UTILIZATION OF MOBILE DEVICES IN ACCESSING INFORMATION BY LECTURERS AND STUDENTS IN PUBLIC UNIVERSITIES IN KENYA

BURUDI PETER SHIBONJE

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DECLARATION

Declaration by the Candidate

This thesis is my original work and has not been presented for the award of a degree in any other University or for any other award

Burudi Peter Shibonje

P304/1808P/14

Sign …….. Date …….

Declaration by the Supervisors

We confirm that the candidate carried out the work reported in this thesis report under our supervision and has been submitted with our approval as university supervisors

Dr. Jotham Wasike
Department of Pure and Applied Sciences
School of Pure and Applied Sciences
Kirinyaga University

Sign…… Date……

Prof. Lucy Ndegwa

Department of Education

School of Education and Social Sciences

Karatina University

Sign…… Date……

DEDICATION

This work is dedicated to my wife Ebby, daughter Favour, and Son Testimony.

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LIST OF ABBREVIATIONS AND ACRONYMS

CAK	Communication Authority of Kenya
CORC	Cooperative Online Resource Catalog
ECAR	Electronic Certificate Authorizing Registration
GNU	GNU's Not UNIX
GPL	General Public License
ICT	Information and Communications Technology
IT	Information and Technology
KU	Kenyatta University
LTE	Long Term Evolution Networks
MARC	Machine-Readable Catalogue
NACOSTI	National Commission for Science, Technology and Innovation
OCLC	Online Computer Library Centre
PDA	Personal Digital Assistants
PEU	Perceived Ease of Use
PC	Personal Computer
PU	Perceived Usefulness
QR	Quick Response
RFID	Radio Frequency Identification Technology
RLG	Research Libraries Group
SMS	Short Message Service
SPSS	Statistical Package for Social Services
UNESCO	United Nations Educational Scientific and Cultural Organization

UoN	University of Nairobi
URL	Uniform Resource Locator
USB	Universal Serial Bus

ABSTRACT

The application of mobile devices is essential in the dissemination of information. In institutions of higher learning, apart from providing convenience, mobile devices open up new avenues for academic libraries to enhance access to information. However, more studies need to be carried out that directly look at the use of mobile devices in enhancing access and use of information. This study aimed at assessing the utilization of mobile devices in libraries in public universities in Kenya. The objectives that guided the study were: to identify various mobile devices available in the libraries; to determine the different ways in which mobile devices are utilized; to examine the benefits of mobile device utilization; to evaluate the challenges faced in the utilization of mobile devices, and to determine viable ways of enhancing utilization of mobile devices in public university libraries in Kenya. The study was guided by the Technology Acceptance Model. The study adopted the descriptive research design. The study targeted 1620 students, 57 teaching staff from three academic departments, 91 library staff, and 38 ICT staff from KU and UoN universities. The study sample size was determined using 10% of the target hence 162 students and six teaching staff were sampled using stratified random sampling while nine library staff and four ICT staff were sampled using purposive sampling. Questionnaires and document analysis were used to collect both primary and secondary data. Descriptive (frequency, percentage, and mean) and inferential statistics (Chi-Square test and Fisher's test) were used in analyzing data. The Statistical Package for Social Sciences (SPSS, ver. 28) was used for data analysis. The study found that the majority of university students access libraries via mobile devices and that they were mostly used for accessing e-resources, and online searches for educational materials. The study found a strong correlation between the use of mobile devices and ease of access to library resources, exposure to diverse content, convenience of utilization of study materials, and interactive usability of study materials. The study established the shortage of power outlets for charging mobile devices, lack of technical assistance, and inadequate internet access were some of the challenges faced in the utilization of mobile devices in public university libraries. The study concluded that using mobile devices in university libraries benefits users significantly and relieves pressure on more traditional library services. The findings of the study will be useful to policymakers and library managers in improving access to information in libraries.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Mobile devices are gadgets that utilize the innovative use of cellular communication for transportable and instantaneous access to information (Coates, et al., 2010). Mobile devices include iPods, MP3 players, Personal Digital Assistants (P.D.A), Universal Serial Bus (USB) Drive, E-Book Reader, Smart Phone, Ultra-Mobile Personal Computer and Laptop / Tablet PC (Adeeb & Hussain, 2012). Personal Digital Assistants (PDA) and smartphones are mobile devices that are agents of real-time communication (Chang, et al., 2014). The hallmarks of mobile devices are their portability, flexibility, simplicity of use, and their unique ability tointegration with other technology systems (Alder & Fotheringham, 2012). Smartphones and other mobile devices offer librarians new opportunities in the delivery of services for users including instruction, systems, reference, and access to resources. Mobile library technology is important for academic libraries to stay relevant in the mobile era, it could be essential for them to adopt mobile library technologies to maximize access to e-resources, stimulate library services and satisfy the users' necessities in a fast and smart manner (Madhusudhan & Dar, 2017).

Ihejrika, Goulding, and Calvert (2021) noted that university libraries in Europe and America have adopted mobile technology to advance their services, maximize their exposure, improve and modernize the image and online reputation, promote specific library content to reach a wider University community, as well as to stimulate discussions and online collaborations. Ball (2019) argued that due to the increasing growth and usage of mobile technology, academic libraries in Ireland are no longer focusing on open source but rather on open data. Mobile technology provides

university libraries the opportunity to display value through mobile technology. Due to a lack of set norms, university libraries in Turkey function under varying conditions. This harms library service delivery. University libraries use a similar level of mobile technology and show a similar level of concern for the services they provide. Mobile sites (separate sites or mobile sites as applications), mobile library catalogs, SMS services, chatrooms, IM-based consultations, mobile device lending services, and augmented reality and QR code applications are all available (Meredith, 2015).

Singh (2020) found that mobile technology is used in India to provide library services to users. The technology makes it easier for students to access e-books. Ask A Librarian to provide service information for users to get quick help in finding information on library services and resources. Libraries use several tools and techniques to circulate the information to the user. Traditional library services are now changing to mobile library information services and the use of mobile phones has made information access very convenient and timely to users. There is a shift from d-learning (distance learning) to e-learning and now from e-learning to m-learning.

Pazur (2018) observed that library users in higher institutions of learning in Croatia are interested in accessing library services and resources through small screen services and some of them are even aware of new directions in searching for information. Libraries deliver various services via mobile devices which include; Mobile OPAC, Training via mobile, Library databases delivered via mobile, and providing notifications in the form of SMS.

In Africa, universities such as the University of Pretoria, the University of Swaziland, the University of Kwazulu-Natal, and the University of Free State have all adopted the use of Mtech in the provision of library services (De-Graft, 2020). King (2018) however noted that the majority of universities are yet to learn more about the use of mobile technology in libraries. Mobile technologies assist academic libraries in improving and fast-tracking access to information and resources from any smart device anywhere. The use of advanced mobile technology in libraries can improve communication between librarians and their users.

According to Azino and Okechukwu (2019), reference services at libraries in Nigeria are becoming increasingly virtual as more and more researchers are working remotely. Technologies such as instant messaging, email, and now SMS text messaging are making it easy for libraries to maintain relevance as information hubs by offering convenient services to busy users. New ask-a-librarian services are offering mobile patrons the ability to text in their research questions from afar. The mobile apps enable library patrons to submit their reference questions by texting them in to librarians, or by utilizing one of their special keywords to receive instant results. Ejiroghene (2020) added that mobile technology has given quicker access to information and libraries. Mobile Technology helps libraries to improve their partnership and provide improved user-oriented services to existing users. Mobile technology helps novices as well as seasoned librarians to stay relevant in a digital society.

Matumba (2021) pointed out that academic librarians at Durban University, South Africa are endorsing the adoption of mobile technology as a delivery model for library services. Library managers and users are encouraging librarians to adopt mobile technology. Factors such as global

library trends, internal university support, and the COVID-19 pandemic have encouraged the adoption of mobile technology. Some effort is however required to successfully adopt mobile technology for library services. The libraries are not ready to fully adopt mobile technology. Shonhe (2019) indicated that ICTs adoption in Botswana libraries is negligible to meet the needs of 21st-century virtual library users. The majority of the librarians have a positive attitude towards technology adoption. Technology adoption in libraries allows quicker access to library resources, enhances service delivery and boost users' satisfaction. Library managers were making efforts to implement vigorous technological infrastructure to assist in the delivery of services such as MOPAC, mobile reference services, SMS alert services, ILL/DD, Library Management Systems and mobile e-journal search.

The mobile learning services in Ghana include smartphones and tablets which started at a slow rate but it has gradually grown and expanded to both urban and rural areas in Ghana for ten years (Kankam, 2020). According to Acheampong and Agyemang (2021), university students in Ghana were aware of the usage of mobile technology in the library and had a positive attitude about it. They expressed high hopes for the availability of library services on mobile technology platforms. Academic libraries in Ghana, on the other hand, were trailing behind in transitioning to m-tech platforms to supply library services due to a lack of technical and professional people with m-tech competencies in the selected libraries.

Ocran (2017) noted that students wished they could access databases, journals, digitized theses, and relevant books using mobile devices and without necessarily visiting the library buildings.

Students liked to access databases and full-text journal articles using their smartphones. Mawere and Sai (2018) revealed that public universities in Zimbabwe had wide-ranging e-resources that are available through different consortiums, members associations, and networks that the universities are a part of. For instance, the Great Zimbabwe University has an advanced search engine, institutional repository, online databases, and electronic past examination papers available online and are accessed via the university link.

Kenya has more than 31 million mobile subscribers. Mobile penetration in Kenya is at around 77%, and 12 of the 19 million Kenyans with internet access use a mobile data subscription (CAK, 2015). Roughly half of the world's population already has some type of mobile phone, making it the most widespread technology and most common electronic device in the world. This implies that mobile phones are more than three times the number of personal PCs and most of today's phones have the processing power of an average PC. These facts and the range of computer-like functionality offered by mobile phones and PDAs led some observers to speculate that many people in the distant future will start to see the mobile phone as an alternative to a PC (Wagner, 2011).

Aside from offering convenience, mobile devices present new opportunities for academic libraries to promote access and expand reach. One area that mobile devices have had an impact on libraries is the capability to use mobile devices for payments for goods and services. In particular, there is an emergence of applications for contactless mobile payments that use radio frequency identification technology (RFID) to enable mobile subscribers to make payment by waving their device directly in front of a terminal or automated device (Coulby et al., 2011). In Kenya, payment

via mobile phone technology is quite common through such services as Safaricom's '*Lipa na MPESA'*. Further, according to Aker and Mbiti, (2015) adoption of mobile devices in higher education in Kenya is a good assessment tool for students and enables those who communicate less in class to express themselves and their ideas in a manner that is more comfortable to them. Again, allowing students to use their mobile devices in the classroom to library resources is becoming increasingly convenient and less expensive than purchasing textbooks, and desktop or laptop computers.

Ndung'u (2016) observes that the shift in collections and services, competition for funds, and the need to justify expenditure is moving librarians out of their comfort zone and seeing them initiate and implement marketing and promotional activities. Ateka and Kwanya (2020) confirmed that a large number of Systems Librarians in Kenya are unaware of QR codes technologies. Only four academic libraries in Kenya are currently using QR codes. The libraries already using QR codes have adopted them because they are portable; can be read using diverse devices; are simple to use; and do not require advanced ICT skills. Academic librarians in Kenya are encouraged to adopt QR codes to support library orientation; promote outreach events; disseminate information about digital spaces from which users can download essential files; create games; and promote library spaces. Omallah, Maina, and Wanangeye (2016) showed that there is increased retrieval and use of library resources and services through the use of mobile phone technology at Mount Kenya University (MKU), Kisii Campus. MKU has created a strong library management system that offers ample platform for library users to interact with library services. MKU E-repository affords users access to books, journals, conference papers, projects, research papers, thesis and

dissertations, university publications, and virtue varsity modules. Against this background, this research examined the utilization of mobile devices among public universities in Kenya.

1.2 Problem Statement

The ability to teach and conduct research is essential to a university's continued existence. However, the development and sharing of knowledge are at the heart of the art of teaching and research. University libraries are strategically positioned at a crossroads for research and knowledge sharing since they are essential to the academic endeavors of their parent institutions and support their very survival. Since mobile devices are where students communicate personally and establish social connections, their inclusion in higher education might be creative and effective. Mobile devices are becoming more and more incorporated into the academic environment. Libraries, library users, and other researchers can employ mobile technologies as possible learning and research infrastructure to find and retrieve information. Although the standards and guidelines have been put in place and enforced in all the university libraries in Kenya, over the years, it has been reported that the university libraries and their information services are inadequate. Hollow (2014) found that only 33% of Kenyan high-learning institutions had successfully implemented the utilization of mobile devices in accessing information from the libraries.

There is a study limitation to evaluate how mobile devices have impacted academic libraries. Little is known about how mobile devices will transform information access in higher institutions of learning in Kenya. The argument question is whether their impact will be gradual and incremental or sudden and revolutionary. Since Kenyan students have been using devices such as laptops and mobile phones for the last two decades, one might argue that the impact of the use of

mobile devices on student's behavior in general and on higher education, in particular, has been relatively gradual. On the other hand, as mobile devices with compelling new features emerge and wireless connectivity is almost ubiquitously available across the country, Kenya may be on the verge of a revolutionary phase of mobile device impact on higher education and libraries. This study sought to examine the utilization of mobile devices in selected public academic libraries in Kenya.

1.3 General Objective

This study aimed at assessing the utilization of mobile devices in accessing information from selected public university libraries in Kenya with a view to enhancing the exploitation of library resources.

1.3.1 Specific Objectives of the Study

The following specific objectives guided the study:

i. To identify the various mobile devices available in public university libraries in Kenya.
ii. To determine how mobile devices are utilized in accessing information from public university libraries in Kenya
iii. To establish the benefits of mobile device utilization in accessing information from public university libraries in Kenya
iv. To identify the challenges faced in the utilization of mobile devices in accessing information from public university libraries in Kenya
v. To determine viable ways of enhancing the utilization of mobile devices in public university libraries in Kenya.

1.3.2 Research Questions

The study sought to answer the following research questions

i. What are the various mobile devices available in public university libraries in Kenya?
ii. What are the different ways in which mobile devices are utilized in accessing information from public university libraries in Kenya?
iii. What are the benefits of mobile device utilization in accessing information from public university libraries in Kenya?
iv. What are the challenges faced in the utilization of mobile devices in accessing information from public university libraries in Kenya?
v. What are the viable ways of enhancing the utilization of mobile devices in public university libraries in Kenya?

1.4 Significance of the Study

The findings may be ofimportance to the students since they will be enlightened on the importance of using mobile devices in accessing information from the library since it enables students to access learning materials from the library at ease. This will help improve the quality of learning. The lecturers will find the findings of this study useful since through frequent utilization of mobile devices in accessing information from the library, they will be able to deliver content in new and innovative ways, thereby improving the quality of teaching.

This study may be of immense benefit to the universities since they will be able to identify the constraints in mobile devices in accessing information from the library and seek ways to address them. This may enable the University to allocate its resources and concentrate its efforts on the critical areas to ensure the success of the programme. If successful, it will enable the University to

successfully implement the utilization of mobile devices, thereby opening a new avenue for effective teaching and increased access to many students. The findings from the study may provide needed direction for the university administration in providing the best options for the effective utilization of mobile devices in accessing study materials from the library.

The government may also use the findings to allocate more funds to boost ICT infrastructure and source of knowledge. It is hoped that the findings of this study may be useful to the Ministry of Education in putting in place mechanisms that enhance effective capacity building for the effective utilization of mobile devices in public universities. The study improves the researchers' knowledge in the utilization of mobile devices in accessing information from selected public university libraries in Kenya involved in the study hence he gained first-hand information. The study may also assist academicians who may also want to embark on similar studies in the future. This study will be a point of reference to academicians with an aim of exploring the utilization of mobile devices in accessing information from selected public university libraries in Kenya.

1.5 Scope of the Study

This study centered its scope on the utilization of mobile devices at the University of Nairobi and Kenyatta University's main campuses. The study target was 1620 students, 57 teaching staff from three academic departments, 91 library staff, and 38 ICT staff from KU and UoN. The study was conducted in the academic year 2022/2023 within a scope of 12 months.

1.6 Limitations of the Study

The study experienced the following limitations:

i. Due to the many types of mobile devices available in this era of the digital world, the researcher only used commonly used mobile devices in this study.

ii. Uncooperative respondents were however assured of confidentiality regarding the information that they would provide.

1.7 Definitions of Operational Terms

The following terms were taken to have the following meanings for this study:

University Libraries: A university facility where a collection of information materials is well preserved and made available to users primarily for academic purposes.

Mobile Devices: Any mobile technology used to access information from the university library. The devices include mobile phones, Laptops, i-pads, pocket PCs, palmtops, P.D.A, and Bluetooth headsets.

Utilization: Access to information, content, and/or allows users to access information from the university library easily.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents an up-to-date review of related literature on the utilization of mobile devices in academic libraries. The literature is sourced from relevant professional education journals and published and unpublished theses. The chapter helps to show what other researchers have found out about the utilization of mobile devices in academic libraries, their findings, and their insights. These studies are geared towards helping the researcher to identify the knowledge gap and justify the need to carry out a study on the utilization of mobile devices in selected universities. The chapter is divided into the following sections: Introduction, related literature on the utilization of mobile devices in academic libraries, and summary. Related literature on the general utilization of mobile devices in academic libraries has been reviewed per the research variables.

2.2 Theoretical Framework

This study was based on the Technology Acceptance Theory developed by Davis (1986). The Technology Acceptance Theory postulates that an individual's attitude toward behavior is influenced by his/her beliefs. Notably, the model deals with the acceptability of an information system/tool, how it can be used to predict the acceptability of the system/tool, and modifications to be made for acceptability. The model assumes that acceptability is majorly determined by Perceived Usefulness (PU) and Perceived Ease of Use (PEU). PU can be described as the degree to which an individual believes that the use of a system/tool will improve his/her performance while PEU refers to the degree to which an individual believes the use of a tool/system will be effortless or require minimum effort. The model postulates that the use of a system/tool is determined by behavioral intention, an individual's attitude to its use, and the perception of its

utility. The attitude of a user towards technology or innovation is dependent on whether the user will utilize or reject the innovation. The attitude of the user, in turn, is influenced by perceived efficacy and perceived simplicity in terms of use, with a direct effect on perceived usefulness and ultimately improving performance (Lai, 2019). The perceived usefulness and perceived simplicity are measured by external variables such as the cost of data, availability of facilities, and associated challenges of the technology or innovation.

Davis (1986) posits that the attitude of an individual is not the only factor that determines his/her use, but the impact the tool or system will have on his/her performance is also a significant factor. A review of the Technology Acceptance Theory has shown that the theory is mostly used theory in model development of a specific user acceptance of emerging technology. Kurnia, Smith and Lee (2005) suggest that amongst other models, the Technology Acceptance Model (TAM) has been the most influential and widely adopted to predict the acceptance and use of various technologies for learning. This is because the model has a strong theoretical basis and enjoys sufficient empirical support. When used effectively, the model can save an educational institution the risk of investing in a technology that may remain abandoned or grossly underutilized.

Moon and Kin (2001) used the theory to explain the users' acceptance of World-Wide-Web in an educational context. Ammar (2014) argued that TAM is an acceptable model and has been employed in many information technology and information system areas such as e-learning. Fu, Farn and Chao (2013) in their study on applied technology acceptance theory established that a manual taxpayer‘s decision to adopt an e-tax method is influenced by perceived ease of use (PEOU) and social pressures. Perceived usefulness (PU) was found to be the strongest determinant

and explained most of the variance in behavioural intention. Lu, Yu, Liu and Yao (2013) study on Technology Acceptance Model for wireless Internet applied the technology acceptance model and established that the attitude towards using is jointly determined by perceived near-term and long-term usefulness and perceived ease of use (PEOU). Perceived near-term usefulness is also influenced by ease of use. De Smet et al., (2012) in their study regarding LMS use in Belgian secondary schools used the TAM and discovered that PU and PEOU had a strong effect on the informational use of an LMS. The main limitation of the TAM theory is given by Van and Cavaye (1999) who indicated that TAM does not account for the influence and personal control factors on behavior. Other factors like economic factors, and outside influences from suppliers, customers, and competitors are also not considered by TAM

Shonhe and Jain (2017) highlighted that technology increases knowledge and escalates personal innovativeness and collaboration with people. Therefore, perceiving technology positively motivates students to not only accept but also utilize it to the fullest for their benefit. Students are likely to use smartphones to access library services if they accept the technology, which includes smartphones (Khrais, 2017; Leavell, 2020). The theory is adopted for this study because for academic libraries to be relevant in today's information world, they must employ and use modern technologies in the provision of their services for client satisfaction. Thus, the Technology Acceptance Theory is completely pertinent to this study because the study tries to determine the impact on the utilization of mobile devices in selected public academic libraries in Kenya from a Technology Acceptance Theory point of view. The theory also deals with the acceptability of an information system/tool, how it can be used to predict the acceptability of the system/tool, and modifications to be made for acceptability. This acceptability forms the basis of the current study's

objectives as it examines the different ways in which mobile devices are utilized in selected public universities, and the benefits of mobile devices utilization at the library.

2.3 Mobile Devices Available in Libraries

Other than the common devices like computers and laptops, other devices are more portable and enhance students learning in higher institutions of learning. They include Smartphones, cell phones, iPods, MP3 players, and tablets. With each new generation of mobile devices, the rapid rate of innovation in this industry continues to expand the potential of these devices, challenging assumptions about how they should be used and presenting additional possibilities (Saxena & Yadav, 2013). According to Mansouri and Asl (2019), library users (particularly students) using web-enabled handheld devices use gadgets like tablets, smartphones, PDAs, and web-enabled cell phones to access a library OPAC.

Devi and Keshava (2021) study on e-sources perception and use among medical students in India found that the medical students used several mobile devices including smartphones and tablets to access online databases. The study also found that mobile Apps and databases facilitate the adoption of mobile technology in universities' libraries. Waral (2018) carried out a study to identify the aim of using mobile devices as well as the challenges faced by engineering students. Results showed that computer ownership among the students reduced drastically as students embraced the use of smaller gadgets like laptops, Personal Digital Assistants (PDAs), tablet personal computers (PCs), cell phones, and e-book readers due to their portability. Ownership of these gadgets was also due to the availability of mobile technology in the universities' libraries which made it easy for students to access reading materials easily.

Kim, Ilon, and Altmann (2013) examined the utilization of smartphones for learning among education and engineering students of a public university in Korea. Study results showed that all students used different smartphones for learning purposes. Students regularly used smartphone apps for learning purposes. The common apps in students' phones were dictionary, translation, document viewer, e-mail and instant messaging, media, notes, scheduling, social networks, and web searching. Anyim (2020) investigated the use of mobile technology for information access and retrieval in emergencies. The majority of mobile technology users were not adequately informed about the usefulness of mobile services in gaining access to information of their choosing, according to the findings. Libraries services were accessed through mobile devices and apps in higher education institutions, such as mobile-based online databases, mobile personal space, or my library via Smartphone, short message service (SMS) notifications, or social media networks. Worldcat mobile, word web dictionary, encyclopedia Britannica mobile, Meebo mobile, Library of Congress, MedlinePlus mobile, and U.S. National Library of Medicine Mobile were among the mobile applications that supported mobile libraries. Free factbook, OECD factbook 2010, history: global maps, planets, etc.

Nalluri and Gaddam (2016) investigated key strategies used by innovative libraries to provide services through mobile services. The study established that students access wide-ranging digital resources and library services and actively engage in learning activities using mobile devices from whichever location and as far as there is strong network coverage. Developments in MP3 format, pod costing, and support for a third generation of smartphones put Smt. HM Library at the leading edge of new and emerging trends in mobile learning and education. Sharma and Madhusudhan (2017) studied real-time utilization of mobile devices for academic purposes in central universities

in India. Study results showed that the majority of university students used mobile devices daily for more than 3 hours. The majority of them used smartphones. The Apps used for creating academic documents included Gmail App, Whatsapp, Google App, Adobe Reader and PDF. Most of the respondents accessed Library Website through their mobile device and only 1.96% accessed e-books from their mobile device. Theophilus (2017) investigated students' perception of mobile technology at the University of Cape Coast, Ghana. Data was collected through interviewing the students. Results revealed that nearly every student owned a smartphone which they used to access library services. The devices frequently used to access library services include laptops, tablets, computers, both net and notebook computers. The students had positive perceptions towards mobile phone-based library services.

Damilola et al., (2019) studied the utilization of mobile technology in public universities in Nigeria. Findings showed that the students relied to a great extent on mobile technologies like smartphones, cell phones, iPods, MP3 players, and tablets to locate, retrieve, evaluate, and use information from the university libraries. The university librarians assisted students on how to access library information from their phones which built more confidence amongst students in using mobile technology to access information from the school library. Kapondera and Ngalande (2020) investigated the usage of mobile technologies in universities in Malawi. The most common mobile technologies in academic libraries were smartphones and tablets. There was, however, low usage of mobile technology in the universities which was alluded to costs involved in purchasing mobile technologies, poor institution ICT policy, inadequate skills in utilization of mobile technologies, and lack of awareness of mobile technologies

2.4 Utilization of Mobile Devices in Public Universities Libraries

Based on the notion that today's students have grown up immersed in a technology-rich environment, it is possible to assume they are capable, interested, and willing to use different and innovative technologies to support their academic goals (Vesisenaho et al., 2010). Today's students utilize their mobile technologies (smartphones, PDAs, tablets) everywhere they go, including their classrooms. Their proficiency with these tools presents opportunities for schools to take advantage of these innate skills. Due to this rapid deployment and growth of mobile technology, academic library resources appear to have the potential to make research material more accessible to and inclusive of all users. Nonetheless, for mobile technologies to have a positive impact on education, guidelines are needed for the application of mobile technologies to support instructional and non-instructional activities. According to Alexander (2004) and Park (2011), the most important aspect of instructional design in the context of library access is the identification of mobile technology.

Recent studies have shown that in general, students are ready to accept and use mobile devices for education (Mahat et al., 2012; Taleb & Sohrab, 2012; Corbeil & Corbeil, 2011; Park, 2011). Educators and administrators must capitalize on this increasing use and familiarity with mobile technologies, which readily place access in the hands of the learners, to develop learning materials that can be delivered at the place and time when users need them and want them. The most logical use for mobile devices is to access networks, services, and academic library resources on demand (Wagner, 2008). They provide users access to a large resource pool, regardless of physical location. Users no longer need to be tethered to a chair and a PC to access the Internet and Web services. Improved and more powerful mobile devices rapidly entering the market and becoming readily

available and more robust telecommunications networks, widespread consumer adoption of the ability to support academic library access with these technologies is more feasible than ever (Vesisenaho et al., 2010).

Gikas and Grant (2013) pointed out that academic library resources are the heart of the next wave of emerging technologies, which is slowly reaching many users of libraries in institutions. They suggested that applications of mobile computing devices and their wireless access to social media, library resources, and online learning management systems have opened the door to three common activities: engaging learners with constant connectivity, fostering collaborative learning, and enabling authentic learning on the move. Mobile devices can thus be employed in a wide variety of ways to enhance learning in both formal and informal education. The educational technology itself usually does not determine how it is used and applied to support teaching or learning (Passey, 2014). Thus, technology-based learning activity does not exist ready-made in technology or software. The same technology or software can generate different activities and experiences in different learning environments. Therefore, technology-based learning activities are always constituted through a situated interaction of learners, teachers, and technologies (Mercer & Littleton, 2007). Hence, what is noteworthy is that educational technologies vary widely; some are more teacher-centered such as interactive whiteboards enabling teachers to convey knowledge to students more easily and some are more learner-centered (e.g. mobile devices) enabling students to construct their understanding and knowledge. A wide variety of approaches to the different technologies can be utilized in an educational context (Passey, 2014).

Mobile access to libraries can be seen as a method for extending and blending teaching and learning. It is important to perceive mobile utilization as part of a learning continuum that includes multiple learning tasks and multidisciplinary learning (Cinque, 2013). Tetard, et al., (2008), for instance, highlighted that mobile access to libraries is not an isolated activity or phenomenon; instead, it should be seen as part of other forms of education. Thus, mobile technologies can be integrated in various ways in and outside the classroom to enhance and extend learning and therefore can promote innovative teaching practices through the utilization of mobile devices. It has been suggested that innovative teaching practices such as student-centered pedagogies, extending learning beyond the classroom, and integrating information and communication technology into teaching and learning can support learners' development of the skills they will need in future life and work (Shear, 2011). Thus, availing academic library resources through mobile technology can also provide skills development in areas such as communication, problem-solving, and critical thinking, which are considered important skills for future life and work (Binkley et al., 2012).

The use of mobile devices to present academic libraries to obtain responses from learners and provide appropriate feedback fits within the behaviorist paradigm, which is a systematic approach to the understanding of human behavior (Naismith et al., 2005). These types of activities can also be called drill and feedback or drill and practice activities. Drill and feedback activities are especially suitable for repetitive practice and small tasks such as the memorization of vocabulary or rehearsing mathematical skills. Drill and feedback activities offer advantages such as the gathering of data to track the progress of each student and the tailoring of content and feedback to suit particular curriculum areas. Mobile devices in drill and feedback activities provide anonymity

and speed aggregating and displaying collective understanding as exemplified by classroom response systems (Hanewald & Ng, 2011).

Markland, Rempel and Bridges (2017) explored the usage of mobile devices at Oregon State University Libraries. The study targeted students living off campus. Results showed that students who lived off campus frequently used library websites for reading scholarly sources. The mobile gadgets were mostly used to view the library website at home and not necessarily go to the school premises physically. Hranchak, Dease, and Lopatovska (2022) sought to determine university/college students' mobile phone practices as well as to understand the development of prospective library information mobile services. The results were based on an online survey whereby students were recruited from different departments in different universities in America and Ukraine. Results showed that the universities offered several mobile services which included information and reference services via messengers, development of library mobile applications of audio and video content; access to educational, scientific, and popular science literature and fiction; and supplementing online services with library chatbot. Dukic, Chiu and Lo (2015) found that university students in Japan used smartphones to access course materials, search library catalogue, discuss course assignments with peers, and take notes for upcoming lessons.

Lo, Cho, Chiu and Ho (2016) explored the art and design students' use of smartphones for accessing library services and learning at the Hong Kong Design Institute (HKDI). Data were collected using questionnaires administered to students. The questions were based on students' utilization of Apps on their mobile devices for academic learning, social networking, and collaborative learning. Results showed that all the students in the university owned smartphones

and were active users of their smartphones. However, only a few students used their smartphones for learning. The students used search engines for research purposes and social communications for networking.

Odu and Omini (2017) examined mobile phone apps and the utilization of library services at the University of Calabar Library, Nigeria. This study employed a survey research design. The population consisted of 4,265 students and 225 were sampled using purposive and convenience sampling. Questionnaires were used to collect data. Results showed that there was a significant relationship between Twitter Apps, WhatsApp, Facebook, Skype and the utilization of mobile library services. Jibril, Musa and Abubakar (2021) examined the availability and utilization of Mobile Apps and Social Media in Libraries of federal polytechnics in Nigeria. The study targeted the students, librarians, and Heads of ICT units. Data collection instruments were questionnaires and observation checklists. Findings showed that mobile devices were used to access Mobile Apps and Social Media services which were available in the universities. The most common Apps and social media services used in the university were Blogs, Facebook, text messaging, and e-mail sending and receiving. The university librarians used these Apps to communicate with the students.

Omallah, Maina and Wanangeye (2016) analyzed the usage of mobile phone technology in access and utilization of library services in selected public universities in Kenya. The study location was Kisii and Mt. Kenya University. The study adopted a cross-sectional survey design. The respondents (library staff) were sampled using stratified random while students were sampled using purposive sampling. Data were collected through interviewing the library staff and administering questionnaires to the students. Findings showed that the universities had made

significant efforts in the adoption of mobile devices. The majority of the students agreed that they used their phones to access MKU online portal to log in and access learning materials from the library. The majority of the students used mobile phones to access, manage, and use their library accounts and library services. The mobile phones enable students to borrow books without queuing at the university reception, download and save e-books, and to renew materials they had borrowed from the library. Findings further showed that there exists a significant relationship between the usage of mobile phones and the utilization of library services.

2.5 Benefits of Mobile Devices Utilization in Public Universities Libraries

With the advent of emerging mobile technologies, the need to integrate mobile devices into accessing academic libraries is inevitable. Mobile device access to academic library resources is an emerging innovation that is being integrated into university exploitation of academic resources to give a complete package of information materials (Ozuorcun & Tabak, 2012). It is the delivery of academic library resources material through mobile devices such as PDAs iPods, mobile phones and smartphones, and tablets (Sitthiworachart & Joy, 2008). According to Kennedy et al. (2006), mobile phones are pervasive mobile devices with university students, with over 97% of students born since 1980 being owners. Due to the increased capabilities of most mobile phones, the number of users using their phones to access the internet is also increasing dramatically. In fact, in many countries, especially developing countries that often lack wired infrastructures, much of the population only uses their mobile phone for Internet access. Kenya is fifth in Africa in terms of mobile phone internet usage. This is shown in Table 2.1

Table 2.1: Percentage of Mobile Web users

N=15,204			
Country	**Percentage mobile only**	**Country**	**Percentage mobile only**

Egypt	70%	Indonesia	44%
India	59%	Thailand	32%
South Africa	57%	China	30%
Ghana	55%	U.S.A	25%
Kenya	54%	UK	22%
Nigeria	50%	Russia	19%

(Mobithink Mobile Statistics, 2016)

Mobile devices impact access to academic library resources in universities in a very significant way. Nikana (2010) asserts that the use of mobile devices in accessing academic library resources in universities may lead to an increased understanding of the material content. Nikana explains that through different collaborative methods and delivery approaches, university students are provided with an increased understanding and depth of knowledge regarding the material content. Nikana also claims that student motivation may increase through the use of mobile devices because students could participate in group discussion and dialogue more often and receive quick and effective feedback which may reinforce learning and increase memory retention. Cronje (2010) reports that mobile devices may act as a good assessment tool for students and may enable students who communicate less in class to express themselves and their ideas in a manner that is more comfortable to them. Again, allowing students to use their mobile devices in the classroom is becoming increasingly less expensive than purchasing textbooks, desktops, or laptop computers.

The use of mobile devices enhances the ability to deliver course content and communication between students and their lecturers. Song (2007) defines six categories by which course content may be delivered using mobile devices:

Pushing: delivering assessments and quizzes without constraints of time and place. Messaging: a one-way communication using SMS Response and feedback: instant two-way communication File exchange: students and Librarians sharing information anytime, anywhere posting information

presentation, dissemination, annotation mostly done with other devices, Lecture room communication: students and lecturers share information in the form of asynchronous messages

Other users see the potential uses of mobile phones in the lecture room as a tool that can do more than foster communication and aid in the exchange of information. Because mobile devices are increasingly multifunctional, they can perform various functions in the lecture room. For example, a student may use his or her mobile device to podcast, study using virtual flashcards, access the internet, read a research paper, respond to a question posed by the lecturer, post a comment, blog, or use the device as a calculator.

Mobile technologies are playing an increasingly important role in students' academic lives. Devices such as smartphones, tablets and e-book readers connect users to the world instantly, heightening access to information and enabling interactivity with others. Applications that run on these devices let users not only consume but also discover and produce content (Hashemi et al., 2011). As such, they continue to transform how the students learn, as well as influence their learning preferences, both within and outside the classroom. The popularity of mobile technologies among students is increasing dramatically. Results from the ECAR research study on students suggest that more and more students bring their own digital devices to university, favoring small and portable ones such as smartphones and tablets (Dale & Povey, 2011).

Although students still rate laptops (85%) as the most important devices to their academic success, the importance of mobile devices such as tablets (45%), smartphones (37%), and e-book readers (31%) is noticeably on the rise. Increasingly, students say they want the ability to access academic resources on their mobile devices. Sixty seven percent (67%) of students who use smartphones

and tablets are reportedly being used for academic purposes in libraries a rate that has nearly doubled in just one year (Osang et al., 2013). Convenience, flexibility, engagement, and interactivity are all factors that make mobile devices more attractive to students (Alzaza & Yaakub, 2011). With these trends in mind, it is not surprising the New Media Consortium's 2013 Horizon Report predicted that mobile applications and tablet computing will have a time-to-adoption of one year or less in higher education (Shonola & Joy, 2014). Many universities now use mobile technologies and create mobile-optimized versions of their websites or build stand-alone applications that can be downloaded from mobile application stores.

Madhusudhan (2015) studied the use of mobile devices for academic purposes in the University of Delhi and the University of Hyderabad. Findings showed that mobile devices were easier, more accessible, faster, time-saving, and could be used for m-learning to improve social interactions. The students mostly used mobile devices to check their social networks and access newspapers. Other students used mobile devices to search educational materials online and find others for academic research. The students discusses classwork and assignment with their peers on WhatsApp since it is cheaper than normal calling rates and the app enables students to create groups to discuss academic matters which enhances the participation of every student in a group work. Mobile services were preferred by the majority of the students since they are very easy to and affordable compared to laptops.

Poongothai, Karupaiya, and Priyadharshini (2015) studied the application of mobile phones for library services in India. The findings revealed that mobile devices have made learning more mobile and appealing due to their flexibility, interaction, and ease. In India, more colleges are embracing mobile technologies for student use. Mobile applications have been included in the

curriculum of several courses, such as Information Technology courses. The apps aid creativity by allowing users to create content. Students learn to express themselves via a device's camera, microphone, and other sensors.

Elahi (2016) sought to identify the need for a mobile-based library information and service delivery system in developing countries; the case of Bangladesh. The study employed an exploratory research design. The study was based on a literature review. Users of academic libraries, especially students and faculty members, have a favorable attitude toward creating and implementing a mobile-based library information and service delivery system, according to the findings. The mobile utilization enabled students to access various materials from the school library and for the tutors, referencing was easier as they would just send links to students' materials through the class WhatsApp groups.

Farley (2015) examined how university students perceived the benefits of mobile learning, the technologies they used, and the extent to which the universities had adopted mobile technology in delivering library services. Findings showed that the students were actively using mobile devices and had access to support their academic learning. The students used their smartphones for various tasks such as news, game scanning, navigation, photography, entertainment, sharing information, and reference. The students constantly used mobile devices for their learning.

Abdulrazzaq and Al-Ani (2018) investigated universities' ability to utilize Smartphone applications and services in the University of Bahrain. Questionnaires were used for data collection. Findings showed that the students and university staff (academic and non-academic) had positive attitudes towards the utilization of mobile technology in the university particularly in

administration and library. The majority of the respondents indicated their willingness to become users of such services if offered. Smartphone enables students to check records of books borrowed, renewing their library items, document reservations, online registration for library cards, and reminder for borrowed items. Smartphone also enables users to register with the library system and send SMS register to the Smartphone library circulation system.

Rivo and Žumer (2022) explored the use of mobile technology among university students in Slovenia. Online questionnaires were used for data collection. Results showed that the students perceived mobile services as beneficial particularly for reading scholarly e-resources but with several challenges. Students perceived mobile services as practical for easy access to e-resources although they did not perceive them as suitable for regular studying. This resulted in low utilization of library online resources. Panda (2021) examined the benefits of the on-the-go reference service using mobile technology in the library. Mobile technology was perceived as an economical and affordable technology solution that helps libraries to keep abreast of the constantly changing needs of their clients and point out measures to effectively deliver user-centered services by evaluating users' needs. Siregar and Dewiyana (2018) sought to determine the basic conditions of mobile technology services and mobile services most needed by library users, as well as constraints faced by libraries and users in the application of mobile technology. Data was collected using questionnaires, interviews, and direct observation. The results showed that mobile technology applications provide better library services and improve the accessibility of library resources most easily, but due to lack of funds, lack of skills, and lack of staff, many libraries are unable to provide this service successfully.

Allen and Taylor (2017) examined the impact of information and communication technologies on e-learning in academic libraries in developing countries. Findings showed that mobile technologies have continued to grow in developing countries. Libraries that have successfully implemented mobile technology assist students and researchers to access information required to be proficient and productive in scholarly pursuits without physical boundaries. Mojaye (2015) investigated the impact of mobile phones on teaching and learning and its usage among university students in Nigeria. Findings showed that the utilization of mobile technology enabled students to easily access information from the university and conducted individual and group research. Mobile utilization had negative effects on students which included distraction in classrooms, cheating during exams, addiction, and poor writing skills.

Adeyinka, Olawuyi and Durodolu (2021) studied university students' usage of smartphones to access library materials and services in sampled university libraries in Nigeria. A survey design was adopted. Findings showed that most undergraduate students preferred to use Android phones. The phones were used to access materials and library services. Visual resources, reference materials, databases, maps, and atlases were the most common types of items viewed online. Undergraduate students found the reference service to be the most accessible service via their smartphones, followed by the circulation service and the online public access catalog. The use of cell phones to access library materials allowed for quick access to information, issue-solving, and the timely submission of assignments. Undergraduates preferred utilizing a smartphone to access library materials and services because it saves time, is stress-free, and offers quick access to items and services when compared to visiting the library.

Mansour (2016) looked at the use of smartphone apps among students at Egypt's South Valley University's Department of Library and Information Science (DLIS). The research methodology used in this study was quantitative. Data was gathered via questionnaires. Students used a variety of educational-related Apps. Google Mobile, Facebook, e-mail, Twitter, YouTube, and Wikipedia Mobile are among the apps available. Students perceived the applications were simple to use and important. The Apps were used to send messages, keep up with the news, and play games. Students reported mostly good feelings towards applications, with a few reservations. Almost all students said they trust the majority of applications on their smartphones because they helped them organize academic and social activities.

Buruga (2016) sought to gain an in-depth understanding of how university libraries in Uganda effectively used mobile technologies to deliver social media-based library services. The study sampled 100 undergraduate students and four staff members. Interview guides and questionnaires were used for data collection. The students and staff members agreed that mobile technologies are important for the provision of library services and resources in the 21st century. The university library provides services to its users through mobile technologies and social media using WhatsApp, Facebook, and Kindle Fires e-readers.

Ilako (2016) investigated students' perceptions and attitudes towards the use of mobile phones in Maklib. Data was collected from postgraduate and undergraduate students using interview guides. The study respondents were sampled using convenient sampling. Findings showed that mobile phone ownership was wide-ranging among university students. Mobile phones facilitated access to various types of information. The students were well knowledgeable about the benefits of using

mobile phones for information access and only a small percentage of the students were not aware of the technology used by the university library. The university mobile services were re-engineered to enhance and improve reference services to meet all the needs of the users. However, the different mobile services have made it difficult to know which devices and services were more appealing to users.

2.6 Challenges Faced in Utilization of Mobile Devices in Public Universities Libraries

The changing landscape of mobile technologies and the usage patterns create challenges for mobile device utilization in academic libraries (UNESCO, 2011). Some people also consider it challenging that mobile devices have a small screen, limited processing power, and reduced input capabilities (Al-Hamouz & Freeman, 2010). Park 2011, however, stated that in light of how rapidly mobile devices are improving, the technical limitations may be only a temporary concern. The present mobile technology in general allows characteristics such as ubiquity, personalization, interactivity, and collaboration because of its size, weight, and portability.

The unquestionable fact, however, is that mobile devices are not being developed specifically for the educational context. Mobile devices, such as tablet devices, incorporate a range of applications, including games and entertainment. Therefore, many European governments, policy-makers, parents, and teachers treat mobile technologies as disruptive. Some countries have even banned or restricted mobile device use in the school context (Hylén et al., 2012). UNESCO's (2011) Mobile Learning Week Report, for instance, suggested that many educators have experienced the frustration of students sending text messages on their mobile phones during class. Therefore, it is important to set guidelines for ensuring the appropriate use of mobile devices in an educational context (Sharples, 2013).

Another reason for the minimal use of mobile devices in academic libraries is that educators are either not familiar with the specific tools or not able to see the link between the tool and the learning opportunities (Ferrari, Cachia & Punie, 2011). Sharples (2013) argued that although the infrastructure and technical support for the appropriation of ICTs currently exist and many teachers are aware of them, the problem might be that clear guidelines and frameworks are lacking. However, this gap can be bridged, for instance, with examples of classroom practice. Hence, tutors should have examples of how to integrate mobile technologies into teaching and learning and with other tools (UNESCO, 2011). Such examples can assist a tutor in finding appropriate tools and learning how to use them as well as designing his or her implementations.

The challenge is to design new forms of academic library resources supported by mobile devices (Sharples, 2013). Some educators, for instance, might be unfamiliar or uncomfortable with the student-centered learning that mobile technologies can facilitate and therefore reluctant to use mobile devices for educational purposes. Thus, it is important to clarify whether there is a need for content knowledge, pedagogical knowledge, or ICT skills (UNESCO, 2011). These kinds of knowledge and skills are a solid part of a teacher's competencies. Such competencies include inter alia teachers' knowledge about the subject matter to be learned or taught, educators' knowledge about the processes, practices, and methods of teaching (such as learning theories), and teachers' knowledge about how to work with technology and how to apply technological tools and resources to teaching and learning (Koehler & Mishra, 2009).

Alrasheedi and Capretz (2013) highlighted that a lack of factors such as technical competence of educators, development of assessment techniques, and institutional support may explain the slow adoption of mobile technologies in academic library access. According to UNESCO (2011), an

essential condition for mobile learning is its need to be systematic, including issues such as affordability, leadership, a shared vision for implementation, teacher training, partnerships, and related policies. Lam et al., (2011) argued that teachers should be provided with training and continuous support. Thus, sufficient support and especially teachers' open minds are crucial in implementing new ideas and approaches in an educational context (UNESCO, 2011).

Lefoe et al., (2009), used to much highlighted that it is no surprise that new technologies have not had a large impact on pedagogy because educators generally find it challenging to engage in new ways of thinking about their teaching within current workload structures. Ertmer (1999) stated that the barriers to ICT integration can be divided into first-order barriers and second-order barriers. The first order includes issues such as lack of adequate access, time, training and support, while second-order barriers include the teacher's pedagogical and technological beliefs and willingness to change. Thus, one clear barrier to mobile device utilization in access to academic libraries is negative educator perceptions and beliefs about mobile learning (UNESCO 2011). Lefoe et al., (2009) stated that teachers who change their teaching practices through new technologies are often enthusiastic individuals working with their projects.

Buruga (2016) identified several challenges that hindered the usage of mobile and social media technologies in public universities as; unreliable internet connectivity, lack of trained library staff members to manage technologies, lack of skills among technology users, and lack of an independent library social media strategy. Abdulla and Esmaeel (2019) studied library staff efforts in providing services through using smartphones in Saudi Arabia. Findings showed that the majority of the university library staff do not use cell phones to provide information services. This

was due to a lack of training on how to use the information systems and a lack of awareness among university staff on the importance of technology and how to use it effectively.

Hamad and Hamarsha (2018) investigated the implementation of mobile technology in academic libraries in public universities in Jordan. The study adopted a case design and data was collected using questionnaires from ten public universities. Findings showed a high level of awareness of the benefits of using mobile technology in the universities. Although the university staff were aware of their roles and the value of mobile technologies in the university, mobile technology was not fully exploited for various reasons. The reasons included incompatible information technology, poor internet infrastructure, and lack of staff training. Consequently, the students did not reap the maximum benefits of mobile technology.

Akinola et al., (2018) study on awareness and use of electronic database among university postgraduates in Nigeria revealed that many postgraduate students faced challenges in retrieving important information because of a lack of search skills. Azubuike and Madu (2017) focused on mobile information services delivery by librarians in public universities in Nigeria. Findings showed that the main challenges facing successful utilization of mobile technology were constant power outrage, different mobile devices to learn how they function, lack of staff training in using mobile devices, and lack of adequate resources for utilization of the mobile technology. Chisenga (2015) conducted a study on library users, ICTs, and libraries in Sub-Saharan Africa. Findings revealed that most libraries did not have adequate financial resources to buy library materials. The universities that succeeded in installing commercial library systems or managed to automate some or all functions lacked adequate resources to upgrade or maintain the library systems. Therefore,

when the systems failed, the universities were unable to pay for maintenance of license fees with regard to software systems and they were blocked from accessing some sites from the vendors.

Matheus (2021) investigated the utilization of smartphones in accessing library electronic resources in a public university in Namibia. The study adopted a case research design. The population included librarians and students. Findings showed that the majority of the students were well knowledgeable about the universities' e-resources. They use the e-resources to follow up on their lectures and the academic calendar. Several factors were identified as hindering the use of mobile technology in the public university. These included network instability, lack of training on the use of smartphones, small screens of the smartphone, inadequate resources for the mobile technology systems, challenges in navigating websites through smartphones, and lack of search skills.

Chaputula and Mutula (2018) examined the extent to which public universities libraries in Malawi used mobile phones in the provision of library and information services. Data was collected using questionnaires. Findings revealed that the universities had ICT infrastructure required for offering library and information services on the mobile phone platform. In addition, the students owned mobile phones and the universities provided free Wi-Fi to enable students to access e-resources from the universities' library. The universities however lacked operational ICT policies to govern the operations of library and information services offered through mobile phones although draft ICT policies were available. Findings further showed that although the library staff were trained to manage the provision of the library and information services through mobile phones, they lacked the necessary skills and human resources needed to provide quality services.

De-Graft (2020) sought to determine the ability of adopting and implementing mobile technology-based library services in academic libraries in Ghana. The study adopted a descriptive survey design. Findings showed that the students were aware of mobile technology and appreciated the institutions' efforts to innovate services. However, the mobile technology library services were not fully implemented in the libraries due to various reasons. There was inadequate ICT infrastructure, skills gas due to inadequate training, lack of policy framework for adoption of the technology, and the challenge of convincing students and the staff to embrace technology.

Edumadze, Ditlhokwa, and Demuyakor (2022) studied students' acceptance and perceptions of the perceived usefulness of mobile learning devices in universities in Ghana. The study sample was 1,030 students and questionnaires were used to collect data. The researcher reported several challenges ranging from lack of resources to cater for internet expenses, poor internet coverage, insecurity, privacy issues, and unreliable power. Irrespective of these challenges, there were high levels of mobile technology acceptance among the students.

2.7 Viable Ways of Enhancing Utilization of Mobile Devices in Public Universities Libraries

Sharma and Madhusudhan (2017) advised that library authorities should lay down policies towards the use of mobile devices and develop new tools and mobile apps for delivering access to e-resources. Chaputula and Mutula (2018a) stated that libraries need to draft Information and Communication Technology (ICT) policies that support the use of mobile smartphones to access e-resources. They also suggested that university and college library staff should be given training on how to manage and access e-resources using smartphones before implementation. Libraries should implement continuous professional development programs related to the deliverance of

library e-resources, through mobile phones to ensure that library staff continues to update their knowledge and skills, as technology is very dynamic.

Ally and Prieto-Blázquez (2014) stressed that to address challenges facing the utilization of mobile devices in academic libraries, educator training must be re-invented because the current model relies on classroom-based face-to-face delivery and does not prepare teachers for the technology-enhanced educational system. Hence, teachers must be trained in their new roles as mobile academic library utilization facilitators. Therefore, tutors need to have basic knowledge of the technology and its features as well as how to design effective learning strategies for mobile learning where learning is learner-centered rather than teacher-centered (Ally, 2013). In particular, it is important to provide hands-on learning experiences and help teachers develop their technological, pedagogical, and content skills (Ally & Prieto-Blázquez, 2014).

The other solution is the need for increased availability of bibliographic records for academic library access (Ozuorcun & Tabak 2012). While each institution needs to establish its priorities including within its service plan a commitment to creating bibliographic records for libraries, individual efforts should coalesce into regional and national efforts to achieve databases where a large number of bibliographic records are supported by standardized access points contributed by a large number of libraries, museums, and archives. These databases ideally would contain high-quality records that could be shared extensively with considerable savings to those who re-use them. Therefore, we need to be sure that our bibliographic utilities, already rich in cataloguing data for traditional library materials find ways to encourage participating members to contribute standard records for the full gamut of libraries (Shonola & Joy, 2014).

One of the most impressive responses to this challenge is OCLC's Cooperative Online Resource Catalog. Cronje (2010) asserts that this service is a Web-based metadata creation system for bibliographic records and pathfinders describing resources. The service has proved to be much used, not only because of its user-friendly interfaces in which persons creating catalogue records (in either MARC or Dublin Core format) are assisted by programs but also because of its "Pathfinders" feature which provides electronic subject bibliographies that point to the library resources represented by the bibliographic records. By October 2001, OCLC's World Cat contained some 500,000 records for electronic resources (Ani et al., 2008). Expansion of data should increase, since in addition to libraries, OCLC plans to seek the contribution of metadata from museums, archives, professional societies, publishers, and others, including authors. CORC expansion is a component of OCLC's plan to transform World Cat from a bibliographic database and online union catalog to a globally networked information resource of text, graphics, sound, and motion.

According to Alzaza and Yaakub (2011), the Research Libraries Group (RLG) hosts another large bibliographic database in which a large number of records for networked resources is available. At this time, there are about 250,000 records that include links finding aids, tables of contents, electronic texts, and Web sites. In addition, an important RLG undertaking with support from the Ford Foundation, the RLG Cultural Materials Initiative has focused on primary sources and cultural materials the rare and often unique works held largely by institutions that are so important for education and research, including published and unpublished texts, images, objects, and artifacts of many types (Gikas & Grant, 2013). Thus, this initiative is targeted at enhancing access to materials not only of interest to libraries but also to archives, museums, and other cultural repositories. Access is provided through Web browsers connecting to an information retrieval

interface developed specifically for this new resource. Common access points will be provided through mapping, while at the same time preserving descriptions particular to the originating discipline. Also noteworthy, RLG has taken a leadership role, at least within the United States to support increased production and sharing of archival collection guides online (Mahat et al., 2012). Cinque (2013) explains that collaboration among librarians has also enabled the development of INFOMINE, a database of about 25,000 records for scholarly and educational Internet resources that have been selected and described by librarians from various institutions. Intended for an academic audience, INFOMINE covers major disciplines and includes both free and fee-based Internet resources such as databases, image bases, bibliographies, software archives, e-journals, e-texts, digital collections and other finding tools and search engines.

One of the goals of INFOMINE is to create an Internet finding tool that is freely available and provides an alternative to more general search engines for locating scholarly or educational Web resources, by providing more focused and appropriate search results focused on significant core and/or reference resources of interest to serious academic researchers (Shear, 2011). In many ways, INFOMINE's goals sound similar to those of the CORC database of librarian-selected and described resources, using standard subject headings and Dublin Core, built cooperatively thus hopefully leveraging time and money as an alternative to each institution building multiple redundant tools. Unlike CORC, INFOMINE is created using open source software (GNU GPL), and can be searched by anyone with a Web browser (Al-Hmouz & Freeman, 2010).

Essential to the success of scholars' efforts to join other users and patrons with the resources they need is our ability to create a strategy for identifying those worthy of the cost of cataloguing them.

Lam et al., (2011) observed that the OCLC Web Characterization Project provides data regarding the distribution of public Web site providers across types of economic activity, and their statistics reveal that Web resources are available for the full range of topics of interest to researchers worldwide. This means that selection criteria that libraries, archives, and museums will have established for printed publications and other non-book materials would apply to the evaluation of Web resources as well.

These include authorship, content, provenance, accuracy, relevance to institutional mission, and subject matter. In addition to these traditional selection criteria, remote access resources entail other characteristics that need to be considered in determining which of them justify cataloguing (Rowland & Nicholas, 2010). Such additional features include the design of the resource, ease of use, timeliness of the content, permanence, quality of links to other sites, value-added utility beyond print versions, scholarly reputation of the originating domain, and uniqueness. Persistence of the resource itself and the URL by which it is accessed are very important considerations in selecting Web resources. For those resources available on the Internet that are commercially available, their cost should be factored into the selection formula (Binkley et al., 2012). Beyond increasing the number of standard records, information managers are challenged to enhance access to and display these records and to do so across multiple systems. The issues related to standards for creating bibliographic records, standards for access points of all kinds, and standards for communicating data across systems.

2.8 Conceptual Framework

The following conceptual framework can be derived based on the variables of the study

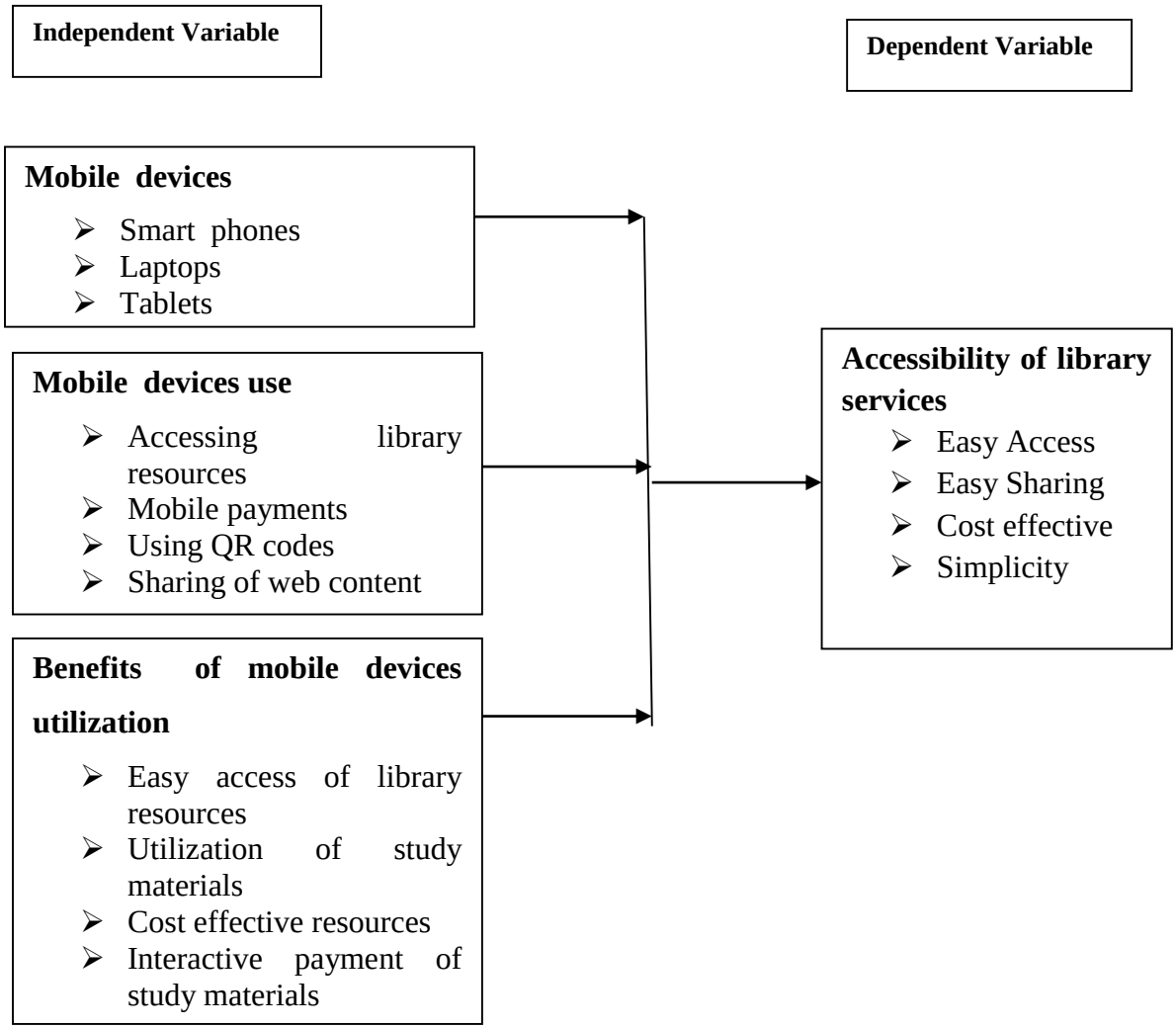

Figure 2.1: Conceptual Framework

Source: Researcher (2016)

The conceptual framework shows that key aspects determine mobile device utilization in academic libraries. Such as mobile device diversity, mobile device accessibility, and mobile device simplicity. Consideration of these aspects is determined by users' attitudes, experience, and course of study. An ideal interaction of these aspects results in the successful utilization of mobile devices in academic libraries that facilitates easy access, easy sharing, and cost-effectiveness.

2.9 Summary of Literature Review

The literature highlighted that mobile devices are crucial to academic libraries. The literature revealed that the benefits of mobile device utilization in academic libraries should be to offer new learning opportunities that extend learning beyond the traditional teacher-led approach. As the literature has emphasized, the potential of academic libraries lies in using mobile technology with new pedagogy. From the literature reviewed, it can be observed that, if mobile devices are not utilized in academic libraries, students in institutions of higher learning could potentially miss the convenience, flexibility, engagement, interactivity, and all other factors that make mobile learning more attractive to students in institutions of higher learning. With this understanding, the current study sought to delve into the utilization of mobile devices in academic libraries with particular reference to selected public universities.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the research design and methodology used in carrying out the study on the utilization of mobile devices in academic libraries: The study was carried out in selected public universities in Kenya. The chapter is divided into the following sections: research paradigms; research design; target population; description of research instruments; description of the sample and sampling procedures; description of the data collection procedures; and description of data analysis procedures.

3.2 Research Paradigms

The definition by Weaver and Olson (2006), of research paradigm reveals how research could be affected and guided by a certain paradigm by stating, "Paradigms are patterns of beliefs and practices that regulate inquiry within a discipline by providing lenses, frames, and processes through which investigation is accomplished". This research will adopt a positivist paradigm. The positivist paradigm arose from the philosophy identified as logical positivism and is based on rigid rules of logic and measurement, truth, absolute principles, and prediction (Halcomb & Andrew, 2005). The adoption of this paradigm was necessary because it ensured a detailed description of the issues by the stakeholders in the utilization of mobile devices in academic libraries. The researcher's intention was to make sense of or interpret the meanings others hold about the utilization of mobile devices in academic libraries.

3.3 Research Design

This research adopted a descriptive research design, which is used to investigate or study a single entity in-depth to gain insight into larger cases. It uses smaller samples for in-depth analysis. According to Yin (2017), a descriptive research design is focused on determining what, when, where, and how a phenomenon occurs. This design facilitates the collection of data that can then be analyzed to create meaningful conclusions and recommendations. According to Amin (2005), descriptive research paired with mixed approaches (qualitative and quantitative) helps the researcher to get insight and comprehension of the phenomenon by collecting narrative data intensively to explain, anticipate, and govern the phenomenon of interest. This design was preferred because it does not involve manipulating variables, it allows researchers to look at numerous characteristics at once, it is often used to look at the prevailing characteristics in a given population and it can provide information about what is happening in a current population (Sedgwick, 2014).

3.4 Study Locale

This study was conducted at the libraries of the University of Nairobi (UoN) and Kenyatta University (KU) main campuses. The UoN and KU are collegiate public universities both based in Nairobi established under the Universities Act 2012 of the laws of Kenya and their Charters. The Universities were selected because they are ranked highly, locally and internationally in terms of infrastructural and instructional quality. Therefore, respondents from these universities provided reliable information regarding the utilization of mobile devices in an academic library. The UoNand KU repository collects, preserves, and distributes scholarly outputs. The contents include scholarly publications, full texts of research papers and working papers, and abstracts of dissertations and theses submitted to the University (University of Nairobi website, 2016).

3.5 Target Population

Barton (2001) cites that any scientific research targets a given population through which interviews and questionnaires are distributed to target the desired or the required data for analysis. Thus in conducting a research study the researcher ideally would investigate all the individuals to whom they wish to generalize their findings. These individuals constitute a population, meaning that they make up the entire group of individuals having the characteristics that interest the researchers (Gall, Gall & Borg, 2003). According to Gall et al., (2003), a target population provides a solid foundation and the first step upon which to build the population validity of the study. In this study, the target population included 1620 students, 57 teaching staff from three academic departments, 91 library staff, and 38 ICT staff from KU and UoN. This population provided reliable information regarding the extent of mobile device utilization in accessing academic resources. The key informants included the library users and the teaching staff as they provided relevant information on mobile usage.

The students are the end users of the library services and are considered as university clients so their opinion regarding utilization of mobile technology to access library services was considered key in this study. The librarians are responsible for providing library professional information services. Academic librarians provide professional services and are normally involved in services such as collection development, information dissemination, training, and marketing of library services, resources, and facilities to the university community. The ICT staff are responsible for ensuring that the systems are reliable and running smoothly. The academic staff were targeted since they also use the library service for research and publishing articles.

3.6 Sampling Technique

To determine the study sample size, the researcher sampled 10% of the target as recommended by Gall et al., (2003) who stated that 10% of the target population is sufficient for a sample size. Therefore, the researcher sampled 162 students, 6 academic staff, 9 library staff members, and 4 ICT staff. The students and teaching staff were sampled using stratified random sampling. Stratified random samples are generally more accurate in representing the population since it ensures that the entire population has equal chances of participating in the study. Students and teaching staff were selected from three departments namely; English (Arts), Biology (Science), and Engineering (Technology). Therefore, from every department, the researcher randomly selected two teaching staff hence six and 54 students from each of the three departments resulting to 162 students.

Purposive sampling was used to sample nine library staff and four ICT staff. Campbell et al. (2020) outlined that purposive sampling allows the researcher to sample participants strategically, and the sampled participants are capable of responding to the research questions relevant to the study. This method allows for depth of understanding rather than breadth of understanding. Sekaran and Bougie (2016) confirm that purposive sampling is a viable sampling method based on the judgment of the researcher and that the respondents meet a specific criterion to be included as part of the sample of the study. The sampled library staff and ICT staff were suitable for the study as they met the requirements stipulated by the researcher. The sampling Frame is presented in Table 3.1

Table 3.1: Sampling Frame

Target Group	Target Population		Total	Sample Size (10% of the target)		Total	Sampling technique
	UoN	KU		UoN	KU		
Users (Students)	630	990	**1620**	63	99	**162**	Stratified random
Users (Academic staff)	20	37	**57**	2	4	**6**	Stratified random
Library Staff Members	34	57	**91**	3	6	**9**	Purposive
ICT staff	18	20	**38**	2	2	**4**	Purposive
Total	**702**	**1104**	**1806**	**70**	**111**	**181**	

3.7 Data Collection Instruments

The study used primary and secondary data to collect data. Primary data was collected using questionnaires while secondary data was collected through document analysis.

3.7.1 Questionnaire

A questionnaire is a means of eliciting the feelings, beliefs, experiences, perceptions, or attitudes of some sample of individuals. The researcher used an open and close-ended questionnaire to collect data from the study respondents. The questionnaire addressed the demographic information of the respondents and the items based on the research questions. This type of questionnaire enables the researcher to solicit detailed information from the respondents. Standard answers are derived from the questionnaire and it also gives respondents a chance to air their opinion regarding the research questions. Questionnaires make it easy to conduct qualitative and quantitative data effectively without bias. The structured questionnaire also provides well-thought-out answers

since it ensures anonymity (Mugenda & Mugenda, 2008). Questionnaires allow each respondent to read and answer the same questions, ensuring that the demands are consistent and they also generate standardized data, which facilitates answer processing. Standardized data also contributes to the results' validity and dependability (Panneerselvam, 2018).

3.7.2 Documentary Evidence

This information was retrieved from textbooks, journals, and newspapers that had relevant information. The documentary evidence helped to supplement other sources of information.

3.7 Pilot Testing of the Instruments

A pilot research is a small-scale study conducted before the main study to test the validity and reliability of the questionnaires. Piloting aids in determining the validity and reliability of questionnaires. The pilot was conducted at Kirinyaga University which is in the neighboring Kirinyaga County. Wright (2018) recommended that 10% of the sample size is adequate for sampling. The pilot hence included 19 respondents (16 students, one academic staff, one library staff, and one ICT staff). The pilot helped to improve the research tools by checking the questionnaire's validity and reliability.

3.7.1 Validity of Research Instruments

Orodho (2009) defines instrument validity as the degree to which the empirical measure or numerous measures of the concept accurately measure the concept. This is the degree to which the measuring instrument's variation replicates genuine variance among people who have been tested. This study used content and face validity. Content validity is the degree to which items in an instrument replicate the content to which the instrument will be generalized (Straub, Boudreau, &

Gefen, 2004). Content validity is the process of evaluating a research instrument to ensure that it has all of the necessary components while excluding those that are not relevant to a given construct area (Straub et al., 2001). The judgmental technique for determining content validity is doing literature reviews and then having professional judges or panels evaluate the results. To promote validation, the judgmental approach to content validity requires researchers to be present with experts. To ensure content validity, questionnaires were issued to senior library staff members, lecturers, and ICT staff members to ascertain if the questionnaire would help to achieve the study objectives.

Face validity is the researchers' subjective judgments of evaluating the instrument's presentation and relevance, such as whether the items are related to the study problem, reasonable, clear, and easy to understand (Oluwatayo, 2012). Each question was examined until the researcher was confident that it accurately measured the intended construct. To enhance face validity, the researcher compared the questionnaire with other similar studies to assess whether the questions were similar to the proposed questionnaire.

3.7.1 Reliability of Research Instruments

Reliability is the degree to which a metric produces consistency (Blumberg, Cooper & Schindler, 2014). The research instrument was pre-tested to fine-tune them. The goal is to ensure that research tools are reliable before they are used in actual research. The detected flaws are fixed, unclear questions are clarified, and the content is rewritten. Cronbach's Alpha was used to establish the reliability of the data collection instrument. Cronbach's alpha is a metric for comparing the consistency between varying items measuring similar constructs. It assesses the instrument's

consistency and asks questions about how well a series of items measures a specific test characteristic. To calculate the coefficient of reliability, single items within a test are correlated. Internal consistency between items is measured using Cronbach's alpha coefficient (Cronbach, 1951). Cronbach's alpha coefficient spans from zero to one, and the closer it is to one, the better the internal consistency of the scale's items is (Zikmund-Fisher et al., 2013). Cronbach's alpha is the most useful for questions on an interval scale since it provides a unique, quantifiable estimate of a scale's internal consistency (Blumberg et al., 2014). According to Blumberg et al., (2014), the cutoff point for Cronbach's Alpha Coefficient is 0.7, and all items with a value less than 0.7 are considered weak and are changed or removed from the final questionnaire. The reported alpha value of 0.704 which is within the recommended threshold hence considered reliable.

Table 3.2 : Reliability Analysis

Respondent Category	Cronbach's Alpha	N of Items (excluding age and gender)
Users	0.704	9

Results in Table 3.2 show the Cronbach's Alpha of the pilot questionnaires for users. The reported alpha value of 0.704 is within the recommended range between 0.7 and 1.0 (Bryman, 2014; Kumar, 2014). Therefore, the questionnaires collected provided reliable and valid results for making statistical inferences.

3.9 Data Collection Procedure

Before proceeding to collect data from the selected respondents, the researcher obtained an introduction letter from Karatina University to obtain a permit from NACOSTI to carry out the research. With consent granted, the researcher visited the selected universities administrators and sought authorization to carry out research in their institution. The researcher sensitized the

respondents on the need for the research, and then the researcher established a contact person among the library staff who assisted in the distribution and collection of questionnaires.

3.10 Data Analysis and Presentation

The collected data was organized and prepared for analysis by coding and entry in the Statistical Package for Social Sciences (SPSS, Ver.28). The researcher used both descriptive statistics (frequency, percentage, and mean) and inferential statistics (Chi-Square test and Fisher's test). Data is presented by the use of tables and percentages. Qualitative data was analyzed using thematic analysis. Sivakumar (2020) states that the concept of thematic analysis is among the most popular approaches to qualitative analysis since it identifies, analyses, and reports patterns within data concerning social phenomena. Responses from open-ended questions were hence grouped in similar themes analyzed into frequencies and percentages and tabulated.

3.11 Ethical Considerations

The researcher sought permission from relevant authorities before proceeding with data collection. Ethical considerations such as confidentiality, anonymity, and avoidance of deception were adhered to throughout the research. The researcher was careful to avoid causing physical or psychological harm to respondents by asking embarrassing and irrelevant questions, threatening language, or making respondents nervous.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter presents the results, interpretation, and discussion of the findings based on the study objectives. The results contained both descriptive and inferential statistics presented in the form of Tables, Pie charts, and histograms. Chi-square analysis showed the significance of the relationship between mobile device utilization and access to library services.

4.2 Response Rate

Out of 181 questionnaires issued, the researcher managed to collect 150 questionnaires forming a return rate of 83 percent. The 83 percent response rate was deemed significant to carry out the analysis in this study. The response rate is in agreement with Kumar (2014) who stated that a response rate of more than 70% is excellent. The high response rate was a result of the researchers' efforts to closely monitor the data collection process and gave the respondents enough time to complete the questionnaires. The researcher also created a rapport with the respondents and assured them of the confidentiality of the data collected.

Table 4.1: Response Rate

Group	Sample size	Response	Response rate
Users (students)	162	131	81%
Academic Staff	6	6	100%
Library Staff members	9	9	100%
ICT staff	4	4	100%
Total	**181**	**150**	**83%**

4.3 Demographic Characteristics of Respondents

This section presents the descriptive statistics on the demographic characteristics of the respondents. It includes results on gender distribution and education level. The results are in the form of continuous sentence pros, pie charts, tables, and bar graphs.

4.3.1 Gender Distribution

This section provides descriptive statistics on the gender of the respondents categorized into: users, lecturers, senior library staff members, and ICT Staff. The results are in the form of frequencies and percentages for all the categories in Table 4.2, Table 4.3, Table 4.4 and Table 4.5

Table 4.2: Gender Distribution of Users

Gender	Frequency (F)	Percent (%)
Male	67	51.1
Female	64	48.9
Total	**131**	**100.0**

Table 4.2 shows that the male users formed 51.1 percent (F=67) while female users formed 48.9 percent (F=64) of the users. Therefore, the gender distribution is approximately equal albeit leaning towards the male respondents. Therefore, there was no gender bias as the survey captured the opinions of both genders.

Table 4.3: Gender Distribution of Lecturers

Gender	Frequency (F)	Percent (%)
Male	2	33.3
Female	4	66.7
Total	**6**	**100.0**

Table 4.3 shows that the male users formed 33.3 percent (F=2) while female lecturers formed 66.7 percent (F=4) of the lecturers. The female gender had more representation than the male in regards to lecturer respondents' distribution. However, the distribution is in line with the Kenya

government's gender policy on staffing (‘one-third gender rule ’2019) hence the representation is within policy requirements.

Table 4.4: Gender Distribution of Senior Library Staff Members

Gender	Frequency (F)	Percent (%)
Male	4	44.4
Female	5	55.6
Total	**9**	**100.0**

Table 4.4 shows that the male library staff members formed 44.4 percent (F=4) while female library staff members formed 55.6 percent (F=5) of the respondents. Therefore, the gender distribution of library staff members neared equal proportions for both genders albeit leaning towards the female respondents. Therefore, there was no gender bias as the survey captured the opinions of both genders.

Table 4.5: Gender Distribution of ICT Staff

Gender	Frequency (F)	Percent (%)
Male	2	50.0
Female	2	50.0
Total	**4**	**100.0**

Table 4.5 shows equal gender representation for both the male and female ICT staff respondents. Therefore, there was no gender bias as the survey captured the opinions of both genders. Findings concur with Lombard (2018) that globally academic libraries are female-dominated whereby the majority of librarians in universities are female. MbamboThata et al. (2019) also argue that traditionally women have been in the majority in the academic library workforce while men held leadership positions.

4.3.2 Age Distribution

This section provides descriptive statistics on the age of the respondents categorized into: users, lecturers, senior library staff members, and ICT staff. The results are in the form of frequencies and percentages for all the categories in Table 4.6, Table 4.7, Table 4.8 and Table 4.9

Table 4.6: Age Distribution of Users

Age Group	Frequency (F)	Percent (%)
20 Years and Below	124	94.7
21-25 Years	2	1.5
31-35 Years	2	1.5
36-40 Years	1	0.8
40 and Above	1	0.8
Total	130	99.2
Missing System	1	0.8
Total	**131**	**100.0**

Table 4.6 shows that the majority of the users ranged between 20 years and below forming 95.4 percent (F=124). The age groups between 21-25 years and 31-35 years each had two (F=2) respondents which formed 1.5 percent each. The age groups between 36-40 years and above 40 years each had one (F=1) respondent which formed 0.8 percent each. Therefore, the majority of the users were youths of the lower bracket, between 20 years and below. This shows that most of them were fresh graduates, in their first academic year of study and this is an age group that is heavily reliant on digital assistance.

Table 4.7: Age Distribution of Lecturers

Age Group	Frequency (F)	Percent (%)
21-29 Years	3	50.0
30-39 Years	2	33.3

40-49 Years	1	16.7
Total	**6**	**100.0**

Table 4.7 shows the age distribution of lecturers. The age group that had the highest representation was between 21 and 29 years (50 percent, F = 3). This was followed by the age group between 30 and 39 years which had 33.3 percent (F=2) and finally followed by age group between 40 and 49 years which had 16.7 percent (F=1). This distribution shows that the majority of the respondents who were lecturers were young and therefore, they were tech-savvy.

Table 4.8: Age Distribution of Senior Library Staff Members

Age Group	Frequency (F)	Percent (%)
21-29 Years	7	77.8
30-39 Years	1	11.1
40-49 Years	1	11.1
Total	**9**	**100.0**

Table 4.8 shows the age distribution of senior library staff members. The age group that had the highest representation was between 21 and 29 years (77.8 percent, F = 7). This was followed by the age groups between 30 - 39 years and 40 – 49 years each having a representation of 11.1 percent (F=1). This distribution shows that the majority of the respondents who were senior library staff members were young and therefore, they were tech-savvy.

Table 4.9: Age Distribution of ICT Staff Members

Age Group	Frequency (F)	Percent (%)
21-29 Years	3	75.0
30-39 Years	1	25.0
Total	4	100.0

Table 4.9 shows the age distribution of ICT staff. The age group that had the highest representation was between 21 and 29 years (75.0 percent, F = 3). This was followed by the 30 - 39 years age group having a representation of 25.0 percent (F=1). This distribution shows that the majority of the respondents who were ICT staff members were young and therefore, they were tech-savvy.

Findings are in agreement with Semenza, Koury and Shropshire (2017) who argued that youthful librarians and ICT staff are required in institutions of higher learning to assist in serving today's users, using today's technology.

4.3.3 Working Experience of Respondents

This section provides descriptive statistics on the working experience of the respondents categorized into: lecturers, senior library staff members, and ICT staff. The results are in the form of frequencies and percentages for all the categories in Table 4.10, Table 4.11 and Table 4.12

Table 4.10: Working Experience of Lecturers

Working Experience	Frequency (F)	Percent (%)
1-3 Years	1	16.7
4-6 years	4	66.7
7-9 Years	1	16.7
Total	**6**	**100.0**

Table 4.10 shows the distribution of work experience for lecturers. The modal experience range was between 4-6 years forming 66.6 percent (F=4). This was followed by the experience of 1-3 years and 7-9 years each forming 16.7 percent (F=1). This distribution shows that the majority of the lecturers had served for a while in their respective universities hence they were familiar with library processes.

Table 4.11: Working Experience of Senior Library Staff

Working Experience	Frequency (F)	Percent (%)
1-3 Years	1	11.1
4-6 Years	6	66.7
7-9 Years	2	22.2
Total	**9**	**100.0**

Table 4.11 shows the distribution of work experience for senior library staff. The modal experience range was between 4-6 years forming 66.6 percent (F=6). This was followed by the experience of

1-3 years and 7-9 years forming 11.1 percent (F=1) and 22.2 percent (F=2) respectively. This distribution shows that the majority of the senior library staff had tenure in their respective universities hence they were familiar with library processes. Ciccone and Hounslow (2019) indicated that academic libraries are now requiring librarians with ICT skills and knowledge of the use of social media and mobile technology to deliver library services.

4.5 Descriptive Statistics of Variables

This section provides descriptive statistics for the questions asked in the questionnaire tool. The discussion emanating from these questionnaires covers the opinion of all the respondents (Senior Library Staff, Lecturers, ICT Staff, and users). The descriptive statistics are sub-classified into sections 4.5.1 (utilization of mobile devices in libraries), 4.5.2 (benefits of mobile device utilization in university libraries), 4.5.3 (challenges faced in utilization of mobile devices in university libraries), and 4.5.4 (solutions to challenges faced in utilization of mobile devices in university libraries).

4.5.1 Utilization of Mobile Devices in University Libraries

This subsection discusses descriptively the utilization of mobile devices in university libraries. The results for users, Lecturers, ICT Staff, and Senior Library Staff are presented in the form of pie charts and frequency tables. The research findings are tabulated below

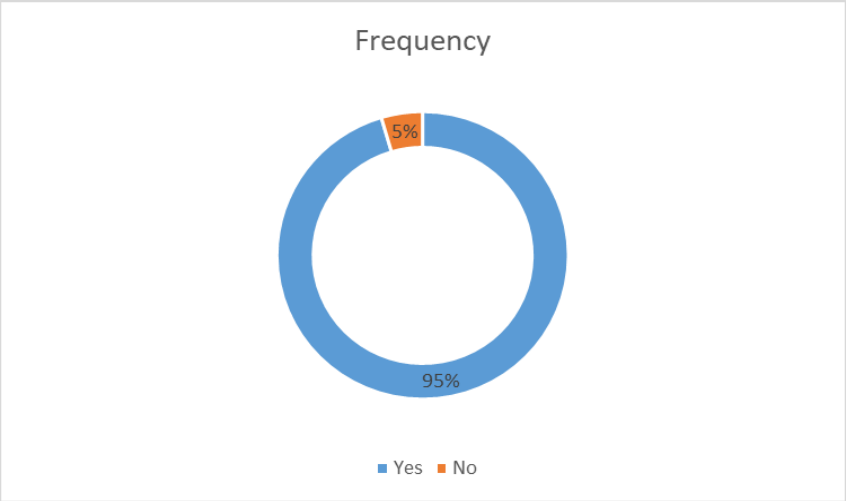

Figure 4.1: Utilization of Mobile Devices in Libraries (Users)

Figure 4.1 shows the utilization of mobile devices by users in university libraries. The majority of the users acknowledged the use of mobile devices in university libraries and they formed 95 % of the respondents. These devices included Smartphones, iPods, tablets, and laptops. The majority of the students own smartphones and almost half of the students own laptops. Only 5 % of the respondents did not utilize mobile devices in the libraries. Table 4.5 showed that 95.4 % of the users were aged 20 years and below meaning that they were young fresh graduates. This is probably the population of users with a high probability of using mobile devices in university libraries. The remaining 5% of the user population were older students who have a high probability of using physical books rather than digital books and aids. Findings are in agreement with Dukic et al. (2015), that more than 70% of universities in Africa have adopted the use of M-tech in the provision of library services. The finding is also in support of Omallah et al., (2016) that the universities in Kenya have made significant efforts in mobile phone technology in access and utilization of library services.

Table 4.12: Users Response on Ways of Utilizing Mobile Devices in Libraries

Ways of Utilizing Mobile Devices	Frequency (F)	Percentage (%)
Accessing library resources	106	80.7
Mobile payments	9	6.7
Using QR codes to search publications	9	6.7
Facilitation of cloud computing	3	2.5
Sharing of user-generated web content	4	3.4
Total	131	100.0

Table 4.12 shows how users use mobile devices in university libraries. The most use was in accessing library resources (80.7 %, F=106). Other users included making mobile payments (6.7 %, F=9) and using QR codes for searching publications (6.7 %, F=9). The last use of mobile devices in university libraries included sharing of user-generated web content (3.4 %, F=4) and cloud computing (2.5 %, F=3). Therefore, the use of mobile devices is phasing away the use of textbooks located on university shelves.

According to Lecturers, Senior Library Staff and ICT Staff, mobile devices are used to access online public catalogue, access online materials, listen to audio books, and digital reminders for users on materials needed to access or return. Other uses noted include easy communication among the users (e.g. WhatsApp, Twitter, Facebook, etc.), entertainment, multiple access to Internet materials, sharing common internet sources (wifi) without having to queue for university libraries' computers and saving space compared to using personal computers. The findings support Jibril et al., (2021) that the most common Apps and social media services used in the university were Blogs, Facebook, text messaging, and e-mail sending and receiving. Dukic et al., (2015) also established that university students in Japan used smartphones to access course materials, search library catalogue, discuss course assignments with peers, and take notes for upcoming lessons.

4.5.2 Benefits of Mobile Device Utilization in Libraries

The study sought to establish the benefits of using mobile devices in university libraries as answered by users, lecturers, senior library staff, and ICT officers. The responses of users were on a three-point Likert scale while the responses of the other categories of respondents were in continuous prose.

Table 4.13: Benefits of Mobile Device Utilization in Libraries (Users)

No.	Utilization	Greater extent	Some extent	Not at all	Mean
a)	Easy access of library resources	67(51.5%)	58(44.6%)	5(3.8%)	2.48
b)	Exposure to diverse study content	71(54.2%)	51(38.9%)	9(6.9%)	2.47
c)	Convenient utilization of study materials	61(46.9%)	57(43.8%)	12(9.2%)	2.38
d)	Availability of cost effective resources	53(40.8%)	47(36.2%)	30(23.1%)	2.18
e)	Interactive payment and usability of study materials	31(23.8%)	61(46.9%)	38(29.2%)	2.00

Table 4.13 shows the benefits of using mobile devices as answered by the users. The responses for the five Likert scale items were coded into three points as follows: ‘greater extent’ coded as 3, ‘some extent’ coded as 2, and ‘not at all’ coded as 1. As for the first item in the Likert scale, it is evident that the majority of the users were of the view that mobile devices greatly made it easy to access library resources (51.5 percent, F=67). Another 44.6 percent (F=58) of the users thought that mobile devices improved the accessibility of library resources to a small extent. Only 3.8 percent of the users did not see the ease of using mobile devices to access library resources. Given that the Likert scale was 3-point (range of 1 to 3), the mean score of 2.48 out of 3.00 shows that more than a third of the respondents saw the ease of access associated with the use of mobile devices. Findings are in agreement with Madhusudhan (2015) that mobile devices are easier, more

accessible, faster, time-saving, and can be used for m-learning. Students use mobile devices to search educational materials online and find others for academic research.

The second question in Table 4.13 covers the exposure to diverse study content associated with the use of mobile phones. The study found that 54.2 percent (F=71) of the users greatly agreed with this assertion, 38.9 percent (F=51) of the users agreed with this assertion to some extent while 6.9 percent (F=9) of the users did not agree with the assertion. With a mean Likert score of 2.47 out of 3.00, it means that more than a third of the users agreed with the assertion that mobile devices exposed users to diverse study content. Results concur with Siregar and Dewiyana (2018) that mobile technology applications provide better library services and improve the accessibility of library resources in the easiest way.

The third question in Table 4.13 is about the convenient utilization of study materials. It was established that 46.9 percent (F=61) of the users greatly agreed with this assertion, 43.8 percent (F=57) of the users agreed to this assertion to some extent while 9.2 percent (F=12) of the users did not agree to the assertion. With a mean Likert score of 2.38 out of 3.00, it means that more than a third of the users agreed with the assertion that mobile devices led to convenient utilization of mobile devices. Finding support Elahi (2016) that mobile utilization enabled students to access various materials from the school.

The fourth question in Table 4.13 is about the availability of cost-effective resources. The study established that 40.8 percent (F=53) of the users greatly agreed to this assertion, 36.2 percent (F=47) of the users agreed to this assertion to some extent while 23.1 percent (F=30) of the users did not agree to the assertion. With a mean Likert score of 2.18 out of 3.00, it means that more

than a third of the users agreed with the assertion that mobile devices made available cost-effective resources. Findings support Panda (2021) who also found out that Mobile technology is an economical and affordable technology solution that helps libraries to keep at par with the changing needs of their clients who are mainly students.

The fifth question in Table 4.13 is about interactive payment and usability of study materials. The study found that 23.8 percent (F=31) of the users greatly agreed with this assertion, 46.9 percent (F=61) of the users agreed with this assertion to some extent and 29.2 percent (F=38) of the users did not agree with the assertion. With a mean Likert score of 2.00 out of 3.00, it means that exactly a third of the users agreed with the assertion that mobile devices led to interactive payment and usability of study materials. Buruga (2016) who found that mobile technologies are important for the provision of library services and resources in the 21st century supports the finding. The other merits of using mobile devices as pointed out by the users include the speed associated with accessing study materials. It also relieves the pressure on the use of library computers since they are not enough for all students. Finally, the students can access library resources away from the library as long as they are within the radius required, hence avoiding the need to crowd the libraries.

According to the lecturers, ICT officers, and senior library staff, using mobile devices in university libraries has the following advantages. It provides the convenience of accessing e-resources at any time such as YouTube tutorials. It provides speedy access to required materials hence shortening the time taken in carrying out research work. They also observed that mobile devices provided ease of exchange of information and it saved on cost in terms of paying staff and purchasing

equipment. The other merit was the limitless access to materials about any phenomenon. The traditional library resources included books on shelves, which were limited in number and could be borrowed only for a certain duration of time. Mobile device utilization also reduces the bulkiness associated with physical library resources. A lot of digital content can be stored in the mobile device storage. Users can view multiple resources by opening many tabs in mobile device browsers. Mobile devices provide instant and easy connection between people separated geographically even across continents. Finally, mobile devices are portable hence alleviating the need of being at a location while studying. The finding agrees with Adeyinka, Olawuyi and Durodolu (2021) that the use of smartphones to access library materials enables quick access to information, offers solutions to problems, and enables immediate and timely submission of assignments.

4.5.3 Challenges Faced in Utilization of Mobile Devices in University Libraries

The study aimed to establish the challenges associated with the use of mobile devices in university libraries. Respondents were asked whether they experience challenges in the utilization of mobile devices. Findings are presented in Table 4.14 and 4.15.

Table 4.14: Responses on Whether Users Encounter Challenges while Utilizing Mobile Devices

Response	Frequency (F)	Percentage (%)
Yes	103	78.6
No	28	21.4
Total	**131**	**100.0**

Table 4.14 shows that 78.6 % of the respondents encountered challenges in utilizing mobile devices in university libraries. Table 4.15 shows the nature of challenges encountered by users in the use of mobile devices in university libraries.

Table 4.15: Main Challenges in Using Mobile Devices in University Libraries (Users)

Challenges	Frequency (F)	Percentage (%)
Insufficient mobile-accessible resources	49	37.5
Inadequate technical support for mobile access	50	38.5
Limited capacity of mobile devices	20	15.6
Incompatible library resources	10	7.3
Negative educator perceptions	1	1.0
Total	**131**	**100.0**

The main challenges noted in Table 4.15 are insufficient mobile-accessible resources (37.5%) and inadequate technical support for mobile access (38.5%). The other challenges noted by the users included: limited capacity of mobile devices (15.6%), incompatible library resources (7.3%), and negative educator perception (1.0%). The other challenges observed by the users in using mobile devices in university libraries were poor Internet connection and few electrical sockets to charge mobile phones. Lecturers observed the following challenges: the need for training on how to use mobile phones to access university library resources, inadequate power points to charge phone batteries, misuse of mobile devices in university libraries such as for entertainment, and inadequate technical support in regard to the users of mobile devices in university libraries.

ICT Staff and Senior Library Staff observed that the format of digital library resources is suitable for personal computers rather than mobile devices. They also noted that the use of mobile devices causes distraction to other students and could potentially lead to time wastage for the users themselves. The users are bombarded with a lot of information hence they lack concentration because they do not focus on one material at a time. This shortens the level of understanding of concepts. Mobile phones are expensive to acquire, especially in considering a good quality mobile phone for study purposes. Mobile phone devices are portable hence easy to misplace or easy to steal. Furthermore, they are prone to technical malfunction, which leads to costly repairs or

replacement. Mobile devices also have limited storage capacity and cannot store infinite resources. Finally, some of the materials downloaded have to be compatible with the mobile device for the users to view. The findings support several scholars who have also identified similar challenges limiting the utilization of mobile devices in universities; Abdulla and Esmaeel (2019); Azubuike and Madu (2017); Matheus (2021) identified a lack of training as a key challenge. Hamad and Hamarsha (2018); Chisenga (2015); De-Graft (2020) sought to identify poor internet infrastructure as the key challenge limiting the utilization of mobile devices in universities.

4.5.4 Viable Ways of Enhancing Utilization of Mobile Devices in University Libraries

This section gives the viable ways of enhancing the utilization of mobile devices as pointed out by the Users, Lecturers, ICT Staff and Senior Library Staff.

Table 4.16: Viable Ways of Enhancing Utilization of Mobile Devices (Users)

Solutions	Frequency (F)	Percentage (%)
Improving mobile accessibility to library	44	33.6
Sufficient training of library technical staff on m-resources	21	16.4
Creation of numerous mobile devices access points.	33	25.0
Investment by the library on development of mobile support infrastructure	18	13.8
Mobile utilization campaigns to improve educator perceptions	9	6.9
All	6	4.3
Total	**131**	**100.0**

According to Table 4.16, the users highly recommended improving mobile device accessibility to the library (33.6%) and the creation of numerous mobile device access points (25.0%). They also recommended sufficient training of library technical staff on m-resources (16.4%), development of mobile support infrastructure (13.8%), and carrying out campaigns for utilization of mobile devices to improve educator perception (6.9%). Other recommendations by the users included the provision of adequate technical support and a reliable Wi-Fi Internet connection. Increase in the

number of electrical sockets in the university libraries to enable students to be able to charge their phones. Lecturers also advocated for the need to have a center for mobile phone maintenance and sufficient power charging sockets. Lecturers further called for the need to carry out training sessions on the importance of using mobile devices in accessing e-resources to decongest libraries and for users to have a full experience of the resources the libraries can offer.

Senior library staff and ICT staff recommended the following solutions to curb the problems faced in using mobile devices in libraries in universities. They recommended adequate power supply and fast Internet connectivity. They also recommended that users of mobile devices complement with use of personal computers and flash disks to be able to save large files that could not be stored on mobile devices. They recommended that the universities enact regulations that promote the use of mobile devices and at the same time, the said regulations should reduce inconveniences caused to other non-mobile phone users. There was another recommendation to subsidize the cost of mobile devices and to provide adequate power backup. The findings support Chaputula and Mutula (2018a) who stated that libraries need to draft Information and Communication Technology (ICT) policies that support the use of mobile smartphones to access e-resources. The staff should be given training on how to manage and access e-resources using smartphones before implementation. Libraries should implement continuous professional development programs related to the deliverance of library e-resources.

4.6 Inferential Statistics

4.6.1 Easy Access of Mobile Devices and Utilization of Mobile Devices in University Libraries

This subsection shows the cross-tabulation results for easy access to mobile devices against the utilization of mobile devices in university libraries. The results include expected counts, Chi-Square test, Fisher's test, and Phi values. The Chi-Square test and Fisher's test are the inferential tests to infer the significance of association while Phi value indicates the amount of association identical to Pearson's R (Obilor & Amadi, 2018). The expected counts guide in selection of the most accurate inferential test. If there is an expected count of less than five, then the Fisher's Exact test will be suitably compared to the Chi-Square test.

Table 4.17: Expected Count for Easy Access of Mobile Devices against Utilization of Mobile Devices in University Libraries

			Easy Access of Mobile Devices			Total
			To a great extent	To some extent	Not at all	
Utilization of Mobile Device	Yes	Count	63	57	3	123
		Expected Count	62.9	55.3	4.8	123.0
	No	Count	3	1	2	6
		Expected Count	3.1	2.7	0.23	6.0
Total		Count	66	58	5	129
		Expected Count	66.0	58.0	5.0	129.0

a. 4 cells (66.7%) have an expected count of less than 5. The minimum expected count is .23

Table 4.17 shows the results for the expected count on cross-tabulation of Easy Access of Mobile Devices against Utilization of Mobile Devices in University Libraries. The least expected count is less than five (0.23), hence, the most accurate inferential statistic is Fisher's exact test rather than Chi-Square statistic (Table 4.18)

Table 4.18: Chi – Square and Fisher's Test Result for Easy Access of Mobile Devices Against Utilization of Mobile Devices in University Libraries

Statistic	Value	df	Asymp. P-value	Exact p-value
Pearson Chi-Square	15.210[a]	2	0.000	0.011
Likelihood Ratio	7.292	2	0.026	0.046
Fisher's Exact Test	8.291			0.015

The Fisher's Exact test in Table 4.18 is 8.291 with an observed p-value of 0.015, which is less than 0.05, the cut-off significance value of the study. Therefore, there is a significant degree of association between easy access to mobile devices and utilization of mobile devices in university libraries.

Table 4.19: Symmetric Measures of Easy Access of Mobile Devices against Utilization of Mobile Devices in University Libraries

		Value	Approx. p-value	Exact p-value
Nominal by Nominal	Phi	0.343	0.000	0.011
	Cramer's V	0.343	0.000	0.011

Table 4.19 indicates the Phi value similar to Pearson's R, which in this case was 0.343 (34.3 %). This indicates a moderately strong relationship between easy access to mobile devices and utilization of mobile devices in university libraries. Phi defines perfect association as predictive monotonous and defines null relationship as statistical independence (Njehia, 2017). In this case, the percent difference with easy access of mobile devices as independent (column) is 34.3%, and with utilization of mobile devices in university libraries as independent is 34.3%. Phi is the mean percent difference between easy access to mobile devices and utilization of mobile devices in university libraries with either considered as causing the other (Njehia, 2017).

4.6.2 Exposure to Diverse Study Content and Utilization of Mobile Devices in University Libraries

This subsection shows the cross-tabulation results for diverse study content and utilization of mobile devices in university libraries. The results include expected counts, Chi-Square test, Fisher's test, and Phi values.

Table 4.20: Expected Count for Diverse Study Content against Utilization of Mobile Devices in University Libraries

			Easy Access of Mobile Devices			Total
			To a great extent	To some extent	Not at all	
Utilization of Mobile Device	Yes	Count	67	50	7	124
		Expected Count	66.8	48.6	8.6	124.0
	No	Count	3	1	2	6
		Expected Count	3.2	2.4	0.42	6.0
Total		Count	70	51	9	130
		Expected Count	70.0	51.0	9.0	130.0

a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is 0.42.

Table 4.20 shows the results for the expected count on cross-tabulation of diverse study content and utilization of mobile devices in university libraries. There are three cells with an expected count of less than 5 and the minimum expected count is 0.42[a], hence, the most accurate inferential statistic is Fisher's exact test rather than Chi-Square statistic (Table 4.22).

Table 4.21: Chi-Square and Fisher's Test Result for Diverse Study Content Against Utilization of Mobile Devices in University Libraries

Statistic	Value	df	Asymp. P-value	Exact p-value
Pearson Chi-Square	7.171[a]	2	0.028	0.043
Likelihood Ratio	4.481	2	0.106	0.111
Fisher's Exact Test	5.227			0.043

The Fisher's Exact test in Table 4.21 is 5.227 with an observed p-value of 0.043 which is less than 0.05, the cut-off significance value of the study. Therefore, there is a significant degree of

association between diverse study content and the utilization of mobile devices in university libraries.

Table 4.22: Symmetric Measures of Diverse Study Content Against Utilization of Mobile Devices in University Libraries

		Value	Approx. p-value	Exact p-value
Nominal by Nominal	Phi	0.235	0.028	0.043
	Cramer's V	0.235	0.028	0.043

Table 4.22 indicates the Phi value of 0.235 (23.5 percent). This indicates a moderately strong relationship between easy access to mobile devices and utilization of mobile devices in university libraries. The associate p-value of 0.043 ($p<0.05$) also shows that the relationship was indeed significant.

4.6.3 Convenient utilization of study materials and utilization of mobile devices in university libraries

This subsection shows the cross-tabulation results for the convenient utilization of study materials and utilization of mobile devices in university libraries. The results include expected counts, Chi-Square test, Fisher's test, and Phi values.

Table 4.23: Expected Count for Convenient Utilization of Study Materials and Utilization of Mobile Devices in University Libraries

			Convenient utilization of study materials			Total
			To a great extent	To some extent	Not at all	
Utilization of Mobile Device	Yes	Count	56	57	10	123
		Expected Count	57.2	54.3	11.4	123.0
	No	Count	4	0	2	6
		Expected Count	2.8	2.7	0.56	6.0
Total		Count	60	57	12	129
		Expected Count	60.0	57.0	12.0	129.0

a. 3 cells (50.0%) have an expected count of less than 5. The minimum expected count is 0.56.

Table 4.23 shows the results for the expected count on cross-tabulation of convenient utilization of study materials and utilization of mobile devices in university libraries. There are three cells with an expected count of less than 5 and the minimum expected count is 0.56[a], hence, the most accurate inferential statistic is Fisher's exact test rather than Chi-Square statistic (Table 4.25).

Table 4.24: Chi-Square and Fisher's Test Result for Convenient Utilization of Study Materials and Utilization of Mobile Devices in University Libraries

Statistic	Value	df	Asymp. p-value	Exact p-value
Pearson Chi-Square	7.237[a]	2	0.027	0.036
Likelihood Ratio	8.328	2	0.016	0.028
Fisher's Exact Test	7.142			0.021

The Fisher's Exact test in Table 4.24 is 7.142 with an observed p-value of 0.021, which is less than 0.05, the cut-off significance value of the study. Therefore, there is a significant degree of association between the convenient utilization of study materials and the utilization of mobile devices in university libraries.

Table 4.25: Symmetric Measures for Convenient Utilization of Study Materials and Utilization of Mobile Devices in University Libraries

		Value	Approx. p-value	Exact p-value
Nominal by Nominal	Phi	0.237	0.027	0.036
	Cramer's V	0.237	0.027	0.036

Table 4.25 indicates the Phi value of 0.237 (23.7 %). This indicates a moderately strong relationship between easy access to mobile devices and utilization of mobile devices in university libraries. The associate p-value of 0.036 ($p<0.05$) also shows that the relationship was indeed significant.

4.6.4 Availability of Cost-Effective Resources and Utilization of Mobile Devices in University Libraries

This subsection shows the cross-tabulation results for the availability of cost-effective resources and utilization of mobile devices in university libraries. The results include expected counts, Chi-Square test, Fisher's test, and Phi values.

Table 4.26: Expected Count for Availability of Cost-Effective Resources and Utilization of Mobile Devices in University Libraries

			Availability of cost effective resources			Total
			To a great extent	To some extent	Not at all	
Utilization of Mobile Device	Yes	Count	49	46	28	123
		Expected Count	49.6	44.8	28.6	123.0
	No	Count	3	1	2	6
		Expected Count	2.4	2.2	1.4	6.0
Total		Count	52	47	30	129
		Expected Count	52.0	47.0	30.0	129.0

a. 3 cells (50.0%) have an expected count of less than 5. The minimum expected count is 1.40.

Table 4.26 shows the results for the expected count on cross-tabulation of availability of cost-effective resources and utilization of mobile devices in university libraries. There are three cells with an expected count of less than 5 and the minimum expected count is 1.40[a], hence, the most accurate inferential statistic is Fisher's exact test rather than the Chi-Square statistic (Table 4.28).

Table 4.27: Chi-Square and Fisher's Test Result for Availability of Cost Effective Resources and Utilization of Mobile Devices in University Libraries

Statistic	Value	df	Asymp. P-value	Exact p-value
Pearson Chi-Square	1.096[a]	2	0.578	0.651
Likelihood Ratio	1.219	2	0.544	0.651
Fisher's Exact Test	1.278			0.651

The Fisher's Exact test in Table 4.27 is 1.278 with an observed p-value of 0.651, which is more than 0.05, the cut-off significance value of the study. Therefore, there is no significant degree of association between the availability of cost-effective resources and the utilization of mobile devices in university libraries.

Table 4.28: Symmetric Measures for Availability of Cost-Effective Resources and Utilization of Mobile Devices in University Libraries

		Value	Approx. p-value	Exact p-value
Nominal by Nominal	Phi	0.092	0.578	0.651
	Cramer's V	0.092	0.578	0.651

Table 4.28 indicates the Phi value of 0.092 (9.2 percent). This indicates a weak relationship between the availability of cost-effective resources and the utilization of mobile devices in university libraries. The associate p-value of 0.651 (p>0.05) also shows that the relationship was insignificant.

4.6.5 Interactive Payment and Usability of Study Materials and Utilization of Mobile Devices in University Libraries

This subsection shows the cross-tabulation results for interactive payment/usability of study materials and utilization of mobile devices in university libraries. The results include expected counts, Chi-Square test, Fisher's test, and Phi values.

Table 4.29: Expected Count for Interactive Payment/Usability of Study Materials and Utilization of Mobile Devices in University Libraries

			Interactive payment/usability of study materials			Total
			To a great extent	To some extent	Not at all	
Utilization of Mobile Device	Yes	Count	26	61	36	123
		Expected Count	28.6	58.2	36.2	123.0
	No	Count	4	0	2	6
		Expected Count	1.4	2.8	1.8	6.0

Total	Count	30	61	38	129
	Expected Count	30.0	61.0	38.0	129.0

a. 3 cells (50.0%) have an expected count of less than 5. The minimum expected count is 1.40.

Table 4.29 shows the results for the expected count on cross-tabulation of interactive payment/usability of study materials and utilization of mobile devices in university libraries. There are three cells with an expected count of less than 5 and the minimum expected count is 1.40[a], hence, the most accurate inferential statistic is Fisher's exact test rather than the Chi-Square statistic (Table 4.30).

Table 4.30: Chi-Square and Fisher's Test result for Interactive Payment/Usability of Study Materials and Utilization of Mobile Devices in University Libraries

	Value	df	Asymp. P-value	Exact Sig. p- value
Pearson Chi-Square	8.107[a]	2	0.017	0.014
Likelihood Ratio	9.302	2	0.010	0.019
Fisher's Exact Test	7.641			0.009

The Fisher's Exact test in Table 4.30 is 7.641 with an observed p-value of 0.009, which is less than 0.05, the cut-off significance value of the study. Therefore, there is a significant degree of association between interactive payment/usability of study materials and the utilization of mobile devices in university libraries.

Table 4.31: Symmetric Measures for Interactive Payment/Usability of Study Materials and Utilization of Mobile Devices in University Libraries

		Value	Approx. p-value	Exact p-value
Nominal by Nominal	Phi	0.251	0.017	0.014
	Cramer's V	0.251	0.017	0.014

Table 4.31 indicates the Phi value of 0.251 (25.1%). This indicates a weak relationship between interactive payment/usability of study materials and the utilization of mobile devices in university

libraries. The associate p-value of 0.014 ($p<0.05$) also shows that the relationship was indeed significant.

4.7 Chapter Summary

This chapter presented the results from the analysis of information received from respondents regarding the use of mobile devices in university libraries. The information collected covered the extent of usage of mobile devices in the libraries, the benefits accruing thereof, the challenges, and recommended solutions. Overall, the results show that there is a change in the mode of accessing library materials, especially with the younger generation in the universities. Younger students embrace the digital mode of learning and accessing library materials, especially through their mobile devices. The benefits noted include portability, reduction in bulkiness, real-time research, ease of communication, and access to diverse information. The results also show the significance of the use of mobile devices in university libraries and the associated benefits. The following benefits were to be significantly associated with the use of mobile devices: ease of access, exposure to diverse study content, convenient utilization of study materials, and interactive payment/usability of study materials. The availability of cost-effective study material was insignificantly related to the use of mobile devices. This is probably because the charge related to the use of physical books is minimal and most of the time free of charge for students.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the results presented in chapter four and brings forth the conclusions and recommendations as proposed by the respondents. The objectives of the study were to determine the various ways of utilizing mobile devices in university libraries, and to establish the associated benefits and challenges faced in using the mobile devices. The study also envisaged to provide possible solutions to the latter challenges. Data was collected using questionnaires dispatched to the library users, senior library staff, lecturers, and ICT officers. Analysis was done using descriptive and inferential statistics with the aid of SPSS analysis software.

5.2 Summary of Findings

The summary of findings has been structured into the objectives of the study: utilization of mobile devices in university libraries, benefits of using mobile devices in university libraries, and challenges of using mobile devices in university library

5.2.1 Utilization of Mobile Devices in University Libraries

The study established that 95 % of library users use mobile devices to access library materials (Figure 4.1). Given most of the users aged between 20 years and below as shown in Table 4.6, it showed that mobile device usage is prevalent among the young university entrants. The various ways in which mobile devices are used in university libraries include accessing library resources, mobile payments, using QR codes to search publications, cloud computing, and sharing of information. Table 4.13 shows that mobile devices were mostly used in accessing library resources. This means that students and other users found it easier to search for library resources

from the convenience of a mobile device rather than the traditional way of looking for books on the library shelves. It was also established that mobile devices were extensively used in communication through instant messaging applications among library users. This enabled the users to easily share knowledge among themselves while utilizing the university's internet (wifi).

5.2.2 Benefits of Using Mobile Devices in University Libraries

Users were required to respond on the various benefits associated with the use of mobile devices including ease of access to library resources, exposure to diverse content, convenience of utilization of study materials, availability of cost-effective resources, and interactive payment/usability of study materials. On a 3-point Likert scale, the greatest benefit identified by the users was the ease of access to library resources (mean = 2.48). This means that they appreciated how quickly and easily mobile devices enabled them to access study materials compared to the traditional library setup. The second popular benefit was exposure to diverse study content (mean = 2.47).

Mobile devices opened the variety of available resources to the students through access to online journals, virtual textbooks, and Internet resources. The third most popular benefit was the convenience of utilization of study materials. This is evident by the inherent nature of mobile devices. They provide mobility to the users and through Internet browsers; users can open multiple tabs at one moment to view various resources simultaneously. The other benefits were the availability of cost-effective resources (mean = 2.18) and interactive payment/usability of study materials (mean = 2.00). These were important considerations for mobile device users receiving less weight compared to the former three benefits. This is because the cost saving associated with the use of mobile devices was not significant. The major benefit noted was the ease of access to

library materials and the flexibility associated with the use of mobile devices. Users embrace how fast and easily they can carry out research in the libraries through the use of mobile devices. Senior library staff, ICT staff, and lecturers also noted the reduction in time to carry out research. They also noted the elimination of bulkiness associated with carrying many textbooks and the limiting nature of borrowing a certain number of textbooks.

5.2.3 Challenges of Using Mobile Devices in University Libraries

The use of mobile devices in university libraries has not been without challenges. From the study, 78.6% of the users acknowledged that they experienced challenges in the use of mobile devices in the libraries. The challenges experienced by the users include insufficient mobile-accessible resources, inadequate technical support for mobile devices, limited capacity of mobile devices, incompatible library resources, and negative educator perception. The main two challenges were insufficient mobile-accessible resources and inadequate technical support for mobile devices (37.5% and 38.5 % respectively in Table 4.16).

Lecturers further noted that users lacked training on how to make the most use of mobile devices in accessing library materials. Some users used mobile devices in libraries for entertainment, which caused a distraction for other library users. The other challenge noted by ICT staff and senior library staff members was inadequate power supply sockets to charge mobile devices. There was no support section for mobile device users hence if they experienced technical hitches; they could not get help from the university. Senior library staff also noted that users were bombarded with a lot of information hence they lack concentration limiting their understanding of concepts. ICT officers noted that mobile devices had insufficient storage capacity hence the users could not store infinite library materials. Furthermore, mobile devices were also expensive to acquire especially

if the users required more storage capacity. Most of the users are university students sponsored either by the government or by their guardians. Therefore, affording an expensive mobile device is not easy for the students. The devices they use are also prone to technical hitches and since they are hand-held portable devices, the users easily lose their devices either by misplacing or being stolen.

5.2.4 Viable Ways of Enhancing Utilization of Mobile Devices in University Libraries

To curb the identified challenges that hinder utilization of mobile devices, the respondents recommended improving mobile device accessibility to library, creation of numerous mobile devices access, sufficient training of library technical staff on m-resources, development of mobile support infrastructure, and carrying out campaigns for utilization of mobile devices to improve educator perception. Other recommendations included the provision of adequate technical support and reliable Wi-Fi Internet connection. Increase in the number of electrical sockets in the university libraries to enable students to be able to charge their phones. Lecturers also advocated for the need to have a center for mobile phone maintenance and sufficient power charging sockets and the need to carry out training sessions on the importance of using mobile devices in accessing e-resources to decongest libraries and for users to have a full experience of the resources the libraries can offer.

5.3 Conclusion

This study established that the majority of library users in universities use mobile devices. The use of mobile devices is mostly associated with new university entrants. This age group is highly technical and prefers digital access to information and communication. The use of mobile devices

in university libraries was mostly for accessing library e-resources, internet searching for learning materials, and communicating with fellow peers. The study established a significant relationship between the use of mobile devices and some of the benefits thereof. These benefits include ease of access to library resources, exposure to diverse content, convenience of utilization of study materials, and interactive payment/usability of study materials.

The study found no significant relationship between the use of mobile devices and the availability of cost-effective resources owing to minimal cost savings in using digital access to library material. The use of mobile devices had challenges, notably, a lack of mobile device technical support, limited power sources to charge the devices, poor Internet connectivity, and expensive repair and replacement costs associated with the use of mobile devices. Nevertheless, the study has concluded that the use of mobile devices in university libraries is greatly beneficial to the users and it reduces the stress on traditional library facilities.

5.4 Recommendations

This section describes recommendations based on the discussed results. The recommendations include operational recommendations (directed to the universities) and suggestions for areas of further research.

5.4.1 Operational Recommendations

The study recommends that universities should put up mobile device resource centers such that mobile device users can get technical assistance. The universities should invest in good Internet connectivity covering the whole university area including student residencies. This will enable access to library materials even from outside the libraries hence decongesting the libraries. The university should also install adequate power sockets in and outside the libraries to enable mobile

device users to be able to use the library resources without power limitations. The public universities should Create a Library Application (App) with the library e-resources. This will make it easy for students to access the e-repository since they will only be required to download the App on the phone, log in to the university portal, and access the library services. The university should also ensure effective and reliable Wi-Fi on-campus since lack of internet was identified as one of the challenges why students may not be able to access the library mobile technology.

5.4.2 Areas of Further Study

Despite the immense benefit offered by the use of mobile devices in university libraries, there were obvious challenges noted. These challenges included irresponsible use of mobile devices in libraries, for example, for entertainment. Furthermore, students can access an array of information simultaneously until they lose focus. This study recommends further study on the negative effects of using mobile devices to access information and its adverse effect on students' socialization and academic performance.

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APPENDICES

Appendix I: Introductory Letter

Burudi Peter Shibonje

C/O Karatina University,
P.O. Box 1957—10101,
Kagochi, Karatina, Kenya.

Dear respondent

RE: REQUEST FOR COMPLETION OF QUESTIONNAIRES

I am a student at Karatina University pursuing Masters of Science in Information Science. I am assessing utilization of mobile devices in accessing information from selected public university libraries in Kenya. I am therefore writing to request you to assist me in the study by filling the questionnaires provided.

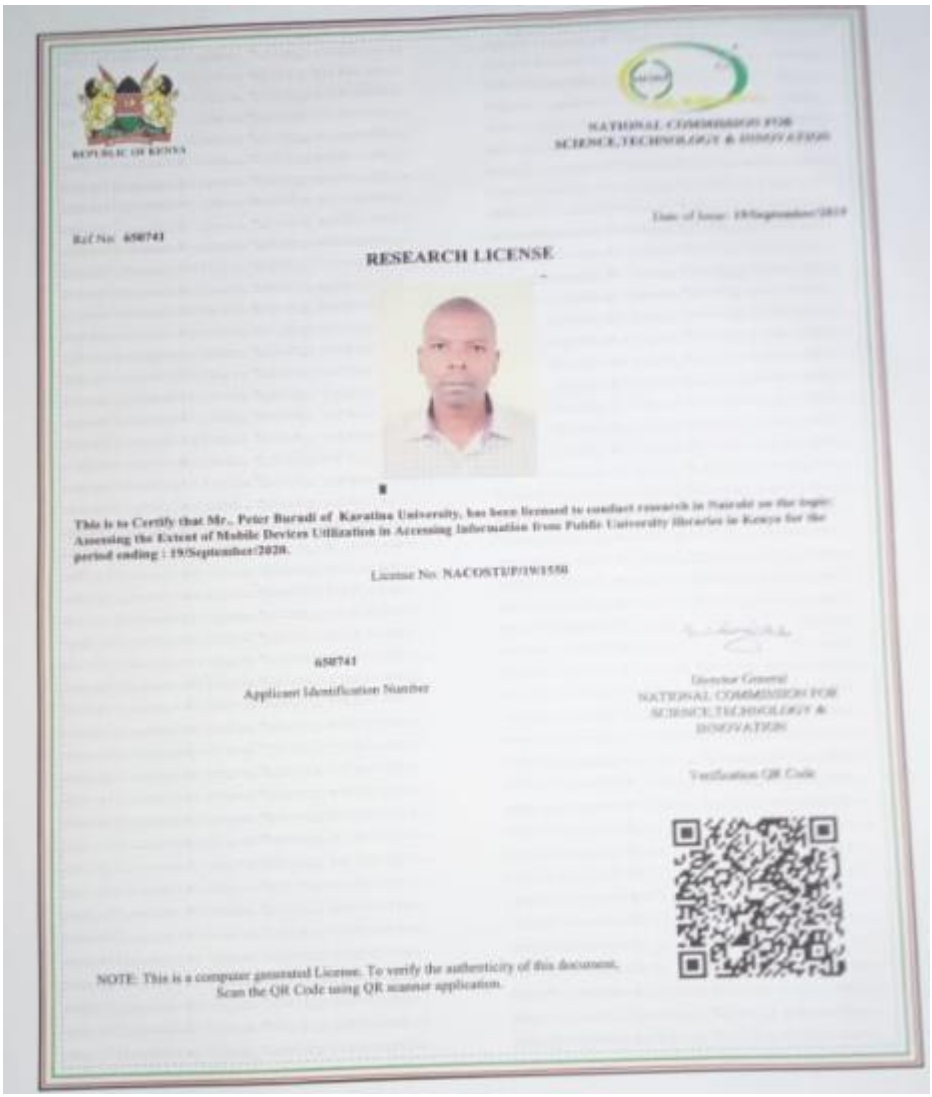
Your co-operation will be highly appreciated.

Thank you in advance.

Yours faithfully,

Burudi Peter Shibonje
P304/1808P/14

Appendix II: NACOSTI Authorisation Letter



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RESEARCH LICENSE

This is to Certify that Mr., Peter Buradi of Karatina University, has been licensed to conduct research in Nairobi on the topic: Assessing the Extent of Mobile Devices Utilization in Accessing Information from Public University libraries in Kenya for the period ending : 19/September/2020.

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Appendix III: Questionnaire for Users

Dear library user,

I am Peter Burudi a master's student at Karatina University I'm glad to inform you that you have been selected to participate in this study investigating the utilization of mobile devices in accessing information from selected public university libraries in Kenya. Your responses will be used for research purpose only and your identity kept confidential. You are kindly requested to sincerely respond to the items on the questionnaire. Please read and answer the questions by putting a tick within the brackets in front of your response to the question.

Thank you,

Yours sincerely

Peter Burudi

Section A: Background Information

1. Gender

a) Male ☐

b) Female ☐

2. Age

a) 20 years and below ☐

b) 21-25 years ☐

c) 26-30 years ☐

d) 31-35 years ☐

e) 36-40 years ☐

f) 40 and above ☐

SECTION B: Ways in Which Mobile Devices Are Utilized in the Library

4. Are mobile devices utilized at your university library?

a) Yes ☐

b) No ☐

b. If YES, please indicate ways in which mobile devices are utilized at your university library

a) Accessing library resources ☐

b) Mobile payments ☐

c) Using QR codes to search publications ☐

d) Facilitation of cloud computing ☐

e) Sharing of user-generated web content ☐

Any other (please specify)

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SECTION C: Benefits of Mobile Devices Utilization in the Library

5. Please indicate to what extent utilization of mobile devices in your library has been beneficial

No	Utilization	To a greater extent	To some extent	Not at all
a)	Easy access of library resources			
b)	Exposure to diverse study content			
c)	Convenient utilization of study materials			
d)	Availability of cost effective resources			
e)	Interactive payment and usability of study materials			

Any other (please specify)

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SECTION D: Challenges Faced in Utilization of Mobile Devices in the Library

7. Do you encounter challenges while utilizing mobile devices in the Library?

a) Yes ☐

b) No ☐

b. If YES, please indicate which among these, are the main challenges

a) Insufficient mobile-accessible resources ☐

b) Inadequate technical support for mobile access ☐

c) Limited capacity of mobile devices ☐

d) Incompatible library resources ☐

e) Negative educator perceptions ☐

Any other (please specify)

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……

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SECTION E: Solutions to Challenges Facing utilization of mobile devices in the Library

7. Please indicate ways in which these challenges can be countered

a) Improving mobile-accessibility to library ☐

b) Sufficient training of library technical staff on m-resources ☐

c) Creation of numerous mobile devices access points ☐

d) Investment by the library on development of mobile support infrastructure ☐

e) Mobile utilization campaigns to improve educator perceptions ☐

Any other (please specify)

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……

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Thank you for your cooperation

Appendix IV: Questionnaires for Senior Library Staff Members,Lecturers and ICT staff

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Section A: Background Information

1. Sex

a) Male ☐

b) Female ☐

2. Age

a) 21-29 Years ☐

b) 30-39 Years ☐

c) 40-49 Years ☐

d) 50 Years and above ☐

3. Working experience in the library

a) 1-3 Years ☐

b) 4-6 Years ☐

c) 7-9 Years ☐

d) 10 Years and above ☐

SECTION B: UTILIZATION OF MOBILE DEVICES IN THE LIBRARY

4. What are the different ways in which mobile devices are utilized in library?

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5. What are the benefits of mobile devices utilization in the Library?

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6. What are the challenges faced in utilization of mobile devices in the Library?

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7. In what ways can these challenges be countered?

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