework (Matingwina & Raju, 2017). Evaluation is a systematic process for collecting, analysing and reporting information to determine whether programmes are effective (DeJong *et al.*, 2006). An evaluation plan should focus on both outcome and process evaluation (Chinman, Imm & Wandersman, 2004). Implementation is a key stage in the development of an information dissemination framework, and as such, it needs to be well-planned (Langford, 2006).

Despite the research and surveys conducted by the aforementioned researchers, in which they expounded on the importance and modalities of technology and improving reading habits of secondary school students, there is no clear study which focused on developing a framework for embracing Web 2.0 technologies to nurture the reading habits of secondary school learners. Most of the reviewed studies have strived to show how technology and related tools have been working as catalysts to improve the reading habits of secondary school students. There is a growing body of research on the theory

and practices in the field of technology and reading habits of secondary school learners. The majority of existing studies have generally concluded that what students read is decided to a large extent by their interests and the content of the materials (McGeown, Osborne, Warhurst, Norgate & Duncan, 2015; Rosli, Razali, Zamil, Noor & Baharuddin, 2017; Adeyemi, 2020). However, a considerable body of research has also reported negative or mixed results of using technology in reading (Arifin, Wahab, Teh & Otman, 2018; R. Ullah & H. Ullah, 2019). However, the emerging literature has already acknowledged the high value of adopting technology to improve the reading habits of secondary school students (Banchisi, 2021; Bamise & Akande, 2021). The inconsistencies arise due to the varying methodologies adopted and different measurement scales. Therefore, this research is an initial effort to compensate for the existing literature deficiencies by focusing on developing a framework for embracing Web 2.0 technologies to nurture the reading habits of secondary school learners.

Research methodology

The researchers settled for a qualitative approach to achieve the objectives of the study. The case study research design was adopted because it was considered to be the most appropriate design for the purpose of the study. Hence, the study adopted a multiple case study design using different BMP secondary schools as cases. The use of a multiple case study design was considered critical to this study, as it allowed a broader perspective to be applied across the secondary schools in the BMP. A multiple case study allowed the researchers to achieve a level of saturation that ultimately revealed common issues and themes regarding the adoption of mobile devices. According to Yin (2009), a multiple case study yields more robust results than a single case study; it builds up a general explanation model that fits each case in the study and provides a means of comparison. The other advantage of this design was that the researchers managed to use the results to compare and reach relevant conclusions. Vannoni (2014) says that the multiple case study design enables one to compare the results from each case and provide the literature with an important influence from contrast and similarities supported. The design enabled the researcher to be viable and realistic. Hence, this design was appropriate and viable for this research study because it dealt with the real problem that the secondary school learners are not reading.

The population of the study included secondary school learners and school librarians from the fifty-four secondary schools in the BMP. The BMP comprises five districts for secondary schools: Bulawayo Central, Imbizo, Khami, Mzilikazi and Reigate. School librarians were included in the study,

as most learners read from these libraries, especially in Zimbabwe, where the cost of living is too high, and parents cannot afford to purchase reading materials. This was supported by Zimbabwe Reads (2014), which states that Zimbabweans live from hand to mouth, hence, parents can no longer afford to buy books for their children. To find those cases or units, the researchers used quota sampling. Quota sampling was used in two stages: firstly, to extract secondary schools included in the study and, secondly, to extract secondary school learners. Quota sampling was categorised according to district, public or private school, and, lastly, according to the availability of school libraries. Quota sampling is not dependent on the presence of the sampling frames. The researchers chose quota sampling mainly because it allowed them to sample the sub-group of great interest to the study.

Data were collected from ten secondary schools in the BMP comprising private and public schools. According to the rule of thumb, focus group projects most often:

1. use homogeneous strangers as participants,
2. rely on a relatively structured interview with high moderator involvement,
3. have six to ten participants per group, and
4. have a total of three to five groups per project (Morgan, 1997:36).

Since there were many learners from public and other private schools, the focus groups were divided into two per school and were segmented into fifteen each. There were few learners from other private schools like the Christian Brothers College and the Dominican Convent, so it was just one focus group of fifteen learners. So, in total, the researchers had fourteen groups of fifteen learners each. In reality, most projects have some elements that require special attention, and it may be relatively rare for a project to match all four of these criteria (Morgan, 1997:36). For this study, the rule of thumb did not apply, as the researchers had fourteen groups which were necessary for this study. This is supported by Sunday (2016), who states that focus groups (guided by a set of questions) should be interactive with a group small enough for everyone to have a chance to talk and large enough to provide a diversity of opinions. The researcher recorded all the conversations to assist when analysing the data. In total, there were fourteen focus groups and two hundred and ten learners who participated in the study. Before the actual interview, the researchers explained to the participants the purpose of the interview. The participants were informed that participation was voluntary and that they had a right to discontinue or stop the engagement if they felt uncomfortable during the interview. The participants were further ensured that they would remain anonymous and that confidentiality would always be kept. The interviews lasted between an hour and two hours.

Semi-structured interviews were used to elicit information from the school librarians of the selected schools where the research was conducted. Semi-structured interviews were useful as they allowed the researchers to frame appropriate questions and, most importantly, rely on the participants to provide information that was useful to the study.

The discussion was centred on the following: ascertaining the types and frequency of using Web 2.0 technologies used by secondary school learners in the BMP in Zimbabwe; finding out the negative and positive effects of Web 2.0 technologies on the reading habits of the learners in the BMP in Zimbabwe; and developing a framework for embracing Web 2.0 technologies to nurture the reading habits of these learners. The questions were asked to learn more about the frequency of use and the positive and negative effects of Web 2.0 technologies on reading. Data were analysed thematically according to the objectives of the study.

Ethical consideration

The University of South Africa approved the ethical clearance: 2016_IS57431663_043. Participation in the study was undertaken voluntarily and anonymously with the learners' consent.

Research findings and discussions

Types and frequency of using Web 2.0 technologies

The UTAUT model argues that for technology to be adopted and used, there should be "facilitating conditions". These conditions make it easier for the intended user to adopt and use a given technology (Davies, Bagozz & Warshaw, 1992). This was an important step to understanding which Web 2.0 technologies the participants used. The learners knew what Web 2.0 technologies were, although some were more familiar with the term 'social media'.

Learners mentioned that they are familiar with Web 2.0 technologies which include WhatsApp, Facebook, YouTube, Instagram, Twitter, Snapchat, Pinterest and Wattpad. This is in line with recent surveys by Lemke, Coughlin, Garcia, Reifsneider and Baas (2017) and Nakabayashi (2018) that Web 2.0 tools such as Facebook, MySpace, wikis and blogs are part of nearly every student's home life. Several learners mentioned that they normally use WhatsApp and Facebook. The reason might be that mobile data bundles for WhatsApp and Facebook are cheaper, as some schools do not allow learners to access their social media accounts using the school Wi-Fi or to bring their own gadgets. When the school librarians were asked which Web 2.0 technologies they were

familiar with, they mentioned Facebook and WhatsApp. One female librarian said she only knows of WhatsApp, which she uses for chatting with her family and friends.

The participants were asked how frequently they used these Web 2.0 technologies. Some learners mentioned that they used WhatsApp every day. For example, one participant indicated that:

> *I use WhatsApp all the time. I sleep, dream, and eat WhatsApp. The only time I am not using WhatsApp is when I am writing a test because even when it's during lesson time, I usually check for any updates.*

The findings indicated that some learners spend most of their time on Web 2.0 technologies. Some learners mentioned that they are on social media all the time, while others spend more than two to five hours daily. Zimbabwean learners are not the only ones who spend more time accessing Web 2.0 technologies. An analysis of the study conducted by Bamise and Akande (2021) shows that students in Nigeria spend one to three hours online daily. Another study by Adeyemi (2020) shows that students spend more than six hours online.

Various librarians from public schools mentioned that they use WhatsApp, although a few have WhatsApp groups with their learners. Some technology-savvy librarians pointed out that they also use Facebook, LinkedIn, wikis, podcasts, tagging, Skype, and Twitter for personal use. Only librarians from private schools mentioned that they were in the process of opening Facebook pages for their libraries.

The research findings revealed that learners access Web 2.0 technologies from different places, including school premises, home, school library and computer laboratory, public transport, Telone Wi-Fi zones and Internet cafes. Access is defined by Backhouse and Chauke (2020) as the ability of individuals and organisations to connect to the Internet using computer terminals, computers, and other devices. The learners revealed that they connect to the Internet using different gadgets, including cell phones, tablets, desktop computers and laptops, to access these Web 2.0 technologies. These findings are supported by the research conducted by Bower (2015), who states that learners have high levels of access to Web 2.0 technologies.

During the interview with librarians from public schools, several mentioned that access to Web 2.0 technologies was prohibited in their schools, although some learners accessed them without permission. One librarian from a public school mentioned that the library received donations

of tablets from a certain organisation, but only four and not enough for the whole school.

During the focus groups, the participants mentioned that they use Web 2.0 technologies for different purposes, including communicating with friends, having discussions with teachers and librarians, accessing novels and newspapers, and obtaining updates on what is happening around the globe and entertainment. Kabweza (2014) noted that smartphones would allow students to connect to various knowledge sources on the Internet to improve their knowledge. In order to capitalise on Web 2.0 technologies, educators need to first understand the types of Web 2.0 technologies that are available and their various features to best use them for specific purposes (Redecker, Aja-Muka, Bacigalupo & Punie, 2009).

Negative and positive effects of Web 2.0 technologies on reading habits

In tackling this research objective, the section was guided by the UTAUT construct of social influence, facilitating conditions and the resultant user intentions and behaviour. The moderating conditions from the UTAUT model adopted were gender, age, experiences, and voluntariness for this research objective. The positive influence includes downloading and uploading novels on WhatsApp, Facebook, Pinterest, and Wattpad, and easy and affordable access to reading materials anywhere and anytime. The findings showed that there are some positive impacts in the adoption of Web 2.0 technologies to cultivate the reading habits of learners. It also revealed that learners are already using Web 2.0 technologies.

One of the participants said, "We joined Facebook groups that upload novels and short stories, but the authors don't send all chapters because they want us to buy the stories, and we don't have money, so we end up not reading." Some of the students are already downloading novels on WhatsApp, Facebook, Pinterest, and Wattpad, although some learners mentioned that some books downloaded via WhatsApp were scanned and sometimes not readable. Ngugi and Mbeira (2014) recommend that because of these new technologies, schools should now incorporate these technologies to stimulate the reading habits of the youths. This was supported by Chettri and Rout (2013), who suggested that several factors, particularly technological changes, are likely to influence the reading habits of children. A study by Owusu-Acheaw and Larson (2014) in Ghana indicated that learners' reading habits could be improved by incorporating Web 2.0 technologies. The librarians, especially from private schools, also mentioned that they have WhatsApp groups with their learners, where they inform them of any interesting books available in the library. This was also supported by Muzawazi (2016), who stated that the Internet has made good contributions

to the education system of Zimbabwe. One learner even said: "It's easier to share resources amongst ourselves through social media. We usually share novels, amongst other things, so social media is very important."

The findings showed that there are some negative impacts on the adoption of Web 2.0 technologies in improving the reading habits of learners. In the focus groups, some learners expressed that social media was destructive as they spent most of their time chatting on WhatsApp and Facebook with their friends, negatively influencing their reading interests. One librarian mentioned that learners were using social media for all the wrong reasons. Some learners used social media for entertainment; others indicated using YouTube to download and stream movies. One learner boastfully said social media is for entertainment. This was echoed by Mutula (2013) when he revealed that social media platforms, such as Facebook and Twitter, have the potential to become important disruptive technologies. From the findings, it was clear that books found on Facebook did not have the full chapters as some authors would only upload a few chapters of the book, and should one want the entire book, one will have to purchase it. Another problem highlighted by the participants was that most of the books found there were not from Zimbabwe. This means that authors and publishers in Zimbabwe should now embrace technologies to meet the needs of their clientele.

Proposed framework

The proposed framework, as shown in Figure 1.1, is based on the findings as well as the literature reviewed in this study. Schools and public libraries might adopt this framework in nurturing the reading habits of secondary school learners using Web 2.0 technologies.

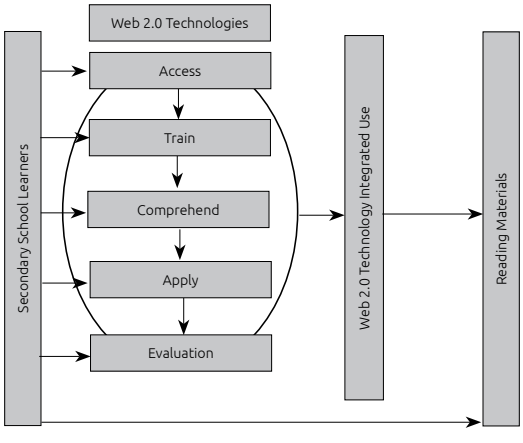

Figure 1.1: Framework of embracing Web 2.0 technologies (FEWT) (synthesised by the researchers).

The paragraphs below explain the suggested model:

Web 2.0 technologies

As illustrated in Figure 1.1, there are different types of Web 2.0 technologies to choose from: blogs, social bookmarking and wikis, to name just a few. The learners need to know the different purposes of using each Web 2.0 technology. For example, learners could use Pinterest and Wattpad to download some reading materials and then use WhatsApp or Facebook to discuss what they would have read. These technologies revolve and are not stagnant. That is why, in the model, the processes are in a cycle.

Access

Learners need to access these Web 2.0 technologies so that they are able to use them to improve their reading habits. Therefore, some schools and public libraries need to change their policies and offer free Wi-Fi so that learners would be able to access these Web 2.0 technologies. These schools and public libraries should limit access times and content so that their learners have discipline in using these technologies. Learners would need to discipline themselves in order to manage the use of Web 2.0 technologies. Web 2.0 tools support social interaction in the learning process.

Training

Learners need to be trained on how best to use Web 2.0 technologies. The librarian, or even the teacher, needs to be trained first, and then they can train the learners. Adopting the chosen Web 2.0 technologies will be easier if learners are trained. Learners must first be trained to select the Web 2.0 technologies best suited for improving their reading habits. Afterwards, they would choose the best technology to adopt to improve their reading habits. Learners need to research the chosen Web 2.0 technology. Having knowledge will help in engaging and adopting these Web 2.0 technologies. Also, having knowledge about Web 2.0 technologies will help them to adopt these technologies to improve their reading. Having proper knowledge of Web 2.0 technologies will provide social interaction with their peers in the learning process. It will also enable students to work at the conceptual level of understanding about authentic reading materials where they can read, discover relationships, discern patterns, develop a deep understanding of content, collaboratively build knowledge and ultimately cultivate their reading habits.

Comprehend

Learners need to understand what the whole process is all about. Learners will have the ability to process the Web 2.0 technologies chosen, understand their meaning, and integrate what they already know. Comprehending is influenced by the learners' skills and the ability to process the information.

Apply

When the learners have understood everything about Web 2.0 technologies, they will need to implement what they have been trained to do. Learners will then choose the Web 2.0 technologies they feel are the best for adoption so that they incorporate them into their reading schedules. By application, it would mean they have performed all the groundwork of knowing, training and evaluating those technologies.

Evaluation

Not everything found on the Internet is of value. When the learners are knowledgeable about which Web 2.0 technology to adopt, they need to evaluate the advantages and disadvantages of that adopted Web 2.0 technology. By evaluating technologies, learners will also have discipline when using that Web 2.0 technology.

When undertaking a research study, the researcher tries to provide a solution to a problem identified and give some recommendations. This entails that when the recommendations provided in this study are implemented, there might be a huge improvement in the reading habits of learners. The current study identified the challenges faced by learners who need to be addressed so that their reading habits are cultivated through adopting Web 2.0 technologies. The idea of adopting Web 2.0 technologies has barely been approached from this point that the researcher has investigated. The current study is critical and necessary in improving the reading habits of learners if the model suggested is adopted. The research that has been conducted, especially in the field of Web 2.0 technologies (Tella & Akande, 2007; Moyo, 2012; Chipangura, 2014; Ngugi & Mbeira, 2014; Shehu, N. & Shehu, A., 2014) tended to look at the provision of these technologies on the library services. This study proposes the issue of adopting Web 2.0 technologies in education, especially in improving the reading habits of learners. The study is expected to further help shape positive attitudes towards the use of technologies, thereby impacting positively on the reading habits of learners in Zimbabwean secondary schools while improving the quality of reading by learners in the county. The suggested model might help schools know the factors affecting the adoption of Web 2.0 technologies, enabling them to tailor their services in a way that makes them appealing to learners. The study is expected to

influence some of the policies of the Ministry of Primary and Secondary Education; if these policies also take into consideration the suggested recommendations, it will be easier for the schools to also adopt them. Schools are under the management and supervision of the Ministry of Primary and Secondary Education, so whatever the ministry suggests, the schools adopt.

Conclusion and recommendations

This study showed that the reading habits of secondary school learners have declined due to social media technologies. Indisputably, it is obvious that the use of social media has constituted great havoc on the reading habits of secondary school learners. Some learners use Web 2.0 technologies for the wrong reasons, such as communicating with friends and entertainment only, although others are downloading novels and some learners are reading newspapers. The study concludes that if some Web 2.0 technologies are embraced, the reading habits of secondary school learners would be nurtured. The researchers recommend that relevant stakeholders, for instance, teachers and librarians, properly train learners on how to best embrace Web 2.0 technologies in order to improve their reading habits. It is recommended that a further study could be conducted to identify the social media platform that contributes to pupils' better reading habits.

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The Role of Libraries in the World of Open Access

The Research Activities of Post-graduate Students in Four Universities in North-Central Nigeria

Stella Amarachukwu Onwukanjo[1]

Federal University of Technology, Minna, Niger State

Abstract

The study was carried out to determine the roles of libraries in the world of open access as it correlates to the research activities of post-graduate students in four universities in North-Central Nigeria (NCN). The study was anchored on five objectives: (1) to find out how libraries support open access for research of post-graduate students in NCN; (2) to ascertain the characteristics of open access documents for research in the four universities; (3) to find out the format in which open access content appears in libraries to support post-graduate research; (4) to find out how self-archiving has helped post-graduate students in their research activities; (5) to find out how the open access mandate has helped the post-graduate students bibliographic visibility towards partial fulfilment of their post-graduate degrees. A sampling fraction of 3.8% was used to select 420 post-graduate students from a population of 11 036 as a purposive sampling technique. A hypothesis would be tested at a 0.5 level of significance, and data would be presented using frequency tables and percentages. The hypothesis would be analysed using the Pearson product-moment correlation coefficient to determine the relationship of the compound independent variable to the dependent variable. The findings from the objectives are that the library is an anchor that guides open access for research amongst post-graduate students in all the universities. The study concluded by stating that there is a need for the university authorities to fund the university libraries for robust and not scanty open access, and there must be open access practices for excellent post-graduate research. The study recommended that all the universities in

1 Stella Amarachukwu Onwukanjo (PhD) CLN (senior lecturer), Library and Information Technology Department, Federal University of Technology, Minna, Niger State; stellaradiant@yahoo.com

Nigeria and globally should have open access to their libraries for enhanced academic achievement and excellent post-graduate research.

Keywords: libraries, open access, correlates, post-graduate students, North-Central Nigeria (NCN).

Introduction

Background to the study

According to Odeh (2013), research is defined as the creation of new knowledge and the use of existing knowledge in a new and creative way so as to generate new concepts, methodologies and understandings. It is a scientific way of answering a research question, solving a problem or generating new knowledge through a systematic and orderly collection and organisation of facts. Research is also defined as the creation of new knowledge and the use of existing knowledge in a new and creative way so as to generate new concepts, methodologies and understandings. This could include synthesis and analysis of previous research to the extent that it leads to new and creative outcomes (Odeh, 2013). Research is undertaken to discover new facts and find additional information. It is a purposeful search for an identified problem or new knowledge. Research involves recognising a need and having it solved. Kumar (2017) posits that the main aim of the research is finding a hidden truth that has not been discovered and then solving it through systematic procedures (Haruna, 2013).

The research involved in this study Is post-graduate research. Post-graduate research activities involve conferences, workshops, seminars, writing theses and dissertations, scientific interactions with students and professors, and publishing in journals: a research output. These foregoing research activities that have been mentioned are what post-graduate students in all the universities in Nigeria are engaged in. They must satisfy all the requirements in post-graduate research before conferring with master's or PhD degrees, respectively. In other words, the presentation of standard research work would make any department in a university award required degrees to individual post-graduate students.

Mullen (2010) and Mercer (2011) posit that the presentation of standard research work will only be made possible if post-graduate students imbibe and align themselves with their university libraries and open access facilities, especially those with good institutional repositories. An open access repository is a collection of full-text documents available on online databases that can be accessed freely and instantly. Open access is freely available on online digital documents. It is the provision of open access, online access,

free toll, full text, and web-wide to their peer review journal articles (Mullen, 2010).

Mullen (2010) and Mercer (2011) believe that open access documents, even though freely available online, should be relevant scholarly literature that is interdisciplinary, global, digital and safely available and not behind technical walls or paywalls to comply with license registration so that open access works would always be freely online. Some characteristics of open access journals are scholarly; therefore, romance, fiction, novellas, magazines, and self-help books are excluded. Most authors are not paid for their efforts since most works like conventional journals are peer-reviewed. They use quality control mechanisms; they are digital, freely accessible and available. Authors could also be allowed to retain their copyrights and use creative commons or other licenses. Open access also implies its free availability on the public Internet, permitting users to read, download, copy, distribute, print, search, or link to the full texts of these articles, read through them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers.

The growing acceptance of open access publishing has given libraries the opportunity to assume the role of publisher. Libraries are given the opportunity to work with faculty authors to explore new methods of communicating and disseminating their research outputs. Open source is computer software released under a licence in which the copyright holders grant users the right to use, study, change and distribute the software and its codes to anyone and for any purpose. Open source is commercially available platforms used to publish open access books, create open access versions of the output of copyright works, and start in-house scholarly journals that highlight the works of faculty authors and students. An increase in open access publication trends could serve as a leveraging tool for libraries against the high cost of journal subscriptions (Chigbu, Njoku & Uzoagba, 2016).

Therefore, it becomes imperative for libraries to take advantage of their good marriage with open access, which exposes post-graduate students to lots of materials for their scholarship and academic advancements to see how their research prowess could be triggered to conduct good and qualitative post-graduate research. Against this backdrop, the researcher has embarked on this study to investigate the roles of libraries in the world of open access as it correlates to the research activities of post-graduate students in four universities in North-Central Nigeria (NCN).

Problem statement

The problem of the study was derived or emanated from the dependent variable, research activities. Research is conducted to gather more knowledge

or use the existing knowledge in other creative ways to generate concepts, methods and understanding of existing theories in a new light. Many people tend to underestimate the importance of research. However, every activity in our daily lives involves research. Simply put, research is the collection of information, the systematic and detailed gathering of information to boost knowledge on a particular subject or topic. However, while conducting the research, researchers encounter numerous challenges. The top ten challenges, according to Odeh (2013), are:

A. Lack of proper research ethics.
B. Ineffective research methodology.
C. Ineffective education system.
D. Ineffective library system.
E. Poor infrastructural management.
F. Low accessibility of data and information insecurity.
G. Lack of funds for research.
H. Poor technological advancement.
I. Political uncertainty.

These aforementioned problems have been plaguing research activities in Nigeria. Hence, the researcher's primary aim is to use the roles of libraries in the world of open access to correlate the research activities of post-graduate students in four universities in NCN.

Objectives

The broad objectives of the study are to investigate the roles of libraries in the world of open access as it correlates to the research activities of post-graduate students in four universities in NCN.

The study would be anchored on five objectives which are to:

- Find out how libraries support open access for research of post-graduate students in NCN.
- Ascertain what the open access documents for research are in the four universities.
- Find out the format in which open access content appears in libraries to support post-graduate research.
- Find out how self-archiving has helped post-graduate students in their research activities.
- Find out how an open access mandate has helped the post-graduate students' bibliographic visibility towards partial fulfilment of their post-graduate degrees.

Research questions

A. How do libraries support open access for the research of post-graduates in these four universities of NCN?
B. What is the open access document for research in the four universities in NCN?
C. In what format does the open access content appear for post-graduate research in the four universities in NCN?
D. How has self-archiving helped post-graduate students in their research activities?
E. How has the open access mandate helped the post-graduate students' bibliographic visibility towards partial fulfilment of their post-graduate degrees in the four universities in NCN?

Hypothesis of the study

One compound null hypothesis was tested at a 0.5 level of significance.

There is no significant relationship between libraries and open access with post-graduate research activities in the four universities in NCN.

Methodology

Research Design

This study adopted a correlation descriptive survey design, which seeks to establish the relationship that exists between two or more variables. The research design was a correlation descriptive survey design. Going by the title, the work is a correlational direction, and the magnitude of the relationship between the variable was indicated, found to be strong and positive: the effect of the compound independent variable on the dependent variable.

Population of the study

The population of the study was 11 036 post-graduate students of the four selected universities in NCN.

Sampling technique and sampling size

A stratified sampling technique was used to select the individual universities, while purposive sampling was adopted to select 402 respondents from the four universities. According to Krejcie and Morgan's (1970) sample table, the selected 420 respondents agreed upon represented the total population well. A purposive sampling technique was adopted to select 105 students from the four universities. A sampling fraction of 3.8% was used to select four-hundred-and-twenty post-graduate students from a population of eleven thousand and thirty-six purposive.

Data collection or research instruments

The questionnaire was the main instrument for the study. It was designed under different research questions. The five-point Likert Scale of strongly agree (SA), agree (A), strongly disagree (SD) and disagree (D) were used to determine the average responses of the respondents.

Validity and reliability of the instruments

In order to ensure the face and content validity of the questionnaire, two professors in the Department of Library and Information Science vetted the questionnaire. It was pretested and corrected by administering some copies to students of the Department of Industrial and Technical Education of the Federal University of Technology (FUT) Minna.

The Cronbach's alpha method was used to determine the reliability coefficients of each research question (RQ). The values obtained were 0.81 for RQ 1, 0.79 for RQ 2, 0.83 FOR RQ 3, 0.75 for RQ 4 and 0.68 for RQ 5. Research questions were used to obtain the alpha values since the work had just two variables.

Method of data analysis

The data in the study were analysed using the Pearson product-moment correlation coefficient to determine the relationship between the variables. The socio-demographic information was analysed using descriptive statistics of frequency, counts and percentages.

Analysis of research questions

This section focuses on analysis and presentations of result tables and graphs on the topic "the roles of libraries in the world of open access as it correlates to the research activities of post-graduate students in four universities in North-Central Nigeria". The IBM® SPSS® Statistics 23.0 statistical package was utilised in this research. A total of four hundred and twenty copies of the questionnaire were distributed to the four selected universities in NCN. Out of the four hundred and twenty copies of the questionnaire distributed amongst the four universities, one hundred and five copies were purposively administered to each of the universities, and a total of three hundred and ninety-two were properly filled and retrieved from the four universities. They were valid for the purpose of the research, representing a 93% return rate; that is [(392/420) *100 = 93.33%]. Table 2.1 shows the breakdown of the return rate.

Table 2.1: Return rate by institutions

Institution	Copies of Questionnaires Administered	Number of returned Questionnaires	Return rates
Benue State University	105	97	92.38
Federal University Technology Minna	105	100	95.24
University of Jos	105	97	92.38
University of Ilorin	105	98	93.33
Total	**420**	**392**	**93.33**

Table 2.1 shows the specific and total return rate of the questionnaires distributed to various schools. The table shows that the Federal University of Technology (FUT) Minna have the highest return rate of 95.24, followed by the University of Ilorin. The research questions have a total return rate of 93.33 which infers that the respondents have a good idea of the topic and the research questions.

Table 2.2: Response on sex and schools of the respondents

Sex	Frequency	Percentage
Male	226	57.7
Female	166	42.3
Schools	**392**	**100**
FUT Minna	100	25.5
University of Ilorin	98	25
Benue State University	97	24.7
University of Jos	97	24.7
Total	**392**	**100**

From Table 2.2, it could be observed that male respondents contributed largely to the research question with 57.7%, while female respondents have 42.3%. The table also shows the percentage of the sampled respondents from each school.

Research questions

Research Question 1 addresses how libraries support open access for research of post-graduate students in NCN. From Table 2.3, 383 respondents (97.7%) strongly agreed that open access has made libraries play the role of publishers, making open access journals available to post-graduate students

Table 2.3: Research Question 1: How do libraries support open access for research of post-graduate students in NCN?

Responses	SA	A	U	D	SD	Weighted Sum	Mean	Std Dev	Decision
A	383(97.7)	5(1.3)	4(1.0)	0(0.0)	0(0.0)	1947	4.97	0.229	Agree
B	187(47.7)	205(52. 3)	0(0.0)	0(0.0)	0(0.0)	1755	4.66	0.595	Agree
C	203(51.8)	181(46. 2)	4(1.0)	4(1.0)	0(0.0)	1759	4.67	0.576	Agree
D	277(70.7)	100(25. 5)	10(2.6)	5(1.3)	0(0.0)	1825	4.66	0.595	Agree
Overall							4.65		
Mean									

From Table 2.3, values in the parenthesis are percentages of the frequency counts. Decisions are made on each response based on the overall mean (4.65). SA = strongly agreed, A = agreed, D = disagreed, SD = strongly disagreed.

Note: Decision rule mean values less than 4.65 are regarded as 'disagreed' or 'strongly disagreed', while those equal to 4.65 are regarded as 'high', and those greater than 4.65 are 'strongly agreed'.

Statements

A. Open access has made libraries play the role of publishers, making open access journals available to post-graduate students at no cost for research.
B. Librarians are working with faculty authors to communicate and disseminate their research output through open access hosted by the university libraries for post-graduate research.
C. The libraries stock in-house scholarly journals that highlight the works of faculty and post-graduate students in the form of an institutional repository for research.
D. The libraries pay a subscription for online databases and give passwords and user names to post-graduate students, which conforms to supporting open access for research.

Table 2.4: Research Question 2: What are the characteristics of open access documents for research in the four NCN universities in support of post-graduate research?

Responses	SA	A	U	D	SD	Weighted Sum	Mean	Std Dev	Decision
A	384(98.0)	4(1.0)	4(1.0)	0(0.0)	0(0.0)	1948	4.97	0.361	Agree
B	244(62.2)	148(37.8)	0(0.0)	0(0.0)	0(0.0)	1812	4.62	0.485	Agree
C	231(58.9)	147(37.5)	14(3.6)	0(0.0)	0(0.0)	1785	4.65	0.682	Agree
D	197(50.3)	161(41.1)	25(6.4)	9(2.3)	0(0.0)	1722	4.69	0.934	Agree
Overall							**4.63**		
Mean									

From Table 2.4, values in parentheses are percentages of the frequency counts. Decisions are made on each response base on the overall mean (4.63). SA = strongly agreed, A = agreed, D = disagreed, SD = strongly disagreed.

Note: Decision rule: mean values less than 4.63 are regarded as 'disagreed' or 'strongly disagreed', while those equal to 4.63 are regarded as 'high', and those greater than 4.63 are 'strongly agreed'.

Statements

A. Open access docuemtns are freely available on the Internet to aid post-graduate research
B. Open access documents are online, that is, digital documents and support post-graduate research
C. Open access documents are scholarly and are peer-reviewed and support post-graduate research
D. To aid post-graduate research, material can be accessed by anybody from anywhere without any discrimination

at no cost for research; 5 (1.3%) agreed, 4 (1%) had an undecided response, 187 (47.7%) strongly agreed, that librarians are working with faculty authors to communicate and disseminate their research output through open access hosted by the university libraries for post-graduate research; 205 (52.3%) agreed with the same statement; 203 (51.8%) strongly agreed that libraries stock in-house scholarly journals that highlight the works of faculty and post-graduate students are informed of institutional repositories for research; 181 (46.2%) agreed, 4 (1%) were undecided, and 4 (1%) disagreed. Finally, from the same research question, it was observed that 277 (70.7%) strongly agreed that libraries pay subscriptions for online databases and give passwords and user names to the post-graduate students, which conforms to supporting open access for research; 100 (25.5%) agreed; 10 (2.6%) were undecided; 5 (1.3%) disagreed.

All the weighted mean values to the different responses in RQ 1 were above 4.65, signifying that all the questionnaire statements were either agreed with or strongly agreed with, which implied that libraries support open access for post-graduate research.

Research Question 2 addresses the characteristics of open access research documents in the four universities in NCN. Table 2.4 shows that 384 respondents (98.0%) strongly agreed that they are freely available online to aid post-graduate research, 4 (1%) agreed, 4 (1%) had an undecided response; 244 (62.2%) strongly agreed, that they are online, that is digital, documents and support post-graduate research; 148, representing 37.8%, agreed with the same statement. Precisely 231 (58.9%) strongly agreed that they are scholarly and peer-reviewed and support post-graduate research, 147 (37.5%) agreed, and 14 (3.6%) had an undecided response. Finally, from the same research question, it was observed that 197 (50.3%) strongly agreed that material could be accessed by anybody from anywhere without any discrimination to aid post-graduate research, 161 (41.1%) agreed, 25 (6.4%) had an undecided response, and 9 (2.3%) disagreed.

All the weighted mean values to the different responses in RQ 2 were above 4.63, signifying that all the questionnaire statements either agreed or strongly agreed as to what constitutes the characteristics of open access documents for enhancement of post-graduate research.

Research Question 3 addresses the contents of open access for post-graduate students in the four universities in NCN. The table shows that 383 respondents (97.7%) strongly agreed that the contents of open access appear for post-graduate students in the four universities in NCN as text and data to software, audio video and multimedia to help post-graduate research, 4 (1%) agreed, 5 (1.3%) had an undecided response and 330 (84.2%) strongly agreed that they appear as preprints and post-prints to aid post-graduate research,

Table 2.5: Research Question 3: In what format do open access documents appear for post-graduate students in the four universities in NCN?

Responses	SA	A	U	D	SD	Weighted Sum	Mean	Std Dev	Decision
A	383(97.7)	4(1.0)	5(1.3)	0(0.0)	0(0.0)	1946	4.96	0.391	Agree
B	330(84.2)	57(14.5)	5(1.3)	0(0.0)	0(0.0)	1893	4.83	0.558	Agree
C	193(49.2)	189(48.2)	5(1.3)	0(0.0)	5(1.3)	1741	4.71	0.653	Agree
D	230(58.7)	154(39.3)	4(1.0)	4(1.0)	0(0.0)	1786	4.72	0.574	Agree
Overall							4.70		
Mean									

From Table 2.5, values in the parentheses are percentages of the frequency counts. Decisions are made on each response based on the overall mean (4.70). SA = strongly agreed, A = agreed, D = disagreed, SD = strongly disagreed.

Note: Decision Rule: mean values less than 4.70 are regarded as 'disagreed' or 'strongly disagreed', while those equal to 4.70 are regarded as 'high', and those greater than 4.70 are 'strongly agreed'.

Statements

A. Open access documents appear as text and data to software, audio video and multimedia to help post-graduate research.
B. Open access documents appear as preprints and post-prints to aid post-graduate research.
C. Authors' personal websites help post-graduate research.
D. Institutional unit archives or repositories controlled by the libraries aid post-graduate research.

Table 2.6: Research Question 4: How have self-archiving or authors making their articles available online helped post-graduate students in their research activities?

Responses	SA	A	U	D	SD	Weighted Sum	Mean	Std Dev	Decision
A	383(97.7)	4(1.0)	5(1.3)	0(0.0)	0(0.0)	1946	4.96	0.391	Agree
B	330(84.2)	57(14.5)	5(1.3)	0(0.0)	0(0.0)	1893	4.83	0.558	Agree
C	193(49.2)	189(48.2)	5(1.3)	0(0.0)	5(1.3)	1741	4.71	0.653	Agree
D	230(58.7)	154(39.3)	4(1.0)	4(1.0)	0(0.0)	1786	4.72	0.574	Agree
Overall Mean							4.70		

From Table 2.6, values in the parentheses are percentages of the frequency counts. Decisions are made on each response base on the overall mean (4.68). SA= strongly agreed, A=agreed, D= disagreed, SD= strongly disagreed

Note: Decision Rule: mean values less than 4.68 are regarded as 'disagreed' or 'strongly disagreed', while those equal to 4.68 are regarded as 'high', and those greater than 4.68 are 'strongly agreed'.

Statements

A. Open access documents appear as text and data to software, audio video and multimedia to help post-graduate research.
B. Open access documents appear as preprints and post-prints to aid post-graduate research.
C. Authors' personal websites help post-graduate research.
D. Institutional unit archives or repositories controlled by the libraries aid post-graduate research.

57 (14.5%) agreed with the same statement, and 5 (1.3%) of the respondents were undecided. Precisely 193 (49.2%) strongly agreed that authors' personal websites help post-graduate research, 189 (48.2%) agreed, 5 (1.3%) were undecided, and 5 (1.3%) strongly disagreed. Finally, from answers to the same research question, it was observed that 230 (58.7%) strongly agreed that institutional unit archives or repositories controlled by the libraries aid post-graduate research, 154 (39.3%) agreed, 4 (1%) were undecided, and 4 (1%) disagreed.

All the weighted mean values to the responses in RQ 3 were above 4.70, signifying that all the questionnaire statements either agreed or strongly agreed about the questionnaire-specified format and that the documents appear to support post-graduate research.

Research Question 4 addresses how self-archiving or authors making their articles available online helped post-graduate students in their research activities. The table shows that 382 respondents (97.4%) strongly agreed that self-archiving helped post-graduate students in their research activities. In the category 'self-archiving or authors making their articles available online satisfies the research needs of post-graduate students', 5 (1.3%) agreed, and 5 (1.3%) strongly disagreed. Precisely 316 (80.6%) strongly agreed that increased institutional visibility builds the research confidence of post-graduate students, 67 (17.1%) agreed with the same statement, 5 (1.3%) of the respondents were undecided, and 4 (1%) strongly disagreed. Precisely 170 (43.4%) strongly agreed that building research confidence of post-graduate students implies that when they self-archive their own works, other students or faculties could use them; 199 (50.8%) agreed, and 23 (5.9%) of the respondents disagreed. Finally, from answers to the same research question, it was observed that 270 (68.9%) strongly agreed, and 122 (31.1%) agreed, that because open access in libraries guarantees long-term cost-effectiveness, post-graduate students do not pay as long as they have their user names and password.

All the weighted mean values to the different responses in RQ 4 were above 4.68, signifying that all the questionnaire statements either agreed or strongly agreed with the questionnaire statements on how self-archiving or authors making their articles available online helped post-graduate students in their research activities.

Research Question 5 addresses how the open access mandate helped the post-graduate students' bibliographic visibility towards partial fulfilment of their post-graduate degrees. Table 2.7 shows that 377 respondents (96.2%) strongly agreed that post-graduate students are mandated to publish before obtaining their master's or PhD degrees, and this upgrades their research; 10 (2.6%) have an undecided response, and 5 (1.3%) strongly disagreed.

Table 2.7: Research Question 5: How has the open access mandate helped the post-graduate students' bibliographic visibility towards partial fulfilment of their post-graduate degrees?

Response	SA	A	U	D	SD	Weighted Sum	Mean	Std Dev	Decision
A	377(96.2)	0(0.0)	10(2.6)	0(0.0)	5(1.3)	1920	4.90	0.544	Agree
B	276(70.4)	116(29.6)	0(0.0)	0(0.0)	0(0.0)	1844	4.78	0.457	Agree
C	301(76.8)	78(19.9)	0(0.0)	13(3.3)	0(0.0)	1843	4.77	0.64	Agree
Overall							4.77		
Mean									

From Table 2.7, values in the parentheses are percentages of the frequency counts. Decisions are made on each response base on the overall mean (4.77). SA= strongly agreed, A=agreed, D= disagreed, SD= strongly disagreed

Note: Decision Rule: mean values less than 4.77 are regarded as 'disagreed' or 'strongly disagreed', while those equal to 4.77 are regarded as 'high', and those greater than 4.77 are 'strongly agreed'.

Statements

A. Post-graduate students are mandated to publish before obtaining their master's or PhD degrees and upgrade their research output and activities.
B. This mandatory publication helps their research visibility.
C. The publication helps them become bibliographically viable and spurs them on for more research output.

Precisely 276 (70.4%) strongly agreed that mandatory publication helps their research visibility, and 116 (29.6%) agreed with the same statement. Precisely 301 (76.8%) strongly agreed that the open access mandate helped the post-graduate students' bibliographic visibility towards partial fulfilment of their post-graduate degrees, helping them to become bibliographically viable, which spurs them on for more research, 78 (19.9%) agreed, and 13 (3.3%) disagreed.

All the weighted mean values to the different responses in RQ 5 were above 4.77, signifying that the respondents either agreed with or strongly agreed with, all the questionnaire statements' on how open access mandate in university libraries helped the post-graduate students' bibliographic visibility towards partial fulfilment of their post-graduate degrees.

Presentation of hypothesis/ hypothesis testing

Table 2.8: Hypothesis 1. Correlation analysis showing a relationship between libraries and open access versus post-graduate research activities in the four universities in NCN.

Variables	N	Mean	Std. Dev	DF	R	p-Value
Open access	392	5.6046	1.31070	391	0.546**	0.000
Libraries for Research	PG 392	5.2577	1.34276			

**. Correlation is significant at p < 0.05 level (2-tailed)

This table shows the relationship between libraries and open access versus post-graduate research activities in the four universities in NCN. From Table 2.8, it can be observed that the result of the Pearson product-moment correlation coefficient (PPMC) shows a significant positive relationship between libraries and open access versus post-graduate research activities. Since the p-value = 0.000 is less than 0.05 level of significance. R (correlation coefficient) is a value that shows the degree of association between two variables. The table shows that R = 0.546, which infers a strong positive correlation between libraries and open access with post-graduate research activities.

Discussion of findings based on research questions

Research Question 1 sought to find out how libraries support open access for research of post-graduate students in NCN. The study revealed that:

- Open access has made libraries play the role of publishers, making open access journals available for research at no cost to post-graduate students.
- Librarians are working with faculty authors to communicate and disseminate their research output through open access hosted by the university libraries for post-graduate research.
- The library stocks in-house scholarly journals that highlight the works of faculty and post-graduate students in the form of an institutional repository for research.
- The library pays a subscription for online databases and gives passwords and user names to post-graduate students, which conforms to supporting open access for research.

These findings agree with the views of Jain (2010), Ward and Lavoie (2016) and Engesner (2014) regarding the support libraries give to open access for research and scholarship. In summary of the three authors' views, Jain (2010), Ward and Lavoie (2016) and Engesner (2014) all agree to the fact that libraries pay a subscription for online databases and give passwords and user names to their post-graduate students in a bid to support open access for their research.

Research Question 2 sought to discover the characteristics of open access documents for research in the four universities in NCN in support of post-graduate research. The study revealed that:

- Open access documents are freely available online to aid post-graduate research.
- Open access online resources are digital documents and support post-graduate research.
- Open access documents are scholarly and peer-reviewed and support post-graduate research.
- Open access materials can be accessed by anybody from anywhere without discrimination to aid post-graduate research.

These findings agree with the views of Ward and Lavoie (2016) and Boufarss and Harviainen Tuomas (2021) as being the characteristics of open access materials seen in libraries.

Research Question 3 sought to find out the format in which the contents of open access appear for post-graduate students in the four universities in NCN.

- The study revealed that the open access content appears as text and data to software, audio video and multimedia to help post-graduate research.
- Open access appears as preprint and post-prints to aid post-graduate research.

- Authors' personal websites help post-graduate research.
- Institutional unit archives or repositories controlled by the libraries aid post-graduate research. These agree with the views of Watson (2016) and Suber (2010) regarding the format in which open access content appears.

Research Question 4 sought to determine how self-archiving or authors making their articles available online helped post-graduate students in their research activities.

The study revealed that:

- Self-archiving satisfies the research needs of post-graduate students.
- Self-archiving increases institutional visibility and builds research confidence of post-graduate students.
- Self-archiving builds research confidence of post-graduate students, implying that when they self-archive their own works, other students or faculties could use them.
- Open access in libraries guarantees long-term cost-effectiveness.
- Post-graduate students do not pay as long as they have their user names and passwords.

These are in consonance with the views of Boufarss and Harviainen Tuomas (2021) and Watson (2016).

Research Question 5 sought to determine how the open access mandate helped the post-graduate students' bibliographic visibility towards partial fulfilment of their post-graduate degrees.

The study revealed that:

- Post-graduate students are mandated to publish before obtaining their master's or PhD degrees, which upgrades their research output and activities.
- This mandatory publication helps their research visibility.
- It helps them become bibliographically viable and spurs them on for more research output.

These findings agree with the views of Mullen (2010), Peekhaus and Proferes (2016), and Boufarss and Laakso (2020) to the effect that open access documents helped the post-graduate students' bibliographic visibility needed for attaining their post-graduate degrees.

Discussion of findings based on the tested hypothesis

Table 2.8: Hypothesis 1: Product-moment correlation analysis showing a relationship between libraries and open access versus post-graduate research activities in the four universities in NCN.

Variables	N	Mean	Std. Dev	DF	R	p-Value
Open access	392	5.6046	1.31070	391	0.546**	0.000
Libraries for research	PG 392	5.2577	1.34276			

**. Correlation is significant at p < 0.05 level (2-tailed)

Table 2.8 shows the relationship between libraries and open access versus post-graduate research activities in the four universities in NCN. From Table 2.8 it can be observed that the result of PPMC shows that there is a significant positive relationship between libraries and open access versus post-graduate research activities since the p-value = 0.000 is less than 0.05 level of significance. The correlation coefficient (R) is a value that shows the degree of association between two variables. The table shows that R = 0.546 which infers a strong positive correlation between libraries and open access with post-graduate research activities. In other words, a statistically significant relationship was found between libraries and open access and post-graduate research activities. Therefore, the null hypothesis has been rejected. The strong positive relationship agrees with all the findings of the study, summarising that libraries and open access must work together for excellent post-graduate research.

Conclusion

Based on all the findings of the study, the conclusion is that open access documents help in making libraries play the role of publishers. Open access documents are scholarly and peer-reviewed. They support post-graduate research and are free online. The self-archiving encouraged by open access documents has helped post-graduate students in their research. The open access mandate has helped post-graduate students in their research and curriculum activities, and open access documents help make libraries play the role of publishers. Therefore, libraries and open access must work together for excellent post-graduate research and curriculum activities.

Recommendations

Based on the findings of this research, the author makes the following recommendations:

- All university libraries should be encouraged to become involved in open access activities and play prominent publishing roles to further help post-graduate students in their research and curriculum activities because open access documents are scholarly and peer-reviewed.
- Since open access documents are scholarly, libraries should become institutional depository centres for developing countries like Nigeria to use their university libraries to support open access activities for all intellectual and artistic documents emanating from the university faculties.
- Developing countries like Nigeria should have strong expertise to build strong open access-based university libraries since the self-archiving that accompanies open access helps post-graduate students in their research activities.
- The open access mandate should be aggressively embraced in university libraries since it helps post-graduate students in their research and curriculum activities.

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The Role of Tanzanian Academic Libraries in Promoting Scholarly Communication through Open Access

A Literature Review

Kardo J. Mwilongo[1], Beth Kachota[2]

Mzumbe University

Abstract

This study examined the role of Tanzanian academic libraries in promoting scholarly communication through open access. A desktop documentary review was used to specifically study the status of open access platforms, ways of promoting open access scholarly communication, and factors deterring academic libraries from fostering scholarly communication through open access. The desktop documentary review involved seven university repositories purposely selected from the directory of institution repositories (OpenDOAR). Quantitative and qualitative survey designs on the open access repositories were used. The information associated with the university repositories was gathered from their respective web pages. A documentary review of the studies on open access scholarly communication was conducted to gain insights into the phenomenon under study. The surveyed data were both quantitatively and qualitatively analysed. Quantitative data were analysed using Microsoft Excel, a computer application software, whereas qualitative data were subjected to the content analysis method. The findings indicate that the surveyed repositories were operational and guided by policy, whereas library websites, repositories and digital libraries are used in promoting open access scholarly communication. However, the factors that deter academic libraries from promoting open access scholarly communication are related to financial, infrastructure, human resources or expertise and university management. The study recommends that Tanzanian universities improve planning for open access, commitment, support and engagement in the training and retraining of its practitioners for effective scholarly communication.

1 Kardo J. Mwilongo, Librarian, Mzumbe University, Morogoro; kmwilongo@mzumbe.ac.tz

2 Beth Kachota, Assistant Librarian, Mzumbe University, Morogoro; bkachota@mzumbe.ac.tz

Keywords: academic libraries, open access, scholarly communication, scholarly works, institutional repository, library website, Tanzania.

Introduction

The advanced development in Information and Communication Technology (ICT) has impacted and changed the roles of many areas in today's society, including academic libraries, in promoting scholarly communication through the dissemination of scholarly works (Dintoe, 2018:3). As a result, most institutions focus on digital technology in terms of tools, techniques and sources used for conducting academic works in all areas of science as well as ways of making research visibility for scholarly communication (Trotter *et al.*, 2014:6). The role of academic libraries is to provide the university community with formal and informal scholarly communication processes including Open Access (OA) journals in their library catalogues and e-journals through depositing their research outputs in open access platforms for scholarly communication (Powdwal, 2017:2). It is up to the libraries to set up and manage open access platforms for scholarly communication. Scholarly refers to a system through which research and other academic works are created, evaluated for quality, disseminated to the scholarly community and preserved for future use (Klain-Gabbay & Shoham, 2016:4). In light of this fact, Jain (2012:8) observed that academic libraries have a role in ensuring that open access is built up with the following features to support scholarly communication: freely available to scholarly communication, free of copyright and licensing restrictions, and materials are available online and can be freely used by anyone. Most academic libraries in developed regions, such as European and North American countries, have witnessed these open access features and are tremendously advanced in scholarly communication.

In developing countries, this endeavour has been fairly earmarked, and efforts to become effective in open access scholarly communication remained unrevealed (Mwilongo, 2018:3; UNESCO, 2019:11; Huang, Cox & Sbaffi, 2021:5). In Tanzania, Dulle (2010:3) and Mwinyimbegu (2019:9) observed that poor research conditions and researchers' low Internet self-efficacy such as inadequate information for search and online publishing skills, and a lack of policy guidelines on the use of open access are the main problems facing academic libraries in promoting scholarly communication to use open access. In addition, Mwilongo (2018:7), Muneja and Ndenje-Sichalwe (2019:10), Nunda and Elia (2019:6), and Kayungi, Ndenje-Sichalwe and Manda (2021:5) point out other related issues of open access for scholarly communication. However, fewer issues were addressed regarding the role of academic libraries in promoting scholarly communication through open access platforms, which this chapter intends to examine. In this regard, academic libraries have

a role in ensuring that quality and sufficient scholarly works are frequently uploaded and available for use. In this, Vasile *et al.*, (2017:13) opine that academic libraries are custodians of the institutional repositories and have a role in managing the collection more efficiently to easily disseminate the research activities and preserve digital assets generated by researchers.

Objectives

The main objective of this chapter is to examine the role of Tanzania academic libraries in promoting scholarly communication through open access. Specifically, this chapter intends to address three main research questions:

1. What is the status of registered Tanzanian academic libraries for scholarly communication?
2. How do Tanzanian academic libraries use open access for scholarly communication?
3. What factors deter Tanzanian academic libraries' use of open access in promoting scholarly communication?

Review of the Literature

Perspectives of open access in scholarly communication

Open access provides the opportunity for wider access to scholarly communication. In view of this, scholarly communication through open access leads to self-archiving, the main strategy for institutional repository development (Mangai & Ganesan, 2021:7). Open access connects people with information and promotes greater access to scholarly works. Open access has potentially increased scholarly communication, access and citation because of increased numbers of downloads (Mierzecka, 2019:4). Most academic libraries in developed countries have, over the years, begun promoting themselves to a new environment for scholarly communication through open access, institutional repositories and preprints (Sandy & Mattern, 2018:12). This is attributed to the explosion of Internet activities in open access journals which had been available since 1990 following the widespread availability of Internet services. It was further noted that the idea and practice of providing free online access to journal articles began at least a decade before the term 'open access' was formally created (Swan, 2012:7). Before this endeavour, scholarly communication was carried out through observation of a phenomenon and new experiments whereby scientists shared data and information via personal letters; a method used in transferring information related to research carried out between individuals and groups (Fjällbrant, 2012:10). Open access came into being to improve visibility, global presence, increase accessibility and collaboration which impacted both citations

and applications of scholarly works, and further encouraging scholarly communication (Harley, Acord, Earl-Novell, Lawrence & King, 2010:11).

Ways of scholarly communication through open access

Scholarly communication refers to the system through which research and other scholarly works are created, evaluated for quality, disseminated to the scholarly community, and preserved for future use. It promotes a shared system of research and scholarship (Lynch, 2020:12). Academic libraries need to develop new resources and services which support the facilitation of scholarly communication through open access platforms, including the university repository. Chewe *et al.*, (2021:9) argue that academic libraries have to use Internet services to access preserved institutional resources. The academic libraries and the librarians have a role to ensure that the available platforms, such as the Online Public Access Catalogue (OPAC), institutional repository, digital library and library websites are crucial and properly managed to promote open access scholarly communication (Kassahun & Nsala, 2015:12; Sejane, 2017:9). The institutional repository software, mostly DSpace and Eprint, are capable of hosting, preserving and providing open access to scholarly works and thus enable scholarly communication (Ramdas, 2012:9; Nemati-Anaraki & Tavassoli-Farahi, 2018:10-11). Open access for scholarly communication has the potential to reach through distance learning, and thus academic libraries have to ensure that they sincerely support the academic works of researchers and the academic community (Mwilongo, 2018:8). Assessment of the quality of open access collections based on the recommended guidelines such as the institutional repository and quality assurance policies, are important for effective scholarly communication (Sejane, 2017:10; Shapiro, 2019:12).

Factors influencing promotion of scholarly communication through open access

Efforts of academic libraries to promote open access scholarly communication are generally influenced by various factors that are subject to the institution's financial status, infrastructures, human resources or expertise and institutional management (Klain-Gabbay & Shoham, 2018:12; Narayan *et al.*, 2018:13; Mwinyimbegu, 2019:11). On financial status, Muneja and Ndenje-Sichalwe (2019:14) narrate that universities have inadequate funding to support open access management; training, maintenance and repair of open access platforms; subscription to other data sources; and professional development programs. The academic library budget for most universities in Tanzania and other developing countries keeps dwindling following the scarce financial resources to allocate to all the university units and services. In addition to the infrastructure, the literature indicates that access to Internet services has positively influenced academic libraries in fostering

open access scholarly communication (Mwilongo, 2018:11; Mwinyimbegu, 2018:12; Kayungi, Ndenje-Sichalwe & Manda, 2021:9). For example, Narayan *et al.*, (2018:15) argue that poor Internet connection for open access of scholarly works contribute to the dilution of the quality of research outputs of most developing countries researchers. Other factors are related to university management support and commitment to academic libraries' open access initiatives (Mwilongo, 2018:9; Narayan *et al.*, 2018:8). The issue of lack of technology-know-how to locate open access resources and the inability to choose from the vast number of information resources is always influencing library information professionals and the academic community in promoting scholarly communication (Klain-Gabbay & Shoham, 2018:10). However, a low level of awareness exists about existent open access repositories despite their availability on websites and institutional repositories and poor information literacy skills to search online materials influence open access scholarly communication (Muneja & Ndenje-Sichalwe, 2019:12; Mwinyimbegu, 2019:9).

Methodology

This study used a desktop documentary review to examine the role of Tanzanian academic libraries in promoting scholarly communication through open access. The survey involved seven higher learning institutions purposely selected from the global directory of institution repositories (OpenDOAR, 2022). These institutions were the University of Dar es Salaam (UDSM) in Dar es Salaam, the Sokoine University of Agriculture (SUA) in Morogoro, the Muhimbili University of Health and Allied Science (MUHAS) in Dar es Salaam and the Mzumbe University (MU) in Mororogo. Other repositories were the Open University of Tanzania (OUT), the Saint Augustine University of Tanzania (SAUT) in Mwanza and the State University of Zanzibar (SUZA) in Zanzibar. Quantitative and qualitative desktop documentary reviews on the institutional repositories were used. The information associated with the institutional repositories was gathered from the respective institutions' web pages. A documentary review of the studies on open access scholarly communication was conducted to gain insights into the phenomenon under study. The surveyed data were both quantitatively and qualitatively analysed. Quantitative data were analysed using Microsoft Excel, a computer application software, whereas qualitative data were subjected to the content analysis method.

Findings and discussion

Status of the open access institutional repositories

The findings of the desktop documentary review in open access institutional repositories for scholarly communication indicate that all desktop documentary reviews in open access repositories were available and easily accessed from their respective pages. The repositories comprised multidisciplined, electronic institutional information resources and were freely accessible. The collections comprised publications, conference papers, journal articles and books. Table 3.1 presents detailed information on the surveyed open access institutional repositories.

Table 3.1: Open access Repository (n=7)

Repository	Status	Software	Establishment	Resources
UDSM	Operates with policy	DSpace	23 March 2016	6579 uploads from 19 communities as of 25 March 2022
SUA	Operates with policy	DSpace	20 May 2015	5346 uploads from 9 communities as of 25 March 2022
MUHAS	Operates with policy	DSpace	24 August 2012	3 uploads from 2 communities as of 25 March 2022
MU	Operates with policy	DSpace	2 July 2016	3309 uploads from 13 communities as of 25 March 2022
OUT	Operates with policy	Eprint	10 October 2012	2058 uploads as of 25 March 2022
SAUT	Operates with policy	DSpace	20 March 2015	109 uploads from 5 communities as of 25 March 2022
SUZA	Operates with policy	DSpace	July 2014	38 uploads from 7 communities as of 25 March 2022

Source: Open access repositories (OpenDOAR, 2022).

Table 3.1 shows that all the repositories are operational and have policies for digital collection management. The majority, six or 75% of the university

repositories employed DSpace software for digital collection management. In this, academic libraries have a role in ensuring that they select the best management software for effective scholarly communication of the digital collection. Despite the fact that the institutional repositories were established between the years 2012 and 2016, they are experienced, but they fairly hold few collections irrespective of their time in existence. Figure 3.1 presents the time when the university repositories were established.

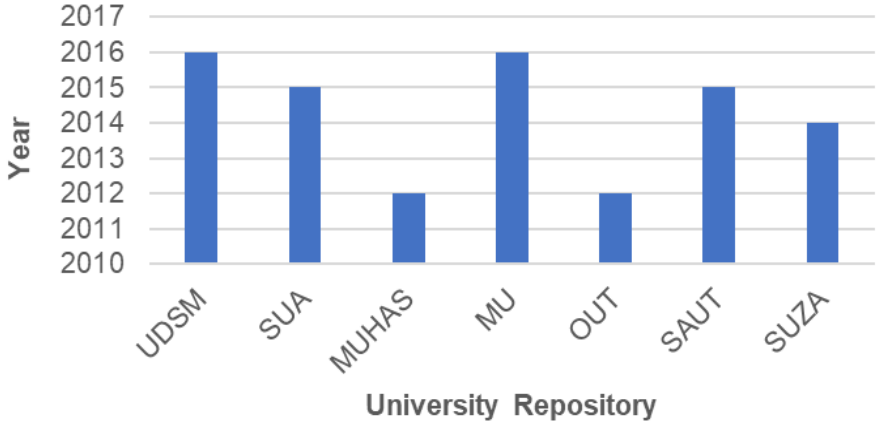

Figure 3.1: Time of the university repository establishment (Research Findings, 2022).

Figure 3.1 shows that MUHAS and OUT established their repositories in 2012, followed by SUZA in 2014, SUA and SAUT in 2015, and UDSM and MU in 2016. The differences in the time of establishment may be contributed to various factors, including the infrastructure for open access scholarly communication, insufficient experts for the establishment and financial issues. However, the OUT established its repository earlier than its counterparts because of the nature of the programmes offered, which are distance-based learning and thus had to break the distance barrier in education by the provision of open access scholarly communication. In this endeavour, academic libraries have to promote sharing of scholarly information, widen interaction of open access platforms, and enhance recognition of one's academic capability and the impact of the preserved knowledge.

Table 3.1 and Figure 3.2 present the distribution of uploads for open access scholarly communication of the university repositories.

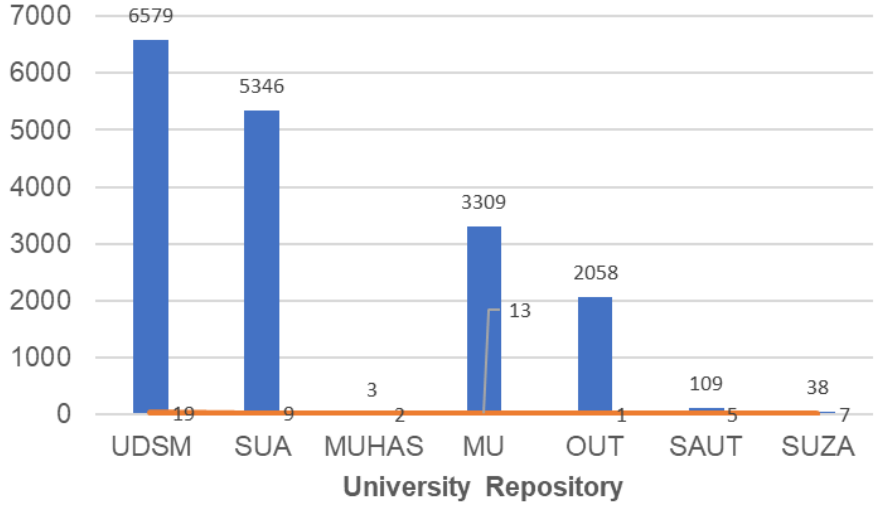

Figure 3.2: Institutional repository communities and uploads (Research Findings, 2022).

Findings in Figure 3.2 show that UDSM, MU and SUA have a substantial number of uploads compared to other respective repositories. The number of uploads at UDSM, MU and SUA correlates to the number of communities which archive their scholarly works to the repository. UDSM has 19 communities, MU has 13 and SUA has 9. However, despite the number of communities in these repositories, the institutions established this service between 2015 and 2016 and have advanced in using open access to promote scholarly communication. The upload of other repositories of SUZA, SAUT and MUHAS is fairly promising despite the earlier establishment of open access scholarly communication. This finding draws attention to the academic libraries trying to improve the repository and upgrade the collection.

Furthermore, Mwilongo (2018:7) and Mwinyimbegu (2019:9) argue that for academic libraries to maintain visibility and open access to scholarly communication, they should be innovative in deploying digital technologies and improve the quality of scholarly works in order to meet and satisfy their user needs. The institution repository has to be frequently updated with current resources, and its collection must be monitored and evaluated to identify strengths and weaknesses. One of the innovative open access initiatives is the integration of the repositories with other government agencies for visibility and one-stop access points.

The Tanzania Commission for Science and Technology (COSTECH) has centralised the institutional repositories for easy and free access to scholarly works from one point. The platform is officially known as COSTECH

Integrated Repositories (CIR). CIR is a digital service that combines the institutional repositories in Tanzania, preserves and freely disseminates scholarly works to the public. This initiative has considered the role of having a central point of access to scholarly works from different institutions and put forward the importance of preserving an institution's legacy, and facilitate digital preservation and scholarly communication. All the Tanzanian desktop documentary repositories registered at OpenDOAR (2022) are integrated with COSTECH for its legacy and scholarly communication (COSTECH, 2022). On the other hand, the universities must play a pivotal role in ensuring that timely and right information is created, stored and freely accessed by its community, researchers, stakeholders and the public in general.

General roles of academic libraries in open access scholarly communication

Open access scholarly communication is an increasingly significant component in the provision of academic publications and information resources. The development of institutional repositories is a response to open access initiatives. Academic libraries are considered as a platform or house of knowledge through which users interact with academic works. Open access scholarly communication is being developed throughout the world as a consequence of the availability of scholarly resources in electronic formats and in response to open access policies and mandates. Amongst other roles, academic libraries are crucial in the management of the institutional repository. In performing the managerial functions, the academic libraries have to perform the following general functions (Mnzava & Chirwa, 2018:10; Mwilongo, 2018:9; Muneja & Ndenje-Sichalwe, 2019:11; Mwinyimbegu, 2019:9; Nunda & Elia, 2019:11; Kayungi, Ndenje-Sichalwe & Manda, 2021:9):

- The academic libraries have to solicit, identify, select, organise, preserve, disseminate and develop open access scholarly communication policy or institutional repository policy; guide users to open access scholarly communication; adopt new and emerging technologies related to open access; update the open access collection; and evaluate and monitor the performance of the open access platform.
- Market the open access platform; promote openness in open resources; advocate, conducting digital information literacy training; strengthen relationships with users and developers of scholarly works for open access; sensitise self-archiving and develop subject-based guides for easy scholarly works access; manage intellectual property rights; and promote appropriate open access licensing.
- Establish a network with other information scientists and libraries on new methods and technologies for open access platforms, including library

websites, institutional repositories or digital libraries, good management and sustainability; work collaboratively to increase institution visibility, attract networking for expertise and fiscal resources.

- Use embedded librarianship and subject-based information specialists of the institution communities for improving uploads, institution and scholars' visibility, quality academic works, and increased scholarly output; promote usage, resources-based learning and user-centred learning on the open access platform.
- Create awareness for scholars on best practices to self-archive their scholarly works which should be legally protected to avoid copyright infringement on usage and adoption of institutional repositories. In this, academic libraries should be dynamic in such a way that they support conventional awareness programmes with information and communication technology to address, build and maintain a harmonised operational environment and the repository.

Conclusion

Scholarly communication and the open access movement have come a long way in recent years; library websites, digital libraries and institutional repositories play a vital role in higher learning and research institutions in today's information era. They have to promote sharing of scholarly information, widening interaction of open access platforms, enhancing recognition of one's academic capability and the impact of the preserved knowledge. This may lead to a central point of access to scholarly works from different institutions and emphasise the importance of preserving an institution's legacy, facilitating digital preservation and scholarly communication. Thus, call attention to academic libraries to improve the repository and upgrade the collection access to quality scholarly works and ensure implementation of open access institutional repositories to meet and satisfy the needs of the academic community and the public.

Recommendations

Based on the study objectives and survey of the purposely selected open access repositories in Tanzanian universities, the study provides the following recommendations to open access repository managers, academic libraries, information professionals and other stakeholders who are involved in the planning, implementation and management of the open access repository:

- Open access repositories' developers, administrators and pioneers should be involved in marketing, creating awareness and advocacy, and maintaining communication and collaboration with other members who

are not well informed on the usefulness of the open access platform or institutional repository for scholarly communication.

- The university should have a well-planned framework for training and retraining library information professionals on open access repositories in order to change their attitude and improve their skills and technical knowledge on the changing technologies and platforms, infrastructure and disaster management.
- The university should ensure that sufficient budget is allocated for the library management of the open access repository for scholarly communication. The university should provide significant support on monetary issues and other proposed innovative strategies for repository management, visibility and sustainability.
- Universities which have not yet established an open access repository for scholarly communication are recommended to develop the tool to ensure effective preservation and dissemination of institutional information resources, locate it centrally through COSTECH IR, and ultimately registered by the global repository directory (OpenDOAR, 2022).

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Enhancing Student-Instructor Interaction in Asynchronous Teaching through Virtual Office Hours Sessions

A Case Study from Sri Lanka

Thilini P. Rupasinghe[1]

University of Kelaniya

Abstract

A key challenge faced by educators during the recent emergency shift to online teaching due to the Coronavirus disease 2019 (COVID-19) outbreak was the lack of student-lecturer interaction, especially in the asynchronous mode. Several studies have revealed that asynchronous teaching lacks student engagement and active learning, the principal components of lifelong and meaningful undergraduate education. In the current study, the concept of "virtual office hours" has successfully been utilised to overcome this challenge. Herein, major theory components were introduced to students using short, pre-recorded lecture videos through a learning management system (asynchronous mode). Then, the lecturer conducted a real-time online session called "virtual office hour", which was designed to answer the questions of students. This was solely a student-driven session and was structured to be different from a typical tutorial session by putting the students in the driving seat of learning. Participation in this virtual session was entirely voluntary, and if students had unclear theory parts, they were encouraged to join and get them clarified. Feedback on virtual office hour sessions was collected from students using questionnaires, resulting in higher student satisfaction. Moreover, the impact of this approach towards the learning process was statistically analysed by investigating the correlation between final exam scores and attendance of virtual office hours. A weak positive correlation (0.3) was observed between final exam marks and participation in this voluntary virtual session. According to the results of this study, it can be concluded that "virtual office hour" sessions are important in improving the quality of virtual teaching because it increases students' trust

1 Thilini P. Rupasinghe, Faculty of Computing and Technology, University of Kelaniya, Sri Lanka; thilinir@kln.ac.lk

in the teacher's care of their learning, which is crucial in the current online teaching paradigm.

Keywords: online teaching, COVID-19, student-lecturer interaction, asynchronous mode, virtual office hours.

Introduction

One of the key challenges faced by educators in recent years is the emergency and unplanned shift to online teaching in the year 2020 as a consequence of school closures due to the unexpected COVID-19 outbreak. Approximately 1.4 billion students were restricted to their households. At the same time, the entire global education system underwent a rapid paradigm shift from the traditional face-to-face approach to online teaching in which delivering content and evaluating students' understanding is solely done using technology (Jeffery & Bauer, 2020).

During this period, education was mainly provided in two modes: synchronous and asynchronous. Synchronous mode, in which classes are conducted in real-time through a platform such as Zoom or Microsoft Teams, that allows students to interact with the instructor in real-time. In this mode, knowledge transfer occurs in real-time at the instructor's pace, while the sense-making part happens alone at an individual level. In comparison, in asynchronous mode, no real-time interaction takes place between the student and the instructor. The content is usually transferred using pre-recorded videos and uploaded to a learning management system (LMS). Students access learning materials through the LMS at their pace; hence, knowledge transfer and sense-making happen alone at an individual level (Mingzi, Xin & Liang, 2021). Out of these two modes, the asynchronous mode was more popular amongst students than the synchronous mode, especially in developing countries such as Sri Lanka (Yatigammana & Wijayarathna, 2021). This can mainly be attributed to anytime accessibility in the asynchronous mode, where students do not have to join in real-time (Rupasinghe, 2021). They can watch the recorded videos anytime during the day at their own pace in asynchronous mode. Most students tend to watch video lectures at night when mobile data costs are significantly low (Yatigammana & Wijayarathna, 2021; Department of Education, 2021).

Additionally, issues related to network connectivity and lack of device availability are minimised in asynchronous mode learning, as students can go through learning materials anytime they want. Also, asynchronous mode provides the opportunity for the students to go through recorded lectures over and over until they understand the content. Because of the abovementioned reasons, asynchronous mode teaching and learning are more popular in the higher education sector, especially in countries with low income, as it could

be implemented with minimum infrastructure and Internet connection requirements (Kayalar, 2021; Yatigammana & Wijayarathna, 2021).

However, a key drawback of asynchronous mode teaching is the lack of student-instructor interaction, which is a key component in a successful learning process. Since there is minimal interaction between the learner and the instructor, it is a huge challenge for the instructor to gain insight into the level of students' understanding of the content. In comparison, synchronous mode provides the opportunity for the instructor to gain a solid understanding of students' knowledge in real-time through immediate feedback, where the instructor can revisit the concepts based on students' responses providing extra support for the students to understand the content better. In asynchronous mode, different activities such as forum discussions and quizzes can successfully be utilised to gain an understanding of students' knowledge. However, this is much more challenging than the synchronous mode of teaching and requires significant time and training.

Virtual office hours sessions can be named as an approach that can be utilised to overcome this challenge. The purpose of virtual office hours sessions is to provide an opportunity for the learner to interact with the instructor in real-time (Pakala, Bairaktarova & Schauer, 2019). This is an extension of the concept of office hours sessions in a conventional face-to-face classroom which provides an opportunity for students to seek help class time outside of normal hours. A number of studies in the literature have shown that participation in office hour sessions has a positive correlation with higher academic achievement and students' satisfaction in the traditional face-to-face model (Swanson, 2016; Meyers, 2003; Li & Pitts, 2009; Jeremy *et al*., 2022). Although the concept of virtual office hours sessions is fairly new, they are a proven effective method of communication for all course types as they can be implemented in in-person lectures, hybrid courses, or online courses (Pakala *et al*, 2019; Li & Pitts, 2009; Jeremy *et al*., 2022).

Hence, in this study, virtual office hours sessions have been utilised as a method to enhance student-instructor interactions in asynchronous mode learning by bridging the gap and providing opportunities for the students to interact with the instructor in real-time. Herein, students' perception of the use of virtual office hours sessions and its' impact on the learning process have been studied, and this study focuses on the following research questions (RQs):

RQ 1: What are students' perceptions of virtual office hours sessions?

RQ 2: What are students' expectations in virtual office hours sessions?

RQ 3: What is the impact of virtual office hours sessions on students' learning process and understanding of the challenges associated with real-time virtual office hours sessions in asynchronous mode?

Methodology

Participants

This study was conducted at a state university in Sri Lanka for first-year students following the Bachelor of Engineering Technology degree programme. This course, "Chemistry for Technology", was delivered online due to the closure of the university as a result of the COVID-19 pandemic, and the approximate class size was 88.

Procedure

The course "Chemistry for Technology" was delivered via Moodle, the learning management system (LMS), in asynchronous mode using the following model.

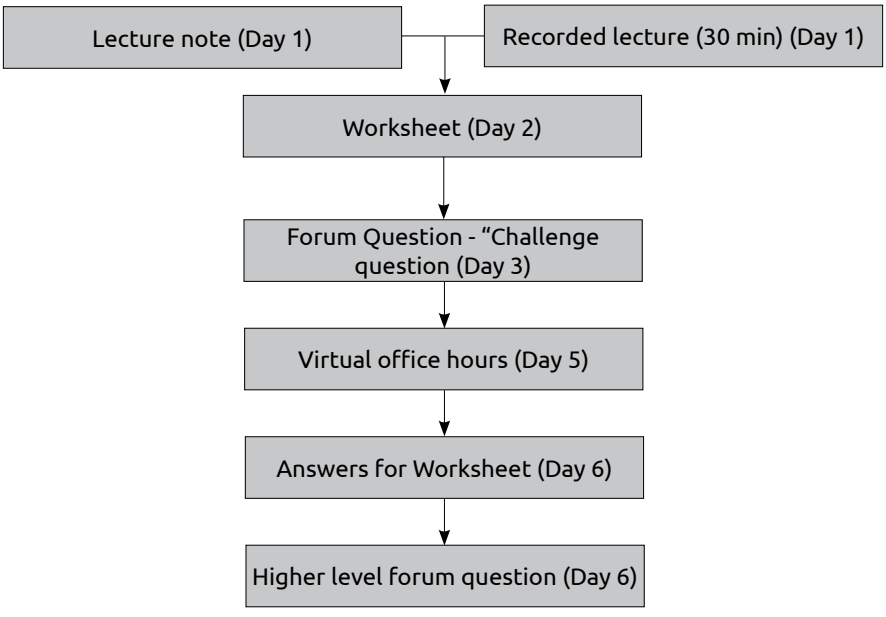

Figure 4.1: Model followed to deliver the module.

Herein, major theory components were introduced to students using short lecture videos (< 20 minutes) developed through the concept of micro-learning, followed by a worksheet related to the theoretical component covered in the video. Questions in this worksheet were mainly at the lower end of Bloom's Taxonomy, such as "remembering" and "understanding", as the sole purpose here was to check whether students have grasped the basic concept. Students were given two to three days to complete the worksheet

and upload it to the LMS. Further, the forum question feature available in the LMS platform was successfully utilised to create a dynamic environment by enhancing students' engagement and participation. Deliberately developed questions covering common misconceptions were posted as forum questions, and the students were given marks for answering these questions. The lecturer was actively involved in the process by providing feedback on their answers. After the submission of the worksheet, the lecturer conducted a real-time online session called "virtual office hours" sessions, which was designed to answer the questions of students. Finally, students were given a challenge question which required higher-order thinking, which allowed the instructor to gain an insight into the level of students' understanding.

The key feature of these virtual office hours sessions was that students were asked to develop questions related to the theory component, worksheet and forum questions. This was solely a student-driven session and was structured to be different from a typical tutorial session by putting the students in the driving seat of learning, thus making it more active learning. Participation in these virtual sessions was entirely voluntary, and if students had unclear theory parts, they were encouraged to join and obtain clarification on them.

The impact of participation in virtual office hours sessions on students' learning process was studied by statistical analysis (correlation analysis) of the relationship between the final examination grade and students' attendance in this voluntary session. Furthermore, students' perception of the virtual office hours sessions was evaluated using a questionnaire of ten items on a five-point Likert scale ranging from 'strongly agree' to 'strongly disagree' and two open-ended questions. The respondent rate was 25% of the total population, and the collected data were summarised and analysed using Microsoft Excel.

Results and discussion

Of the students who responded, 22% were females, while 78% were males in the age group 21 to 23.

What are students' perceptions of virtual office hours sessions? (RQ 1)

Attitudinal questions were given in the survey to check student perception of virtual office hours sessions, and the responses to the questionnaire are summarised in Table 4.1.

According to Table 4.1, most students have indicated a positive impact of virtual office hour sessions in their learning process (Questions 1 to 3). In order to gain further insight into the perception of students, responses

Table 4.1: Summary of questions on understanding students' perception (RQ 1):

Q no	Question	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	Attending virtual office hours sessions was a good use of my time	50%	43%	7%	0%	0%
2	Virtual office hours sessions were helpful in improving my chemistry knowledge	64%	36%	0%	0%	0%
3	Virtual office hours sessions were useful in understanding unclear theory components in the recorded video lecture	64%	29%	0%	7%	0%
4	I would like to have virtual office hours sessions in future classes	50%	36%	14%	0%	0%
5	I suggest having virtual office hours sessions in other subjects too	43%	43%	14%	0%	0%

Table 4.2: Summary of questions on understanding the reasons for attending virtual office hour sessions voluntarily:

Q no	**Question**	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
6	I attended virtual office hours sessions to learn course materials/content	43%	36%	21%	0%	0%
7	I attended virtual office hours sessions to get my questions answered	57%	36%	7%	0%	0%
8	I attended virtual office hours sessions to get to know my instructor better	36%	43%	21%	0%	0%

indicated as 'strongly agree' and 'agree' were combined and categorised as 'positive responses', while 'neutral', 'disagree' and 'strongly disagree' were combined and categorised as 'negative' responses (Figure 4.2). As seen in Figure 4.2, the majority of the students have identified virtual office hours sessions as a satisfactory experience in their learning process, with positive responses of 93%, 100% and 93% for Questions 1 to 3. Moreover, 86% of respondents have suggested incorporating virtual office hours sessions in future classes and other subjects.

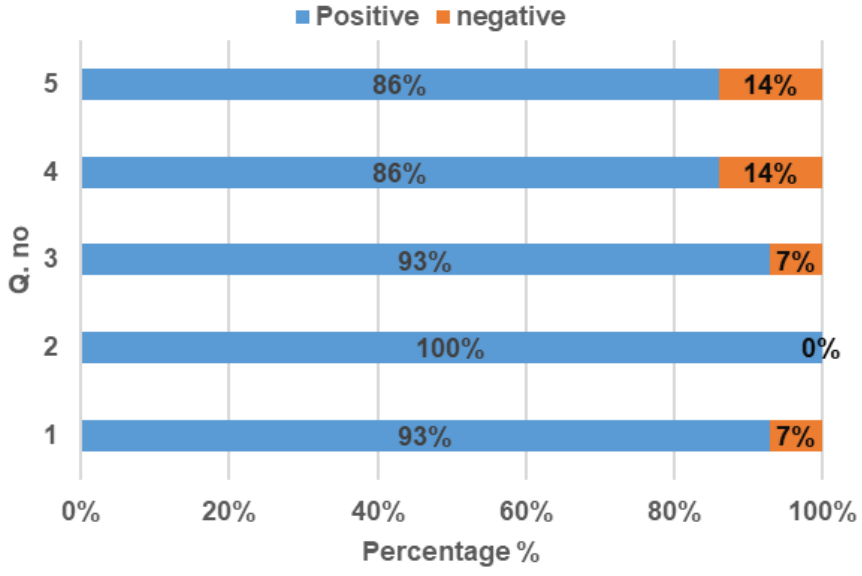

Figure 4.2: Summary of responses on understanding students' perception (RQ 1) after categorisation.

What are students' expectations in virtual office hours sessions? (RQ 2)

Although virtual office hours sessions were not mandatory, students regularly attended virtual office hours sessions. However, this varied according to the topic covered in a given week, where there was high participation when a difficult topic was taught compared to a simple one. Table 4.2 summarises the responses to questions about potential reasons for attending office hours.

According to Table 4.2, the majority of the students have indicated that they attended virtual office hours sessions to have their questions answered (93% positive responses for Question 7), which further endorses the positive impact of virtual office hours sessions in the learning process. Generally, in an asynchronous class, student engagement is considerably low, and students

Table 4.3: Students' responses to open-ended questions on the reasons for attending virtual office hour sessions and the challenges they had to face:

In your own words, why did you attend the virtual office hours sessions?	**What were the challenges you had in attending virtual office hours sessions?**
That's the best way for me to clarify my questions.	Poor Internet connection.
To find answers to the questions that I had in the lecture and worksheets.	I have poor Internet access,
To understand unclear theory parts and to attempt more questions.	Mobile data and Internet connection problem.
To gain a clearer understanding of the lessons which were already covered.	Sometimes Internet signals were lost, and power cuts.
To solve the problems that have arisen.	Connection was not stable.
Because it is good for studies, and it is a new experience for us.	Occasionally there are signal problems in our area.
To understand unclear theory parts.	
To better understand the subject matter.	
To improve my knowledge.	

are in a passive mode where knowledge transfer solely happens through video lectures without interacting with the instructor. However, through the synchronous approach, students are deliberately put in the driving seat of learning through active engagement, where they have to come to virtual office hours sessions with their own questions rather than just passively listening to the instructor.

What is the impact of virtual office hours sessions on students' learning process and understanding the challenges associated with real-time virtual office hours sessions in asynchronous mode? (RQ 3)

In order to gain further insight into this observation, an open-ended question had also been included in the questionnaire, and the responses to this question are summarised in Table 4.3. Students indicated that they attended virtual office hours sessions to understand unclear parts of the video lecture, to clarify their questions and to improve their knowledge. From Questions 6 to 8 and responses to open-ended questions, it can be concluded that students have identified virtual office hours sessions as a way of clarifying unclear theory components from the recorded video lectures. Hence, it can be recommended to include virtual office hours sessions in asynchronous mode modules to provide a high-quality and meaningful education.

Also, another open-ended question was included in the questionnaire to understand the challenges associated with this type of real-time virtual office hour session. The majority of the students have indicated Internet connectivity issues and data affordability as the main challenges.

Finally, the impact of the virtual office hour sessions on the performance of students was studied by investigating a correlation between the attendance of virtual office hours sessions and final examination marks. According to the analysis, a weak positive correlation of 0.3 was observed between the attendance in this voluntary office hour session and the final examination performance.

Recommendations for instructors

After analysing the results, it is clear that incorporating a synchronous component (virtual office hours session) in an asynchronous module has multiple benefits. Importantly, this provides a solution for one of the prevalent issues in asynchronous mode teaching; lack of student-instructor interaction. A robust and effective interaction between students and instructors can be promoted through virtual office hours sessions. Additionally, synchronous virtual office hours sessions facilitate student engagement and peer interactions in an asynchronous module. Notably, as described in the results section, this has also exhibited a positive impact

on students' performances. Therefore, it can be recommended to include a synchronous component such as virtual office hours sessions in modules delivered in asynchronous mode. This can be a real-time session every two to three weeks, and the instructor should structure this session in a way that promotes active engagement and has to be different from a traditional tutorial or discussion session. Students should be advised to bring their own questions related to the lecture video and worksheet or tutorials. A key feature of a virtual office hours session is that the instructor is a facilitator without recreating a traditional classroom setting. The concept of inquiry can be included in the virtual office hours sessions by providing guidance to students to master theoretical components without directly providing instruction. This approach would be highly beneficial for instructors from developing countries where most of the modules are delivered in asynchronous mode owing to issues related to Internet availability, availability of devices, network issues and the high cost associated with Internet connections.

Limitations

This study is limited to one institution with data from one academic year (2020/2021) in a Bachelor of Engineering Technology (BET) degree programme. The study was conducted at a university in Sri Lanka during the university closure period due to the COVID-19 pandemic. Hence, students' perceptions of virtual office hours sessions may be influenced by context-specific social, economic and mental issues during the panemic. Despite these limitations, our study is the first to provide insight into the impact of virtual office hours sessions on students' academic performance and investigate students' perception of virtual office hours sessions in the Sri Lankan context where the utilisation of technology for education is limited. The findings of the study provide significant insight to academics on enhancing student-instructor interaction in an asynchronous teaching environment using virtual office hours sessions.

Conclusion

The current study focuses on exploring the possibility of utilising a new concept called virtual office hours sessions in asynchronous mode teaching. Virtual office hours sessions are a real-time, voluntary, student-driven session promoting student-instructor interaction in asynchronous teaching. Herein, the perception of students of virtual office hours sessions and the impact on the learning process has been investigated. A higher degree of student satisfaction was observed when students clearly indicated that this session helped them improve their subject knowledge and clarify unclear theory components in the recorded lectures. Further, respondents

suggested incorporating virtual office hours sessions in future classes and other subjects. Moreover, a weak positive correlation of 0.3 was observed between the attendance in this voluntary office hours session and the final examination performance, which further endorses the positive impact of virtual office hours sessions for a successful learning process.

Generally, student engagement is considerably low, and students are in a passive mode in asynchronous-mode teaching, where knowledge transfer solely happens through video lectures without any interaction with the instructor. However, through the approach of virtual office hours sessions (including a few synchronous sessions), students have the opportunity to actively interact with their instructor. Further, proposed virtual office hours sessions are structured in a way where students have to come to the sessions with their own questions or unclear parts, rather than just passively listening to the instructor or following the instructions given by the lecturer. This indirectly puts students in the driving seat of learning as they have to go through lecture materials and attempt to undertake tutorials/worksheets before virtual office hours sessions. Additionally, incorporating virtual office hours sessions every two or three weeks in an asynchronous mode module would ensure that all the students are in accordance in terms of course progression. This would also provide students with a sense of their learning progress. Hence, according to the results of the current study, it is highly recommended to include virtual office hours sessions in asynchronous mode modules to provide high-quality and meaningful education in the virtual environment.

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Information Needs of Kampala Urban Vegetable Farmers

A Unique Information Gap for University Libraries to Embrace

Ruth Nsibirano[1]

Makerere University

Kisa Agatha Nsibirano[2]

Ministry of Defence

Abstract

A university library is a fountain of information to all its traditional users: students and faculty, plus affiliated users and researchers who are granted user rights for stipulated periods on payment of a user fee. In the face of new realities, it is important to appreciate that university libraries, compared to public or community libraries, are conveniently located, bigger, open for longer hours, better funded and offer more and better services. Unfortunately, they have remained conservative to the colonial exclusive setup instead of accommodating the need to transform and meet local needs. If knowledge is indeed to be for everybody, then university libraries should reconnect and embrace change to benefit more users.

Focusing on agriculture, which is the backbone of many economies, this paper seeks to answer three questions: What information needs do urban vegetable farmers have? What information sources are available and used? And whether university libraries are priority information sources for urban vegetable farmers in Kampala. A qualitative study was conducted, using thirty in-depth interviews and six focus group discussions. Data were collected and later thematically analysed. Findings revealed that urban vegetable farmers needed information on sources of clean seeds, inputs and markets. Libraries seemed unwelcoming to and passively excluded "non-educated" community members. Thus, farmer teams and not university libraries were the most efficient and used sources of information for urban farmers. We recommend that university libraries should transform from an only elitist

1 Ruth Nsibirano, Makerere University, Kampala, Uganda; rnsibirano2015@gmail.com

2 Kisa Agatha Nsibirano, Jinja, Uganda; agatakisher@yahoo.com

campus discourse to integrate service to the community through library outreaches, open days, and capacity-building to benefit urban farmer groups. This chapter further recommends that different community categories within the university neighbourhood deserve personalised information packages to propel the country's efforts to attain middle-income status, modernise agriculture, the backbone of its economy, and contribute to attaining the United Nations' Sustainable Development Goals 1, 2, 11 and 12.

Keywords: urban farming, vegetable and mushroom growing, agricultural information sources, Kampala urban farmers, academic libraries and unique user communities, library outreach

Introduction

Globally, urban farming is on the increase in many cities (Yan, Liu, Liu & Zhang, 2022) and in Uganda (David *et al.*, 2010; Hemerijckx *et al.*, 2023). A number of factors explain the growth of this livelihood strategy. Urban farming makes huge contributions, especially lifting standards of living and promoting food security amongst the urban poor (FAO, 1996; Sangwan & Tasciotti, 2023). Thus, urban farmers require support as all farmers do. Unfortunately, urban farmers are excluded when such support is offered, including the provision of information and inputs. Y*et al*l farmers, regardless of the geographical location, should be supported to meet their information needs so that they are able to enhance their farming enterprises. Government or private support services extended to farmers unintentionally exclude urban vegetable and mushroom farmers. Public libraries would have played this role since they were established to freely provide information resources and services to interested users (Abdurrahman, 2023). Uganda has over 22 public libraries mandated to serve cities and towns by providing resources and services to equally meet the needs of individuals and groups.

Furthermore, public libraries can be effective in bridging the gap between information providers and trainers and information users such as farmers (EIFL, 2023). Unfortunately, the current reality in Uganda is that partly due to limited space for personal reading in homes and in some schools, access to and use of public libraries has been taken over and is now dominated by school children (The Monitor, 2021). Over time, other potential public library users have been edged out. The displacement of other users from public libraries justifies a need to rethink how transformation in academic libraries can happen to allow such libraries to embrace the new role of an "intellectual commons" (Fagbola, Uzoigwe & Ajegbomogun, 2011).

On 13 July 2018, the Makerere University Library joined the rest of the world to celebrate World Library Day. The theme of the day in Makerere University Library celebrations was "Remodelled Library Services: Informed

Societies". The theme aligned with the International Federation of Library Associations and Institutions (IFLA) annual theme: "Transforming Libraries, Transforming Societies: Reaching Out to the Hard to Reach". The two themes motivated the reflection on the role of the university in general through its vision statement: "... a thought leader of knowledge generation for societal transformation and development" (Makerere University, 2020), but also libraries in general and university libraries in particular in supporting efforts to transform the Ugandan society, from peasantry to a middle-income economy (Museveni, 2013).

If Makerere University and the university library can assume the role of effective players in social transformation and open alternative gates to include the otherwise excluded population through information provision, all Sustainable Development Goals (SDGs), especially 1, 2, 11 and 12, can be impacted. Undoubtedly, agriculture continues to be the backbone of many growing economies (Diao, 2010; Schoonraad, 2016; Stilwell, Bats & Lor, 2016). It is also true that agriculture is a livelihood option for many (Lwoga, Ngulube & Stilwell, 2010). Through agriculture, populations find employment to earn a living (World Bank, 2017), and it is a source of food supply for the ever-increasing number of urban dwellers (Matuschke, 2009).

Although previously, the countryside was a key source of food supplies for urban dwellers (Matuschke, 2009), the increasing levels of rural-urban migration mean that more people abandon farming for better opportunities in towns (Da Silva, 2017). The effect of rural-urban migration has not only changed the urban-rural population balance to 54% in urban, but it has also created an ever-increasing demand for food supplies and has impacted food consumption patterns. Urban income increases make people demand processed foods, fruits and vegetables (Da Silva, 2017). Thus, urban agriculture comes in handy as a survival strategy (Byamugisha, Ikoja-Odongo & Nasinyama, 2010).

Yet, urban residents experience rapid changes that affect their ability to access food (Mackay, Tusabe & Mugagga, 2022). And with more people to feed in the urban areas and fewer producers in the countryside, there are fewer food supplies and, as such, escalating food prices. Amidst such realities, a new trend of urban farming is unavoidable. Urban dwellers have to find ways of coping with increasing food prices resulting from an imbalance between supply and demand. Due to the food imbalance, urban dwellers, particularly the under-privileged, are more likely to have a small garden in the backyard as a cheap alternative food source (Byamugisha *et al.*, 2010; Garrett & Ruel, 2000; Siegner, Sowerwine & Acey, 2018). In the spirit of taking advantage of new opportunities, the increasing food market opportunities in towns are push factors fuelling urban farming. Urban farmers grow a variety

of crops and practice numerous agricultural activities. About three years ago, Kampala had a total population of 1.86 million people; of these, about 40% were engaged in urban farming (UBOS, 2015). Owing to the fact that urban agriculture is practised on a limited land base, it has not been easy to establish actual percentages of those participating in this form of agriculture. Nonetheless, vegetable production is amongst the dominating practices (Sabiiti & Katongole, 2014; Sabiiti *et al.*, 2014).

Successful agricultural practices require information so that farmers can be guided (Rao *et al.*, 2019). A study conducted in 2010 on information needs and use amongst urban farmers documented the need to provide information to farmers within their respective groups of practice (Byamugisha, Ikoja-Odongo & Nasinyama, 2010; Byamugisha *et al.*, 2008). This study emphasised that in order to ensure enhanced productivity, farms need information. Globally, libraries take the upper hand as sources of information (Onuoha & Awoniyi, 2011). It is also expected that libraries will always be an information hub and meet the information needs of the communities. Unfortunately, most (university) libraries provide information to only those directly registered with them, including students, academic staff and researchers. It is time for university libraries, such as the Makerere University Library, to extend these useful services to new categories of users, which is critical for social transformation.

Libraries cannot plan for and provide required information to new categories of users, such as urban farmers, if their information needs and information-seeking behaviours are not known. The majority of the urban farmers are men and women from the community who perhaps have never been to the university. It is not known for sure if academic libraries consider this category as patrons. It is also not explicitly known if urban farmers are interested in the information that the academic library provides. A number of possible questions can be posed: "Will urban farmers even know that university libraries exist for the sole purpose of meeting information needs?" "Do urban farmers have access to rich university library resources?" "Are university libraries aware or even prepared with the kind of information to serve the information needs of this category of the community?" If the answer to all the posed questions is a "no", then it is certainly right for a study to seek to establish the following:

1. What information needs do urban farmers have?
2. What information sources are available and used by urban farmers?
3. University libraries exist in urban communities; however, do urban farmers in Kampala consider them as priority options for meeting their information needs?

The key thesis for this chapter is that university libraries have a missed opportunity to serve a unique user group of urban farmers simply because urban farmers and the academic library possibly do not know about each other. Thus, a study was conducted amongst urban farmers, specifically those engaged in vegetable and mushroom growing to answer the questions above to explore information needs and information sources used and assess if libraries are priority sources of information for urban vegetable and mushroom farmers in Kampala.

Justification for such a study was formed out of a conviction that identifying information needs and the sources people use gives the information provider an indication of the content or potential information that users need. This will go a long way to facilitate university libraries to approach the communities that increasingly have unique information needs that should not be ignored. This new trend is even more urgent now that elite communities are accessing electronic resources more than physical ones. Libraries approaching this otherwise new category will guarantee their essential role, justifying continued existence and visibility in addressing an information gap. This is in sync with the feminist theory and the politics of inclusion (Fisher, 1990), a theoretical perspective that guides the discussions.

Methods and tools

This qualitative study was conducted in the Rubaga division, Kampala district. A sample of thirty vegetable and mushroom growers was purposively selected. To be included in the study as an in-depth interviewee, one had to be involved in urban farming and growing vegetables or mushrooms. The in-depth interviews with vegetable farmers were held in their homes where the gardening too place. This was also conducted to enable observations to be made. In-depth interviews were conducted in Luganda, the widely understood and spoken local language in the area, using an interview guide. In addition, six focus group discussions were made, with an average of eight farmers selected from different associations that bring vegetable farms together. Only association members who had not participated in the in-depth interviews were selected to triangulate and solicit qualitative data regarding the role farmer associations play. Focus group discussion guides were used to collect data during the focus group discussions. Permission was requested from participants, so all interviews were recorded and later transcribed verbatim by two independent researchers. The transcripts were compared for completeness before coding and analysis was undertaken using thematic analysis. Data collection was performed from September to November 2016.

Study Results

Social demographic characteristics

A total of twenty female and ten male urban farmers were interviewed. The higher number of females can be explained by two factors: one of the factors is that more women are participating in urban agriculture, and this is consistent with a study that was conducted in the United States (US), which reported that males are less likely to participate in urban agriculture (Chenarides, Grebitus, Lusk & Printezis, 2020). The second factor was the fact that sample selection was purposively done, and, therefore, more females than males were found participating in urban vegetable and mushroom growing and were selected. Further, in this study, the average age for females was 31.1 years and 32.8 years for males. Thirteen (65% of the females) were single, four (20%) were married, and three (15%) were separated, while amongst the males, nine of them (90%) were married.

Information needs of urban vegetable and mushroom farmers

Interviewees were asked to mention all information needed in the urban vegetable and mushroom farming practice. The major issues identified and listed in the order of urgency included sources of the right seeds for vegetable farmers. The interviewees commented that vegetable seeds purchased from agribusiness shops often have no labels to indicate expiry dates. Once planted, the seeds, often old, do not germinate. While mushroom growers needed information on sources of quality spawns, cotton cake was used as a substrate. Alternative material was used since cotton was not readily available. Furthermore, mushroom growers needed skills and knowledge on how to add value to mushrooms because they are perishable. This finding points to an information gap that university libraries could fill. This assertion is premised on the view that universities are also research institutions and, therefore, can and should have information on improved seeds and spawns, as well as provide information on processing to add value. The libraries have neither collected nor repackaged such information from university faculties and researchers for dissemination to the usually poor, semi-literate or illiterate urban farmers, as summarised in the words of some farmers:

> *… we know that in Makerere and Kawanda, research is done, but for us, we cannot go there. We even cannot speak English; maybe the seeds are quite expensive; we do not know (Female FGD participant).*

Information sources used

When respondents were asked to indicate how they received information, a number of information sources were mentioned, and the mentioned agricultural information sources accessed and used included fellow farmers; urban farmers in the same areas knew each other and could thus share information on what they know as a way of supporting each other as friends in the same venture. Another source was listening to radio programmes targeting farmers.

Interviewees also said that farmer demonstrations on the farms were another source of information that was important, as quoted by one mushroom grower:

> *For me, I get the spawns from a farmers' association to which I am a member. Once you register with a membership fee of sixty thousand shillings (approximately 17 USD) you are able to buy prepared gardens of planted spawns … (Female, in-depth interviewee).*

> *… a good source of agricultural information on the price of mushrooms and marketing is if you join in farmer groups. For me, I am a member of the Kiti Kyamuwogo Mushroom Association and I have gained a lot of knowledge from the group. We meet every first Saturday of the month and learn many things. We also bring our harvests for sale (Female, in-depth interviewee).*

Another interviewee said:

> *… we get a lot of information from those farmers who are growing the same crops as we are. It is important to make friends with and visit big farmers (Male, 30 years).*

University libraries strategically reconnect with communities

There is an unmet need amongst urban farmers since services open to benefit farmers mainly target rural areas, indirectly excluding urban farmers. University libraries could strategically reconnect with urban communities, be involved in farming to meet changing information needs and help deliver SDGs 1, 2, 11 and 12. In this study, participants were asked if they had access to extension services from research institutions for information. Those who participated in the in-depth interviews and the focus group discussions said these extension services were unavailable. This alludes to the need for the university library to extend its services to close this information gap. This finding was also different from the earlier finding, which indicated

that agricultural researchers and extension workers were the other sources of agricultural information for the urban farmers (Byamugisha*et al.*, 2010; Byamugisha *et al.*, 2008). This finding can probably be explained by the fact that the Rubaga division does not have an agricultural research station. The second plausible explanation could be the fact that urban farms are scattered in small clusters, possibly not easily identifiable by information service providers such as extension workers attached to urban authorities.

Furthermore, the study participants considered were not highly educated and thus could have limited their choice of information sources to only the informal ones. It is also possible that, at the moment, vegetable and mushroom growing in urban areas is not considered a category deserving of support. Thus, such actors are missed when sending out extension workers attached to the urban authority. A male participant who had at one time benefited from urban authority support to poultry farmers, a more established livelihood option in urban areas, commented that:

> *There is a radio programme called "Olutindo" [literal meaning 'bridge'] on Central Broadcasting Service (CBS), which runs a programme on agriculture once a week, usually transmitting information related to poultry farming. Furthermore, as Kampala City Council, we are privileged to have a programme called "Agaffa ewa Mayor" [literal meaning 'news from the office of the town mayor'] on CBS every week on Tuesdays at nine pm. We are also privileged that we have been given more airtime to talk about urban agriculture and urban agricultural ordinances (Male, 28 years).*

Study participants shared the view that radio talk shows support urban farmers. It was revealed that more radio stations air agricultural information. For example, Top Radio provides information every Saturday from 14:00. In addition, a number of television programmes support urban farmers, such as *Omulimi Asinga* ("best farmer") and *Enkumbi Telimba* ("the hand who cannot tell lies"). The *New Vision* and *Daily Monitor* dailies both have articles to provide information to farmers. However, the information shared in both these print media as well as on radio and television talk shows is not categorically for vegetable and mushroom growers. There is room for the university library to partner with or repackage appropriate information for the less-known and less-provided livelihood options such as urban vegetable and mushroom growing. University libraries can take advantage of the existing avenues by making use of these channels to support urban vegetable farmers. The results show that a number of strategies have been devised to address the need for information on mushroom growing. However, this has been an initiative by the mushroom-growing farmers, not the university

libraries. Yet, universities and their libraries are information fountains mandated to conduct research and support the scientific generation of knowledge that should support local needs and interest groups such as urban vegetable and mushroom growers.

This finding paints a contradictory picture of university libraries as fountains of information because the information held is selectively controlled. Scholars have argued that libraries are part of the fabric of society and that libraries have gradually moved from being elite institutions to promoting reading amongst the general population (Stilwell *et al*., 2016). The current study findings show the contrary. There is no single fresh development in the library in general but also in university libraries that indicates a deliberate intention of moving out of the comfort zone to assist mushroom and vegetable urban farmers. It is quite unfortunate that the assertion made by Ranganthan over nine decades ago in the five laws of library science, particularly Law 5, that the library is a growing organism (Gorman, 1998; Shadrach, 2016) is threatened by the lack of flexibility to include new categories of users. University libraries are failing to grow beyond the colonial elitist mentality. Transformation should be driven by the university libraries as authoritative information sources to provide the information that meets the particular needs of individual urban vegetable farmers (Moore, 2002).

Discussion

The social demographic characteristics show that there were more women than men engaged in urban agriculture. Most of the women who participated in the study were younger than the men. They were mostly single women, while most of the men who participated in this study were married. This could be due to the purposive sampling strategy that was used for selection or an indication of the realities about who is engaged in urban vegetable farming. The current study findings indicate that sources of information on agriculture for farmers are still through fellow farmer networks. The argument by Semwanga (2007) that the majority of urban farmers in Kampala use networks as the major source of information is still true. Our findings differ from an earlier study conducted in 2010 by Byamugisha *et al*., that revealed several sources for agricultural information. As these scholars mentioned sources that included neighbours (67.1%), personal experience (57.2%) and friends (56.4%) and which were location- and gender-specific, our findings only found fellow farmers, associations and radio talk shows as key sources of information available for urban vegetable and mushroom farmers. Despite the slight difference in sources of information, both studies allude to a situation characterised by situated experiences and context-specific variations that leaves a vacuum that libraries could fill. A case in point is the urban farmers

not in groups, those in private housing arrangements with limited interaction with neighbours.

One result of urbanisation has been the erosion of collective preference for individualistic value systems (Chen, 2015). For such farmers, the university library could be an empowering institution. In its absence, some farmers use farmer-to-farmer sources of information when available. Unfortunately, such informal information source alternatives have some limitations (Adio, Abu, Yusuf & Nansoh, 2016). Therefore, the information-seeking behaviours of urban farmers can be limited by the extent and effectiveness of the awareness of others with an interest in the choice of vegetables to grow. Shared interest in the choice of vegetables to grow is the only guarantee to access any information, regardless of its correctness. Sharing information is performed for social support. Thus, urban vegetable and mushroom growers have confidence in the information received through these informal networks. The finding is consistent with and is a confirmation that where formal information structures are absent, farmers will try to fill the information gap by resorting to informal sources such as relations of fellow farmers as peers and radio talk shows (Adio *et al.*, 2016). To transform university libraries from elitism, strategies such as redefining library users' categories and university faculty working and mobilising themselves to rally with the university libraries would be winning strategies. It would equally drive success in the university's responsibility to share working innovations and information that can address local issues and improve communities.

Are libraries priority information sources?

There is an insignificant use of libraries quoted at a rate of 1.1% even when some urban farmers have formal education (Byamugisha *et al.*, 2010). The reason for less value attached to the library as a source of agricultural information was due to limited awareness of the library offering the needed information. The university libraries have chosen to play the game of exclusionary politics (Fisher, 1990) and, as such, remain alienated from urban farmers. This university library culture that focuses on the elite formal category of users condemns the farmers to remain users of informal information sources that are sometimes limited in scope, extend to only close peers and possibly lack updated science facts. This is a new reality that should offer an opportunity for university libraries to consider and revise arguments put out by earlier scholars. For example, although Atherton (1977) noted that interpersonal sources of information are now better suited to handle special individual needs and questions and offer immediate feedback than formal sources, the current realities of urbanisation make this argument difficult. Wilson and Walsh (1996) also observed that the phenomenon of informal sources of information is better. As informal sources of information can co-

exist with formal information sources, university libraries should appreciate that the historical appreciation accorded to informal sources of information in the information science literature is challenged by new goals like attaining the SDGs, middle-income status, which will require the university libraries to adjust their original scope of practice.

Conclusion

To improve the practices of university libraries and how the urban farming actors perceive these libraries for their information needs, we revisit the words of one scholar of information science, Ikoja-Odongo (2002). He once observed that the information sources most preferred by farmers in a country or a section of the country are a function of how the farmers have been sensitised to the usage of the other options. The university libraries should therefore take on the role of supporting the transformation of urban vegetable farmers' information-seeking and guide them to embrace libraries as new information sources. This can be performed through a number of ways, including outreaches, open days or even capacity-building for the existing informal information seekers to equip them with authentic and accurate information. Libraries can also repackage otherwise inaccessible information from researchers and scientists into easy-to-access formats for the level of agricultural information users.

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Revitalisation of Public Libraries in the Attainment of Sustainable Development Goals in Nigeria

Abu Ahmed Adamu[1]

Kenyatta University

Yahaya Abdullahi Isah[2]

Federal University of Technology Minna

Stephen Adekunle Ajayi[3]

Kenyatta University

Abstract

Public libraries have been able to impact people's lives directly and positively by providing information to everyone in the community, thereby driving community and societal change. The libraries have also continued to increase their chances of delivering access to information to attain Sustainable Development Goals (SDGs) in advanced countries. The paper focuses on efforts developed by public libraries in developing countries, especially Nigeria, to attain the vision for the United Nations' Sustainable Development Goals 2030 (SDGV 2030). This includes the provision of entrepreneurship empowerment services for women in various vocational skills such as netting and soup making to alleviate poverty and the provision of computer-based services for both adults and children for them to be able to have literacy skills that will inform their access to effective information. Through outreach services, public libraries will be able to create awareness of the benefit of education, especially in Northern Nigeria, where girl child education is usually discouraged. Government policy, funding, and lack of professional staff were challenges limiting public libraries from contributing more to attaining the SDGs. Hence, the study recommended that the government of Nigeria should include public libraries in their strategic plan as well as improve funding so that they can contribute more to the attainment of SDGV

1 Abu Ahmed Adamu, Federal University of Technology Minna, Nigeria; Kenyatta University, Nairobi, Kenya; abu.adamu@ku.ac.ke

2 Yahaya Abdullahi Isah, Federal University of Technology Minna, Nigeria; yahaya.isah@futminna.edu.ng

3 Stephen Adekunle Ajayi, Kenyatta University Nairobi, Kenya; ajayi.stephen@ku.ac.ke

2030 in the area of advocating for justice and creating awareness of climate change. The study concluded that the revitalisation of public libraries will increase the chances of Nigeria attaining the SDGs agenda by the end of 2030.

Keywords: public libraries, sustainable development goals, SDGs, ICT, education, poverty alleviation.

Introduction

The UNited Nations (UN) Sustainable Development Goals (SDGs), also known as Global Goals, build on the success of the Millennium Development Goals (MDGs). The Goals are unique in that they call on all countries, rich and poor, to take action to promote prosperity while protecting the environment. They recognise that addressing poverty requires strategies that promote economic growth and address a variety of social needs such as education, health, social protection, and job opportunities, as well as addressing climate change and environmental protection.

While the SDGs are not legally binding, governments are expected to take ownership and create national frameworks to achieve the 17 SDGs: no poverty, zero hunger, good health and well-being, quality education, gender equality, clean water and sanitation, affordable and clean energy, decent work and economic growth, industry, innovation and infrastructure, reduced inequalities, sustainable cities and communities, responsible consumption and production, climate action, life below water, life on land, peace, justice and strong institutions and partnerships for the goals. Countries are primarily responsible for monitoring and reviewing progress towards achieving the SDGs, which will necessitate the collection of high-quality, easily accessible, and timely data. Regional follow-up and review will be based on national-level analyses and contribute to global follow-up and review.

Access to authentic and reliable information is one of the hallmarks of today's information age, in which almost 'everyone' has access to information via the Internet or the media. Every individual, therefore, requires the right information in order to function and make the right decisions in life. Promoting access to reliable information is thus ingrained in the functions of libraries all over the world.

In the process of achieving these SDGs, the library plays a significant role in advocating for the attainment of the SDGs through various strategies. The importance of libraries and librarians in achieving the SDGs cannot be overstated, as public and educational libraries are the primary or sole providers of such access (Ogunmodede, Adio, Aboyade, Ebijuwa, & Oyetola, 2023). Increased access to information and knowledge, underpinned by universal literacy, is an essential pillar of sustainable development, according to the International Federation of Library Associations and Institutions

(IFLA). As a result, libraries are expected to fill these gaps by providing access to relevant information. One of the SDGs' is for all libraries to play a significant role in providing access to data, research, and knowledge that supports informed research and public access to climate change information (IFLA, 2018).

Public libraries play an important role in disseminating information for educational, cultural and recreational purposes. These libraries are close to their local communities and provide information in different forms to individuals. According to Okojie and Okiy (2020), public libraries have been able to impact directly and positively on the well-being of people, thereby driving community and societal transformation. Hawkins in Akomolafe (2012) states that knowledge and information obtained from libraries have become the essential currency for productivity, competitiveness, increasing income, and prosperity, all of which are indications of national integration and growth. Public access to knowledge allows individuals around the world to make informed decisions that can improve their way of livelihood in society. Communities with current, timely and relevant information are better placed to alleviate poverty and inequality, improve agriculture, provide quality education, and support people's health, culture, research, and innovation (IFLA, 2018). Therefore, it is unsurprising that associations and international organisations such as the Bill and Melinda Gates Foundation continue supporting public libraries to advocate for SDGs.

Associations like the African Library and Information Associations and Institutions (AfLIA) and the Nigeria Library Association (NLA) have intervened to empower public libraries to achieve SDGs through the training of public librarians on leadership (Okojie & Okiy, 2020).

Today, librarians are compelled to use new skills and strategies in order to change, survive, and compete in the world of virtual information, according to Yahaya and Ubale (2016). Library campaigns have become very important in the provision of library and information services that are not well-marketed and may not be well-patronised (Gupta & Savard, 2010). A library campaign is a series of actions and activities librarians undertake to improve service delivery and user satisfaction. Igbinovia (2016) argues that libraries and librarians in Nigeria have been doing a great deal, especially in the area of creating awareness and supporting the attainment of the SDGs.

Yahaya and Ubale (2016) argue that the nation must have and provide relevant, up-to-date, and adequate information on food security, democracy, health education, gender equality, and other topics. Libraries and librarians can provide access to information that would enable people to lead productive lives based on their skills in acquiring, organising, offering for use, and

publicly preserving information in such a way that it can be found and used when needed.

The achievement of the SDGs by the target date of 2030 will almost certainly face some challenges. Librarians, as information professionals, are thus rightly positioned to create awareness, design strategies, and promote the attainment of SDGs within the time frame.

In the pursuit of its political and economic agenda, the Nigerian government has demonstrated an unwavering commitment to achieving its objectives. However, the stark reality of Nigeria's high poverty levels reveals that governments alone cannot bear the burden of combating poverty; it is imperative for diverse organisations to unite in this battle. As nations worldwide strive towards fulfilling the SDGs, the Nigerian government relies on the collective support of all institutions, where libraries hold a pivotal position. Regrettably, the recognition of these beneficial SDGs, encompassing the conservation of natural resources for future generations and meeting essential human needs, eludes many developing countries. What could be attributed to this phenomenon? Is it plausible that librarians lack a comprehensive understanding of the inherent nature of these goals? Are librarians cognisant of their crucial roles in advancing these objectives? What attitudes do librarians harbour concerning the pursuit of these goals? Given these circumstances, the study endeavours to scrutinise the integral role of public libraries in the realisation of SDG aspirations.

Objective of the study

The main objectives of the study are to:

- Discuss public libraries' role in achieving the SDGs in Nigeria
- Describe public library strategies for achieving the SDGs in Nigeria.
- Identify the challenges public libraries face in Nigeria in achieving the SDGs.

Roles of public libraries in achieving SDG

A public library plays an important role in society, being the people's university, as it provides the needed information for the general public irrespective of the form and size of their audience. Ayaowei, Memory and Mercy (2021) and Igbinovia & Osuchukwu (2018) report that libraries provide a medium for information dissemination and knowledge-sharing. The major role of public libraries in achieving the SDGs is the ability to provide the needed information to the general population (Abata-Ebire, Adebowale

& Ojokuku, 2018). So, the roles public libraries play in achieving the SDGs include:

- Information access and dissemination: Public libraries act as knowledge centres by providing everyone in society with free and equitable access to information (Mainka *et al.*, 2013). Kosciejew (2020) reports that these libraries are essential in spreading knowledge about the SDGs, creating awareness, and fostering comprehension of the objectives and their aims.
- Promotion of education and literacy: Public libraries play a crucial role in achieving the SDGs (Omona, 2020). These libraries promote education and literacy activities, critical components of many SDGs. They give tools and activities to improve literacy skills, educational materials, and chances for lifelong learning to people of all ages (Bahrami & Harandi, 2020; Abata-Ebire *et al.*, 2018).
- Acting as community centres: Public libraries act as community centres, promoting social inclusion and empowerment within the community (Adhikary, Karak & Adhikary, 2019). They develop forums for discussion, teamwork and interactive activities that support SDGs through library programmes, workshops, and outreach initiatives that enable people and communities to actively contribute to sustainable development.
- Sustainable development advocacy: Public libraries can act as advocates for sustainable development and SDGs (Kosciejew, 2020). They can raise awareness about environmental issues, social justice, gender equality, and other key aspects of sustainable development. Islam, Sultana and Widén (2022) argue that libraries can organise events, campaigns, and initiatives that encourage individuals and communities to take action towards achieving the SDGs
- Collaboration and partnership building: Public libraries can collaborate with other institutions, organisations, and stakeholders to enhance their contributions to the SDGs (Willems, 2022). Osuchukwu, Otubelu, Ogbonna and Ndukwe (2016) report that public libraries should form partnerships with government agencies and non-governmental organisations (NGOs) to leverage resources and expertise. This will help in the implementation of SDG-related initiatives more effectively.
- Libraries play a crucial role in achieving the SDGs (Omona, 2020): Abata-Ebire, Adebowale and Ojokuku (2018) state that in achieving the SDGs, libraries can provide information on how to alleviate poverty in society, provision of information on sustainable agricultural practices to reduce hunger, provision of information in different mediums in order to reduce maternal mortality and other health-related issues amongst other important information.

Public libraries' strategies for achieving SDGs

Okuonghae and Igbinovia (2019) conducted a study on the role of libraries regarding the attainment of SDGs; the study findings show that libraries contribute to the attainment of the SDGs in Nigeria by providing a conducive learning environment and resources to users. The findings further revealed that libraries also foster attainment by creating awareness amongst citizens. In addition, according to Okuonghae and Igbinovia's (2019) research, libraries can promote SDG attainment by providing both quiet and collaborative spaces conducive to all types of learning, forming a consortium or collaboration that supports goals in ensuring information and research to help decision-makers achieve the SDGs, providing access to information, and assisting government, civil society, and business in better understanding local information needs. Furthermore, different scholars state below the ways public library campaigns can lead to the achievement of SDGs.

The Reading 4 All campaign (Ohio State University, 2023) promotes reading habits and enhances literacy, supporting SDG 4: Quality education. Public libraries are accessible to all, and, provide information both for literate and illiterate people. Reading tends to enhance knowledge (Winter, 2023). Public libraries have the ability to arrange reading initiatives, storytelling sessions, and book collection events as a means of promoting reading habits amongst both children and adults. In addition, it is possible for them to engage in partnerships with educational institutions and local community groups in order to extend their outreach to marginalised communities and foster a passion for literacy.

In line with SDG 9: Industry, innovation, and infrastructure: This initiative seeks to close the digital divide. Internet use, computer classes, and digital literacy courses are all resources that may be obtained from a public library at no cost. Public libraries can also collaborate with technology firms or local governments to provide science, technology, engineering, and mathematics (STEM)-focused activities like coding boot camps, financial advice to entrepreneurial start-ups and robotics workshops (Fairbotham, 2021; Tbaishat, 2021).

Public libraries have the potential to launch initiatives that advocate for gender equality and the advancement of women, consistently with SDG 5. The organisations have the ability to arrange events that commemorate the accomplishments of women, facilitate dialogues on gender-related matters, and offer material on women's entitlements, governance, and business acumen. Public libraries can potentially provide networking opportunities targeted towards women and girls. Izah (2020) reports that they offer entrepreneurship support to women and girls, thereby leaving no one behind.

The Sustainable Living campaign (World Wide Fund, n.d) is centred on the advocacy of sustainable practices and the cultivation of environmental consciousness, with the aim of advancing SDG 12: Responsible consumption and production and SDG 13: Climate action. It is possible for public libraries to arrange educational sessions pertaining to recycling, composting, energy preservation, and sustainable agriculture. In addition, individuals have the ability to assemble and manage compilations of literature and materials pertaining to sustainability, climate change, and environmentally conscious ways of living. Kornfeind (2022) states that libraries across various continents, including Europe, Asia, South America, and Australia, transform contemporary library practices by incorporating innovative environmentally-friendly design elements, intelligent technologies, sustainable construction materials, and the adaptive reuse of historical edifices. In addition, public libraries also offer extension services to livestock keepers by educating them on sustainable agricultural practices (Zimu-Biyela, 2016).

According to SDG 3, public libraries have the potential to organise initiatives that endorse health and wellness. The individuals can arrange health screenings, conduct workshops on nutrition and a healthy lifestyle, and promote awareness campaigns on significant health concerns. Cabello and Butler (2017) report that librarians in public libraries are seen as social ad hoc health workers who help people navigate the complexities of life, from navigating the health system to helping those with housing needs. Libraries have the potential to collaborate with nearby healthcare institutions to offer information and materials about mental health, illness prevention, and healthcare accessibility.

Furthermore, in their study, Pearson and Hall (2015), identify library strategies for effective public awareness, which include developing key messages for effective service delivery, ensuring that staff, board members, and volunteers understand and can deliver key information for achieving library objectives, creating public awareness by engaging the use of all forms of media in propagating information.

Challenges in achieving SDGs in Nigerian public libraries

Funding constraints

One of the biggest problems is that public libraries do not receive enough funds (Babayi, Makintami & Tumba, 2019). Insufficient funds can affect the campaign, which cannot build up the library's infrastructure, buy appropriate resources, and offer good services and programmes. If the campaign does not have enough money, it might not be able to reach underserved areas or meet the different needs of the population.

Digital divide

Nigeria, like many other underdeveloped countries, is faced with the problem of rural and marginalised communities where access to technology and the Internet is a major problem, thereby making libraries face difficulties in providing digital literacy programmes and online resources, closing the gap in information access and technological skills (Tayo, Thompson & Thompson, 2016).

Infrastructure and resources

Many public libraries in Nigeria lack adequate infrastructure and resources (Ejedafiru, 2010). Libraries may find it difficult keeping their physical spaces in good shape, acquiring books and materials that are current and up-to-date, and acquiring access to modern technology and digital resources (Baada, Ayoung, Bekoe & Azindow, 2020). Insufficient infrastructure and resources limit the public library campaign's ability to effectively engage with the community and provide the necessary services.

Low awareness and patronage

Public libraries in Nigeria often struggle with low awareness and patronage (Eyiolorunshe & Eluwole, 2017). Some communities may not fully understand the value and benefits of libraries or may perceive them as outdated institutions. Anyaoku (2015) states that limited awareness of public libraries can lead to underutilising library services and resources. Promoting libraries as vibrant and dynamic institutions that contribute to education, lifelong learning, and community development is crucial to address this challenge.

Professional development opportunities for library personnel are crucial for the success of the public library campaign. However, challenges such as limited staffing, insufficient training, and low remuneration can impact the quality and range of services provided. Goulding (1995) states that investing in the professional development of library staff and attracting qualified professionals is vital for the campaign's effectiveness.

Policy and institutional support

Libraries may not be able to contribute to the SDGs if they do not have strong policy frameworks and institutional support. Policies related to funding, infrastructure development, and collaboration with other stakeholders may be lacking or inadequate. Advocacy efforts are necessary to garner stronger policy and institutional support for public libraries in Nigeria; as reported by Million and Bossaller (2020), advocacy is important to advance and maintain library services.

Addressing these challenges requires collaboration amongst government agencies, library associations, NGOs, and community partners. Strategies such as advocacy for increased funding, awareness campaigns, capacity-building programmes for library staff, public-private partnerships, and innovative outreach initiatives can help overcome these obstacles and enhance the library campaign's impact on achieving the SDGs in Nigeria.

Conclusion

Nigerian public libraries have the potential to make major contributions to the achievement of the SDGs. However, they encounter many problems that must be addressed in order to enhance their efficiency. Inadequate financing, the digital gap, restricted infrastructure, low awareness, socio-cultural considerations, personnel issues, and policy support are amongst the major obstacles that public libraries face in Nigeria. Despite these obstacles, public libraries continue to play an important role in enhancing access to education, bridging knowledge gaps, stimulating community development, and supporting self-education. They help play a critical role by enhancing access to quality education, digital inclusion, gender equality, sustainable living, health and well-being, and cultural exchange, amongst others.

Public libraries contribute effectively to the realisation of the SDGs in Nigeria by launching focused campaigns, providing diversified resources, delivering innovative programming, and cooperation with partners. If these challenges are addressed, public libraries will certainly contribute to achieving the SDGs.

Recommendations

The article suggests the following recommendations in line with the attainment of the SDGs:

- Government should increase manpower and improve allocated funds for public libraries to enable them to carry out services that can help in achieving the SDGs. Mansour (2020) states that funding is paramount for public libraries to function effectively.
- In order to equip the public libraries with the required facilities, they should be innovative in generating funds by soliciting funds from friends of the libraries, overdue penalties, fee-based services, and space rental for seminars and conferences, amongst others. Alternatively, Agosto (2008) states that public libraries can generate funds through grants, provision of fee-based services, and donations from private individuals or corporations like the Carnegie Mellon Foundation.
- Public libraries should strengthen community engagement by providing specialised information services, capacity building through workshops

and "do-it-yourself" training programmes to the public, especially rural dwellers. Hapel (2020) found that community engagement has enhanced trust and a sense of belonging with clientele whenever the library engages with its community.

- Libraries should engage in advocacy programmes on SDGs like street-walk, distribution of flyers, radio jingles, and social media campaigns to inform the public of the goals. Effective lobbying and advocacy are important skills needed by librarians to contribute to the attainment of the SDGs (Abata-Ebire, Adebowale & Ojokuku, 2018).
- Public libraries should provide SDG-related awareness programmes and materials to the public in a suitable format and local language that their users will easily understand; providing materials and communication in the local dialect of the people goes a long way in achieving the SDGs (Ugwu & Ogunremi, 2019).

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Bridging the Universal Literacy Gap

The Role of Libraries in Providing Information Access Towards the Achievement of Sustainable Development Goal 4 (SDG 4)

Sarah A. Gbenu[1]

Lagos State University

Pauline Ruguru Njagi[2]

Kenyatta University

Adebola O. Adegoroye[3]

Lagos State University

Abstract

Sustainable development was a key topic during the review of the Millennium Development Goals (MDGs) in 2005 to help meet current demands without sacrificing the capacity of future generations to meet their requirements. In order to replace the MDGs, stakeholders, including the International Federation of Library Associations and Institutions (IFLA), approved the post-development agenda in 2015. This chapter discusses the significance of public libraries in promoting equitable access to information, universal literacy, and public access to information by improving communications infrastructure. The chosen theory of change sheds light on the contribution of public libraries to achieving universal literacy. The peer-reviewed and grey literature published online between 2015 and 2021 will be examined to gather data. Additionally, data will be thematically evaluated to assess and summarise public libraries' contributions to closing the global literacy gap.

Keywords: information access, universal literacy, SDGs, MDGs.

1 Sarah A. Gbenu, Lagos State University, Nigeria; Email: gbenusarah52@gmail.com
2 Pauline Ruguru Njagi, Kenyatta University, Kenya; Email: rugurupauline@gmail.com
3 Adebola O. Adegoroye, Lagos State University, Nigeria

Introduction

Although the United Nations Sustainable Development Goals (SDGs) call for action is a bold initiative that the United Nations adopted in 2015 in an effort to, amongst other things, end poverty, safeguard the environment, and achieve universal literacy, there is a need for alignment with functional units in society. Positive progress that benefits the human population without impairing the potential of the next generation to significantly meet present and future requirements and advance socioeconomic development is what is meant by sustainable development. The SDGs are based on the Millennium Development Goals (MDGs), which include an integrated framework for global participation from all countries and acknowledge that access to opportunity starts with access to knowledge and information (Tbaishat, 2021:124-143).

Libraries are viewed as organisations that give people a large platform to learn, innovate, and develop skills essential to sustainable development. The ability of libraries to deliver knowledge to the community will be impacted by the SDGs' actualisation because libraries are crucial tools for the development of society. Furthermore, knowledge development is influenced by information access, which reduces ignorance and the amount of environmental uncertainty. Information is a fundamental right that promotes social and economic justice as well as individual and social development. Libraries are considered effective venues for enhancing public access to information, society's capacity for knowledge generation, and information literacy skills, all of which contribute to various levels of empowerment, especially for marginalised groups and those who live in poverty and their involvement in economic development (Tbaishat, 2021:125–143).

In SDG 4, the United Nations envisioned a society where everyone has fair access to high-quality education. The ability to leave poverty and advance socioeconomically is made possible by universal access to education. Significant advancements have been made in boosting school enrolment figures for both boys and girls, especially those in developing nations, since the turn of the 20th century (Dapo-Asaju & Bamgbose, 2019:184-190). However, the 2018 SDGs secretariat report on enrolment revealed that more than half of all children and adolescents do not meet the minimum competence requirement, particularly in reading and mathematics, and that around 260 million children do not attend school. By utilising high-technology, low-technology, and no-technology ways and assisting nations in mobilising resources, the Global Education Coalition (GEC) aims to deploy creative and context-appropriate solutions to provide education remotely. Additionally, the GEC seeks to ensure that everyone has access to resources through fair solutions, prevent duplication of effort through coordinated

actions, and prevent an increase in dropout rates by ensuring 100% of the students return when schools reopen (Omona, 2020:1-19).

Achievement of universal literacy through UNESCO Public Library Manifesto

According to the United Nations Educational, Scientific and Cultural Organization (UNESCO) Public Library Manifesto, nformation, literacy, and education should be reflected in the fundamental services provided by public libraries (UNESCO, 2022). As a result, information specialists in public libraries should work to instil and reinforce reading habits in choldren from an early age and support formal and informal self-education at all levels. The manifesto also recommends that public libraries offer chances for creative growth, especially for young children. Public libraries should develop literary programmes for people of all ages, promote oral tradition, give people access to cultural expression through the performing arts, and promote intercultural conversation that supports cultural diversity (Andersdotter, 2018:777-780).

The UNESCO manifesto was a major catalyst for the growth of public libraries across the world, but especially in the emerging nations of Africa (Dapo-Asaju & Bamgbose, 2019:184-190). General tax dollars sponsor public libraries and have the legal right to provide free services equally to everyone in the neighbourhood. Because they provide timely access to accurate information and sufficient knowledge, public libraries are better positioned to meet the SDGs, particularly those relating to excellent education. Unrestricted access to high-quality information enables people to take advantage of economic possibilities and empowers them to make decisions that could improve their standard of living. Knowledgeable people are better able to reduce poverty and inequality, progress agriculture, maintain excellent health, promote culture, and boost the economy through research and innovation.

Based on this, the following research questions were chosen:

1. What is the role of public libraries in promoting inclusive access to information?
2. What telecommunication infrastructure should be implemented in public libraries to enhance universal access to information?
3. What are functional approaches to the achievement of universal literacy?

Theoretical Framework

Theory of change

The theory of change was developed by Weiss in 1995 and offers interventions based on ad hoc examination of the available data that lead to a particular

development. The model is helpful in developing solutions to problems that successfully address the root causes of problems that impede progress and guide decisions regarding the best course of action. With a timetable for completion, the SDGs establish a shared set of developmental objectives for all communities worldwide by 2030 (Dapo-Asaju & Bamgbose, 2019:184-190). Change in information agencies could contribute to a workable strategy for actualising the SDGs, particularly knowledge acquisition to eliminate ignorance, as libraries are significant institutions that provide a channel for knowledge access, information literacy skills, lifelong learning, and research for economic development (Pinto & Ochôa, 2020). In addition, it is challenging for public libraries to campaign for significant and long-lasting support without strong associations, partnerships, networks, and clear, feasible plans. Decisions that affect policies may help garner support from local, national, regional and international entities, since libraries are regarded as powerful agents of change. Furthermore, broad access to information is necessary for significant development. Therefore, public library personnel should put into practice the many suggestions, such as promoting the sustainable development aim of universal literacy and facilitating access to information, by providing high-quality information services pertinent to community requirements (Mansour, 2020).

Methodology

In order to arrange, collect, and analyse data samples for a reliable research result, the study used a secondary research strategy to systematically investigate online peer-reviewed and grey literature produced between 2015 and 2021. The layout makes it easier to analyse patterns found in earlier studies and use the knowledge to understand the process that leads to the implementation of the SDGs through a public library platform. The consulted material focused on the global contribution that libraries provide to realising universal literacy (SDG 4).

Observation and discussion of key themes

Discussion

Public library role in bridging literacy gap

According to Okuonghae and Igbinovia (2019), public libraries can help to realise the SDGs by fostering information, and digital and media literacy. Additionally, bridging the information gap and promoting universal literacy by assisting diverse institutions, including the government, non-governmental organisations (NGOs), and corporate organisations, to grasp local and indigenous knowledge (Bradley, 2016). Adopting the necessary

infrastructure to improve digital inclusion and unrestricted access to knowledge is necessary since the general public funds libraries through special levies (Tbaishat, 2021). States dedicated to closing the literacy gap and reducing levels of population ignorance have made significant investments in public libraries to increase knowledge collecting and dissemination (Poluru, 2020).

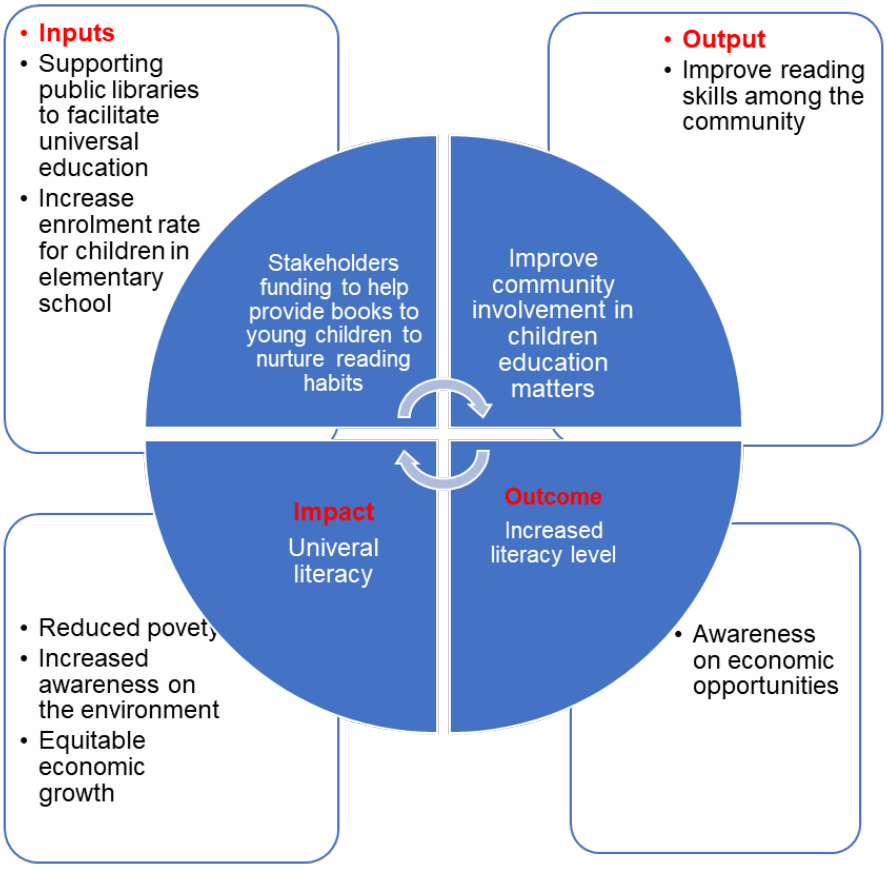

Figure 7.1: Illustrating theory of change (Researcher, 2022).

Public libraries as local gateway to knowledge

According to the International Federation for Library Associations (IFLA) and the UNESCO Public Library Manifesto, the library is a living force for education and culture, (Jain & Jibril, 2017). Additionally, the IFLA believes that information is a crucial tool for promoting world peace and spiritual welfare via the minds of both men and women. (Omona, 2020). Fundamental

human values such as freedom, wealth and individual growth depend on adequate education and unrestricted access to knowledge, ideas, cultures and information. Public libraries play a crucial role as the community's access point to knowledge, providing the fundamentals for independent decision-making, lifelong learning, and the cultural development of individuals and different social groups (Abata-Ebire, Adebowale & Ojokuku, 2018).

Role in community development

Public libraries play a crucial function as social and cultural organisations, particularly in underdeveloped and underprivileged areas of emerging countries. The provision of information and related services to rural areas encourages the growth of knowledge, skills, and a lifelong learning culture (Okuonghae & Igbinovia, 2019).

Conclusion

In order to accomplish SDG 4, which calls for guaranteeing inclusive and equitable access to high-quality education for everyone, libraries are essential for closing the information access gap and promoting literacy amongst all people. In addition to offering access to a variety of educational resources such as books, journals, databases, and online platforms to support literacy and education, libraries are important sources of knowledge and information. Additionally, programmes like literacy campaigns and reading clubs can assist in raising literacy rates, encourage lifelong learning, and support social and economic growth.

Public libraries should include all age ranges, linguistic minorities, and special needs groups while developing their collection. Additionally, the public library should develop its collection with specialised elements like appropriate media, contemporary technologies, and traditional aspects like print materials in order to improve universal access to knowledge and to close the literacy gap. The informational materials must reflect modern social trends, societal growth, and memories of human labour and creativity that are pertinent to the conditions and demands of the region.

However, in order to accomplish SDG 4, public libraries must be redefined; finances must be dramatically released to assist programmes promoting universal literacy; public libraries and librarians must be supported in promoting the SDG 4 agenda; and technological infrastructure must be strengthened to provide access to digital resources. As a result, it is crucial to support libraries and ensure that they have the tools, funds, and assistance required to grant everyone access to knowledge and education.

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Leveraging Content Strategy for Library Digital Media Platforms amongst Selected University Libraries in Zimbabwe

Stephen Tsekea[1]

Bindura University of Science Education

Josiline Chigwada[2]

University of South Africa

Abstract

Many organisations have created websites and digital media platforms to communicate with patrons. University libraries have also embraced these digital ways of sharing resources and services. However, many times users have difficulty in finding information. There is also a lack of properly established policies on content creation, updating, and sometimes deletion. Some staff handling these digital media platforms may lack proper skills in making a strong social media presence for their organisations. Some libraries are therefore finding it difficult to have well-written content and maintain a viable and beneficial online presence. This work is based on a survey of twenty universities in Zimbabwe. An online questionnaire was sent to the university librarians involved in digital media technology creation and updating. A follow-up digital content analysis of the sixteen universities that responded to the questionnaire was conducted. The findings showed that all the libraries produce digital media content, although some do not have policies. The major challenge is updating the content. The authors recommend that librarians should continuously develop themselves so that they are able to deal with digital media content creation, maintenance and deletion.

Keywords: digital media, websites, content strategy, university libraries, digital.

Introduction

Libraries have adopted technology to enhance their services and resource delivery. The use of such technology has seen libraries developing digital platforms such as websites and social media pages. Web content is a valuable

1 Sub-Librarian, Bindura University of Science Education, stsekea@buse.ac.zw
2 Post-doctoral Research Fellow, University of South Africa, chigwaj@unisa.ac.za

asset on the Internet (Tatar, Dias de Amorim, Fdida & Antoniadis, 2014). In Zimbabwe, many university libraries have social media pages and websites for communicating with their patrons. Such digital platforms have been created to enhance the services offered by these libraries. Often libraries post news and announcements on their digital platforms, e-resources collections, opening hours, visions and missions, services offered, guides, and various library programmes and activities (Pasquini, Amerini & Boato, 2021; Datig, 2018; Elsayed, 2017). However, some of the platforms seem to be created mainly for the sake of just having one. There is a lack of content updates, poorly crafted content, old information, and a deficit of proper policies for the creation and handling of these digital media platforms (Datig, 2018). Instead of harnessing such great tools for their advancement, some libraries are destroying their image. It is against this background that the study was conducted to achieve the following objectives:

- To discover the content posted on digital media platforms by university libraries in Zimbabwe.
- To examine the policies on content creation, updating and deletion in university libraries.
- To assess the challenges faced by university libraries in content creation and updating.

Literature review

The literature presents a complete communication shift from a traditional to a more contemporary approach where digital media usage can determine an organisation's or company's trajectory (Sundaram, 2017; Elsayed, 2017; Blakiston & Mayden, 2015). Libraries are using more digital media platforms to enhance their users' experience. Datig (2018) notes that many libraries are increasingly pursuing ways to make sure that they increase their online presence for marketing and outreach programmes. The need to ensure that libraries are fulfilling the demands of the twenty-first-century user has led to libraries developing effective marketing strategies. Sundaram (2017) notes that if organisations are to survive, there is a need for their marketers to improve the organisation's online marketing through social media platforms. Organisations need to ensure a vibrant content strategy for generating, uploading and deleting content (Blakiston, 2013).

Scholars (Datig, 2018; Elsayed, 2017; Quadri & Adebayo, 2016; Newton & Riggs, 2016; Blakiston & Mayden, 2015; Raward, 2001) show how mainly different projects have addressed the issue of content on websites. The main conclusions of these projects have been summed by Datig (2018) as "if the issue of content is left unmanaged, it may lead to potential loss of credibility

that can frustrate users". Content communicates information about a product or service (Datig, 2018). According to Elsayed (2017), content is king, "everything is content", "it's all about content", and "content comes first". Content strategists try to make sure that they use words and data that will not create unambiguous content that supports meaningful and interactive experiences (Lovinger, 2007). Datig (2018) sees content strategy as a valuable tool for libraries looking to improve their marketing and the overall experience users have when interacting with the library.

Academic libraries use social media content to engage, collaborate and promote their services (McCallum, 2015). Further, Adetayo and Williams-Ilemobola (2021) note that libraries use social media platforms to market various library resources and services, provide news and announcements, and upload various videos and photos of user guides and events taking place at the library. Library websites and social media platforms such as Facebook, Twitter, blogs and discussion forums are popular digital tools. Elsayed (2017), using a quantitative approach, studied the strategies used by academic institutions to develop and upgrade their content. He surveyed website coordinators who participated in the study and found that none of the universities surveyed had a web-content strategy or were working on one.

Blakiston (2013) notes that many academic libraries have challenges in developing content. They end up developing content that is complex and sometimes old. The lack of such content strategy policies in many institutions has resulted in staff members being assigned to upload content but with very little guidance and experience in how to do it. In a study by Avemari and Bolarinwa (2012), they found that university websites could not meet the user's information needs due to the shortcomings of their content. Elsayed (2017) surveyed university website coordinators and found that 35% had qualifications in fields unrelated to website design and thus may have the potential to contribute negatively towards content uploading. Tatar *et al.*, (2014) also note that democratising web content creation has led to mere consumers becoming creators and content distributors with fewer skills to upload content. Therefore, the importance of content creation and management highlighted by Datig (2018) led to this study to assess if librarians manage the content posted on various social media platforms. The lack of new content or the dormant nature of some social media platforms of some university libraries in Zimbabwe led the authors to find out if the librarians are facing challenges in content creation and management.

Methodology

An online survey was used to gather data whereby a census of all university libraries was conducted. The population of the study was composed of

librarians from twenty university libraries in Zimbabwe. Of these, fourteen are state universities, six are private universities, and all were chosen regardless of their ownership status. The twenty universities have functional academic libraries that are manned by professional librarians and thus were targeted. Due to its embedded data analysis feature, which would assist in the analysis phase, an online survey tool, Google Forms, was used to collect data from the respondents. The targeted respondents were librarians creating, updating, and posting content on social media, university websites, and other online digital platforms. Sixteen responses were obtained, showing an 80% response rate. A follow-up web content analysis of the sixteen universities that responded was conducted to check the type of content uploaded on library websites and official social media platforms to confirm the data obtained from the questionnaires. To ensure that the official social media platforms were used, only those with links to the library website were consulted. A six-point checklist schedule was designed to analyse the digital platforms. The checklist had the following points to be observed:

- when last was the content uploaded/added,
- how often is content uploaded,
- type of content uploaded,
- interactions with clients,
- the time taken to provide feedback, and
- any errors noted.

The collected data was then coded using this checklist and the analysis feature within Google Forms was used to analyse the data.

Findings and discussion

Respondents indicated they are utilising the library website, Facebook, Twitter and the e-learning portal. This is in line with what was stated by Adebowale and Williams-Ilemobola (2021), who indicated that libraries are now utilising digital media platforms for marketing library resources and services. The majority utilised the library website and Facebook, while only one used the e-learning portal to communicate with the clientele, as shown in Figure 8.1. This shows that the university libraries in Zimbabwe are moving along with the trending issues as a way of meeting the patrons where they are since most users are now making use of the various digital media platforms to obtain information and to communicate with the librarians (Pasquini et al., 2021; Datig, 2018; Elsayed, 2017). The e-learning portal has been pointed out as one of the platforms being utilised, since some chat features and discussion forums are more like social media platforms that users take advantage of to communicate with the librarians.

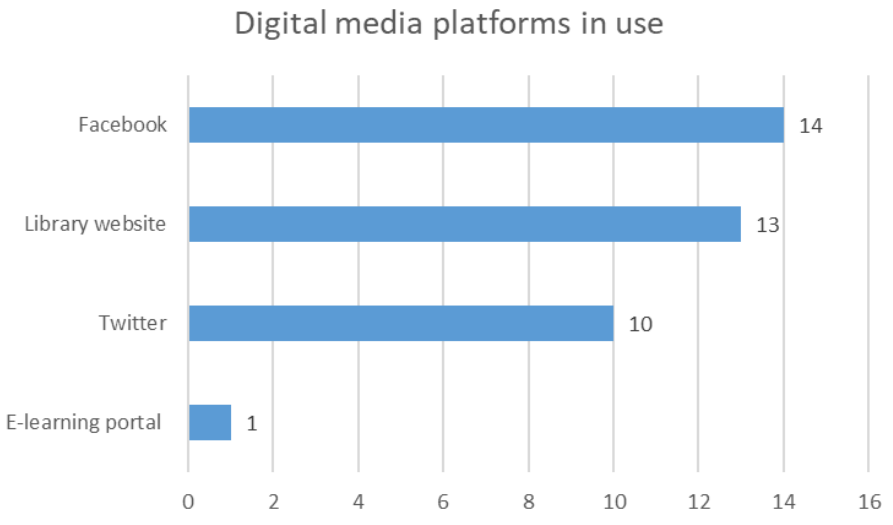

Figure 8.1: Digital media platforms used in libraries.

The posts normally posted on these digital media platforms include announcements, new databases and acquisitions, training calendars, information about opening hours, any new developments in the library, e-resources promotions, library events, tutorials, scholarly information, and upcoming events, as shown in Figure 8.2. This shows that university libraries are utilising social media and other digital platforms to dispatch urgent news that can benefit the clients to create awareness of the available services and products within the library, as supported by Datig (2018).

The findings showed that librarians use policies such as the university information and communication technology (ICT) policy, the library ICT policy, the social media policy, and the institutional repository policy to develop, upload and delete content. This supports what was pointed out by Blakiston (2013), who wrote about the importance of a vibrant content strategy when dealing with e-content. The majority of the libraries make use of the institutional repository policy, as shown in Figure 8.3. This shows that there are some guiding principles that should be put in place when utilising various social media platforms from the content creation stage to deal with challenges that might arise when using the platforms. Therefore, the findings showed that all the policies that deal with digital content management had been consulted by the librarians from the department to the university-crafted policies.

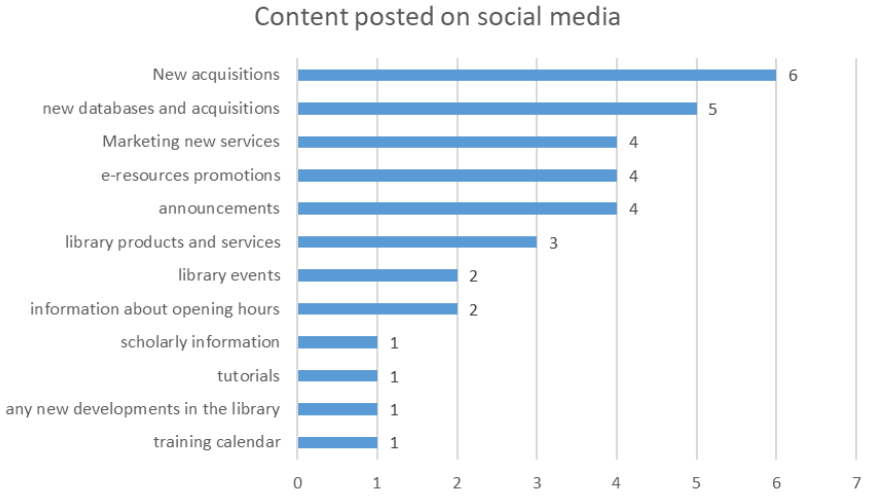

Figure 8.2: Types of content posted on digital media platforms.

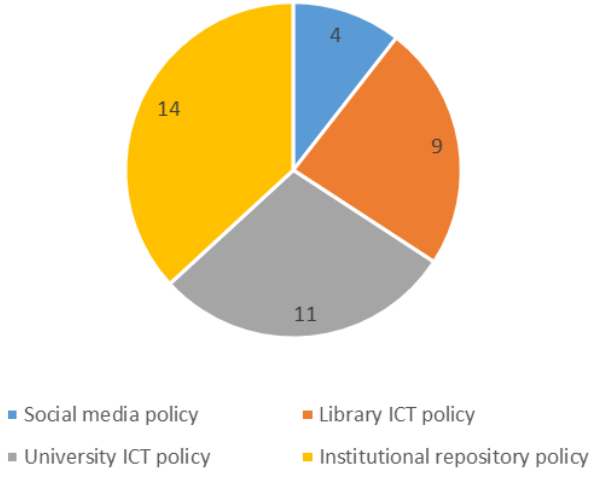

Figure 8.3: Policies for digital content creation.

In terms of frequency of updating content on the digital media platforms, the responses ranged from daily to monthly, while others indicated that they do not have a policy to that effect, as shown in Table 8.1. In terms of deleting content, the respondents stated that they do so yearly (1), weekly (2), monthly (3), and have no policy (10). This shows some variations within

the university libraries since some are not governed by any policy in terms of content creation and management, as supported by Elsayed (2017).

Table 8.1: Frequency of updating content on digital media platforms:

Frequency of updating content	Count
Daily	2
Weekly	8
Monthly	2
No policy	4

There are specific people dedicated to content creation, updating, and deletion on digital media platforms in fifteen institutions; only one did not have someone responsible for that. Three respondents indicated that the dedicated person is at the top management level, eleven at the middle management level, and one at the operational level.

The challenges are a lack of skilled personnel to run the section for digital media content creation, uploading, and deletion; lack of policies on updating and deleting content; too much bureaucracy; too much technical jargon, which might be difficult to understand for students. Elsayed (2017), Tatar *et al.*, (2014), Blakiston (2013), and Avemari and Bolarinwa (2012) documented the same sentiments in terms of the challenges being faced by academic libraries. However, Olajide and Alao (2015) noted a general problem of awareness in academic libraries on implementing and utilising social media digital platforms in developing countries. Figure 8.4 documents the challenges pointed out by the respondents.

Half of the respondents, eight, indicated that they were not trained in digital content management leading to the mentioned challenges when they carry out their duties. The other half, eight, stated that they received some form of training that gave them leverage in dealing with some of the challenges that might be experienced.

It was discovered that library websites are all encompassing for the library services, as stated by Sundaram (2017) and Datig (2018). However, most of them have dates of last updates ranging from 2016 to 2022. It was difficult to find the dates of when the content was updated on some websites. Four library websites were not accessible from the university home pages. Links for social media platforms ranged from Facebook, Twitter, YouTube, WhatsApp, Google+, and Pinterest. However, some were broken links from the library website. One of the Facebook pages was last updated on 19 August 2021. About six hours before the research was conducted, the latest had just

been uploaded. Some university libraries have challenges with their digital media platforms as some websites are inaccessible and have little and old content, as pointed out by Avemari and Bolarinwa (2012).

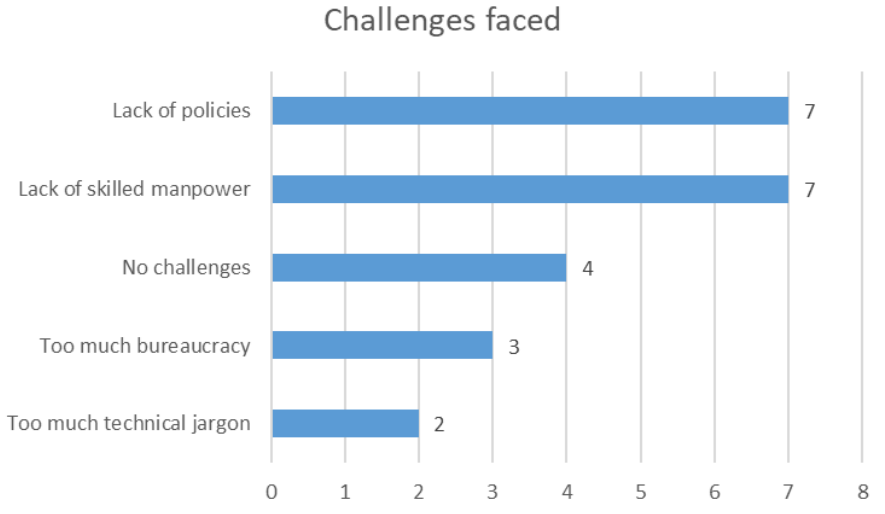

Figure 8.4: Challenges faced in creating, updating, and deleting digital media content.

Conclusion and recommendations

In conclusion, it can be noted that digital media content is available in the form of notices and library services, and libraries are using policies to create and upload content. All the academic libraries use various digital media platforms such as library websites, e-learning portals, and social media platforms such as Facebook and Twitter to communicate with the clientele. However, the major challenge is updating the content on the websites and other digital media platforms. There is also a general lack of skills in content creation, updating, and deletion on these digital media platforms since most of those dedicated to the management of these platforms were not trained in digital content management. The authors recommend the need to upskill and reskill librarians to be able to continuously update the content on digital media platforms and to develop policies that assist librarians in creating, uploading, maintaining, and deleting content. Training can be on how to influence people using language and, as argued by Halvorson (2009), that people understand that more content may not necessarily mean better content and that less is more because it is easier to manage and is user-friendly. Policies should align with the trending issues in academic

librarianship that allow for the moderation of what is posted on digital media platforms as well as the roles and responsibilities of all those who utilise the platforms. Without these guiding principles, it would be difficult to ensure that the content is being managed on these platforms, which might deter users from frequently visiting and utilising them. This is very important as content is what users come to read, learn, see or experience (Halvorson, 2009).

Despite the challenges university libraries faced by in digital media content and management, the authors recommend the continuous use of these platforms to engage with the patrons and ensure that the digital media platforms are always updated. Similarly, Buchanan (2017) concurs that content strategy is an important aspect of the development of digital media platforms and libraries should continue to harness the potential offered by these tools. Content strategy can potentially improve both the user experience and the library itself (Datig, 2018).

Library users can be informed about the digital media platforms during library orientation as well as information literacy training sessions so that they are aware of the type of information they can obtain from these platforms. This would enhance the usage of these platforms and might be a motivation amongst librarians to continue posting new content and managing the platforms. Each university library should have a staff member responsible for content creation and management on digital media platforms and social media; it would be good to update the content daily in line with what would be happening within the library. These content creators can be at the middle management level so that they are able to implement the policies in place that govern the use of various digital media platforms.

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Offline Internet for Remote Learning in Low-Resource Environments

Paul Ingiona Adie[1]
University of Calabar
Anthony Etta Bisong[2]
University of Calabar
Otu Michael Obuop[3]
University of Uyo

Abstract

Offline Internet is a specially designed computer system that stores information in very large quantities for learning in low-resource regions, either by direct retrieval of information from a storage device, a Wi-Fi-enabled seeder sharing its resources with leech-computers or a device that periodically updates its local information contents whenever it goes online. The offline population faces barriers to Internet adoption spanning four categories: incentives, low incomes and affordability, user capability and infrastructure. The taxonomy of offline Internet is classified functionally under three major groupings: completely offline systems, hybridised offline systems and offline servers. The problems of offline Internet include a learning analytics challenges, what learning metric to measure, device divide, gender divide, institutional technophobia, and the need for greater local technical competency. Recommendations made include enabling offline Internet interventions to supply data on user's learning activities for educational data mining goals, building in of learning analytics component that simulates the academic performance of users, memory retention, learner engagement and self-regulated learning, and the use of existing technological devices that are owned by the majority of the target population. Women should be necessarily included in technological interventions for remote learning, and they should be ensured of meaningful benefits from such projects; thus, schools and educators should encourage both bring-your-own-device and use-your-own-device (UYOD) initiatives as practical

1 Paul Ingiona Adie, Faculty of Educational Foundation Studies, University of Calabar, Nigeria; pauladie@unical.edu.ng.
2 Anthony Etta Bisong (PhD), Educational Technology Unit, Department of Curriculum and Teaching, Faculty of Educational Foundation Studies, University of Calabar, Nigeria.
3 Otu Michael Obuop (PhD), Faculty of Education, University of Uyo, Nigeria.

steps to overcoming the digital divide and a smart way to utilise digital literacy skills, and efforts should be made to expose some driven students to the technologies so that in the absence of technicians, meaningful solutions can still be realised.

Keywords: offline internet, remote learning, SDG 4, low-resource environments, emergencies.

Introduction

Offline Internet is that specially designed computer system that stores information in very large quantities for learning in low-resource regions and/or emergencies, either by direct retrieval of information from a storage device, a Wi-Fi-enabled seeder sharing its resources with leech-computers or a device that periodically updates its local information contents whenever it goes online. We are in the age of "device store width" and no longer Internet bandwidth; thus, the amount of relevant information a non-human device can store offline is more important than Internet speed which is unavailable in most parts of the Global South and emergencies.

According to Sprague *et al.*, (2014), the offline population faces barriers to Internet adoption spanning four categories: incentives, low incomes and affordability, user capability and infrastructure. For incentives, barriers in this category include a lack of awareness of the Internet or use cases that create value for the offline user, a lack of relevant (local or localised) content and services, and a lack of cultural or social acceptance. The root causes of these consumer barriers include the high costs that content and service providers face in developing and localising relevant content and services and their associated business model constraints, low awareness or interest from certain audiences, limited Internet freedom and information security (Sprague *et al.*, 2014).

The second barrier in the category is low income and affordability. In this area, the predominant barrier is the low income of individuals in the offline population. This barrier is exacerbated by the high costs associated with providing access to the Internet for disproportionately rural populations. The low incomes reflect the poor economic circumstances of large segments of the offline population, often including unemployment and the need for economic development, employment, and income growth opportunities in their regions. At the same time, there is often a lack of adjacent infrastructure (such as roads and electricity), thereby increasing the costs faced by network operators in extending coverage. Several other factors can contribute to high service costs for device manufacturers and network operators, including taxes and fees and, in the case of some countries, an unfavourable market structure (Sprague *et al.*, 2014).

The third barrier in the category is user capability. This category includes barriers such as a lack of digital literacy: unfamiliarity with or discomfort in using digital technologies to access and use information, and a lack of language literacy: the inability to read and write. The root cause of such literacy barriers is often an under-resourced education system (Sprague *et al.*, 2014).

Infrastructure is the fourth barrier in the category. Barriers in this area include a lack of mobile Internet coverage or network access in addition to a lack of adjacent infrastructure such as grid electricity. The root causes of these consumer barriers include limited access to international bandwidth; an underdeveloped national core network, backhaul, and access infrastructure; limited spectrum availability; a national information and communications technology (ICT) strategy that does not effectively address the issue of broadband access; and under-resourced infrastructure development (Sprague *et al.*, 2014).

Ibáñez (2020) opines that remote education aims to move the in-person courses to a remote, virtual, distance, or online classroom. This method prioritises education as an emergency and looks out for the well-being of the students.

Low resource environments simply refer to places, especially in the Global South, which are beleaguered by large-scale poverty and lack of financial resources amongst the majority of the citizens. As a result of the overwhelming poverty in the region, even the educational system is underfunded and under-resourced, from a lack of adequate teachers to instructional materials and school infrastructure to poorly equipped laboratories and scanty libraries.

Emergencies refer to unforeseen situations such as armed conflict or natural disasters. Emergencies cause major disruption of education systems. Schools and colleges are often damaged during armed conflict or used for temporary accommodation of people rendered homeless or displaced by war or disasters such as earthquakes, pandemics, floods or hurricanes, and students, teachers and their families may seek safety in other countries as refugees. In situations of chronic conflict, the quality of schooling may deteriorate if governments are unable to distribute teacher salaries due to security problems and/or lack of funds (Sinclair, 2001). The common feature with all emergencies is the disruption of formal schooling; thus, governments and non-governmental organisations (NGOs) have to provide alternate means of learning remotely.

Offline Internet thus offers the panacea to the challenge of cost-efficient and cost-effective remote learning that requires no Internet data

cost or Internet connection and works with existing digital devices in low-resource environments and emergencies.

Statement of problem

There are 7.8 billion people in the world, while 3.6 billion people worldwide still lack online access (Endless OS Foundation, 2022). More so, the Alliance for Affordable Internet (A4AI) analysis has found that USD 428 billion in additional funding is needed over the next ten years to connect everyone to quality broadband by 2030, but:

- Should the unconnected population wait until 2030 before they can benefit from digital remote learning?
- How best should relevant digital remote learning be delivered to the unconnected population without incurring the cost of Internet data?
- How can an unconnected populace learn both remotely and digitally in a cost-efficient and cost-effective way?

The United Nations' Sustainable Development Goal (SDG) 4 is to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all; thus, the issue of the digital divide is an unfortunate reality that contravenes the ideals of this humanist goal. In addition, the Coronavirus disease 2019 (COVID-19) pandemic exacerbated the global digital divide leading to disruption of the schooling of over 1.6 billion students with more than 192 country-wide closures resulting in interrupted learning, unequal access to digital learning portals and a rise in dropout rates.

Offline Internet thus offers the panacea to the challenge of cost-efficient and cost-effective remote learning that requires no Internet data cost, no Internet connection, and works with existing digital devices. It is the intent of the researcher to view this sensitive technology and taxonomise the emerging field of offline internet.

Purpose of study

The purpose of this study is to X-ray offline Internet for digital remote learning in low-resource environments and emergencies. Specifically, the chapter seeks to:

1. Examine the correlates of the digital divide.
2. Define offline internet.
3. Taxonomise offline internet.
4. State exemplars of the sub-categories of offline internet.
5. State the problems of offline internet.
6. Recommend solutions to the problems faced by offline Internet use.

The taxonomy of offline internet

Completely offline systems or 'sneakernet' are those specially designed computer systems that store information in very large quantities for learning in low-resource regions and/or emergencies by directly retrieving information from a storage device, for example, universal serial bus (USB) sticks, subscriber identity module (SIM) cards, secure digital (SD) cards, mobile applications (apps), mobile devices or even computer systems. These are mostly used for personalised digital remote learning.

Hybridised offline systems are those specially-designed computer systems that store information in very large quantities for learning in low-resource regions and/or emergencies by direct retrieval of information from a device or mobile app that periodically updates its local information contents whenever it goes online, or it goes online for user authentication purposes. This category is also used for personalised digital remote learning.

The offline server, seeder networks or nano servers refer to those specially designed computer systems that store information in very large quantities for learning in low-resource regions and/or emergencies by direct broadcasting or seeding of information from a storage device or a Wi-Fi-enabled seeder sharing its resources with leech-computers or smartphones or devices. These are mostly used in schools, communities, refugee camps and correctional facilities to enable collaborative learning while still gathering data on individual users' learning activities.

Completely offline systems

- **Smart TxtBks** democratises access to content by converting old SIM cards into 'textbooks' that students can access offline using cell phones. With the use of analogue technology, students gain access to e-books, are more engaged and are freed from the burden of carrying heavy school books. Smart TxtBks is ideal for delivering 'bite-size' (160 characters) learning content that can be stored in the phone's SIM cards and retrieved as messages (Smart Communications, 2022).
- **Kiwix** is free software that brings knowledge to millions around the world by making it available offline. Wherever on Earth, learners can browse Wikipedia, read books from the Gutenberg Library, or watch technology, entertainment and design (TED) talks and much more, even if they do not have an Internet connection (Kiwix Association, 2022).
- **Two Rabbits** is an interactive audio program based on the Cameroonian official curriculum recorded via a hand-crank MPEG-1 Audio Layer 3 (MP3) player featuring songs, stories, and games performed in the Baka style and language. When an initial two-year pilot showed remarkable

results, they worked to strengthen the model based on lessons learned and expand it to twenty villages over two years (Two Rabbits, 2022).

- The **Rumie Tablet** is preloaded with high-quality educational textbooks, videos and games tailored to a student's age and curriculum. Rumie tablets are interactive digital libraries that cost less than the average textbook. All learning content can be used offline, making each tablet a portable library for students to use wherever and whenever they want (Edshelf, 2022).
- **Mavis Talking Pen and Book**: The Mavis Talking Book consists of a digital pen (Mavis Pen) and a specially printed book (Mavis Book). When the pen touches text or pictures in the book, it reads the corresponding audio, including interactive games, quizzes, multi-language translations, etc. They are talking books for literacy, numeracy, health and other subjects such as English with phonics, mathematics, rhymes, and languages (HundrED, 2022b).
- The **VPpendrive** has a complete video lecture of courses; no need for Internet connectivity. The V-Pendrive has a lifetime validity. Topic-wise, chapter-wise explanations, videos, worksheets, quizzes, and more. The V-Pendrive shows the entire content and can be viewed on televisions, laptops, tablets, projectors or smartphones.
- **Tap Tap Read** empowers low-literate youth and adults to teach themselves basic reading skills with short, interactive lessons that are fun and engaging. Lessons on alphabet, phonics, vocabulary, fluency, and comprehension help students become solid readers. Lessons work offline once the app is downloaded, and most lessons take less than five minutes to complete. The friendly, clean design helps students focus on the lesson. It is curriculum-based on the science of reading.
- The **NENA Offline e-reader** has published around 3,000 e-books in all the fields covered by African authors, half in English and half in French. Most are in electronic publication (ePub) and hypertext markup language (HTML) format for offline or online reading and on any medium (computer, tablet, smartphone, e-book reader). More complex works are in interactive portable document format (PDF) format. They all offer a rich hypertext navigation feature (African Union, 2020).
- **Sayans computers** come with educational software containing a collection of resources to enhance research even without the Internet, improving access to information and better learning outcomes. Secondly, Sayans computers have a low power consumption and are installed with a long-lasting battery bank. They are cheaper for both purchasing and continuous use as they use very little power, enabling anyone to obtain a computer. The computers are great for ICT programming and are already installed with programming software and tutorials and thus better ICT

development science, technology, engineering, and mathematics (STEM) learning outcomes (African Union, 2020)

Hybridised offline systems

- The **Jara Emergency Unit** empowers children in under-resourced communities to receive a quality education anytime, anywhere. The Jara Emergency Unit is a personal education device that enables children to learn localised education content in any language without needing access to power, a quality classroom, or the Internet. The Jara Emergency Unit is built for durability and low- and no-infrastructure contexts, collaborating with e-learning platforms for locally customised content, enabling the technology to be remotely updatable, designing for data collection (Internet of Things, IoT) and designing with communities (Jara, 2022).
- The **uLesson** SD card contains the contents of the app, including the video lessons and quizzes, and a dongle (an on-the-go device that plugs into the charging port of a smartphone or tablet and enables learners to read content from the SD card). These two items enable users to watch the pre-recorded video lessons offline without worrying about expensive data streaming costs. However, the package requires that Internet data be kept on to enable an authentication process that consumes only 0.1 megabytes (MB) of mobile data, ensuring that the SD card is being used on the account it is intended for and that the contents are not being pirated. Available subjects include senior secondary school English, mathematics, physics, chemistry and biology and junior secondary school English, mathematics, basic science, business studies and basic technology (uLesson, 2022).
- **Ustad Mobile** provides a free, open-source mobile learning app that enables conflict-affected and marginalised youth to access and share educational content offline. The app is designed for limited connectivity, works on almost any Android phone, and does not require a mini server or Wi-Fi access point (NGL Education Technology Solutions, 2022).
- **Kytabu** is a textbook leasing mobile app for curriculum textbooks used by 11.8 million students in the Kenyan education system. Built to provide low-cost access to digitalised versions of all Kenyan textbooks, Kytabu enables teachers and students to rent textbooks a page at a time, a chapter at a time or full book for periods varying from one day to one week, one month and one school term (African Union, 2020).

Offline servers

- **Kolibri** is unique in that it provides offline educational content that can be curated to standards or to meet local needs while providing pedagogical support to educators. It excels in environments where mini -earning hubs can be created to replicate the experience of some tools with learning management system (LMS) functionality available online but without the Internet. Digital content is first scraped from the web and hosted in a library, which runs on a local server. From there, a curriculum developer or any other educator into channels can organise content or lists of curated content, which are then synced to instances of the app installed on local devices. The content can then run without any further Internet connection, and the teacher can work with learners through a special teacher view, which allows them to manage classes, view student progress, create exercises, and more. Synchronising content and data through peer-to-peer or storage devices is seamless (HundrED, 2022a).
- **i-Pathways Oasis** is an innovative solution that delivers all of the i-Pathways curricula, features and functionality to a computer laboratory environment on a single, unique device. Students can connect to the device wirelessly and access the i-Pathways system and curricula. Students can complete assessments, engage in all the instant feedback activities, and prepare for their high school equivalency exams. Teachers can track student progress and provide feedback (i-Pathways, 2022).
- **Internet-in-a-Box** brings the best of the world's free knowledge (Wikipedia, Khan Academy, Open Street Map, e-books and many others) to those working offline, such as anybody nearby with an old smartphone, tablet or laptop. An Internet-in-a-Box "learning hotspot" can be set up anywhere in the world, even with solar power, using very diverse hardware (Internet-in-a-Box, 2022).
- **The Ideas Cube** creates a Wi-Fi hotspot that users can connect to using a smartphone, tablet, or computer to access thousands of educational, cultural or training resources. In a library, a school or a medical dispensary in a rural area, the Ideas Cube provides content in the form of texts, videos or online courses and allows around forty simultaneous connections. The Ideas Cube can be updated to broadcast new content when connected to the Internet. The data and frequency of user use are then collected to best meet their needs in the field. The Ideas Cube emits a Wi-Fi signal with a range of up to 30 meters depending on the environment. Up to 40 users can log in simultaneously with a smartphone, tablet or computer. The battery allows up to five hours of autonomy and can be charged with solar panels (LWB, 2022).
- **KA Lite Offline Server** is lightweight web application software that allows users without Internet access to engage with Khan Academy videos and

exercises in completely offline settings. It brings the flipped classroom model to some of the most remote areas in the world. Users can track their progress through videos and exercises, and coaches can log in to check students' progress, identifying which areas the students need the most help in. If KA Lite ever reaches an Internet connection, it can synchronise this usage data with the KA Lite Hub, an online data repository that allows project administrators to view data and manage accounts remotely of offline deployments. KA Lite is no longer under active development (KA Lite, 2022).

- **Scolaryx**, an educational box, is a micro server containing the equivalent of 10 000 lessons available offline. Its administration is relatively simple and can be performed by the head of the school, the learner or a parent. The Scolaryx box contains a Wi-Fi card to connect to a computer and access educational content without the Internet. The Scolaryx mini box also has high-definition multimedia interface (HDMI) access for classroom class screenings. Scolaryx can also be used with a mobile phone or tablet and thus enjoys the intuitiveness of mobile technologies to enable learners to feel the reality they are entering the classroom. The diversity of educational resources (videos, animations, sounds, quizzes, games, etc.) offers learners an exhilarating learning experience (African Union, 2022).
- **EDBox** is a nano server that allows students, teachers and parents to access tens of thousands of educational content without access to the Internet. Teachers can use these digital resources in class. Accompanied by a mini projector, the EDBox can be used to simulate difficult concepts that need to be represented and to show or demonstrate the operation of mathematical, biological, physical, and chemical processes. The box is also a library of downloadable resources that enable students to have documentary resources in various disciplines and formats from developed countries. This affords students an equal opportunity to access knowledge. The pedagogical uses of this device are numerous: self- or teacher training, course preparation, classes before pupils, and provision of free educational content to download on Wi-Fi smartphones for teachers, parents and students (African Union, 2022).
- **Kekelitheque** is a virtual library accessible via a web platform or a mobile application without necessarily requiring an Internet connection. A virtual library is a collection of digital documents such as texts, images and sounds, digitised or born-digital, accessible remotely, especially via the Internet, offering different public information access modalities. Kekelitheque offers several advantages:
  - a very easy "offline" access to educational resources (without a need for Internet access),

- easy installation of the Kekelitheque chest,
- a library suited to rural areas,
- the effective preservation and classification of educational resources, and
- a reduced budget for the installation and maintenance of Kekelitheque (African Union, 2022).

- **RACHEL Pi** is an acronym for remote area community hotspot for education and learning. RACHEL Pi is a portable, plug-and-play server that can connect a whole classroom of computers to a world of educational content with a single click. It stores copies of open educational websites such as Wikipedia, Khan Academy and physics education technology (PhET) simulations and makes that content available over a local wireless connection (HundrED, 2022c).
- The **Corrections Off-Line Education Platform (COEP)** is an offline digital library that provides a full Internet-like experience for users in detention, treatment and other institutions that lack Internet access. Rich with millions of resources for the General Educational Development (GED) test, high school, secondary, and post-secondary education, it is in use at dozens of correctional facilities around the US (Amini, DiVittorio & Clarke, 2022).

Problems of offline internet

1. Learning analytics challenge: Offline Internet usage poses a challenge in providing data on users' learning outcomes since they do not have the learning analytics component and connectivity of feedbacking learners' data to the server for educational data mining goals. The inability of an offline Internet system to capture learners' activities will only lead to uninformed decision-making by the organisation behind the project because if an offline Internet intervention cannot be evaluated on the learner's terms, its impact cannot be quantified and qualified. Data must be collected to comprehensively review the impact of educational technology interventions, as there is a bias within studies to focus on the positive impact of educational technologies. This often means "unintended consequences are ignored or simply not looked for". Only through providing more balanced findings can education stakeholders better understand the actual effects of educational technology interventions on marginalised learners (Zubairi, Kreimeia, Jefferies & Nicolai, 2021).
2. What learning metric to measure: Most offline Internet interventions are only interested in measuring the number of downloads or the opening of files contained. Few offline Internet interventions have a learning

analytics component that reports or simulates academic performance, self-regulated learning, learner engagement, retention of learnt content, etc. (Zoom, 2020; Dele-Ajayi, 2020).

3. Device divide: The use of devices not owned by all target users or unaffordable by the majority of users of an offline Internet intervention only further embeds inequality in access instead of reducing it (Zoom, 2020). If the majority of the target learners own smartphones, then it will be wasteful to use laptops as the offline Internet intervention, as the majority of the target users will be excluded from benefiting from the educational project.
4. Gender divide: Most women are not engaged in the use of technology for learning around the world (Zoom, 2020). Crompton, Chigona, Jordan & Myers (2021) observe multiple barriers that influence gender disparities in accessing and benefiting from educational technologies, including social inequalities or norms and technological constraints (Cullen, Mallett & Murphy, 2019). Girls are often more likely to have lower levels of digital literacy than their male counterparts (Crompton *et al.*, 2021; Zubairi *et al.*, 2021). A study conducted by the Malala Fund found that fathers were 36% more likely to support and assist their sons' learning using EdTech during COVID-19 than their daughters' learning (Crompton *et al.*, 2021).
5. Institutional technophobia: In most secondary schools, there is resistance by institutions and teachers to students using their devices in schools (Onyema, 2019). The platform iCampusgh was initially designed by Ghana's Centre for National Distance and Open Learning (CENDLOS) in 2016 to be used as an intranet on the iBox, a Ghanaian-developed local server fixed into ICT laboratories in schools and with content provided as part of a wide-scale ICT development programme with funding provided by the World Bank. The content on iCampusgh/the iBox was initially planned to provide ICT-based learning and teaching in less well-resourced senior high schools (Cullen *et al.*, 2019). However, one of the reasons for the low adoption of iBoxes in Ghanaian schools and which are particularly pertinent to teaching and learning in the senior high secondary elective sciences of biology, chemistry and physics, is government, school and parental concerns over the use of mobile phones to access ICT-based teaching and learning (Addae-Kyeremeh, Cullen, Mallet & Owusu-Agyemfra, 2021).
6. Need for greater local technical competency: Especially for offline servers or nano servers, this category requires greater local technical competency in place to support and maintain services rather than when using Internet-based services. (Kukulska-Hulme *et al.*, 2020).

Conclusion

This chapter has shown offline Internet as the panacea to the challenge of cost-efficient and cost-effective remote learning that requires no Internet data cost, no Internet connection, and works with existing digital devices in low-resource environments and emergencies. The chapter also examined the correlation of the digital divide, defined offline internet, and taxonomised offline internet, stated some exemplars of the sub-categories of offline internet, stated the problems of offline Internet and recommended solutions to the problems faced by offline Internet users. Recommendations are to ensure the optimal use of offline Internet for the achievement of sustainable development goal four which is inclusive and equitable quality education and lifelong learning for all, especially in low-resource environments and emergencies.

Recommendations

- Offline Internet providers can use short message service (SMS) technology or the Internet of Things (IoT technology to enable offline Internet interventions to supply data on users' learning activities to a computer server for educational data mining goals.
- Offline Internet providers should build in learning analytics components that do more than just record downloads. They should also be designed to simulate the academic performance of users, memory retention, learner engagement and self-regulated learning.
- Governments, NGOs and providers of offline Internet interventions should use existing technological devices that are already popular and owned by the majority of the target population, as it makes it easy to onboard the majority, if not all.
- Women should be necessarily included in technological interventions for learning, and extra effort should be made to ensure they benefit meaningfully from such projects.
- Schools and educators should encourage both bring-your-own-device and UYOD initiatives as practical steps to overcoming the digital divide, institutional and instructional inadequacies, and a smart way to utilise digital literacy skills.
- Most completely offline interventions do not require standby technicians; however, for offline servers, efforts should be made to expose some driven students to the technologies so that in the absence of technicians, meaningful solutions can still be realised.

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Embracing Emerging Technologies
in the New Normal

Libraries Staying Connected with Patrons During the Pandemic

Dominic Dankwah Agyei[1], Theresa L. Adu[2]
University of Health and Allied Sciences

Abstract

The outbreak of the Coronavirus disease 2019 (COVID-19) generated health and social concerns for the world. Beyond the loss of lives, the pandemic had social effects like lockdowns and physical distancing, devastatingly affecting human lives. One area of the Ghanaian economy that was severely affected by the pandemic is the education sector, particularly institutions of higher learning. Academic activities in most institutes of higher learning thrive and revolve around the existence of dynamic academic libraries. To circumvent the social challenges of the pandemic, most academic libraries utilised collaborative technologies to stay connected to their users. The motivation of libraries for choosing collaborative technologies is yet to be scientifically investigated in the Ghanaian setting. Thus, using the Unified Theory of Acceptance and Use of Technology II model, this study examined how libraries in Ghana relied on collaborative technologies to stay connected with users during the pandemic. In all, sixteen librarians were purposively selected from four libraries in the Volta Region of Ghana. Semi-structured interview guides with questions that sought to respond to the objectives of the study were used to glean data from the study participants. The data were thematically analysed. Few libraries stayed connected to their users. It was realised that Zoom, Moodle, WhatsApp, email, Microsoft Teams, Google Meet, and Skype were the common collaborative tools used by libraries. Decisions regarding the acquisition of these tools came from non-librarians. Performance expectancy, effort expectancy, and facilitating conditions were the librarians' primary criteria for adopting these tools.

1 Dominic Dankwah Agyei, University Library, University of Health and Allied Sciences, Ho; dadankwah@uhas.edu.gh
2 Theresa L. Adu, University Library, University of Health and Allied Sciences, Ho; tadu@uhas.edu.gh

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Introduction

The central role of academic libraries in education delivery and advancement of knowledge can never be underestimated. According to Oluwaseyi, Omozaphue, Omolere and Motunrayo (2022), academic libraries help in achieving the missions of the universities of which they are a part by acting as functional allies in academic activities and providing support for students and faculties through the provision of information resources and technology, serene ambience for personal and collective activities, programmes and events, and assistance with information retrieval and literacy activities. Academic libraries have evolved over the years, particularly with the advent of information and communication technology (ICT), enabling them to seamlessly provide innovative and user-centred services to their users regardless of the time and location (Allen & Taylor, 2017). Furthermore, technology has placed academic libraries in better positions to support all aspects of open science, including open education resources, open access, research data management, e-infrastructures, distance learning, online reference interviews, and remotely supporting patrons (Ayris & Ignat, 2018). The ability of libraries to rely on technology to constantly pursue development, adopt ground-breaking and innovative service models, and spur novelties (Allen & Taylor, 2017; Wenborn, 2018), has enabled libraries to resiliently survive many challenges, including the current Coronavirus disease 2019 (COVID-19) pandemic (Dadhe & Dubey, 2020; Lobo & Dhuri, 2021; Zhou, 2021).

The outbreak of the pandemic has generated health and social concerns for the world. Beyond the loss of lives, the pandemic has had social effects like lockdowns and physical distancing, devastatingly affecting human lives (Sikali, 2020). Notwithstanding the resilience of most library systems worldwide, the pandemic outbreak was seen as a major disaster that affected the regular operations of most libraries. In Ghana, one of the key areas of the sector severely affected by the pandemic is education, especially institutes of higher learning. Academic activities in most institutes of higher learning thrive and revolve around the existence of dynamic academic libraries. Libraries support curricula development, information literacy skills advancement, scholarly communication support, research data management, and archiving of scientific productivity, amongst other essential roles. The pandemic directly or indirectly affected all these essential roles that libraries play.

Progressively, most libraries found a way of responding to this pandemic. For instance, in separate studies by Ashiq, Jabeen and Mahmood (2022) and Hamad, Al-Fadel and Fakhouri (2022), it was found that most libraries during the disruptive pandemic period resorted to extended loan periods. The studies further recorded the suspension of fines and regular updates of library websites to stay connected with their users. Also, Harris (2021) reported on how academic libraries in Jamaica used the enforcement of government preventive protocols and the transition to online service delivery as strategies to respond to the pandemic. Meanwhile, Temiz and Salelkar (2020) observed that most libraries collaborated with other academic libraries and publishers to facilitate interlibrary loans and free access to databases, respectively. Some academic libraries utilised collaborative technologies to serve the needs of their diverse users and stayed connected to them to further circumvented the social challenges of the pandemic.

Collaborative tools include technologies that aid teamwork in achieving a common goal or objective (Whitsett, 2021). According to Lopes, Oliveira and Costa (2015), online collaborative tools help create teams composed of persons with different skills and knowledge, with such tools having the possibility to store and share information effortlessly. In the academic and scientific environment, collaborative tools integrate technology effectively into the curriculum in the project-based learning (PBL) context (Hsu & Shiue, 2017). Earlier studies on collaborative tools have focused on virtual teams in organisations (Dulebohn & Hoch, 2017; Gibbs, Anu & Boyraz, 2017), the application of videoconferencing to deliver education (Correia, Liu & Xu, 2020), telemedicine (Fatehi, Armfield, Dimitrijevic & Gray, 2014) and in the use of digital tools in business enterprises (Karl, Peluchette & Aghakhani, 2022). Amongst these tools, Zoom video conferencing, Microsoft Teams, Google Meet, WhatsApp, and Skype are the prevalent collaborative applications (apps) used for business activities and service delivery (Adipat, 2021; Hacker, vom Brocke, Handali, Otto & Schneider, 2020; Oloyede, Faruk & Raji, 2022; Pratama, Azman, Kassymova & Duisenbayeva, 2020).

In libraries, using mobile devices for service delivery is a common practice (Siregar & Dewiyana, 2018). In the developed world, videoconferencing platforms were widely utilised to assist digital technology for patrons (McMenemy, Robinson & Ruthven, 2022). Nevertheless, in developing nations, deploying online collaborative tools in library service delivery is an area witnessing a dearth of scientific literature. A search through the literature on collaborative tools in libraries, notably in the Ghanaian academic fraternity, showed that little or no work had been conducted. In an era where pandemic restrictions, blended learning, virtual meetings, and collaborative learning and working are taking centre stage, a study that sought to scientifically explore how libraries stayed connected

with their patrons during the pandemic is imperative. This is because the findings of this study will serve as a guide to using technology to mitigate the effects of future pandemics and disasters in libraries. The study also sought to understand why academic libraries chose specific collaborative technologies for service delivery during the pandemic.

Theoretical framework

This study was guided by the Unified Theory of Acceptance and Use of Technology II model (UTAUT 2) (Venkatesh, Thong & Xu, 2012). This model was deemed fit for this study because of its user-focused nature and because it comes with the synergy of the merger of eight technology acceptance models (Pinigas, Cleopas & Phiri, 2017). UTAUT 2 was also selected because of its reliability and validity. The theory informed the design of the study, the development of the data collection instrument, as well as the analysis of the data.

Methods

This study used the qualitative research design as it provided the researchers with the opportunity to solicit, in greater detail, responses from the study participants and, at the same time, helped the team to simulate participants' unique feelings regarding the objectives of the study (DeJonckheere & Vaughn, 2019). A semi-structured interview guide was used as the data collection instrument. Using this method with the guidance of the UTAUT 2 model helped to fill the literature gap regarding the focus of this study. Sixteen librarians were purposively interviewed from four academic institutions in the Ho Municipality of the Volta Region of Ghana. The interviews were conducted via phone after the researchers had scheduled to meet with the participants at periods convenient to them. The decision to conduct virtual interviews was because, at the time, the country still had some COVID-19 restrictions and protocols that prohibited face-to-face physical contact.

Further permission was sought from the participants for the audio recording of all the interview sessions, enhancing the word-for-word transcription of the interviews thereafter. Four university librarians and twelve systems librarians (or professionals in charge of e-resources in their respective institutions) were contacted. The libraries included the University of Health and Allied Sciences (UHAS) Library (the library of a public university exclusively dedicated to medical education), the Ho Technical University (HTU) Library (the library of a public technical university), the Evangelical Presbyterian University College (EPUC) Library (the library of a private university) and Ho Nursing Training College (HNTC) Library (the library of

a training college dedicated to the training of nurses). These libraries gave a good representation of academic libraries in the country. Also, the principle of saturation: a situation when no additional issues or insights were identified, and responses began to be repetitive, making further data collection redundant, which signified that an adequate sample size was reached, and staff strength: the number of staff in the departments targeted for this study, informed the sample size (Hennink & Kaiser, 2019; Saunders *et al.*, 2018). The data analysis followed the deductive thematic analysis approach, which enabled the researchers to develop the themes based on the research questions and aspects of the collaborative tools (Fereday & Muir-Cochrane, 2006). Thus, most of the themes that emerged from this study were guided by the research questions.

Furthermore, participants' phrases and sentences that were similar and sought to communicate the same idea were put together as codes. Eight initial themes emerged from the data. However, further consolidation was made to reduce them to six as some were related. It is important to note that only one of the university librarians was male, and about 70% of the systems librarians were men. Most of the participants had obtained second degrees in library and information science and related disciplines at the time of the study, with most of them spending a significant number of years in their current roles.

Results

This section of the study outlines the findings based on the themes that emerged from the data. First, the findings on the reasons libraries decided to stay connected with their patrons during the pandemic are outlined, after which the common collaborative tools used for engaging with their patrons are detailed. Furthermore, details on what motivated the libraries to adopt a particular collaborative tool, the possibility of choosing an alternative tool, the services performed with these tools, and the criteria the librarians used in selecting the collaborative tools are then offered.

The decision to stay connected

The first theme sought to respond to the question: Why did your library decide to stay connected with your patrons during the pandemic?

In this regard, only one academic library had a clear strategy to stay connected with its patrons and staff. Even with that, such a decision emanated from a general institutional directive. An assistant librarian in charge of systems at a library made the following statements:

> *For us, once there was a national directive to close down tertiary institutions, we went on break. Some of us did not really engage with our patrons during such periods. You see, I am a back-end person. I offer technical services, and so once the library was on break, I had little to do (EPUC 1).*

Even though the view of EPUC 1 reflected the views of most of the participants, a participant from another institution shared a varied view. Below is an expression from him:

> *As a university, there was a management decision to move most of the university's services [including library services] online. This meant that we kept a constant engagement with our patrons (UHAS 3).*

A participant from the same library (UHAS) further clarified the earlier stated response:

> *The university librarian was proactive by first communicating to our patrons through our Public Affairs Directorate, our decision to stay connected and the various approaches they could use to reach the library (UHAS 1).*

Another had this to say on the above theme:

> *No, we didn't have any formal policy to engage with patrons. However, there were many instances where faculty undertaking further studies would call and book for some time with you so that you take them through some training regarding a project they were undertaking (HTU 2).*

The lack of directive from the libraries also came with its own challenges, as a participant from EPUC made the following observations:

> *Even though there was no directive to engage with our patrons (which meant that we were on break), some of us kept getting requests, especially from our faculty, on various issues. Sometimes, I had to use my own Internet connection, aside [from] sacrificing my private time, in order to be able to respond to them (EPUC 1).*

Common collaborative tools

Another theme from the data was the collaborative tools available to the libraries. This theme was in response to the question: What digital collaborative tools are available for staying connected with your users?

Regarding this theme, it was observed that each institution used between one and four collaborative tools. A participant said the following:

> *We did not use only one tool. What we did was to sometimes complement our subscribed tool with other tools, especially where there was a limitation with the tool. Zoom, for instance, was good for engaging with patrons, but we could not upload files. As a result, we needed to add WhatsApp to share and maintain files (UHAS 1).*

The study further observed that the common tools utilised by the libraries (in order of usage as provided by the participants in the interviews) included Zoom, Moodle, WhatsApp, email, Microsoft Teams, Google Meet, and Skype. A participant from HTU emphasised how Zoom was widely used:

> *You know the university has a Zoom subscription. As a result, the library had an automatic subscription (HTU 1).*

Another librarian shared her view on this:

> *I think most universities through WACREN [an organisation that operates a cloud-hosted platform based on Zoom software which provides video conferencing, online meetings, chat, and mobile collaboration with users] have Zoom subscriptions. So yes, we used Zoom a lot. We also used Moodle to organise our training sessions (UHAS 2).*

Motivation for adopting tools

For this subtheme, the question was: What factors does your library consider in adopting any of the collaborative tools?

Regarding the libraries' reasons for choosing a particular collaborative tool, the study found that none of the libraries directly influenced the tool to adopt. The study established that decisions regarding what application to subscribe to were influenced by the mother institution and the availability of the tools at the disposal of the mother institution. When a participant was asked a question on the above theme, he asserted the following:

> *Hmm, unfortunately, the library was not involved in the decision to subscribe to Zoom. It was the university management that took the decision. And the decision was not made because of the library but to get a tool to serve all university services (EPUC 1).*

A participant shared a similar sentiment from HTU:

> *Even though we used Zoom, it was never our decision. No, the library did not ask for that. And it is why we needed to use the free version of other applications like Microsoft Teams to complement the performance of Zoom (HTU 1).*

Possibility of alternative decisions

The question: Would your library have decided otherwise with regard to the adoption of a collaborative tool if you had the chance?

This question produced overwhelming affirmative answers. A participant had this to say:

> *You are a librarian yourself, right? Don't you think that per the services we offer, we could get more tailored or customised applications? Zoom was okay, but we could not do much besides a few services like training and teaching (HTU 2).*

> *I am sure that some of us would have chosen other tools than the one the university subscribed to. You remember I told you earlier that we had to resort to the functionalities of WhatsApp and, sometimes, Microsoft Teams ([for] which we only used the free version) before we could efficiently engage with our patrons. However, I must also say that the subscription or installation of Moodle was beneficial. It helped us to organise our training and teaching resources in an orderly form and also helped us to engage with the patrons (UHAS 3).*

Services performed with the tools

This theme emerged from the question: What key services did your library offer with these tools?

The study found that most libraries used collaborative tools to engage with patrons for training and teaching, answering user queries, meetings and informing or updating the stakeholders.

The following are some responses to the theme above:

> *It depends on the tool. For instance, we used the Zoom purposely for teaching and training, whereas the WhatsApp was used purposely for informing our users (EPUC 1).*

> *Moodle was used for teaching. However, we engaged with the patrons via Zoom to explain further the materials we deposited on the Moodle (UHAS 2).*

Criteria for selecting a tool where applicable

At this point, the participants were asked: If you or your library had the opportunity to select digital tools to engage with your patrons, what would be your guiding criteria?

Where applicable, most libraries focused on performance expectancy (efficiency), effort expectancy (user-friendliness), and facilitating conditions to make decisions regarding adopting collaborative technologies.

> *Yes, whenever we have our way to choose, we thoughtfully do that. For instance, when we decided to add the free version of Microsoft Teams, we considered how efficiently it was in helping us engage with users and add files for groups, amongst others. So yes, for me, the tool's efficiency is important (HTU 2).*

> *You see, when I want to select an app, I always think about the end user. I ask if they can easily use it. So, for instance, I recommended we add WhatsApp to our collection of tools. This was because I felt that nobody teaches people how to use the app. It is very user-friendly (UHAS 3).*

Discussion

The emergence of the COVID-19 pandemic disrupted the usual way of life. Business enterprises had to devise ways to circumvent this disruption by finding ways of staying connected with their patrons during the period. This study found out why enterprises like libraries decided to stay connected and by what means. It further sought to determine the factors that motivated the libraries to adopt specific collaborative tools and the library services performed with them. Also, the major criteria used to inform the choice of these tools were explored.

One of the key revelations of this study was that most libraries closed down during the pandemic without any formal plan of engagement with their patrons. In tandem with this study's findings, most Bangladesh libraries did

not formally engage with their users during the lockdown periods (Begum, Roknuzzaman & Shobhanee, 2022). However, there are contrary findings, especially in the Global North. For instance, most libraries in the US decided to stay connected with their users by providing extended service through diverse means (McMenemy *et al.*, 2022). While some used collaborative technologies (Cowell, 2020; Johnson, 2020; Tanzi, 2020) and kept Wi-Fi services on throughout the pandemic (Matthews, 2020), others also loaned out library electronic devices (Garcia-Ortiz, 2021; Real, 2021) in order to stay connected to their users. A similar observation could be made from the South African experience, where the approach was to embrace the change by harnessing the opportunity to offer remote library services (Shirley, Mawire & Baloyi-Sekese, 2020). In this study, only one library had a formal decision to sustain engagement with its patrons. In this study, the libraries' decisions to remain open and stay connected to users were influenced by the mother institution. Thus, those academic institutions that decided to offer remote tuition to their students automatically enabled their libraries to stay connected with their users.

Regarding the common collaborative tools used by the libraries, it was realised that the libraries, particularly those that formally engaged with their users during the pandemic, used different tools ranging from the Zoom video conferencing tool to the WhatsApp messaging app. The decision to use multiple tools to engage with users might have stemmed from the diverse user group of the libraries to the fact that no one tool is complete for library service delivery. Earlier studies, for instance, have elaborated on how Zoom video conferencing and Google Meet became popular and were used together to rescue educational activities during the COVID-19 pandemic crisis (Adipat, 2021). Furthermore, the findings of Hacker *et al.*, (2020) showed how Zoom and Microsoft Teams emerged as widespread social technologies to enhance togetherness as a result of their abilities to enable access to human activities and contacts that were restricted as a result of the pandemic. Based on established criteria, to confirm the findings of this study, Oloyede *et al.*, (2022), identified Zoom, Skype, Google Classroom, CISCO Webex and GoToMeeting as the best and most common collaborative tools for educational activities. Thus, the findings of this study are a reflection of how these tools became common commodities, especially in the education sector in most countries.

The participants in this study, especially those affiliated to libraries that stayed connected with their users during the pandemic, revealed that their mother institutions often influence the decision to adopt a digital tool. In Ghana, most academic libraries are not autonomous, relying heavily on their parent academic institutions for most financial decisions. As a result, these academic institutions try to minimise the cost of operation by acquiring

tools that can serve a wider scope of the institution (Ajayi, Adetayo, Gbotoso & Salvador, 2021; Rachman, 2020; Rafi, Ahmad, Naeem & Jianming, 2020). Thus, once a digital collaboration tool has been acquired for teaching, the library is expected to use it for its service delivery. This finding is the main reason why the participants in this study indicated their willingness to opt for alternative tools if they had the opportunity. In some instances, the decision to acquire such tools may not involve librarians and can affect the acceptance of such tools for library service delivery.

Regarding the theme of the services performed with these collaborative tools: the findings of this study relate to earlier studies. For instance, Umaru and Omame (2020) have indicated how suitable WhatsApp and Skype are for virtual reference services. Also, Hacker *et al*., (2020) confirmed that such tools are appropriate for numerous educational activities, including library service delivery. In a period of movement restrictions, tools that make virtual communication will be embraced by many. Thus, the acceptance and use of these collaborative tools during the pandemic might result from the convenience these tools bring to both the librarians and their users in overcoming the challenge of restrictions on movement.

Finally, this study revealed that whenever the participants had the chance, they focused on efficiency, user-friendliness, and their belief that such tools can solve their problems as the key criteria for making decisions regarding the adoption of collaborative technologies. These three selection standards have been confirmed by earlier studies conducted by Onaolapo and Oyewole (2018) and Zainab, Kaur, Karim and Muhamad (2018) as the preferred reasons why individuals adopt certain technologies.

Conclusion

Most libraries used in this study were caught off guard, as they had no plan to have virtual engagement with their users prior to the outbreak of the pandemic, resulting in most libraries not having formal engagements with their users. During this period, collaborative tools like Zoom, Moodle, WhatsApp, email, Microsoft Teams, Google Meet, and Skype became handy in library service delivery. The dependence on mother institutions for acquiring these tools resulted in the adoption of tools that the librarians would change if they had the opportunity. These findings are red lights for libraries to find alternative ways of funding (including grantsmanship) so as to limit the dependence on their mother institutions for such decisions. Pandemics will stay with us, so libraries and other stakeholders, including library associations, should keep preparing ahead by investing in digital collaborative tools.

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The Nexus Between Academic Libraries and Students' Academic Achievement

Londolani B Munzhedzi[1]
University of Johannesburg
Mukovhe Mukhwantheli[2]
University of South Africa

Abstract

Academic libraries offer students various services that cater to their academic needs. The use of these libraries goes beyond just fetching a book for research and an assignment; they also encourage the culture of reading. The services provided by academic libraries have a prime impact on students' academic achievements. Libraries amalgamate information resources and technologies to provide students with online resources such as electronic journals, databases, e-books, journal articles, government gazettes and physical books. Educational systems around the world are highly supported by academic libraries. Thus, this study examined the relationship between academic libraries and students' academic achievement in South Africa. While this study is highly theoretical and relies profoundly on journal articles, books, latest case studies and dissertations to present its argument, fifty students from different universities in South Africa were randomly selected for the study from the University of Johannesburg, University of Limpopo, Vhembe Technical Vocational Education and Training (TVET) college, Rosebank College and Richfield Institute of Learning, University of Pretoria, University of Venda, and the University of South Africa. These students were selected through stratified sampling, and the researchers used an online survey developed and distributed through Google Forms. The findings of the study revealed that a relationship exists between academic libraries and students' academic achievement. Lastly, the study recommended that higher institutions of learning provide books, articles, journals, theses, and dissertations that are up-to-date and relevant to all fields of study. Moreover, it is important to provide digital access to library services as South Africa embraces the technological era. A systematic literature review has been

1 Londolani B. Munzhedzi, University of Johannesburg. munzhedzilondolani64@gmail.com
2 Mukovhe. Mukhwantheli, University of South Africa. mukovhemukhwantheli@gmail.com

used to study documented evidence, and data were collected from a stratified sampling using an electronic survey questionnaire.

Keywords: academic libraries, students, academic achievement.

Introduction

Academic libraries play a vital role in providing educational information and resources. Due to changes in information technology, library services are now accessible both online and physically. However, a change in the information technology environment poses a challenge to users of library services and providers of library resources. The wake of the Coronavirus disease 2019 (COVID-19) pandemic revealed a need for library services to be online. Institutions of higher learning have facilities which assist in teaching and learning, and the library is one of these facilities. The significance of academic libraries cannot be stressed enough; it is hard to imagine an institution of higher learning without a library. Carvalho e Rodrigues and Mandrekar (2020) reveal that libraries play an important role in providing reliable information to students. Thus, libraries represent the core mission of an educational institution: "Library represents the physical manifestation of the core values and activities of academic life" (Konlan & Yebowaa, 2017).

Academic libraries are viewed as the "heart of any university" (Allison, 2015). An academic library refers to a library that is part of an educational institution such as a college, university or any other postsecondary institution designed to cater for the needs of students, staff and others by agreement (Reitz, 2002). In addition, Gbemi-Ogunleye (2016) defined libraries as a "collection of books, manuscripts, journals and other sources of recorded information". The size of the collection is used as an indicator of academic quality. These collections provide students with efficacious information that is true, factual and reliable through various creative works such as scholarly journals, books, novels, short stories, theses, dissertations, audio tapes and CD-ROMs (Mohammed & Makki, 1997).

Academic libraries provide students with academic resources (both physical and digital), working spaces and opportunities for self-development (Basil, 2012). Librarians offer services such as guidance and tutoring students on assignments and projects with referencing and consultations. Access to learning materials has the potential to bridge the inequality gap and provide all students with an equal opportunity to perform better in their academic activities. This boosts students' confidence in their academic writing and fosters critical thinking and personal growth. Given the importance of access to resources, it is crucial for librarians to have a thorough knowledge of the student's needs (Carvalho e Rodrigues & Mandrekar, 2020).

Library services such as orientations and videos give students, especially first-year students, retention and persistence in their academic activities. De Souza (2010) mentioned parental support, financial aid, mentorship and self-confidence as factors that facilitate academic success for students. While these factors contribute to a student's academic success, library services are often overlooked as a variable enabling academic achievement. Access to library materials and services, either online or physical, boosts students' confidence and bridges the inequality gap between students from rich homes and those from marginalised backgrounds. Subsequently, all students have a fair chance to succeed and excel in their academic activities, be it research, assignments, theses, tests and dissertations.

Academic libraries and students' academic achievements

Undeniably, the habit of reading is fostered from childhood (Cotter, 2002:13). However, the surroundings one is exposed to can influence the habit of reading; thus, it can also emerge. Many students are exposed to libraries when they go to higher institutions of learning. A study by Smith (2013) revealed that students perform better when they use library resources and services as opposed to those who do not visit the library either physically or online. Furthermore, the same study revealed that students who carry out academic research become even more learned in their field of study. Reading develops critical thinking; thus, frequent utilisation of library services and resources will lead to even higher academic achievement (Gbemi-Ogunleye, 2016).

Books available in libraries, coupled with guidance on assessments, help students develop their literacy skills (De Souza, 2010). Libraries have been dispersing knowledge for many years, and in his 1992 study, Elley (1992) discovered a direct link between the ability to perform better in academic activities with the provision of library materials. Students from low socioeconomic backgrounds have a fair chance at academic success through the provision of learning materials by academic libraries. Gbemi-Ogunleye (2016) posits that such students depend on books from the library to complete their assessments and increase their chances of higher grades. However, it is important to note that other students also performed better without constantly using library resources (Ayodele, 2000).

An educational institution with an effective library preserves high academic achievement (Whitmire, 2017). Successful academic performance supports students with knowledge generation and advances their knowledge (Konlan & Yebowaa, 2017). The world is constantly evolving, and information technology is changing the development process. Therefore, the current and upcoming generation needs to capacitate themselves with skills and knowledge relevant to current global challenges (Konlan, 2020). This means

that libraries need to provide students with timely information through various forms of communication. Academic libraries are now available through different digital platforms. Library resources are readily available to students from anywhere at any time.

A significant correlation exists between students' assessment marks and the use of libraries (Wong & Webb, 2011). However, these authors further suggest that higher marks may also depend on the quantity of citations as opposed to quality. Nonetheless, Whitmire (2017) assessed the link between book loans, Internet visits and academic success. The study revealed a positive relationship and illustrated that students who loaned library books and visited sites performed better than those who did not. Although Wong and Webb (2011) are sceptical about this relationship, they assert that library resources have an unmeasurable effect on students. This includes the development of their thinking capacity that cannot be measured on paper:

> *Academic libraries have for a very long time existed solely for the purpose of supporting university faculties and departments with their vast collections of recorded knowledge. Through their association with universities and colleges, academic libraries are part of a broader societal knowledge system and influenced by other role players in their traditional core areas of focus, namely organisation and storage, as exemplified in models of society's knowledge system (Molepo, 2018:18)*

Students' adoption of information technology has shown active and collaborative learning by accessing library resources online. The world was hit by the unanticipated COVID-19 pandemic, and students had to learn online. At this time, library services had to be readily available online in order to cater for students' academic needs. This supports Whitmire's (2017) statement that information technology fosters high student engagement with library services and resources through its hybrid existence, physically and digitally. For example, the ability to access the university website to search for journals that are relevant to one's study. Beyond students' engagement, library materials also provide support to researchers and lead to positive outcomes for their studies. There are abundant studies on students' academic achievement and on academic libraries; however, there are fewer studies in South Africa, and more concrete and reliable first-hand information is required.

Conceptual framework

The theoretical foundation of this study is derived from the student development theory by Astin in 1988 (Long, 2012:37). This theory suggests that students' developmental stage affects how they think and experience the world. Thus, it can also reveal to institutions their needs and the support they require throughout their academic journeys. "Students' development is closely related to students' involvement with their friends, academicians and academic programs" (Long, 2012:37). This theory presents that students who invest in their studies have a greater chance to perform better (Tinto, 2015:45). Konlan and Yebowaa (2011) argue that students who utilise library services and resources vary systematically with those who do not. Thus, it gives a study to estimate the relationship between academic libraries and students' academic achievement. To attest to this, a study by Marzoli & Papa (2017), titled *School library and students' achievement: a relationship to go into*, revealed a positive relationship between reading comprehension performance and the size of the school library collection. Furthermore, a standardised test by Megan Oakleaf concluded that "the quality of the library is a predictor of academic performance" (Oakleaf, 2020:16).

Methodology

This study used the quantitative research design and followed a survey search design. A survey was developed and distributed to students from various universities in South Africa. The target population consisted of undergraduate and postgraduate students in all fields of study. The participants were selected through a stratified sampling technique, ensuring that the selection of students was not biased. Through stratified sampling, students were sampled as per faculty to accommodate all fields of study and various institutions in South Africa, be it TVET colleges or public and private universities. As questionnaires were distributed through Google Forms, the response rate was 100%.

Research findings

The findings of this study are presented in a graphical and grammatical format of all the questions probed. The survey had ten questions that probed participants, with eight questions with predetermined responses.

In your own words, what is an academic library?

The first question asked participants (students) to define an academic library in their own words. This question probed to see if the respondent understood an academic library. Amongst other definitions, many respondents showed

an understanding of what an academic library is, and some of the definitions were:

> *A library found within a university to help students with research.*
>
> *A library with a plethora of accredited information that is academia related.*
>
> *It is a building whereby students find information, either digital or books, to assist in their studies.*

From the first question, which required respondents to define an academic library in their own words, this study draws that some respondents understand the library as a "building" while others understand that a library can also operate digitally. Thus, this study concludes that an academic library is housed in an educational institution, which can serve two additional purposes: to support education and research by university faculty and students.

Academic libraries are helpful to students.

The second statement was, "Academic libraries are helpful to students". This question was posed to find out if students find academic libraries within their institutions of learning useful to them as they pursue their studies. It provided participants with options to agree, strongly agree, stay neutral, disagree and strongly disagree, and the responses from the fifty participants are illustrated in the Figure 11.1.

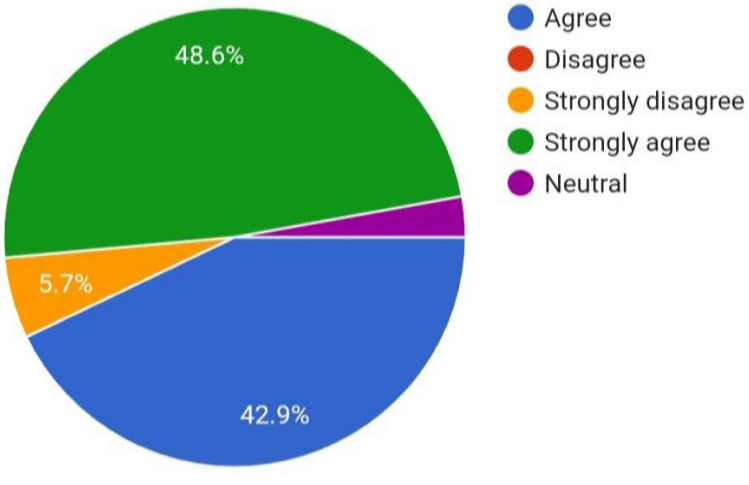

Figure 11.1: The manner in which academic libraries are useful to students

Based on the percentages acquired and depicted in Figure 11.1, academic libraries are helpful to students as 48.6% strongly agree with this statement, followed by 42.9% that just agree. This brings the study to the conclusion that academic libraries are helpful to students. On the contrary, 5.7% disagree; and the researcher observed that from those who disagreed, many of them do not understand that online journals are sometimes also provided by libraries.

Academic libraries helped to ease my academic journey.

The third statement on the survey was "Academic libraries helped to ease my academic journey", and the results are as depicted in Figure 11.2. The purpose of this statement or question was to understand from students' responses if academic libraries have eliminated difficulties in their academic journey. Remember that many academic libraries often have services, such as the Turnitin program, to help better academics. Of fifty students, 42,9% strongly agree that academic libraries helped ease their academic journey, followed by 31,4% who just agree. On the contrary, 22,9% were just neutral, 2,8% strongly disagreed, and none disagreed. From the results, this study concludes that academic libraries ease students' academic journey.

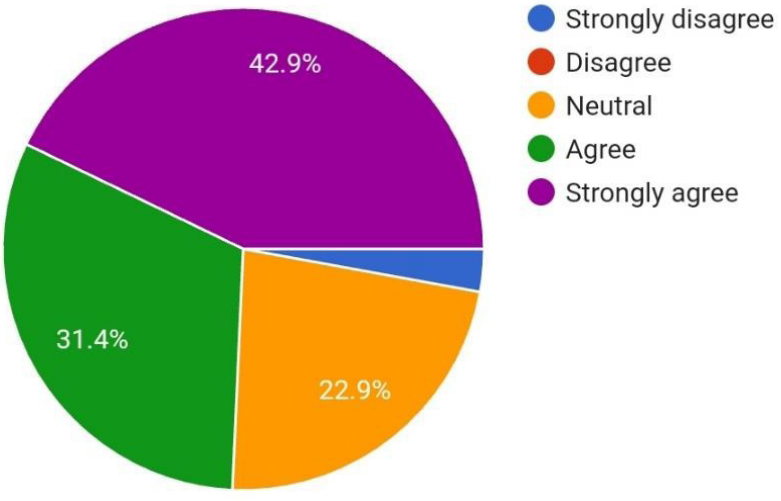

Figure 11.2: The ability of academic libraries to ease academic journey

When I used library services and resources (including online journals, Turnitin, etc.) I felt confident about my work.

Participants were required to indicate if they felt confident using library resources and services such as electronic journals and Turnitin. The responses

indicated that the majority of students feel confident (48.6%), some agree (34.3%), and some are neutral (17.1%). As there are no students who disagree, this study confidently concludes and presents that academic libraries give students confidence in their work. FIgure 11.3 depicts the responses of fifty students:

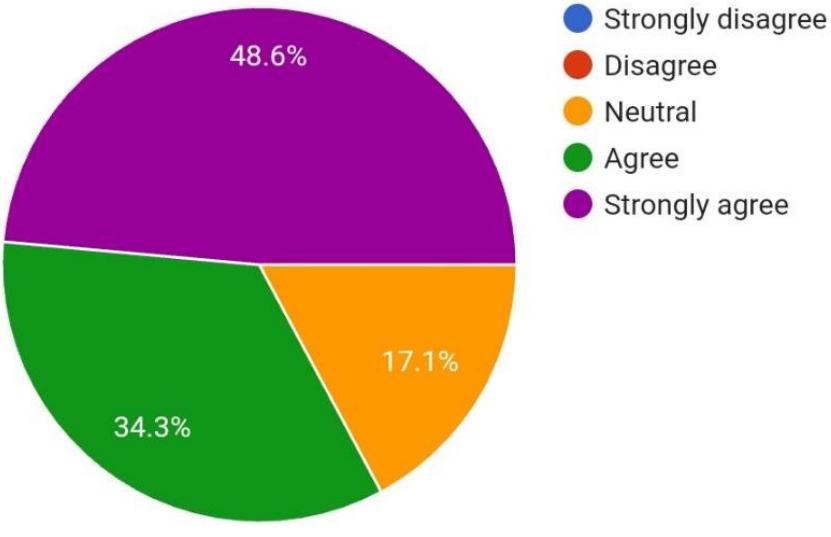

Figure 11.3: Academic libraries boost the confidence of students in their work

My academic performance is/was influenced by the provision of library services.

On a scale from one to ten, participants were required to scale if their academic performance was influenced by the provision of services. The results, as shown in Figure 11.4, bring this study to the conclusion that students' academic performance is/was influenced by the provision of library services. However, very few respondents scaled one and two. This leads the study to show the need to popularise library services in all academic institutions.

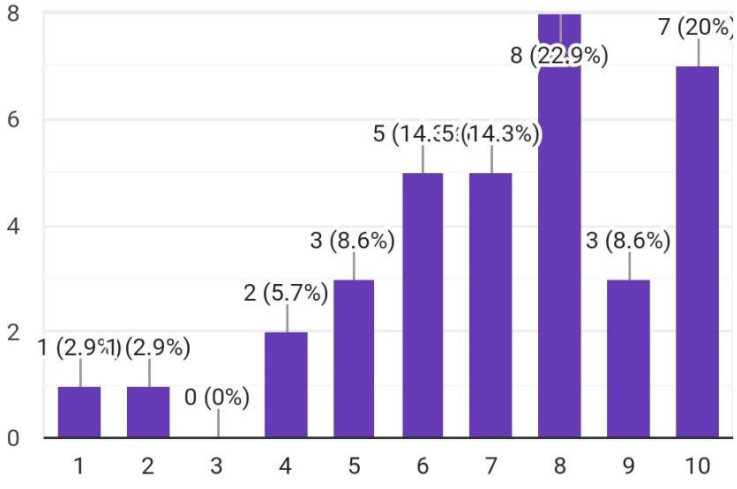

Figure 11.4: The influence of library services to students' academic performance

Library services and resources have guided me in my assessments, which developed my literacy skills.

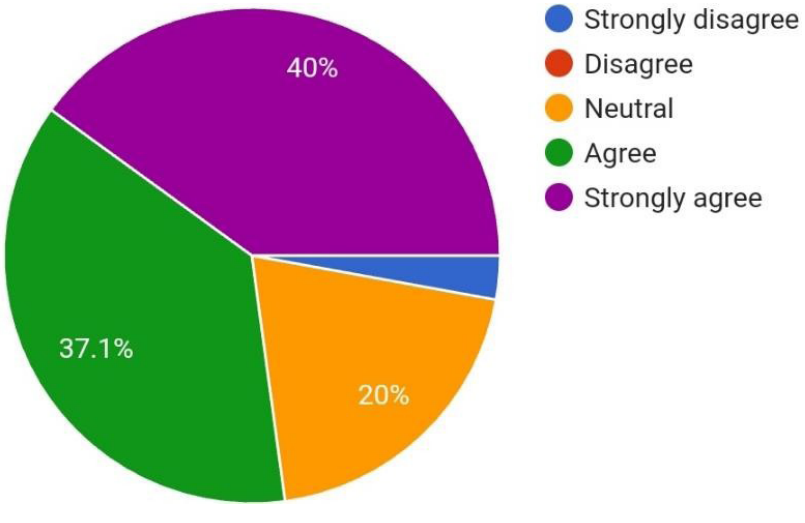

Figure 11.5: The role of academic library services in guiding students in their assessments and developing their literacy skills

According to Figure 11.5, 40% of the respondents strongly agree with the probed statement, while 37.1% agree and 20% are neutral. Based on the

results, the study concludes that library services help students develop their literacy skills through assessment guidance.

Academic libraries fostered my habit of reading.

The literature review above revealed that the habit of reading is fostered from childhood. Other authors argued that surroundings can influence the habit of reading. This statement was to figure out a stand point from these two statements. The results reveal that 45.7% of students agree with this statement, with 22.9% strongly agreeing, 14.3% neutral, 8.6% disagreeing, as well as strongly disagreeing. The conclusion of the study is that libraries have fostered the habit of reading for many students, while for some, it was perhaps fostered from childhood. The results are:

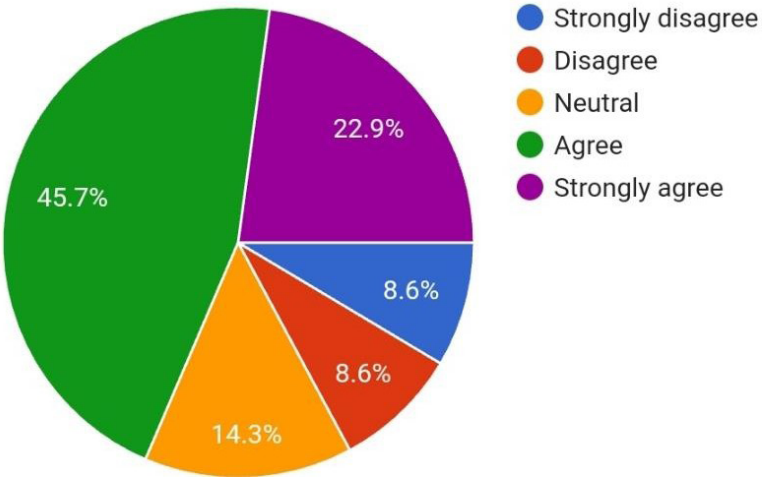

Figure 11.6: The impact of academic libraries in fostering the habit of reading

Academic libraries are redundant in higher institutions of learning.

The main purpose of this statement was to find out if students across South Africa found libraries useful or redundant in their universities and colleges. The findings of this study show that students find libraries useful as opposed to being redundant. This is shown in Figure 11.7, with 22.9% of students disagreeing, 20% strongly disagreeing, and 28.6% neutral. With the 25.7% who agreed, the researcher later found that using the word "redundant" on the question confused some participants. This is because, on the last question that they were offered the chance to comment on, they opposed their response to this response.

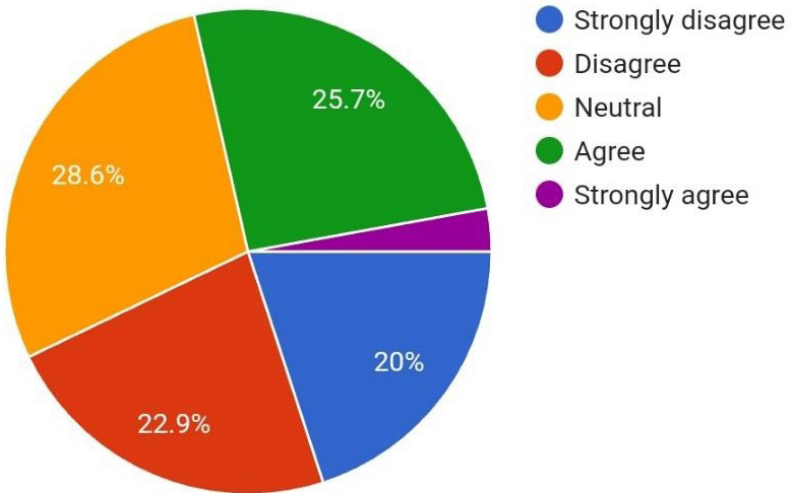

Figure 11.7: The redundancy of academic libraries in higher institutions of learning

Academic libraries are important to any higher institution of learning.

Based on the results illustrated in Figure 11.8, academic libraries and all institutions of higher learning are important. To illustrate, 73.5% of students firmly agree that academic libraries are important for higher institutions of learning.

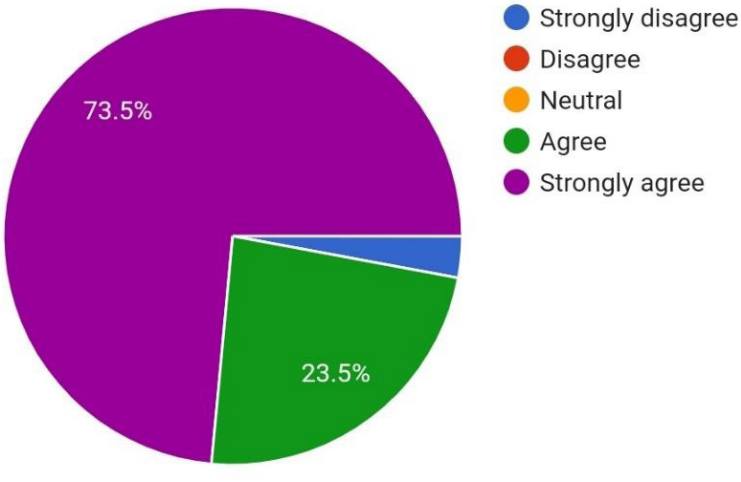

Figure 11.8: The importance of academic libraries to any higher institutions of learning

Conclusion

This study revealed that academic libraries have a greater impact on students' academic achievement. The findings of the study reveal that students' academic achievement is twofold: one result is that frequent use of library resources results in high academic achievement. Another result is that some students do not use the library services because they feel that they do not cater for them through the provision of updated information and the latest books.

There are a number of limitations to the use of libraries, including the inability to provide up-to-date books and other learning resources. This makes libraries ineffective, and they need to be improved.

Recommendations

This study draws multiple recommendations from the comments of students who participated in the study:

- Learning materials provided by academic libraries are limited to certain knowledge; thus, they should be expanded to more materials to assist all students.
- Moreover, libraries need to transform the experience of the students from just being a building to accessing learning material online as the world becomes faceless.
- The culture of libraries needs to be reinstalled into the current generation, and this can be achieved by providing more information on how they can access library services online, calling for library orientation programmes which must be conducted more often for first-year students, to educate them about the services offered by libraries.
- Librarians should also be educated in a certain field.

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Information Communication Technology Skills and Students' Engagement in Online Learning Spaces during the Covid-19 Pandemic

Bukola Amao-Taiwo, Geraldine Njideka Ekpe-Iko
University of Lagos
Idahosa Eki
York University

Abstract

The circumstances surrounding the Coronavirus disease 2019 (COVID-19) pandemic presented a drastic decline in the use of traditional face-to-face methods of teaching and learning in higher education institutions. As the new normal advanced the use of information and communication technology (ICT) devices and skills for online and distance learning and the use of digital libraries, this study investigated the extent to which the access and use of ICT devices and skills have supported students' engagement in online classes during the school closures that characterised the COVID-19 pandemic era. The study adopted a mixed-methods research design involving the use of questionnaires and online focus group discussions to draw responses from participants from public and private higher education institutions in Lagos and Ogun States, Nigeria. Two research questions and one hypothesis were formulated to guide the study. A researcher-designed questionnaire and a focus group discussion guide were administered online to elicit responses from participants. Data were analysed using descriptive and inferential statistics. Results showed a significant positive relationship between the ICT skills of students and the level of engagement during online classes. It was recommended that lecturers and facilitators of knowledge in online learning facilities should make concerted efforts to up-skill such that the facilitation of learning will be engaging for the students in online facilities even beyond the pandemic era.

Keywords: ICT access, ICT devices, ICT skills, students' engagement, digital libraries, online learning facilities.

Introduction

One of the innovations that characterised the twentieth century is the acceleration of information communication technology (ICT) devices as support for businesses, health, and education-related services. Beyond the use of devices, the advent of ICT has ushered in the need for new knowledge and skills that will enhance the productivity of various sectors. Van Slyke (2008) defines ICT as the range of technologies that support the utilisation of information, including computers and computer-related products, email, multimedia messaging services (MMS), and other forms of communication. Even though the use of ICT as support for learning and business is becoming the norm, the ability to think critically to create new knowledge and solutions that enhance productivity through these devices has become more important than being able to access and operate ICT devices.

Saheb (2005) argued that it is becoming practically impossible for many people to spend a day without interacting with sophisticated information and communication technologies (ICTs) ranging from television and radio to the mobile telephone and the Internet. However, for millions of people in the world's poorest countries, there remains a "digital divide", excluding them from the benefits of ICTs. The *Digital 2020 Global Overview Report* outlined that 169.2 million mobile connections constituted 83% of Nigeria's total population. However, about 50% of these mobile phone connections are by urban residents, implying that the proportion would be skewed towards high socio-economic and urban households. The digital divide has been a major factor responsible for the educational inequalities that have become the order of the day and were deepened by the pandemic.

Adopting the use of ICT resources for education has led to what Saheb (2005) termed the "new education system." This system is characterized by learning strategies such as e-learning, distance learning, Internet-based learning, or web-based learning. It presents the opportunity for educators to digitalize texts, images, sounds, and videos, making it easy to access any kind of information anywhere in the world. This is achieved with a few clicks on digital libraries. Today, ICT has minimised the challenge of access to educational resources, and people can access information without barriers. However, one challenge that hinders the full adoption of ICT tools in the university system is the cost of acquiring and accessing infrastructure that makes using ICT resources seamless for lecturers and students.

Beyond access to ICT devices and infrastructure, adopting engaging pathways that embed the use of ICT skills in the content, delivery of lectures, and use of digital libraries is becoming a necessity. Henderson, Selwyn and Aston (2017) averred that digital technology plays a significant role in student engagement, making it a central feature that defines student educational

experience. However, providing skilled educators has become a pathway for reducing the limitation of online teaching and learning, including minimal exposure to effective teaching practices and lower-quality interactions (Dumford & Miller, 2018). Online teaching and learning require competencies and an understanding of strategies that will endear teachers to adapt technology to align with the achievement of learning outcomes.

Bond and Bedenlier (2019) define student engagement as the energy and effort students apply in the learning community, with behavioural, cognitive, or affective engagement being the observable indicators over time. Although the level of engagement comes to play through the observable actions of students, these actions are shaped by internal influences, the learning environment, learning activities, and relationships between student-student, student-content, and student-lecturer. An engaged student is most likely to be inquisitive, interested, and connected to the learning content and activities if the lecturer presents content and activities centred on students' interests and expectations. It has been established that a higher level of engagement improves learning outcomes and better academic achievement (Zehner, 2011; Cheong & Ong, 2016).

As student engagement with physical libraries becomes impossible due to the pandemic, digital libraries have become increasingly popular for students, providing more convenience and accessibility. However, promoting student engagement in digital libraries has also become crucial for facilitating learning and promoting academic success. Lecturers can help enhance the learning experience and encourage students to become more actively involved in their studies by providing students with easy access to digital resources and implementing effective engagement strategies. According to Wang and Liu (2020:259), "Student engagement in digital libraries has been found to be positively related to their perceived usefulness, satisfaction, and learning performance". Nevertheless, some students struggle without face-to-face interactions, personalised assistance, and physical resources. Many physical libraries offer virtual reference and chat services, online access to e-books and journals, and curb-side pickup of physical materials to address these challenges. Some libraries have adopted hybrid models that combine in-person and online services to provide the best of both worlds. Ultimately, the pandemic has disrupted student engagement with physical libraries, but it has also highlighted the need to adapt and embrace new technologies to support learning and engagement. Webb et al. (2008) proposed that libraries can promote student engagement by providing a variety of learning resources and opportunities for collaboration through workshops, events, and other interactive programmes that encourage students to explore and engage with new ideas and perspectives.

The COVID-19 pandemic has revealed significant inequalities in the education system, and students who lack access to digital tools may struggle to keep pace with their peers and find it challenging to make up for lost time. Although there may be disparities in the availability and accessibility of ICT tools for students, a lack of engaging course content and learner-centred activities delivered by instructors during remote learning can also contribute to further inequalities in the quality of teaching and learning, both during and after the pandemic. Having to engage students on university learning management systems (LMS), digital libraries, and other platforms like Zoom, Google Classroom, Microsoft Teams, and others require the provision of opportunities for learners to be involved in discussions, tasks, and activities that connect curriculum content to real-life scenarios. Based on the preceding, this study investigates the extent to which lecturers have leveraged students' ICT skills to support engagement in on-learning spaces.

Research questions

- In what ways have students accessed ICT support for online learning?
- How often do lecturers leverage on ICT skills of students to support engagement in online learning?

Hypothesis

No significant relationship exists between students' ICT skills and engagement in online learning spaces.

Statement of the problem

In a bid to minimise learning gaps during the lockdowns that characterised the COVID-19 pandemic, alternative learning modes that entailed the use of digital devices, applications, digital libraries, and the Internet were adopted. However, students and their lecturers became overwhelmed with challenges ranging from the availability and accessibility of ICT devices to Internet connectivity and coupled with the need to embrace engaging teaching and learning strategies. These challenges are due to the uncertainties embedded in the need to embrace a new pathway to instruction and delivery of learning content to students in a space that was considered non-traditional. The online mode of learning requires lecturers and students to have the necessary ICT skills to function optimally using the technological devices and available resources, but this seems insufficient. Having students log into classes only to mute and then get involved in other non-academic activities is a sign of disengagement, which might lower the achievement of learning outcomes.

As stakeholders in the educational sector battle with opportunities to increase access to technological devices and connectivity, the need to ensure that learning outcomes are achieved by delivering engaging content and experiences has become very important. This study, therefore, examined the extent to which ICT skills have enhanced students' engagement in online learning spaces.

Literature review

ICT and connectivity support for online learning

Recently, online learning has become increasingly popular, particularly due to the COVID-19 pandemic. However, access to ICT facilities and reliable Internet connectivity is non-negotiable for students to effectively participate in online learning. Davis, Gough and Taylor (2019) assert that poor connectivity can lead to losing interest and motivation for online learning and difficulties accessing course materials and communicating with instructors and peers. Furthermore, Pokhrel and Chhetri (2021) assert that ICT support is essential in facilitating effective and efficient online learning, particularly for students who may not have access to the necessary equipment or technical expertise. Without access to these facilities that support learning, the teaching-learning process will be dragged down, especially in virtual learning spaces where technology determines engagement. In addition to ICT facilities, a stable supply of electricity is essential for students to participate in online learning. Power outages and blackouts can interrupt online classes, leading to missed lectures and assignments. In a study conducted by Oyediran, Omoare, Owoyemi, Adejobi & Fasasi (2020), it was found that a lack of consistent electricity supply was a major limitation that adversely affected students' ability to participate in online classes during the COVID-19 pandemic.

Student engagement in online learning spaces

Student engagement is the intention of students to participate in learning activities. These engagements are vital to the teaching-learning process, and it is assumed that an interactive relationship exists between teaching strategies, student engagement, and academic achievement. This assumption is based on the conclusions of an array of studies that student engagement leads to high-quality education, increases student retention, and also enhances the institution's reputation (Ashwin & McVitty, 2015; Kuh, Kinzie, Buckley, Bridges & Hayek, 2006).

Chapman (2019) identifies three main criteria of student engagement that lecturers should consider when planning their teaching strategy,

including cognitive criteria, behavioural criteria, and affective criteria. The cognitive criteria are the extent to which students pay attention and expend mental effort during the learning task; the behavioural criteria address the active response of the students when learning is in session, and the affective criteria focus on the student's emotional reactions to the learning task. Engagement with ICT can be enhanced by possessing certain cognitive requirements. These requirements include digital and information literacy, critical thinking, problem-solving, creativity, collaboration, and communication. Wang and Liu (2020) identify these requirements as important factors that enable individuals to use digital technology effectively and take full advantage of its benefits.

Popovich and Neel (2005) observe that the introduction of online teaching in universities has led to increased enrolment of students, elimination of overcrowded classrooms, and improved student retention rate. However, Bawa (2016) raised concerns about the low retention rate of many online or distance education programmes, stating that online and distance courses have a 10% to 20% failed retention rate. As COVID-19 presents the opportunity for massive migration from face-to-face to online learning spaces, lecturers should be aware that teaching and engagement strategies that work well in the face-to-face learning spaces could fail in the online classroom, and excellent lecturers could find themselves struggling to identify with students online (Boon, 2015). Orlando and Attard (2015), however, conclude that teaching with technology is not a one-size-fits-all approach; therefore, there is a need for awareness in terms of teaching styles and activities that will foster feedback, support collaborative learning, and enhance student participation.

ICT devices in online learning spaces seem to demand a new level of skill for engaging students effectively. Goldhammer, Gniewosz, and Zylka (2016) aver that ICT engagement is the major conditioning personal characteristic that affects the development and adaptation of ICT skills in learning environments. Ainley and Armatas (2006) argue that the connection between the learner and the learning environment is central to understanding how virtual learning environments have motivated or engaged students in online spaces. However, it has also become expedient to know that having the competencies required for behavioral engagement is critical for learning outcomes to be achieved. Behavioural engagement entails participation in terms of sharing and the use of technological devices and tools for content sharing and hands-on activities that promote active learning. Therefore, strategies for adapting teaching to better meet the needs of students require increasing the speed at which information is presented; providing opportunities for multi-tasking and interactive learning; and presenting information through a variety of media (Jukes & Dosaj, 2005). Salmon (2012)

advocates interventions such as 'weaving' discussion threads together to stimulate student engagement; such activity, while possible without ICT, is one that ICT has made compellingly easy.

Digital libraries as online learning spaces

Digital libraries have become increasingly important as online learning spaces due to their accessibility and availability of resources (Paynter et al, 2020). Libraries have evolved from traditional brick-and-mortar structures to virtual settings with the rise of online education, giving students access to a wide range of digital resources and services around the clock (Harisanty et al., 2023). Salmon (2020) avers that digital libraries have gained popularity as online learning spaces, offering students an array of digital resources, materials, and tools. Digital libraries provide various benefits as online learning spaces, such as flexibility, convenience, and accessibility. They allow students to access resources from anywhere, anytime, which helps them study and learn at their own pace. Digital libraries also enable personalised learning opportunities as students can select resources and materials that suit their learning preferences and goals. There are multiple methods to measure student engagement in online libraries, including tracking the frequency of visits, the length of time spent on the platform, and the number of resources accessed (Gibson & Cho, 2020). According to Salmon (2020), different factors can affect how involved students are with online libraries, including the convenience of access, how easy it is to use, and the availability of resources. Wang, Li and Zhang (2021) conducted research and discovered that implementing gamification strategies, such as awards, badges, and leaderboards, can boost student engagement when using online libraries.

Methodology

In carrying out this research, a descriptive survey research design that entailed using mixed methods was employed. The population for the study comprised all undergraduate and postgraduate students of tertiary institutions such as universities, polytechnics, and colleges of education in Lagos and Ogun State, Nigeria. A researcher designed a "students' ICT support and engagement in online learning spaces" online survey questionnaire, and a focus group discussion guide was used to collect quantitative and qualitative data, respectively. The sample comprised one hundred and seven undergraduate and postgraduate students purposively selected for the online survey, while the focus group discussion had two groups of eight students. The focus group was conducted online using the WhatsApp platform. The goal was to provide deeper insights into the level of engagement and device availability of the students during the pandemic. Cronbach's alpha coefficient test of reliability

was applied to measure the internal consistency of the questionnaire, using the IBM® SPSS® Statistics 23.0 to ensure reliability at an alpha level of 0.05. The analysis gave an alpha coefficient of 0.957 which was considered high enough to justify its use for the study. Both instruments went through face and content validation by experts in the field of ICT and online education. Quantitative data responses were rated on a four-point Likert-type scale with the coding of four, three, two, and one, respectively. The criterion mean was set at 2.5 for the quantitative data and was analysed using descriptive and inferential statistics. The hypothesis was tested using the Pearson product-moment correlation coefficient, which is a measure of the linear relationship between two variables. In this case, the Pearson correlation coefficient is used to examine the strength and direction of the relationship between students' ICT skills and their engagement in online learning. Data from the focus group discussion were transcribed manually. Emerging themes and patterns in the data are identified through a careful reading of the transcribed text. The identified themes and patterns were then grouped to form broader categories, which were used to develop a comprehensive understanding of the subject of the study.

Results

Demographic characteristics of participants

This section shows the demographic characteristic and data of participants.

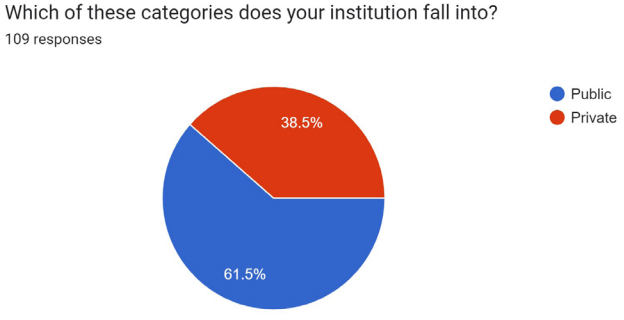

Figure 12.1: Category of institution of participants

Figure 12.1 shows that 66 (62%) of the participants were students of public institutions, while 41 (38%) were students of private institutions. There were more respondents from public institutions than from private institutions.

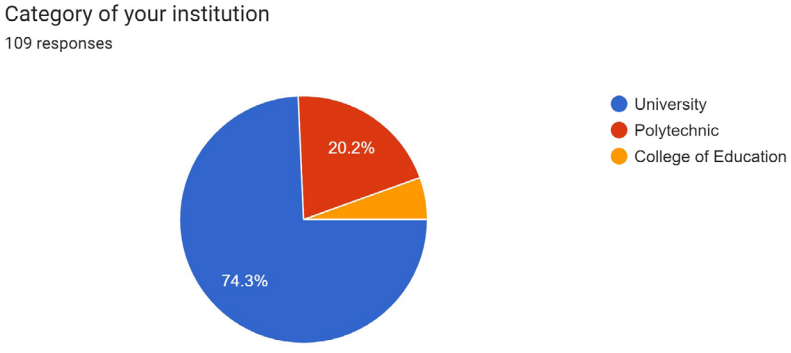

Figure 12.2: Type of institution

Figure 12.2 indicates that respondents included 79 from universities (74%), 22 from polytechnics (21%), and 6 from colleges of education (6%) students, with university students being the majority and college of education students being the least.

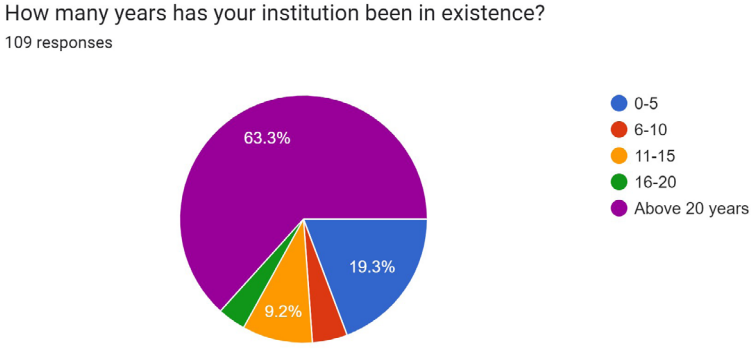

Figure 12.3: Age of institution

Figure 12.3 shows that 20 (19%) of respondents were from institutions that had been in existence from 0 to 5 years; 5 (5%) were from institutions between 6 to 10 years, 10 (9%) from institutions between 11 to 15 years, 4 (4%) from institutions between 16-20 and then 68 (64%) from institutions founded over twenty years ago.

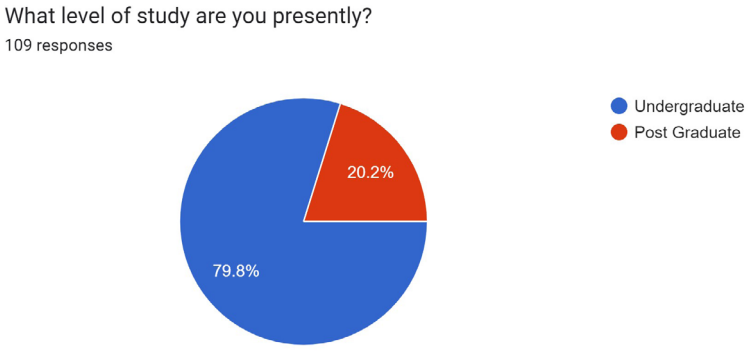

Figure 12.4: Student academic level

Figure 12.4 shows that 86 (80%) of respondents were undergraduates, while 21 (20%) were postgraduates.

Research Question 1: In what ways have students accessed ICT support for online learning?

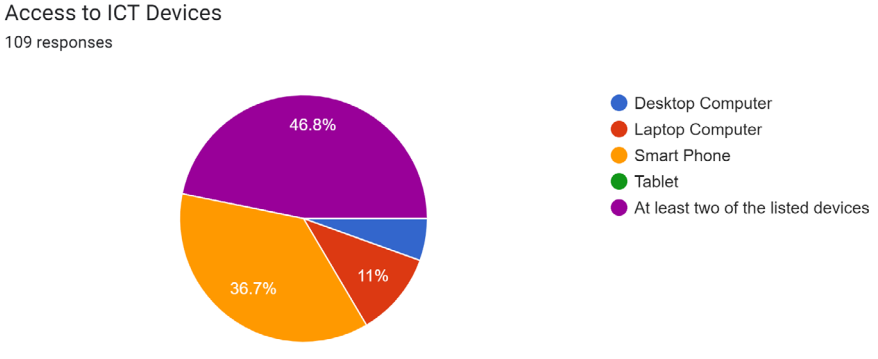

Figure 12.5: ICT access

Figure 12.5 shows the various ICT devices which students have access to. The data shows that 49 (46%) students had access to at least two desktop computers, smartphones, laptops or tablets. A significant number of students, 40 (37%), also accessed online learning spaces via a smartphone.

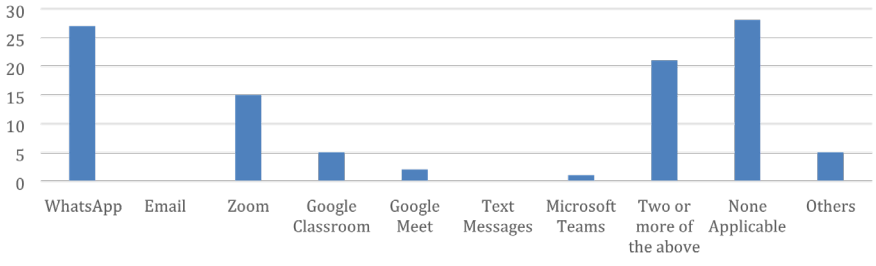

Figure 12.6: Online Teaching-Learning platform

Figure 12.6 shows that most of the students participated in online learning through the WhatsApp platform, while none of the students utilised text messages and email as a platform for learning.

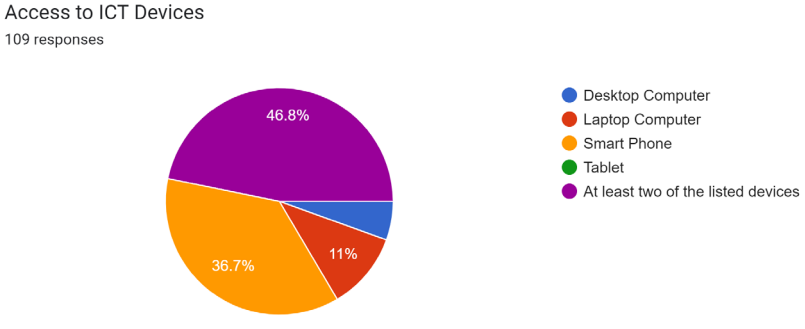

Figure 12.7: Ownership of ICT devices

Figure 12.7 indicates that 55 (51%) of the respondents owned a personal smartphone, while 40 (37%) owned at least two desktop computers, smartphones, laptops, or tablets.

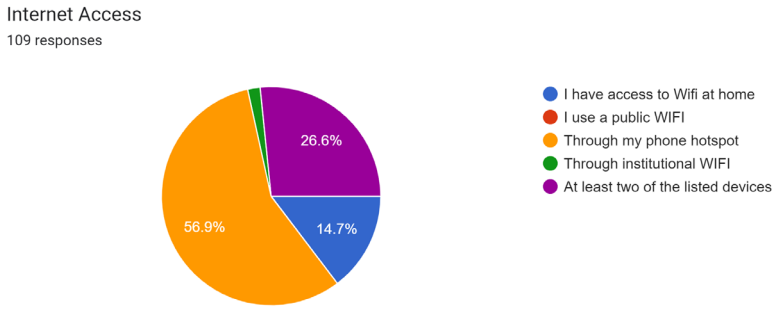

Figure 12.8: Internet access.

Figure 12.8 indicates that a significant number of respondents, 61 (57%), accessed the Internet via a personal phone hotspot, while only 2 (2%) had access to institutional Wi-Fi.

Research Question 2: How often do lecturers leverage on ICT skills of students to support engagement in online learning?

The information in Table 12.1 shows how lecturers leverage on ICT skills of students to support engagement in online learning during the COVID-19 pandemic.

Hypothesis Ho1: There is no significant relationship between students' ICT skills and engagement in online learning spaces.

Table 12.2: Relationship between students' ICT skills and engagement in online learning

	N	Mean	SD	R	P	Remark	Decision
ICT Support	107	2.44	0.93	0.71*	0.01	Significant	Ho1 rejected
Student Engagement		2.44	0.93				

*Correlation is significant at a 0.05 level (two-tailed).

The information in Table 12.2 shows the relationship between ICT skills and the engagement of tertiary institution students. The result of the tested

Table 12.1: Frequencies, percentages, means, and standard deviations (SD) of the responses on ICT skills in Lagos and Ogun States Higher Institutions (N=107)

S/N	During the COVID-19 online learning experience, students were given an opportunity to:	Always	Often	Sometimes	Never	Mean	SD
1	Design and build a web page	14 (13.1%)	30 (28.0%)	8 (7.5%)	55 (51.4%)	2.03	1.15
2	Create and present content with PowerPoint.	13 (12.1%)	40 (37.4%)	13 (12.1%)	41 (38.3%)	2.23	1.10
3	Create and present an audio or video	20 (18.7%)	36 (33.6%)	14 (13.1%)	37 (34.6%)	2.36	1.14
4	Download or access online audio or video recordings of lectures they could not attend	38 (35.5%)	28 (26.2%)	17 (15.9%)	24 (22.4%)	2.75	1.17
5	Download or access online audio or video recordings to revise the content of lectures already attended	33 (30.8%)	31 (29.0%)	16 (15.0%)	2 7(25.2%)	2.65	1.17
6	Download or access online audio or video recordings of additional content related to coursework from the library	31 (29.0%)	32 (29.9%)	17 (15.9%)	27 (25.2%)	2.63	1.15
7	Use a social networking platform (e.g., Facebook) to communicate / collaborate with other students on the course	38 (35.5%)	26 (24.3%)	13 (12.1%)	30 (28.0%)	2.67	1.23
8	Create and keep a personal blog as part of course requirements	18 (16.8%)	27 (25.2%)	13 (12.1%)	49 (45.8%)	2.13	1.17
9	Contribute to another blog as part of a course requirement	13 (12.1%)	35 (32.7%)	14 (13.1%)	45 (42.1%)	2.15	1.11

S/N	During the COVID-19 online learning experience, students were given an opportunity to:	Always	Often	Sometimes	Never	Mean	SD
10	Use the Web to share digital files related to a course (e.g., sharing photos, audio files, movies, digital documents or websites)	27 (25.2%)	28 (26.2%)	27 (25.2%)	25 (23.4%)	2.53	1.11
11	Use Web-conferencing or video chat to collaborate with other students taking the course	30 (28.0%)	26 (24.3%)	22 (20.6%)	29 (27.1%)	2.53	1.17
12	Receive pre-class discussion questions from lecturer via text message on personal mobile phone	23 (21.5%)	31 (29.0%)	22 (20.6%)	31 (29.0%)	2.43	1.13
13.	Learn about the technological tools to be used in class	27 (25.2%)	25 (23.4%)	20 (18.7%)	35 (32.7%)	2.41	1.19

Key: Always (4), Often (3), Sometimes (2), Never (1), St.Dev.=Standard Deviation

hypothesis shows that there was a positive and significant relationship between ICT skills and engagement of tertiary institution students in Lagos and Ogun States ($r = 0.71^*$, $P = .01 < 0.05$). Thus, the null hypothesis of no significant relationship between students' ICT skills and engagement in online learning was rejected. Based on these results, it can be concluded that students with better ICT skills tend to have higher engagement in online learning.

Discussion of findings

Findings in this study showed that a significant number of students accessed ICT support, especially devices and Internet access, through personal efforts using personal mobile phones and devices. Obviously, there were limited opportunities in terms of institutional support for data, devices, and Internet access. This is likely to be the result of the abrupt emergence of COVID-19, which suddenly required institutions to plan amid numerous uncertainties. Beyond the sudden nature of the pandemic, it is not a hidden fact that provisions such as devices and mobile data for learning purposes are solely the responsibility of students in higher education institutions of learning in Nigeria. In some institutions, particularly in public-owned institutions, access to networks is limited to certain parts of the school, which may not be convenient for students at certain times. This way, some students patronise cybercafés for Internet access to work on assignments or to download information. Indigent students will certainly find it difficult to cope with this situation and sometimes may have to wait to use their friends' facilities. This is in agreement with the study of Agbebaku and Ajegbelen (2016), who found that many university lecturers and students visit cybercafés within and around their institutions to make use of Internet facilities, while the ones who can pay for private modems buy for their personal use. While this might be acceptable before the COVID-19 era, infrastructural support for students and lecturers is non-negotiable in the COVID-19 and post-COVID-19 era. A conversation from the focus group discussion affirms this result. One of the respondents, a 300-level student in a public university, had this to say:

> *Although our lecturers often schedule us for online lectures through WhatsApp and sometimes Google Meet, we often do not have enough data to connect, and even when we connect, sometimes, the lectures seem so boring, so we log in and then use our time for other activities while the lectures are going on.*

This statement seems to suggest that students do not find online classes engaging hence the need for targeted efforts by lecturers.

The test of the hypothesis showed a significant relationship between ICT skills and students' engagement in online learning spaces. This relationship shows that lecturers have opportunities to leverage students' ICT skills to support active learning activities that will promote better learning outcomes. When students are actively engaged, they tend to be connected and eventually utilise what has been learned in problem-solving. ICT skills are important for online learning spaces, including digital libraries. By engaging students through Microsoft PowerPoint presentations, conducting online research, sharing ideas through the whiteboard, and engaging in group conversations on online discussion platforms, students can learn deeply and thereby take ownership of learning. It is, however, pertinent to note that lecturers are saddled with the task of presenting the opportunity for such activities to the students, thereby making a case for continual professional development on online teaching strategies that engage students effectively. ICT skills are essential for students to effectively use digital libraries. These skills can help students search for information efficiently, navigate the digital library, evaluate information quality, use technical features, and collaborate effectively. The inability to perform these tasks can have an adverse effect on learning outcomes.

The lack of these skills can pose very frustrating challenges to students and cause some form of disengagement from learning. Such disengagement leads to students logging in for classes and leaving while still logged in to engage in other things perceived as more important. Students often interact regularly with personal devices, which presents an opportunity for facilitators of learning to utilise the same devices for learning activities. In this regard, lecturers and students should be trained in ICT skills to enable engagement in every form of online learning. According to Dennen, Bagdy, Arslan, Choi & Liu (2022), collaborative course development and teaching can help minimise pedagogical and technological tasks that will endear instructors to focus on meeting the unique needs of students and also maximise student engagement in non-pandemic times.

Conclusion

The skills that students possess in the field of ICT are valuable assets that can assist lecturers in delivering stimulating content and activities that promote the attainment of learning objectives. Nevertheless, it is imperative that both lecturers and students undergo continuous training and professional development in ICT skills to ensure active participation in online learning. During non-pandemic times, collaborative course development and teaching can enhance student engagement, and it is vital to provide infrastructural

support for students and lecturers to guarantee fair access to education in online environments.

Recommendations

- Leaders of higher institutions need to provide data to relevant government agencies to engage in partnerships that will breed home-grown solutions to the challenges of access facing the students, especially in access to ICT devices, connectivity, and skills in teaching and learning.
- Lecturers should make concerted efforts to up-skill such that learning will be engaging for the students in online and offline learning spaces.
- Digital libraries should provide opportunities for collaboration and knowledge-sharing amongst users. This could include discussion forums, online communities, and shared workspaces where users can collaborate on projects or assignments.

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