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ADOPTION AND IMPLEMENTATION OF MOBILE TECHNOLOGY BASED LIBRARY
SERVICES IN GHANAIAN ACADEMIC LIBRARIES

BY

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DECLARATION

I do hereby declare that, with the exception to references I made to other peoples's work which are duely acknowldeged, this thesis is the result of my own original work under the supervision of Dr De-Graft Johnson Dei and Prof. Perpetua Dadzie. This work has no been submitted either in part or whole for another degree elsewhere.

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DEDICATION

To my lovely mother, Alberta Nunoo and my brother, Michael Acheampong

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LIST OF ABBREVIATIONS

AHRQ	Agency for Healthcare Research and Quality
ECAR	Educause Centre for Applied Research
E-learning	Electronic learning
GSM	Global System for Mobile Communication
GSMA	Global System for Mobile Communications Association
HTTP	Hyper Text Transfer Protocol
ICT	Information Communication and Technology
ITU	International Telecommunication Union
M-learning	Mobile learning
MMS	Multimedia Messaging Service
MT	Mobile Technology
MOPAC	Mobile Online Public Access Catalogue
NCA	National Communication Authority
OPAC	Online Public Access Catalogue
SMS	Short Message Service
UCC	University of Cape Coast
UEW	University of Education, Winneba
UNESCO	United Nations Educational, Scientific and Cultural Organization
WIFI	Wireless Fidelity
WiMAX	World Wide Interoperability for Microwave Access

ABSTRACT

Modern trends in library settings particularly in the academic library environment require that, academic libraries be positioned to provide remote and boundary-less access to their collections and services. Mobile Technologies (MT) have been embraced by stakeholders of academic libraries globally in recent times, as it is considered as a strong communication medium that can offer convenient library services to library patrons. The overall objective of this study was to ascertain the potentials of adopting and implementing Mobile Technology based Library Services in academic libraries in Ghana. The study was a descriptive survey and the mixed method approach was used. The study was limited to two academic libraries in Ghana namely, Sam Jonah Library of UCC and Osagyefo Library of UEW. A total sample size of 400 respondents was used, consisting of 10 library staff and 390 graduate students. Purposive and convenience sampling techniques were adopted to select the library staff and graduate students respectively. Three hundred and sixty five responses were received. A questionnaire and an in depth interview were used to collect data for the study. The data collected was analyzed with SPSS software version 22 using descriptive statistics (frequency counts and percentages) and content thematic analysis. The major findings were that there was a strong awareness and deep appreciation for the use of MT library services among library management and students, however MT based library services has not been implemented in these two libraries due to diverse reasons. These include inadequate ICT infrastructure, skills gap as a result of lack of training, lack of policy framework for the adoption of the technology and clearing the hurdle of convincing university management to accept the technology. As a result, it was recommended that the two libraries need to invest more in ICT infrastructure specifically MT infrastructure and build on their human resource base through recruitment and professional training on emerging technologies.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Globally, libraries are becoming sophisticated but user-friendly in this 21st century with the integration of emerging technologies in their operations. Libraries by and large are the repositories for most important information concerning any area of interest to readers. Libraries play a major role in the development of a nation as far as information management is concerned, be it a community library or an academic library. Academic libraries are of concern to many in as much as the provision of timely scholarly information is concerned. Academic library, according to Jamil, Tariq and Jamil (2013) is one which is established with collections which are essential to support and strengthen educational quality. For many decades, academic libraries have been avenues of possession and allocating information through books, journals, maps and other resources that are used by students in their learning process.

Oakleaf (2010) emphasised that generally, effective academic libraries are entryways to academic information through their own collection and by facilitating access to the collections (materials). In line with its core mandate of providing a support system for teaching and learning, it also provides effective library services to support the research activities of researchers. Hardesty (2000) as cited in Oakleaf (2010) specified that library resources in academic libraries are devoted to the needs of students and researchers at the university. Simmonds and Andaleeb (2001) equally elaborated that the use of library resources in academic libraries is influenced most by users' perceived understanding of the libraries and their resources and those who are

more acquainted with the academic libraries are more likely to use the resources available in them.

Today's age of technological advancement has called for reforms in the landscape of academic libraries in terms of digitization and effective service delivery. Academic libraries owe a key duty to keep pace with technological advancement in order to cope with users' continual sophisticated information requirements and getting access to their information needs regardless of their location. In line with this, Tait, Martzoukou and Reid (2016) argued that the prevalence of online learning activities requires that academic libraries, move from concentrating on the management of physical resources and traditional medium of service delivery to changing resources into digital forms to be accessed anywhere by users regardless of geographical location to support teaching, learning and research.

Having noted the technological development trend in academic libraries, the most contemporary digital reformation is the mobile technology-based library services. Mobile technology, such as a smartphones, tablets computers, ebook readers, PDA's, IPod and gaming devices are progressively being considered as mediating tools in information searching process, especially at the academic libraries level.

Current trends point to the fact that there is increased usage of mobile devices and internet usage among library users. To Speight (2009) as cited by Paterson and Low (2011), the growing concern for the use of mobile technology in providing academic library services is obvious in a number of research studies recently conducted and the growing number of mobile-friendly websites and easy to use applications being developed and deployed for service delivery in academic libraries.

In recent times, several academic libraries around the globe are providing mobile technology-based services to meet their users varied and tailored needs by adopting existing mobile technologies in their operations (Zha, Zhang, Li, & Yang, 2016). It appears that the universal presence of mobile technology devices has made it practically difficult for libraries to ignore them. Mobile technologies have impacted positively and changed information delivery in most academic settings.

Liu and Briggs (2015) postulated that mobile technologies assist and provide the medium for dissemination and retrieval of information with the use of handheld mobile devices such as tablets, smartphones, e-book readers, iPod, PDA's among others. Currently, a lot of mobile devices are embedded with several applications, functionalities and unique attributes that can be used to access digital contents of the information. It is asserted that "most mobile devices are now built with features that are capable of accessing and processing information just like desktop computers" (Khaddage & Latteman, 2013 p. 119).

Incontrovertibly, mobile technology-based library services are becoming the order of the day in most universities globally. The increasing usage of mobile devices among library patrons as a result of the development in mobile internet has made it practically impossible to ignore this innovative technology if academic libraries are to meet their users' needs expeditiously in the 21st century (Dahlstrom, Walker, & Dzuiban, 2013). Mobile technology-based library services involve the delivery of library services through mobile devices. They include tailor-made mobile technology services such as mobile instant messaging for reference services, SMS alerts services, mobile databases and e- journal finder, mobile online public access catalogue (MOPAC), mobile

library instructions and virtual tours, mobile research consultations, library user education through mobile devices platforms (Haifeng, 2010; Hung & Chanlin, 2015; Ghosh, 2016). Mobile technology-based library services can also be developed to capitalize on social media services such as Twitter feeds, Facebook feeds, blog and podcast.

Aldrich (2010) and Emmanuel (2010) as cited in Saravani and Haddow (2017), also indicated that as the demand for online access to information regardless of the location of the clientele increases, academic libraries have been actively accepting initiatives to digitise and preserve physical materials, to store them in online repository systems and to encourage their free access via mobile platforms with the aid of mobile technology. A body of literature such as Canuel and Crichton (2011); Hallam (2009) and Latham and Poe (2012) on mobile technology-based library services indicated that the academic library settings globally are shifting from the routine traditional environment to the mobile environment. Most academic libraries have been involved in early and continual endeavours by assessing the changing nature of the libraries, both in its current state and in the future and critically aligning their technological strategies to reflect on these innovative changes especially in the area of mobile-based library services which are mobile technology driven.

According to Saravani and Haddow (2017), the introduction of mobile technology-based library services in providing access to online information delivery to existing remote users and planning for physical changed spaces in academic libraries appear well rooted, although not all scholars settle on this view. Views shared are that the key benefit of mobile technology-based library services are their possibilities towards increased enhanced library services delivery and making access to information and learning becoming available anywhere and anytime (Lever & Katz,

2007). Research survey conducted by the California Digital Library as cited in Paterson and Low (2011) concerning mobile technology-based library services revealed that “mobile users use mobile devices to access the library services to find quick pieces of information and they are already using online databases and online catalogues on their mobile devices”. To this effect, there seemed to be a call among library users to adopt mobile technology-based library services as this helps users to get quick access to information without necessarily being physically present at the library. A study by Vollmer (2010) further revealed that 55 percent of the respondents said they would like to search the library catalogue on their mobile frequently or sometimes away from the library. Likewise, Malathy and Kantha (2013), observed that mobile technology applications increasingly affect the dissemination of information in academia and enhanced communication for and between library patrons. These mobile- technology based library services have gained broad acceptance due to the increased need in supporting the mobile workforce and the rapid improvement in the services provided through mobile technologies.

Hence, clearly, having noted the growing trends in mobile technology application in libraries around the world, there is the need for such innovations in Africa, especially academic libraries in Ghana such as Sam Jonah library of University of Cape Coast and Osagyefo library of University of Education, Winneba so as to reap the overwhelming benefits of mobile technology application in libraries.

1.2 Statement of the Problem

Academic libraries in the 21st century are moving from traditional service provision (hard/physical) to a more contemporary service provision (virtual/ICT). The embracement of contemporary service like ICT related service provision by academic libraries is informed by the

growing demand of users across many different geographical locations and convenience. The way users access and retrieve information is being changed by mobile technology applications and service innovations (Li, 2013). Mobile technology has become the key to the accomplishment and modernization of the services of academic libraries (Barile, 2011). Kumbhar and Pauer (2014) opined that mobile technologies and availability of easy to use mobile devices have introduced a “libraries in hand” trend.

In recent times, more and more libraries around the globe especially those in the developed countries are adopting and integrating mobile technologies to provide innovative services and provide boundary-less access to unlimited electronic information resources for library patrons (Wang, Ke, & Lu, 2012). Chang (2013) and Zha, Zhang, Li, and Yang (2016) cited North Carolina State University library, Cambridge University library, and Amsterdam University library as some of the libraries providing a variety of mobile technology-based services for their users . In Africa, universities such as University of Pretoria, University of Swaziland, University of Kwazulu-Natal and University of Free State have all adopted the use of mobile technologies in the provision of library services (De Wee, 2015; Paul & Mavuso, 2012).

Despite the growing usage of mobile devices among students and the availability of mobile broadband and WIFI internet almost everywhere in the developing countries (Rogers, 2012), academic libraries in Ghana are yet to fully exploit this opportunity and provide mobile technology-based library services. A Jumia Annual Mobile Report (2018) indicated that mobile devices subscription in Ghana is anticipated to reach about 40 million in the next two years. The report further stated that by 2021 Ghana’s mobile devices penetration will witness over 130% growth and that currently, Ghanaians are among the top mobile device users in Africa.

From preliminary observation, the University of Cape Coast and the University of Education, Winneba, libraries have to some extent automated most of their library operations. The two libraries are increasingly integrating technologies like online public access catalogue (OPAC) in their operations. They have digitized most of their thesis collections and have other electronic resources. In addition, services such as reference services, user education, circulation services, selective dissemination of information among others are offered to their users. Notwithstanding this and the enormous increasing usage of mobile devices among students on university campuses (Dadzie, 2009), the two libraries are yet to implement mobile technology-based library services or make any of their services available on mobile technology platforms.

Several studies have been done on the use of mobile technologies in academic libraries globally. Examples include (Jaradat, 2012; Lui & Briggs, 2015 ; Saravani & Haddow, 2015, Hamad, Farajat & Hamarsha, 2018). In the African context some studies have been conducted on MT applications in libraries. Notable among them are (Paul and Mavuso, 2012; Sekyere, 2011; Baro, Efe & Oyeniran, 2014; Mohammed, 2014 ; De Wee, 2015 ; Chaputula & Mutula, 2018).

There is however, lack of remarkable research that have ascertained how mobile technology-based library services can be adopted and implemented in academic libraries in Ghana with particular reference to Sam Jonah library, UCC and Osagefo Library, UEW. In addition, the researcher is yet to identify any research work that sought to examine the views of graduate students', library management and library IT staff to ascertained their views on the potentials of adopting and implementing mobile technology based library services in Ghanaian academic libraries. The lack of research in this field in Ghana has created a knowledge gap. Accordingly, this study is timely and aims to fill this specific knowledge gap.

1.3 Purpose of the Study

The purpose of this study was to ascertain how mobile technology-based library services can be adopted and implemented in Sam Jonah Library, University of Cape Coast (UCC) and Osagyefo Library, University of Education, Winneba (UEW).

1.4 Objectives of the study

Specifically, the study sought to address the following objectives:

1. To assess the level of awareness and appreciation for the use of mobile technology -based library services in academic libraries at the selected universities.
2. To assess the preparedness of library management towards the implementation of mobile technology based library services in academic libraries at the selected universities.
3. To identify the students' proficiency in relation to mobile devices usage.
4. To identify the library services that can be delivered on mobile technology platforms at the selected academic libraries.
5. To examine the willingness of students to use mobile technology based library services in the academic libraries at the selected universities.
6. To identify the requisite training and skills of the staff for the adoption and implementation of mobile technology based library services at the selected academic libraries.
7. To identify the potential challenges associated with the adoption and implementation of mobile technology based library services at the selected academic libraries.

1.5 Theoretical Framework

The researcher relied on the Technology Acceptance Model (TAM) as the theoretical framework for this study. Technology Acceptance Model is a model founded by Fred Davis in 1989. This model is used to assess people's acceptance and usage or acceptance and implementation of any technology in an institution. It determines the factors that make an individual or institution to either accept or reject an emerging technology and use. According to Davis (1989), these factors are the perceived usefulness of the technology and perceived ease of use of the technology. He further explained the perceived usefulness of technology to mean the level of belief that one that the use of a particular technology will increase or improve one's performance of work.

In other words, technology is useful in meeting the needs of the user. The perceived ease of use of technology, on the other hand, meant the level of belief that one has such that the usage of a particular technology is easy to use. Thus for an individual or institution to actually use or reject a particular technology they will have to form a behavioural intention. This intent is influenced by their attitudes that is what they think about the technology, basically their general impression about the technology. The factors that form the bases of individuals or institutions attitude to use a particular technology are the perceived usefulness of the technology and perceived ease of use of the technology and that is the central premise of Technology Acceptance Model. This model is adopted by the researcher for this study because for academic libraries to be relevant in today's information world, it must employ and use modern ICT technologies in the provision of its services for client satisfaction. Thus, a particular technology to be adopted will be determined by the perceived usefulness and perceived ease of use of the technology by both library staff and library users.

1.6 Scope of the study

This study was confined to the Sam Jonah library of University of Cape Coast and Osagyefo Library of University of Education, Winneba.

1.7 The significance of the Study

It is envisaged that the study will provide insight into the state of mobile technology-based library services in Ghanaian academic libraries. Secondly, it would serve as a guide to policymakers in the management of academic libraries and inform university authorities in making decisions as to the road map to be adopted in implementing mobile technology-based library services. Moreover, if the outcomes of the study are implemented, it will be the utmost benefits to students.

Lastly, the study would add up to the available literature and fill the knowledge gap regarding the adoption of mobile technology-based library services in academic libraries in Ghana and the application of technologies that are mobile-driven in other equally important spheres of life.

1.8 Setting/ Research Environment

This is the research environment where the study was carried out. The researcher selected the Sam Jonah Library, University of Cape Coast and the Osagyefo Library, University of Education, Winneba as the research setting. The two libraries are located at the main campuses of the two major public universities in the Central Region of Ghana.

1.8.1 Brief history of University of Cape Coast Library

The University of Cape Coast was established in the year 1962 in the Central Region of Ghana. The university was set up for the sole aim of training graduate teachers for second cycle institutions like the teacher training colleges and the technical institutions in Ghana (Vice Chancellor's Annual Report, 2016). However, the university has also introduced several

programmes to produce highly qualified health professionals, administrators, agriculturalists and many more in both regular and modes mode and with satellite campuses (UCC-Strategic Plan, 2008). The university has a five-story library complex formerly known as “the main library”. The library is now known as “Sam Jonah Library” and this came about as a result of a recommendation proposed by the University of Cape Coast 50th anniversary Ad hoc committee for naming landmarks, buildings and monuments of the university. At a meeting held on 27th October 2015, the university’s Academic Board considered the report of the Ad hoc committee and decided that the library should be named after the Chancellor of the University, Dr. Sir Sam Jonah (Vice-Chancellor’s Annual Report, 2016). The library is a hybrid academic library that provides scholarly information and innovative services to support the teaching, learning and research activities undertaken by the university for the accomplishment of its mission and vision. The Sam Jonah Library is one of the largest academic libraries in Ghana. It has the capacity for stocking over 750,000 books (UCC library Guide, 2012).

The library has an institutional repository and a collection of digital materials (UCC institutional Policy, 2012). The institutional repository started in 2010 and currently has about 1,015 theses and other research articles. The library, which is the heart of the university, also subscribes to electronic resources (journals both abstract and full text) through the Consortium of Academic and Research Libraries of Ghana (CARLIGH) for its users. In addition, it can seat 2,000 users at a time (UCC library Guide, 2012). It also complements the faculty, schools and departmental libraries.

1.8.2 Brief history of University of Education, Winneba Library

The University of Education, Winneba situated in the Central Region of Ghana, was set up as a University College under PNDC Law 322, in September 1992. In March 2004, it was granted the full university status by the University of Education Act, Act 672. The Act brought together seven diploma awarding colleges located in different towns under one umbrella institution. The University of Education through a dint of hard work is now providing high-quality education to teachers in the various educational sectors within Ghana. Currently, it has study centres in Kumasi, Ajumako and Mampong all in Ghana. It runs academic programmes in various specialized areas for teachers on regular and distance basis (Vice Chancellors Annual Report 2013).

The University Library, known as Osagyefo library is located at the Main Campus of the university in Winneba. The library through the vision and mission of the university plays a major role in the academic excellence of students. It has collections such as books, e-journals, monographs, reports, periodicals, electronic resources and publications of the international agencies (UEW library Guide, 2016). The library also renders services such as reference services, lending and borrowing, interlibrary loans services, user education and reprographic services.

1.9 Organization of the Study

The study was organized into six main chapters.

The chapter one deals with the introduction/background to the study, statement of the problem, the purpose of the study, objectives of the study, theoretical framework to the study, scope and limitations of the study, significance of the study and brief descriptions of the study settings.

Chapter two focuses on the literature review of relevant theories and concepts relating to the topic under the following themes: World view of the topic, African View and Ghanaian view of the topic.

Chapter three discusses the methodology which would include the research design, selection of cases, target population of the study, sampling and sample size and data collection instrument.

Chapter four focuses on the presentation of data and analysis

Chapter five covers the discussions of the results of the major findings emanating from the analyzed data.

Chapter six presents the summary of the findings, conclusion and recommendations of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

According to Creswell (2017), knowledge accumulates and for that reason, individuals are capable of educating themselves and add new knowledge to what is already known. The objective of a literature review as postulated by Neuman and Krueger (2003 p. 126) includes; “to demonstrate a familiarity with the body of knowledge and establish credibility; to show the path of previous research and how a current study is connected to it; to put together and sum up what is known in an area; and to learn from others and kindle new thoughts”. The review of relevant literature looked at the following thematic areas from the global, African and Ghanaian perspective:

- a. The Concept of ICT, Evolution of Mobile Devices and Mobile Broadband
- b. The Concept of Mobile Technology
- c. The Changing Roles of Academic Libraries in the Digital Information Age Era
- d. Mobile Technology Applications in Academic libraries
- e. Awareness and Appreciation for the Use of Mobile Technology Based Library Services
- f. Preparedness of library management in the adoption of Mobile Technology Based Services
- g. Students proficiency in relation to mobile devices.
- h. Mobile Technology Based library Services.
- i. Student Willingness to Use Mobile Technology Based Library Services.
- j. Staff Training on Mobile Technology Based Library Services.

- k. Challenges associated with the Implementation of Mobile Technology Based Library Services in Academic libraries.

2.2 The Concept of ICT, Evolution of Mobile Devices and Mobile Broadband

2.2. 1 Concept and Definition of ICT

Information and Communication Technology highlights the importance of communication in data handling. It elaborates how technology is employed to access and disseminate information. ICT merges information technology (IT) to provide easy and timely access to information through several communication technologies such as wireless networks, cell phones, internet, and audio/video conferencing (Tamilsel, Sivakumar & Sevukan, 2012). In the broader sense ICT embraces all aspects of computing technology. Aina, Okunnu, and Dapo-Asaju (2014) have defined ICT from a different perspective. However, all the definitions have some common grounds which have to do with using technologies in accessing, manipulating and communicating data. For instance, Oluwaronbi (2012) postulated that ICT is any electronic-based technology generally used to retrieve, store, process and package information as well as provide access to knowledge. Thus ICT involves the “use and application of telecommunications and computers in the acquisition, storage, retrieval, and dissemination of information to a wider and dispersed audience” (Aina, Okunnu, and Dapo-Asaju, 2014). From the above definition ICT resources are not only limited to computers but includes telecommunication equipment.

The glossary of the American Library Association defined ICT from the perspective of library and information science to be the use of computers and other technologies in acquiring, storing, organizing and disseminating information (Levine-Clark & Carter, 2013). ICT applications are widely used in academic libraries around the world. They are used in carrying out the key

operations in the library. According to Imhonopi and Urim (2014), Academic libraries are integrating ICT in their operations because they are constantly looking for avenues to provide quick and better ways of disseminating information to their user communities.

2.2.2 Definition and Evolution of Mobile Devices

2.2.2.1 Definition of Mobile Devices

Mobile devices are internet enabled portable devices that aid in the processing, storage and retrieval of information just like as desktop computers (Khaddage & Latteman, 2013). They have in-built functionalities and features that mediate information access. According to Valk, Rashid, and Elder (2010) and Walsh (2012), they comprise mobility devices such as smartphones, e-book readers, Personal Digital Assistants, MP3 players, cell phones and tablets. Mobile devices' functionalities have become versatile, allowing people to use them for communication purposes and to access simple and too complex forms of information. Ferry (2009); Barnhart and Pierce (2012), also shared the view that modern mobile devices are handy, internet enabled and can be used to access web-based contents and re-edit the accessed information and share on a collaborative platform.

To Moreira, Ferreira, Santos, and Durao (2017), mobile devices are user-friendly, portable, adaptable and individuals can customize their usage to derive the full benefits from them. They are broad-spectrum computing devices with multi-core processors that come in handy with internet inbuilt features and can be used for several communication purposes.

2.2.2.2 Evolution of Mobile Devices

In recent times, there have been revolutions in the growth rate of mobile devices used globally. The mobile devices evolutions are now part of us. The popularity of mobile devices notably

tablets and smartphones have increased over the past years. In a study conducted by Educause Centre for Analysis and Research (ECAR) (2012) as cited in Dahlstrom, Walker and Dziuban (2013) it was observed that mobile devices usage is on the rise especially among student communities. UNESCO (2012) report indicated that the global scene is witnessing exponential growth in terms of mobile phone popularity. Leblois (2013) opined that in the less developed countries individuals are purchasing more mobile devices specifically mobile phones and tablets as a replacement for desktop computers.

Mobile devices are currently commonly available and owned by more people than regular computers (Davis, 2012). The steady penetration of mobile devices can be attributed to the varied benefits and functionalities it brings to the lives of the users (Moreira, Ferreira, Santos, & Durao, 2017). In Africa, mobile devices (smart phones, mobile phones, PDA's, tablets, among others) possession has experienced substantial growth having an average of six hundred and fifty million or more than half of the population users across the continent (World Bank, 2012; Sambira, 2013). Africa is now considered second only to Asia when it comes to the utilization of mobile phones (World Bank, 2012).

2.2.3 Mobile Broadband Penetration

2.2.3.1 Mobile Broadband Penetration in Africa

Broadband technology and specifically mobile internet has become key precedence in the 21st century across the globe of which Africa is not an exception. Mobile broadband (mobile internet) creates the platform that helps millions of users to be online and enables innovation and use of new services on the basis of mobile access to the internet using all features embedded into the smart devices and accessible through software applications (Stork, Calandro & Gilward, 2013). In the past, accessing the internet was done at computer laboratories at schools, workplaces and

public internet cafes. This era has changed and most people now access the internet using their mobile devices like smartphones, PDA's, e-book reader and tablets (Caperon, 2015). Boohene, Kwafoa, Biney, and Nunekpeku (2014) defined Broadband internet access to include the high speed wired connections to the public internet at downstream speeds not less than 256 kilobits per second. Mobile Broadband network has proven to be one of the reliable transport media for internet access because of its high access speed and continuous connectivity (Pew Internet Report, 2012).

To Romeo, Llyold and Downes (2012), in order to determine the progress of ICT integration and advancement in a country, the broadband penetration rate is used as the base to measure such progress. He further stated that the mobile broadband penetration rate is the country's populations that are subscribers. Statistics from the International Telecommunication Union (2015) reveal that mobile broadband connections have reached 84% of the world's population. There has been a growing use of mobile phones, PDAs, MP3 players, gaming devices, tablets and laptops in Africa and this together with development in telecommunications infrastructure has exponentially increased the penetration rate of mobile broadband in developing countries (Guedalia & Guedalia, 2013). The United Nations and the World Bank have both emphasized on the crucial role mobile broadband internet plays in creating the enabling environment for technological innovations and integrations both in businesses, government agencies and educational institutions (Gbahabo & Fombang, 2017). The impact of telecommunications' infrastructure especially in the area of mobile broadband connections on the current revolution in service delivery, and how this accelerates growth in all spheres of life cannot be underestimated. According to the International Telecommunication Union (2015) and Minges (2015), there is an increasing usage in mobile broadband internet in Africa. This rapid growth has been attributed to

the fact that there have been better telecommunication policies and reforms in Africa within the last decade which has given rise to lower cost in terms of network installations, affordable ICT services and mobile devices (Gillwald, Moyo, & Stork, 2012).

Broadband mobile internet is improving access to rapid information and in developing countries, it is now considered as the major driver in facilitating access to economic and social welfare opportunities (ITU, 2012). For instance, financial inclusion through mobile banking and mobile money in Africa and health care information delivery in most African countries has been achieved with the investment made in mobile broadband infrastructure (ITU, 2012). The citizenry in developing countries has waded into the adoption of using mobile phones to access the broadband internet. A study by Stork, Calarado and Gamage (2014) on the “Future of broadband in Africa” indicated that there is an astronomic growth in mobile broadband and this resulted in a drastic decline in residential fixed-line phones for internet access in countries such as Ghana, Namibia, Kenya, South Africa and Tanzania. Their study further revealed that in Namibia, Ghana, Uganda and Ethiopia about 80% of internet users access the internet with mobile phones. In South Africa, Kenya, Nigeria, Tanzania and Rwanda 70% of the internet users access the internet via mobile phones. GSMA (2016) and Sambira (2013) opined that there are over 500 million mobile subscribers across Africa and this is extremely due to the continued expansion of network coverage and falling mobile internet enabled devices like smartphones. Bassey, Okoro and Okon (2016) posit that most users of mobile broadband internet in Africa use it to carry out research, for educational purposes, entertainment, socialization, reading news and in the job search.

2.2.3.2 Mobile Broadband Penetration in Ghana

Ghana has recognized and accepted the significant role ICT plays in the economic development of the country and this is stated in the ICT policy for Accelerated Development (ICT4AD) which was adopted in 2003. In line with this, there has been the adoption of numerous ICT policies like the National Communication Policy and the National Broadband Policy (Government of Ghana, 2004). The realization of these policies revolves around high-speed internet connectivity and thus mobile broadband technologies are the new innovative technologies that can provide the platform and internet connections for robust ICT infrastructure network. Mobile broadband has become a key infrastructure requirement as it facilitates the development of the entire ICT-enabled sector and has a considerable impact in the creation of information society. A study by Frempong (2009) asserted that mobile broadband has become deep-seated in Ghana's communication system and businesses, educational institutions as well as government agencies are using it as strategic technology to provide innovative services.

Recently, Ghana has seen a major investment in broadband communication and the country is making gains as far as mobile broadband wireless access is concerned (ITU & UNESCO, 2015). Statistics provided by the National Communication Authority (2016) revealed that mobile broadband internet access has been on the rise steadily. The report stated that mobile broadband data subscription has increased exponentially from 16.8 million during the second quarter of 2015 to 18.8 million at the end of the second quarter of 2016. The mobile broadband penetration rate in Ghana as of 2018 stood at 78.8% (NCA, 2018). The rapid increase in mobile broadband internet access is keenly due to the proliferation in the use of portable internet-enabled mobile devices and the fact that mobile services are now essential part of routine activities of Africans (Barton & Leke, 2016; GSMA, 2016; Curwen & Whalley, 2013; Sarpong, 2016). In Ghana,

mobile broadband is used mainly as a medium for voice communications, email, accessing information, web browsing and social networking.

2.3 Concept of Mobile Technology

According to Hamad, Farajat, and Hamarsha (2018 p. 4), mobile technology (s) are “handheld information (IT) objects that encompass hardware (devices), software (interface and applications) and communication (network services)”. It can also be defined as “technology that uses radio frequency spectrum in any band to facilitate the transmission of text data, voice, video, or multimedia services to mobile devices with freedom of time and location limitation” (Kim, Mims & Holmes, 2006. p 79). Thus, they include mobile phones, portable digital assistants and integrated wireless solutions (Jarvenpaa & Land, 2005; Roy, Das, & Majumdar, 2016). We are in the digital era and this technological age is characterized by “personal and technical mobility”. There is the evolution of mobile devices such as mobile phones, MP3 players, tablets, PDAs. This evolution, coupled with seemingly growing wireless internet connections and the embracement of universal swift-speed mobile broadband makes mobile technology a critical innovation if organizations/institutions are to meet the needs of their customers/users.

Mobile Technologies have changed the way people communicate. MT augment the way people access, receive and interact with information, and they provide new channels for collaboration and communication (Hamat, Farajat & Hamarsha, 2018). To Hamat et al (2018), these new technological advancements provide faster access to an increasing volume and variety of information. Sabah (2016) opined that MT (specifically cell phones and tablets) has already proven effective in all aspects of daily life. Users are increasingly relying on mobile devices as

the most important means of performing many daily activities such as web navigation, e-mail access, reading books and social media engagements with friends. MT provides easy to use technologies and immediate access to vital information. It is considered a contemporary technology with enormous benefits to individuals, educational institutions, corporate organizations and government agencies. Mobile devices provide a transportable way to access data across borders, areas and institutions (Singh-Negi, 2014). MT provides a mobility central interface for individuals to access and share information anywhere anytime (Saxena & Yadav, 2013; Singh-Negi, 2014). People progressively want to accomplish daily activities easily and rapidly by means of mobile devices and indeed mobile technologies are changing society through how people create, share information and collaborate with one another (Wasserman, 2010; West & Ei, 2014). Although mobile technology is an emerging technology, because of its vast benefits, technology experts and stakeholders are utilizing their applications in their various workplaces (West & Ei, 2014). Oblinger, Oblinger and Lippincott (2005) asserted that key projects in several areas have indicated how mobile technology is capable of moulding and empowering people, advance change and promote the development of 21st century skills. The success of mobile technology and its numerous accompanied applications can be attributed to the astonishing growth in mobile devices, the growth in mobile broadband internet connections (Domingo & Gargante, 2016).

2.3.1 Importance of Mobile Technology in Education

The application of technology in education in the 21st century is steadily shifting towards mobile based and education practitioners are accepting the significant roles being played by mobile technology in shaping the current and future education landscape. There is no uncertainty regarding the impact mobile technology will have on education in the future in the sense that

mobile technology applications are in line with the fast-paced information era (Hsu, Ho, Tsai, Hwang, Chu, Wang, & Chen, 2012). According to Ahmadi, Keshavarzi, and Foroutan (2011), MT is effectively aiding in doing away with the time and space impediments linked with conventional classroom-based instruction. The widespread usage of mobile devices among students and the swift growth seen in technology-based instructions as opposed to the normal conventional teaching methods on various campuses have greatly impacted the education sector (UNESCO, 2012; Alper & Gulbahar, 2009; Hsu, Ho, Tsai, Hwang, Chu, Wang & Chen, 2012). The education sector is revolving as a result of emerging technologies and the fact that stakeholders are dealing with digital native learners who are abreast with these emerging technologies and wants to have boundary-less access to information (Cheon, Lee, Crooks, & Song, 2012; Ghavifekr, Afshari, & Amla, 2012).

In the views of Yuen, Song, and Jong (2008); and Oyelere, Suhonen and Sutinen (2016), the escalated growth in smartphones and other mobile devices together with their portable and advanced processing functionalities are providing the technology that opens up new ways to access education. Mobile technology assimilation in education impacts positively on the academic fortunes of learners. It affords instructors and learners the opportunity to work in partnership to plan, devise and implement collaborative learning strategies in the study room. MT such as Apple iPad and iPhone applications has a significant transformation on education with more than 108,000 educational applications that can be used to complement studies in the classrooms (Sherry & Gibson, 2002; Pollara & Broussard, 2011). The conventional mode of education that takes place within the boundaries of physical settings is rapidly giving way to mobile learning that enables learners to be part of the learning process without limitations of time, space and pace (Hyman, Moser, & Segala, 2014). The intrinsic digital perkiness of present

students makes it a necessity for stakeholders in education to redesign the medium of tuition in order to enhance the learning and thinking capacity of students.

Over the years, there has been the major deployment of funds to provide infrastructural facilities, contents and resources connected to the incorporation of mobile devices in the educational sector (Johnson, Smith, Willis, Levine & Haywood, 2011). The investment is geared towards reaping the expected benefits from the application of mobile technology in education. There are numerous educational benefits connected with mobile technology adoption and application in the education sector.

2.3.1.1 Mobile Technology Providing Access to Distance learning and Mass Education

Cavus and Ibrahim (2009) mentioned that a report by International Council for Open and Distance Education outlined that a lot of scholars have the conviction that the use of mobile devices and its associated technologies have increased education for the vast majority of people. It has promoted and widens access to educational opportunities by removing barriers associated with the traditional medium of classroom instruction. Learners can now acquire knowledge remotely at anywhere and at any time (Cavus & Ibrahim, 2009). The integration of mobile technologies and improvements in ICT infrastructures in general in educational sectors globally have removed the roadblocks of physical distance and other shortfalls associated with distance learning (Subba, 2006). MT in education has created a collaborative educational system where instructors and learners are no longer dispersed by physical space but they can hook up with each other in real time to learn and share educational resources.

A study conducted by Yousuf (2007) on the “Effectiveness of mobile learning in distance education” revealed that distance learning students recognized the value of mobile technology

and prefer to use mobile devices to get information related to their studies. This was also in line with the findings of similar studies by Traxler (2003).

2.3.2 Mobile Technology Learning in Higher Institutions

Mobile technology has gained recognition due to its immense benefits. Universally, students across countries from all levels of studies in the higher institutions are making use of it (Dhir, Gahwaji & Nyman, 2013; Kinash, Brand, & Mathew, 2012). Institutions of higher learning have been transformed due to swift advancement in portable computing devices and proliferation in mobile internet networks (Liaw, Hatala, & Huang, 2010). It is evident that students in higher institutions have developed a preference for mobile devices for studies because of their affordability and the functionalities they provide. The impact of mobile devices and mobile technology on learning in higher institutions have extensively been recognized (Falloon, 2017; Kinash et al., 2012).

A study by Educause Centre for Applied Research (2012) as cited in Gikas and Grant (2013) on the “usage of mobile technology in institutions of higher learning” reported that students are the front liners when it comes to the application of mobile technologies in the lecture room. The findings indicated that 67% per cent of the students’ body opined that mobile technology is key for achieving their academic objectives. Similarly, a survey conducted by Walker and Jorn (2009) at University of Minnesota, USA, observes that students widely appreciate the role mobile technology plays in their academic lives and that ownership and usage of smartphones, tablets, PDA’s for the academic purpose have risen drastically.

Boakye (2016); Arokiasamy, Abdullah, and Ismail (2014) postulated that the revolutions of mobile technology are enabling access to technology for students in higher institutions to support

their learning. Without doubt, several institutions of higher education nowadays offer courses by taking into consideration mobile wireless technologies as a substitute instructional tool. For instance, tertiary institutions in the United Kingdom (UK) are making lecturing and learning process vibrant by adopting mobile phones and mobile technologies as a means to accumulate and share digital information resources ranging from reviewing students scores, accessing electronic books and teaching kits (Cui & Wang, 2008; Shepherd & Reeves, 2011). Canada College, San Francisco University, and a Turkish University have developed an interactive learning Network (ILN) model that analyzes the test performance of students using tablets and mobile technology (Enriquez, 2010; Erkollar & Oberer, 2012). The students are also given tablet devices with embedded technologies like Google+ and Hangout applications that facilitate collaborations and interactions. Faqih and Jaradat (2015); Azar and Nasiri (2014) indicated that mobile technologies are being implemented as learning tool to teach French and English languages in institutions of higher learning.

The ultimate learning status environment for students in institutions of higher learning has now changed as a result of emerging trends in technologies. Mobile technologies have facilitated access to rich digital learning materials and encouraged university students to be part in the design of curriculum and instructions (Boakye, 2016; Domingo & Gargante, 2015; Gerger, 2014; Yang, Li, & Lu, 2015). Cochrane (2010) postulated that when university students were given iPad, most of them indicated that they used it as an electronic reader device to access online information and other notes pertaining to their courses. Several authors have observed that students in higher learning institutions now prefer to learn outside the context of the conventional classroom using their mobile devices and other emerging technologies (Boakye, 2016). Mobile devices such as smartphones, PDA's, tablets, e-book readers, MP3 players, gaming devices and

their associated applications are rapidly being integrated as a mediating instrument in the lecturing processes in most universities around the globe. An illustration of this is the application of mobile technology by students to create animations, images, or video contents on a specific subject matter with their colleagues.

Cheon, Lee, Crooks, and Song (2012 p. 1061) revealed that “empowering students with confidence in using mobile learning would lead to a greater likelihood of mobile technology learning adoption”. Thus, teachers and students gain more skills with the use of mobile technologies in the teaching and learning processes when several courses offered by universities are online based. The normal conventional lecture rooms in higher institutions cannot be said to be the sole learning settings where students are required to gather or assemble at all times for instructional activities. Most students in higher learning institutions prefer to use their portable mobile devices to partake in lecture room studies and access digital information anywhere without physically being present in the learning environment. Thus MT provides the liberty for university students to acquire knowledge in different learning settings and work in collaborations with researchers to share thoughts, resolve problems, or present views relating to a particular topic.

2.3.3 Mobile Technology and Education in Africa

Mobile device (mobile phones, PDA's, tablets, among others) possession in Africa has experienced substantial growth, having an average of six hundred and fifty million or more than half of the population users across the continent (World Bank, 2012; Sambira, 2013). Africa is now considered second only to Asia when it comes to the utilization of mobile phones (World Bank, 2012). The rise in the usage of mobile devices in Africa can be attributed to the

affordability of mobile devices and the progress made in terms of mobile broadband internet infrastructural developments in Africa. Bean (2012) stated that “the need to increase access to education to millions of people around the African continent has been the major educational challenge”. This is due to the high cost associated with educational infrastructural development and human capital needed to carry out such a daunting task. Notwithstanding these challenges, MT’s are being integrated strategically into the educational landscape of African countries to leverage these challenges (Bean, 2012).

In Africa, mobile technology applications are being utilized as a platform to disseminate educational, health and agricultural information (Bolton, 2014). Mobile technology is being used as an instructional vehicle to enhance interactions that exist between students and their teachers as a channel for sharing files, a platform for collaborations and as an information search tool. Educational policy makers in Africa are tapping into the benefits of MT and incorporating them in the lecture room settings to provide both formal and informal studies (World Economic Forum, 2011). MT platforms such as Mxit and Dr Math Tutoring Service have been developed and implemented to assist students in the lecture rooms in Africa (Bolton, 2014). These MT applications which were developed in South Africa at Meraka Institute in Pretoria allow students to get access to lecture room teaching from competent lecturers via instant text messages on their mobile devices.

Mobile for literacy Project (M4Lit Project) is another mobile technology platform that is being adopted in the educational sector in Africa. It is a mobile platform that encourages reading among students by connecting mobile phones with books and providing the channel for the dissemination of contents that engage readers to collaborate with each other through reading

competitions, remarks and contributions (Nicholson, 2011). The technology is being used in schools in Kenya and South Africa. In the views of Wagner (2014), the M4lit Project has prepared students with excellent reading skills and improves their knowledge base for university education. Shonola, Joy, Oyelere and Suhonen (2016) in a study on the “The Impact of Mobile Devices for learning in Higher Education Institutions in Nigeria” revealed that majority of the students selected for the study were using and adopting mobile devices in their educational endeavours. Most of them were using their mobile devices to access educational resources and participate in studying activities even if they are remote from lecture rooms.

In 2009, Nokia developed a mobile technology platform called “Momaths” which provides information with regards to mathematics theories, problems and test (Nokia, 2010). The application allows students and lecturers in South African educational institutions to get access to mathematics contents using mobile devices to support their learning and teaching.

Keengwe and Bhargava (2014) in their study on “Mobile learning and integration of mobile technologies in education” also reported that MT applications such as Tessa (Teacher Education in Sub-Saharan Africa) and MILLEE (Mobile and Immersive Learning for Literacy in Emerging Economies) are being integrated into the educational systems in Africa and other developing countries globally. According to Bean (2012) as cited in Keengwe and Bhargava (2013), Tessa is a mobile technology platform that originated from the Open University in UK in the year 2005 and the mobile platform aids in training teachers by granting them access to course design guidelines and mobile accessible educational materials. It also provides the medium for teachers and educational practitioners from Sub-Saharan Africa to collaborate with their compatriot around the globe. In the same vein, the MILLEE project makes use of mobile phone-based games to teach English in deprived areas in developing countries.

Access to MT has been noted worldwide to offer potentials to younger generations to embrace the digital age thus elevating education and knowledge acquisition to a higher level (UNICEF, 2012). The 21st century is characterized by digital contents and the barriers associated with lecture rooms teaching and learning is being eliminated by technologies. African countries are embracing this change and they have made key strides in terms of mobile technology applications in the educational sector.

2.4 The Changing Roles of Academic Libraries in the Digital Information Age Era

2.4.1 Academic Libraries

Academic libraries are basically known to be within institutions of higher learning. According to Amina (2005), they are primarily located in universities, polytechnics and colleges and play a significant role in serving several institutions of higher learning. To him, they exist to support the curricular needs of students and provide information to support the research needs of the academic communities. Academic libraries have become indispensable in 21st century learning as they serve as a hub for most academic information. Kyrrillidou (2008) asserted that the most resource centre in any academic institution in terms of information repository is the academic library and they are the reserves of masterminds.

Opare-Adzobu, Afful-Arthur, Laryea, and Filson (2014) opined that academic libraries provide information services to the patrons who are mainly researchers, students, lecturers and staff. They offer additional services such as reference services, electronic support services, user education, lending services, inter-library lending and document delivery services. Academic libraries are in the endless changing mood. They are changing their traditional functions to be in tune with emerging technologies and the changing information needs of their users who are now

more technologically inclined (Alvite & Barrionuevo, 2010). To this end, the traditional mandate of academic libraries has revolved as a result of the advancement in emerging ICTs because this has affected how people access, receive and communicate with information.

2.4.2 ICT applications in Academic Libraries

The delivery of timely information services is an important mandate of academic libraries to complement teaching, learning, and research of institutions of higher learning. Major shifts in academic libraries today have posed a challenge to academic libraries in the provision of digital information as compared to the print information (Otiye, 2004). It is envisaged that based on current trends the future of academic libraries is likely to be fully digitized as universities are inculcating ICT in their teaching and learning processes and migrating into digital environments (Board, 2011).

The advancement in ICT and emerging of new technologies at the tertiary level of education place a task on librarians and libraries to plan to clinch on to development in the education sector and re-design their services to take advantage of digital and mobile technologies (Bartnik, Farmer, Ireland, Murray & Robinson, 2010). A study by Gould and Gomez (2010) on “new challenges for libraries in the information age: a comparative study of ICT in public libraries in 25 countries”, discovered that libraries are not fully used by their patrons because of lack of ICTs integration in their operations and service provision. The study further stated that the way users access and interact with information have changed due to emerging technologies and as such if services offered by libraries are not satisfactory to their clients’ needs, then, it would not be surprising that their clients will ignore them.

According to Odero-Musakali and Mutula (2007), the future of academic libraries depends on their ability to hold unto emerging technologies to render their services. Academic libraries need to re-invent their services to be incongruent with the opportunities provided by increased digitization, mobile broadband, mobile technologies and focus on new digital innovations that make them a partner in learning (Meulemans & Carr, 2013; Corwin, Hartley, & Hawkes, 2009). ICT has helped academic libraries to globalize their information delivery. ICT has a major impact on academic libraries around the world. Globalization of information with ICT applications is the hallmark of most renowned 21st libraries (Omoniwa, 2001). Kofi and Opare-Adzobu (2010) asserted that academic libraries are currently operating in a new technological environment to satisfy their users' needs. They added that the application of ICTs in their operations reduces the time and energy spent by staff in performing library operations. Integrating emerging ICT innovations also provide a convenient platform for library users in accessing information and services of the library anytime regardless of their geographical location. ICT resources and its applications in academic libraries is critical in this modern digital era. Such intervention helps academic libraries to provide several services such as online electronic resources/databases, online public access catalogues and online digital content services (Ghuloum & Ahmed, 2011).

2.4.3 Accessing Academic Library Services

To Okello-Obura (2010), the information needs of patrons of academic libraries are drifting towards a preference for online information. The advancement in ICT devices especially in the area of mobile technologies and a sharp increase in electronic resources usage by library users have altered the face of informatics and how people communicate, interact and access information (Appleton, 2006; Swain & Panda, 2009; Singh, 2009). Academic libraries around

the globe are shifting from the conventional delivery of print information to the electronic versions to effectively serve the needs of their users who are now more adapted to using emerging technologies to access information (Appleton, 2006).

According to Toner (2008), developments in technologies have created virtual lecture rooms and mobile learning. In order to continue to meet the needs of their user's community and remain vital to support teaching, learning and research, academic libraries have to integrate new technologies in their operations (Toner, 2008). Modern trends in academic libraries indicate a paradigm shift into a web environment where innovative technologies are being utilized to offer contemporary services (Moyo, 2004). Choi (2009) posits that the availability of affordable mobile broadband internet and proliferation in the usage of mobile devices and technologies among academic library users have afforded them the convenience to remotely access library resources anytime, anywhere and seek online assistant from librarians.

2.4.4 Internet Usage in Academic Libraries

The use of the internet in sourcing for information is a growing trend in most developing countries and has bridged the information access gap between developed and developing countries. The web environment is regarded in the 21st century as the rightful place to sort for information. In addition to this, the increase in internet-accessible information has impacted greatly on academic libraries. The internet has shaped the academic landscape in providing access to information from remote locations globally. The internet is a global network of computer networks (Boohene et al., 2014). There has been a paradigm shift from the manual way of accessing information sources to a more remote and faster way to access information as a result of the internet.

A study conducted by Nasir Uddin (2003) on “Internet use by University Academics-a bipartite study of information and communication needs” revealed that there was the need to invest in emerging ICT technologies and resources so that internet usage for research, teaching and learning will enhance academics. Globalization has necessitated independent learning, teaching and research through the internet. With the growing usage of internet and portable internet enabled devices among users of academic libraries, the medium for acquiring and disseminating information for learning, teaching and research has shifted from the manual means to technological. In adding up, Buck, Kessler, Horbel and Christian (2011) and Pew Internet Report (2012) as cited in Chayko (2014) opined that the current state of technological advancement especially in the area of mobile technologies had made mobile internet an option for many users in accessing online information either from libraries or any other sources.

2.5 Mobile Technology Applications in Academic libraries

Mobile technologies have greatly transformed how people interact and access information. As MT grows speedily, several students are utilizing mobile devices for academic objectives. An inquiry carried out by ECAR discovered that the statistics of students on university campuses adopting internet-enabled mobile devices has increased from 51.2% in 2009 to 62.7% in 2010 (Smith, Salaway & Borreson Carasu, 2009; Smith & Caruso, 2010). Therefore the popularity of mobile technologies is compelling libraries to review their service delivery approach to serve a lot of patrons who prefer to access library services on their mobile devices (Carney, Koufogiannakis, & Ryan, 2004; Cummings, Merrill, & Borrelli, 2010). Again Nowlan (2013) emphasized that academic libraries have to diversify their services to be in line with the revolutions in the computing world especially in the area of mobile technologies. The integration

of MT in academic libraries operations permits users to access the resources of the library and make enquires remotely without physically being present at the library (Cummings, Merrill & Borrelli, 2010).

Griffey (2010) postulated that as more students make use of the internet on their mobile devices especially using their smartphones as compared to conventional PC, academic libraries should acknowledge the benefits of mobile technology and provide services through such medium to meet users needs. In 2009, the Association of Research Libraries anticipated that “ubiquitous presence of WiFi, handheld communication devices, smartphones, among others will spur libraries to re-tool content for mobile users and mobile devices” (Lowry, 2009, p. 16). Murphy (2011) mentioned that academic libraries are advancing mobile contents and solutions in this information age in order to meet the needs of students and researchers who are complacent with the use of MT for rigorous research. Mobile technology applications help libraries to design modern and stimulating services to patrons who use mobile internet enabled devices. They provide the prospect for academic libraries to improve their traditional library services through mobile collections and databases, mobile catalogues, mobile SMS services, mobile library instructions and virtual tours (Hahn, 2008).

In the Ghanaian context, mobile technology-based library services are yet to receive recognition. This is largely due to the fact that development in terms of new technologies has always been a problem in developing countries. Kamba (2011) in his studies in Africa revealed that 85% of the libraries offer less than one PC for every hundred (100) library users. About 15% of them are not linked to computers and the internet at all. Technologies are not fully exploited to realize the maximum benefits in university campuses in Ghana (Armah, 2009).

2.6 Awareness and Appreciation for the Use of Mobile Technology-Based Library Services

The transitions and rapid-paced developments in Information and communication technology (ICT), particularly, in the area of MT, have changed the manner in which the public exchange ideas and share information resources. MT improves how individuals access, collect and inter-relate with information, and they present novel mediums for communiqué. These emerging MT developments grant quicker access to increasing quantum and diversified information. Nevertheless, the challenge for academic libraries in this perspective is to remodel and adapt to this contemporary technologies to augment their everyday services and make them relevant to meet the needs of their users (Canuel & Crichton, 2011; Hamad, Farajat, & Hamarsha, 2018). Libraries are confronted with the popularity of MT and they are being faced with the task on how to provide mobile technology-based library services and make their collections accessible on mobile devices. A study performed by Bornhold (2014) with 73 universities in the United States of America revealed that 52 of the libraries representing 71.2% have implemented mobile technology-based services because of the immersed value the innovation brings to service delivery and their patrons.

In their study among randomly sampled library patrons and managers in academic libraries in Jordan by using the case study design, Hamad et al. (2018) found a high level of awareness among library staff about MT applications to complement and improve library operations and services. However, their views with regards to the availability of the needed resources to embrace MT, and the expertise of the library staff were moderate. The responses from the library workers revealed that the implementation of MT would be challenging, and some were averse to extensively adopt this innovation. The results imply that MT's are contemporary but then it will be very difficult to be abreast with the trend, therefore the need for in-service and re-training of

library staff for the effective adoption and implementation of such technological innovation. Primarily, it was discovered that librarians perceive MT as a beneficial catalyst that can be adopted by libraries to aid them in their interactions with users, to build better patrons feedback and provide them with right kind of services. Thus the findings of the study by Hamad et al (2018), in summary, indicated that the level of awareness of MT applications and concepts in libraries is very high and mobile technology improves the services and operations of the library by allowing patrons accessed library's collection remotely.

In a similar study, Saravani and Haddow (2011) interviewed 42 professional library staff from the Australasian Vocational Education and Training sector using the mixed method approach to determine their level of awareness and the coaching requirements to respond to MT advancements. The study probed the rationale for training and support to meet new challenges and the pre-requisite for such technological amelioration. The results professed a high awareness of the impact of MT applications on library services and also revealed major factors contributing to MT acceptance at both the organizational level and individual level. The results further accentuate that libraries should integrate MT in their operations by providing the right framework for its adoption and by upgrading the skills of library staff to engage them in the implementation. However, the findings suggested that the participating libraries in the study pay inadequate attention to technological advancement and their potential (Saravani & Haddow, 2011). An email survey carried out by Thomas (2010) in academic libraries to ascertain the awareness and appreciation for mobile technology-based services, indicated that 65% of them offered some form of mobile technology-based services to their users. He opined that library staff sees MT based library services as an innovation to build a strong connection with users. The

remaining academic libraries that were yet to offer MT services enumerated reasons such as inadequate funds, lack of skilled staff and the perceptions they have regarding MT innovations.

A survey conducted by Karim, Darus and Hussin (2006), among randomly sampled 206 students' in Malaysian Public University concerning their perception and awareness on mobile technology-based library services revealed that 193 respondents (94 %) used SMS and mobile online public access catalogue (MOPAC) services provided by the library. The usage rates of other forms of services provided via mobile technology were still low per the findings. It was also discovered that most of the mobile technology based mobile library services are used by ICT students. This may be due to a lack of awareness among the respondents from other social science-based faculty, who were getting less exposure to progress in ICT development. The results also indicated that most of the respondents were aware of the information services provided by the library on mobile platforms but were not using the services (Karim, Darus, & Hussin, 2006). The investigation further depicts that most of the respondents were in favour of library renewal services to be provided using their smartphones. Other mobile technology library services proposed to be offered also indicated a high acceptance rate. The results further showed that 94% of the respondents indicated that they would subscribe to the library services if those services were to be offered on mobile technology platforms. The remaining respondents were probably reluctant due to reasons such as affordability and accessibility of mobile devices (Karim et al., 2006). Moreover, Washburn (2011) reported in their study in the United States that library patrons particularly college students are highly aware of the usefulness of MT library services and majority of them indicated that they would recommend the technology to their friends.

Similarly, Dresselhaus and Shrode (2012) in their investigation to established whether students use mobile technologies for their academics particaluraly in accessing library resources found that over 87% of the sampled students value the use of mobile devices to access information and services from the library. They were of the view that mobile technologies provide better communication and interactions between them and librarians and also enable them access library services remotely from varied mobile devices without any geographical restrictions.

Although the integration of mobile technology applications for academic libraries still has a way to develop, academic libraries and librarians are making steadily effort to keep in tune with the technology.

2.7 Preparedness of Library Management towards the Adoption and Implementation of Mobile Technology Based Library services

In the views of Pope, Peters, Bell and Burhans (2010) the adoption of mobile technology in academia has extensively been embraced in the 21st century than any technology. The technology plays a key role in improving the quality of services of academic libraries by allowing them to connect with their users anytime and anywhere. Despite the fact that the adoption of MT applications in academics libraries is still in the early stage, library management is making pragmatic effort to keep pace with the innovation (Kumar, 2014). Library management is both the initial and final decision-making authority to make policies and guidelines concerning IT integration in libraries. Adekunle, Omoba and Tella (2007) opined that the successful implementation of new technologies in information centres is basically influenced by the preparedness of management and other stakeholders towards such integration.

Noting the value of MT, it is important that managers of academic libraries become enthused and prepared towards the delivery of services through the MT platform. In a study using two survey instruments, that is the semi-structured questionnaire and interview, Saravani and Haddow (2011) investigated library staff preparedness towards mobile technology in 14 higher institutions of Education libraries across Australia and New Zealand. The library managers selected for the study showed keen interest in the perceived value of Mobile Technologies and exhibit preparedness in building the competencies of their subordinate to enable them to offer mobile technology services to library users. Their research also indicated that librarians have direct engagement with library patrons and are focused on delivering new technology services to enhance their operations (Saravani & Haddow, 2011). The findings presuppose that the library managers and staff were prepared to embrace MT, however, they pondered not about the challenges MT switch could bring.

In another dimension, Chaputula and Mutula (2018) used the multi-case study approach to carry out in-depth semi-structured interviews with university/college librarians and information and communications technology (ICT) directors and revealed that all the libraries examined in Malawi had a large amount of the needed ICT resources to expedite the provision of library and information services through mobile devices. The available ICT infrastructural resources were specifically internet infrastructure and ICT systems such as library management system (LMS), servers, tablets computers, desktop computers and fibre-optic cables that facilitated access to both cable and Wi-Fi internet connections. Furthermore, the libraries selected for the studies had E2 Proxy Server, which could facilitate remote access to e-resources and other digitized collections. These indicate the libraries preparedness for MT in the 21st library space. Besides the ICT infrastructure, the libraries examined had plans to acquire and install other ICT-related

resources to mediate the provision of library services through mobile technology. There were plans by one of the libraries examined to install Unstructured Supplementary Service Data SMS gateway to aid in the provision of mobile SMS reference services. Equally, the other libraries were hopeful that they will in the near future acquire the requisite e-library infrastructure to potentially enable them to offer basic routine library services on mobile phone platforms. Again the libraries selected for the study had an arrangement of probing the likelihood of using cloud infrastructure to brace ICT initiatives including the provision of library and information services through mobile technology. It was noted from the study that most of the other ICT resources, which the libraries needed, were available on the local marketplace. This implies that the libraries in the current study could easily acquire such type of infrastructure if they had financial resources (Chaputula & Mutula, 2018).

Shonhe (2019) conducted a thorough investigation in Botswana to assess how ready librarians were towards MT technology adoption in Botswana public libraries using a mixed methods approach. The study was to probe and ascertain if library managers who are the key stakeholders when it comes to ICT implementation policies were prepared to provide library services through the use of MT technology. The findings of the study indicated that ICTs adoption in Botswana libraries is negligible to meet the needs of 21st century virtual library users. However, the findings also indicated that 96 per cent (96%) of the librarians selected for the study showered an affirmative attitude towards technology adoption. He was of the opinion that technology adoption in libraries allows quicker access to library resources, enhances service delivery and boost users' satisfaction. As a result, library managers selected for the study 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 researcher further states in his findings that in spite of the efforts by librarians to adopt emerging technologies in their operations in Botswana, they still face challenges ranging from low internet bandwidth, lack of ICT skills on the part of library staff and inadequate technological assistance from other library stakeholders.

In like manner, Sampath-Kumar and Birada (2010) conducted a study on an inquiry in the use of ICT in college libraries in Karnataka, India and discovered that although library management are prepared to inculcate emerging technologies innovations in their operations, ICT in college libraries has not gotten to an elevated peak. The main challenge has been a lack of financial resources, inadequate human capital, and poor training opportunities for librarians to embrace new technologies. Again in a study to understand mobile technology use for library service at Capital University in South Africa, Iyamu and Mtshali (2013) found that the technology infrastructure that the library had was obsolete. In a contrast, a study by Igben and Akobo (2007) to ascertain the state of ICT in libraries in River State, Nigeria, revealed that 75% of the libraries in River State have incorporated ICT's in their library operations and thus library management is always prepared to implement new technologies. By and large, librarians are being noted as early implementers of new technologies in the area of service delivery (Singh & Mahajan, 2014; Gupta & Margam, 2017). It is however incumbent on the managers of academic libraries to make the right decisions with regards to the adoption of emerging technologies. In the view of Larson (2019), library managers must always anticipate the benefits that will accrue to their information centres when they adopt new technologies as well as the costs components associated with such technological implementations.

2. 8 Students' Proficiency in Relation to Mobile Devices Usage

The experiences and skills competence of students with regards to technology usage especially in the area of mobile devices are important in making pragmatic decisions with regards to developing mobile technology-based library services. Academic libraries' decisions in terms of applications of mobile technology in their operations should be propelled by users' (students) proficiency in terms of mobile devices. To Zheng and Ni (2010) mobile devices include smartphones, PDA's and portable tablets computers with Internet-enabled features allowing users to access information on it just like desktop computers. Mobile devices allow their users to install software's and apps on it to meet their daily needs. The technology is transforming how students create, utilize and communicate information (Little, 2011). Mobile device usage among students is on the rise because of its mobility and the numerous educational benefits it brings to them. In support of this, Dahlstrom, Walker and Dziuban (2013) observed in their study that mobile devices had increased among university students and there was remarkable proficiency in their usage for accessing and retrieving online academic information.

Moving around campuses, during class sessions, in cars and at home, mobile devices (smartphones, PDA's, gaming devices, tablets computers) are the regular aide of this current calibre of students. Kim, Llon and Altmann (2013) and Chang, Sheu and Chan (2016) opined that university students are major users of contemporary technologies such as mobile devices and their applications due to the fact that most of them are digital migrants and knowledgeable with their uses. In this regard, several types of research have revealed that students are well versed with the use of mobile devices especially for accessing information resources for academic purposes (Krishnan, 2011; Paterson and Low, 2011).

Alzaza, Naji and Yaakub (2010) conducted a study in Malaysia using a sample of 261 randomly selected students' participants . The results show that ninety-five percent of the respondents possess a mobile device. With respect to mobile device applications knowledge, 51.7% have less than five years knowledge in the usage of mobile device applications; 42.5% indicated that they have between 5 and 9 years knowledge. It was just 5.7% that have more than 10 year's knowledge. The findings showed that the student's proficiency with regards to mobile device application is encouraging. In related research, Cassidy, Colmenares, Jones, Manolovitz, Shen and Vieira (2014) explored the views and preferences of learners in the United State of America for new technologies and how they used these technologies to access library services and resources. The findings indicated that 456 students out of 941 own tablets computers (specifically Apple iPod) and e-book readers and the remaining students showed a keen interest in acquiring these mobile devices in the subsequent months. A total of 98.4% of the respondents owns mobile phones. The respondents exhibited proficiency in the use of mobile devices. A percentage of 82.9% of those owning tablets and 84.4 per cent of e-book readers were using them to access digital collections, send or receive messages and access social media services from the library and online. The increase in mobile phone usage was also as a result of their ease of use in terms of portability and functionality and 79% of the respondents were using it to renew borrowed books online from the library, 72.3% were using it for SMS enquiries with the librarians. In addition, the results revealed that respondents were conversant with the use of their mobile devices for social media.

A focus group study by Seeholzer and Salem (2011) on students in Kent State University also discovered that students were proficient with the use of mobile devices. They mentioned in their research that students also desire to utilize their mobile devices to interact with library staff via

SMS and access library services and information notably catalogue and academic databases. In a similar vein, Lo, Cho, Leung, Chiu, Ko and Ho (2016) reported in their study in Hong Kong that all the students' respondents selected for the study demonstrated competency in the use of smart mobile devices. A total of 43 students out of 51 surveyed opined that they are familiar with the functionalities of mobile devices and are mostly accessing internet services on these mobile devices to interact with their friends via emails, SMS and to while away time. Similarly, Alfawareh and Jusoh (2014) reported in their research that mobile device ownership especially smartphones among university students in Saudi Arabia was very high (94.14%) and majority of them were using them to access educational information online. Their findings further revealed that 91.92% were using their mobile devices to access social networking platforms, 83.20% can check and send emails with their smart phones and 72.9% were capable of using their mobile devices to send or receive SMS.

In Uganda, an investigation by Illako (2017) on students in Makerere University Library reports that 96% of the students owned internet-enabled mobile devices and they are proficient in terms of their usage. They indicated that they often accessed the collections and services of the library on these devices at their own convenient time without necessarily visiting the library. Based on this observation, the researcher proposed that the library should create more awareness on mobile technology-based services to enable the few students who are not aware of the services to utilize them.

It is important to note that delving into the proficiency level of students regarding mobile devices and its utilization affords an opportunity for academic libraries to develop mobile technology tailored made services and provide appropriate resources that will meet their information seeking needs.

2.9 Mobile Technology Based Library Services

Libraries have extensively embraced the concept of mobile devices applications to provide numerous innovative services to meet the needs of their users (West, Hafner & Faust, 2006). Mobile devices include smartphones, iPods, PDA's, tablets computers, e-book readers that are portable and have internet enabled functionalities in them. Lippincott, Smith, Jacobs and Lippincott (2010) postulated that mobile devices and it accompanied applications allow library patrons to access digital contents created by libraries in the palm of their hands.

According to Kurkovsky and Meesangnil (2012), the adoption and applications of mobile technology to prioritize delivery of mobile content services is the new dimension in most information centres globally. A report published by ACRL in 2010 revealed that librarians are altering their services to make them accessible on mobile platforms (ACRL Research Planning & Review Committee, 2010). Academic libraries are developing mobile library applications to provide expedient and suitable means for patrons to interact with their services. Now, with mobile library technologies, patrons can search a library's catalogue, view upcoming events, make a reservation for library facilities, text for reference enquiries, and renewed borrowed materials. It must consequently be noted that mobile technology-based library services create the medium for librarians to develop digital contents for library users through the use of mobile technologies. They are services that make use of smartphones and other mobile devices such as computer tablets; PDA's to present a novelty and opportunities for information centres to provide services for their remote users (McKiernan, 2010; Paterson & Low, 2011).

In the views of Kroski (2008); Choy and Goh (2016); and Hung and Chanlin (2015), mobile technology-based library services include mobile online public access catalogue (MOPAC),

mobile e-journal, mobile databases, short messaging services (SMS) for reference services, mobile collections (e-books, audio materials), mobile digitized thesis, mobile library tour/instruction. A study by Mansouri and Soleymani (2019) revealed that the most contemporary services that users want to have on their mobile devices are mobile collections and databases, circulation and renewal services, mobile reference services (ask a librarian) and mobile library tour or instruction. In the global scene, different strategies are adopted by top universities libraries to offer mobile technology-based library services (Pakdaman, Sharif, Ziaei & Ghaebi, 2018). Despite the varied strategies, Dukic, Chiu and Lo (2015), in their study in Hong Kong and Japan recommended that for libraries to offer services on mobile technology platforms, they need to critically explore the exact information needs of their patrons. Research in Africa with regards to mobile technology-based library services in academic libraries does not depict a very good image. Several academic libraries in Africa are not utilizing the benefits of mobile technologies in their information delivery. Mobile technology adoption and implementation are crucial for the advancement of the services of academic libraries in the 21st century which is characterized by the digital information age, proliferation in mobile internet, and mobile devices and users preference for boundary-less access to information. Academic libraries in Africa should, therefore, deploy more investments in the development of mobile technology-based library services.

2.9.1 Mobile Online Public Access Catalog (MOPAC)

Current trends indicate that patrons of libraries especially those within academic libraries are using their mobile devices to access the conventional catalogue of their respective libraries instead of using laptops and desktop computers (Paterson & Low, 2010). According to Baker and

Vassilakaki (2014), academic libraries are creating mobile versions of their online public access catalogue to allow their users get access to their collections on their mobile devices without restrictions to physical space and time. Cummings, Merrill and Borrelli (2010) conducted a study to ascertain whether library users will access the OPAC of Washington State University Libraries on their mobile devices and found that 58.4% of the respondents accessed the OPAC using their mobile devices. The rest of the respondents indicated that they were not accessing the library catalogue currently but they are hoping to do so in the future.

Similarly, Canuel and Crichton (2011) carried out an investigation to ascertain the mobile contents and services offered by Canadian Academic libraries. Their investigation revealed that all the libraries selected for the study provide mobile forms of their OPAC. Mobile OPAC (MOPAC) mediates instantaneous and rapid retrieval of library's collection (Paterson & Law, 2011; Vila, Galvez & Campos, 2010). The study by Paterson and Law (2011), at Edinburgh University in the UK, probe into the importance of mobile technology services provided by the university's library to its students and recorded that a total of 60% of the students prefer to access the library's catalogue on their mobile phones. However, per the findings, the students indicated that although the current MOPAC services provided is simple they desire to have advanced versions that may give them more search options and features.

2.9.2 Mobile Short Messaging Service for Reference Services

Instant text messaging is increasingly being inculcated in libraries as a medium to improve reference service operations. Mobile technology-based library reference service enables libraries to provide quick feedback to patrons' enquiries through mobile devices (Chua & Goh, 2010; Harinaarayana & Raju, 2010). Mobile devices specifically smart cell phones enhance the communication between a reference librarian and a user. This can be done through short text

messages to respond immediately to the information needs of a client. The idea of mobile technology application in libraries for reference service arises when mobile devices are being utilized to engage and enhance reference interviews. Through the use of the mobile device, clients can use text message (SMS) to make enquiries from a reference librarian and the reference librarian can also use the same medium to provide a response to the client. It has been noted that Mobile SMS for library reference service is a new innovation in libraries that help to identify the appropriate informational needs and preferences of clients.

According to Lippincott (2009), to take full advantage of the impact mobile technology can add to reference operations, it is necessary for academic libraries to develop reference contents that are accessible on mobile devices. This innovation will aid in providing the right information sources for clients for mobile reference services. Quinnipiac University in the United State of America has designed a Reference Mobile SMS system where postgraduate learners in physician assistant module are offered reference information in their area of study (Raths, 2009).

The adoption of mobile technology in reference operations such as electronic mails via mobile platforms, SMS, and ask a librarian chat services help to provide references services outside the boundaries of libraries and engage library patrons who don't normally make face to face enquiries with reference library workers (Lippincott, 2009).

Globally, offering reference services on mobile device platforms to assist patrons with timely responses to their enquiries is gaining popularity in libraries. Libraries are currently dealing with remote users who will hardly want to visit the library to make enquiries.

Kroski (2008) opined that for libraries to meet the needs of 21st century users, they will have to develop a virtual reference system that provides the medium for patrons to send enquiries to

reference librarian through email, text message or live chat through the use of mobile devices. The SMS mobile reference system can also be used by reference library staff to deliver instant messages to patrons to notify them of the arrival of new collections, library events, the due date for borrowed items and any other library information (Smith, Jacobs, Pearce, Collard & Whatley, 2010 p. 250).

In a research conducted by Mbambo-Thata (2010) and De Wee (2015) to gain insight into the procedure of implementing smartphone services at University of South Africa library, it was discovered that the library is using a mobile technology system known as AirPac. The AirPac provides an avenue for users of the library to have interactions with reference librarians to make general enquiries and request and the librarians also respond to these requests with the use of the AirPac. AirPac is a mobile app that users have to install on their mobile devices. The study further indicated that when respondents were questioned about the value of the App, they stated that the App has made access to the library unproblematic and also enable them to get prompt a response to their requests in the form of SMS on their mobile devices (Mbambo-Thata, 2010; De Wee, 2015). However, as part of the findings, the researchers emphasized that adding novel services to libraries operations require constant monitoring and assessment to reap the full benefits of such a service.

Smith, Jacobs, Pearce, Collard and Whatley (2010), examined SMS reference services in New York University Library to understand the structure and nature of the service and how it can be enhanced as compared to face to face reference services. They discovered that the majority of the library users were relying on sending messages from their mobile devices to make enquiries from the librarians for services such as renewal of borrowed books and reservation of study rooms.

Patrons who were even within the confines of the library building were still sending SMS on their mobile phones to interact with library staff. Additionally, the study also revealed that the communication between the patrons and the librarians through the SMS goes beyond just making quick enquiries but sometimes through dialogue.

In a like manner, Goh (2011) used a quantitative method to investigate SMS mobile technology-based library services usage among a sample size of 90 students of the University of Wellington, New Zealand. He discovered that SMS mobile reference services were extensively in the known to most of the students and they were using the services to get reference assistance from the librarians.

2.9.3 Mobile Databases and Collections

An increasing number of publishers and academic libraries are designing mobile versions of their web pages and creating digital contents of collections that can be accessed on mobile device platforms on the go. According to Buczynski (2008) and Murray (2010), mobile databases are mobile affable, and accessible anywhere anytime as they easily sync with mobile devices. Researchers and Students can access the mobile versions of academic databases on their handheld internet enabled devices because publishers are adopting modern ways to create mobile forms of their electronic journals and books (Lippincott, 2010). Publishers who are providers of scholarly academic databases are integration mobile versions of their website that can be accessed on mobile phones. Bridges, Gascho and Griggs (2010) opined that JSTOR, EBSCO and Taylor & Francis allow library patrons to access the contents on mobile devices. The development of mobile databases and collections in this digital and mobility era allows patrons to have unlimited access to a library's digital collections and other external databases from publishers.

In the University of Oulu in Finland, they have developed a mobile technology application known as SmartLibrary which aids patrons of the University's library to get access to the informational resources on their mobile devices irrespective of their geographical location (Hahn, 2008). A survey conducted by Li (2013) across major academic libraries in China to assess their services as mobile technology-based library service providers had it that the all 14 academic libraries examined in China had designed mobile interface of their website that allows their patrons to use mobile devices to access their digitized collections and browse through the library's academic databases. However, the developers of this service added that mostly they are faced with the challenge to design a mobile framework that will sync well with different mobile devices with varied functionalities and unique mobile browsers.

Nalluri and Gaddam (2016), in their study, reported that "Duke Mobile" which was developed by Duke University in North Carolina (USA) grants students opportunity to access mobile digital contents (e-books, archived images, videos, audiobooks) and e-journals the university library subscribes to on their mobile devices. The application can easily be downloaded and install on a users mobile device and allow them to access the library's collection and databases regardless of their physical location.

2.9.4 Mobile Technology Social Media Based Library Services

A mobile technology social media library service enables library patrons to connect with librarians and collaborate with other patrons on a common shared network. The use of mobile technologies in academic libraries to promote social media services is key to attract researchers to use library services because most of them are in possession of mobile devices and can access

these services anywhere (Xu, Kang, Song & Clarke, 2015). Again, it is noted that current research investigations have become a collaborative practice that revolves around social media tools (Cann, Dimitriou, & Hooley, 2011). Academic libraries, globally, are employing social media tools and mobile devices and apps to provide timely and collaborative services for their patrons. Research indicates that certain specific tertiary institutions library digital information and services are wholly used and designed via social media instruments and mobile technologies to fit into the context of the social networking settings (Lui, 2008; Harinarayana & Vasantha, 2010).

Mobile technology-based social media library services provide an avenue for academic libraries to devise and offer varied innovative services and information for their user community and stimulate them to share research ideas and knowledge (Casey & Savastinuk, 2006; Penzhorn & Pienaar, 2009; Mahmood and Richardson, 2011:). The most frequently used social media tools that academic libraries can use to promote their services and can be accessed on mobile platforms by users include library blogs, wikis, social networking sites and podcast (Chua & Goh, 2010; Harinarayana & Raju, 2010; Mahmood & Richardson, 2011). A study conducted by Baggett and Williams (2012) in the United State on students' perceptions with the use of mobile technologies to access social media services provided by thier libraries, it revealed that more than one third of the respondent access the library's Facebook page on their mobile device and request that it should be updated frequently with news feeds. Surprisingly, the respondents' shared negative opinions regarding wikis, blogs and podcasts. In a related study by Xu, Kang, Song and Clarke (2015) in 39 academic libraries across China to access how mobile technology is being adopted to promote social media services through a mobile social media application known as WeChat it revealed that 72.7% of the libraries use the mobile app to publicize library

services and information. The WeChat is also an interactive mobile technology platform that offers library users the opportunity to engage in collaborative discussions. The report from the study further indicated that to get the platform running all the time, librarians with technical expertise are required to handle and maintain the technology.

2.9.5 Mobile Technology Library Instructions and Library Virtual Tour

Mobile technologies are being adopted in academic libraries to offer instructions, orientations and virtual tour. Among the key services of an academic library is user education or instructions. Students who have just enrolled in universities can be taken through how to use the library resources and services through mobile technologies and accessible on the podcast and YouTube platforms. Librarians in academic libraries are carving and disseminating instructions on the usage of library resources in audio and video formats that are accessible on mobile devices (Margam & Dar, 2017). Malathy and Kantha (2013) opined that mobile library tour and instructions are innovative ways of guiding remote users to effectively appreciate and use the resources and services of a library. Mobile device adaptable audios and videos files can be created to explain the services and facilities available within academic libraries to remote users who don't have time to be part of on-site training programmes. Podcasting has been widely used as mobile technology to enhance library instructions and tour (Murray, 2010). The technology helps in the provision of desirable contents for students on distance education modules that can be accessed on mobile devices. Sheridan Libraries (2009) as cited in Murray (2010) disclosed that in the United State, Sheridan Libraries situated at John Hopkins University has a podcast service that assists users to know about the libraries' informational resources, services and how to make use of the library.

In a related study conducted by Jowitt (2008) in New Zealand using the mixed method approach to ascertain the views and usage of library instructional podcasts by librarians and students, it was revealed that 71.1% of the respondents were in support of the podcast library service provided by university library. The respondents indicated that the system is easy to use and hence they are relying on the innovation to receive lots of library instructional guides on the system (Jowitt, 2008). Kroski (2008) and Murray (2010) also outlined in their studies that Washington State University, Murray State University, Arizona State University, University of Southern California provides video and audio MP3 files of library instructions and virtual tours that can be accessed with mobile devices via YouTube and iTunes channels. Similarly, Tenopir (2010) also indicated that Pent State University library has resorted to the use of handheld devices to offer library users with one-on-one instructions. The researcher indicated that though the innovation is widely accepted and used, challenges such as poor wireless internet connectivity, the small screen size of the devices to display all contents are sometimes encountered.

2.10 Student Willingness to Use Mobile Technology Based Library Services

Mobile technologies serve as remarkable platforms for students to strategically use them to interact with their libraries and get the needed information to improve upon their studies. Currently, with the increasing number of students accessing the internet with their mobile devices, most of them have resorted to the use of mobile devices as a means to seek educational information. Despite the huge number of students who are using mobile devices for academic works, it is noted that quite a number of potential student users of a library may not be willing to use mobile technology-based library services in spite of their availability (Thong, Hong, & Tam, 2002). In developing mobile applications for mobile technology-based library services, it is

important to consider the perspectives of the users. To Joo and Choi (2015), users would prefer to access library resources via online and specifically on their mobile devices when the system that drives such services is simple to use and interactive. Academic libraries must, therefore, in this context put strategic measures to develop mobile technology-based services that are easily accessible on varied mobile device platforms, valuable and satisfactory to their users.

Kumar (2014) conducted a study in India to discover students' willingness to access services provided by their libraries via mobile technologies. The findings indicated that a greater number of the students expressed a positive preference for such innovation and was willing to use such services. They, however, stated that the quality of the services offered on mobile interfaces should be the same as the one provided through the normal online library's website. In a related survey in China by Hu and Zhang (2016) to explore intentions of students in Chinese universities to use mobile technology library services, findings revealed that the willingness of students to use MT services by libraries strongly depends on the behavioural attitudes of students which is influenced by how they perceived such services to be useful to them.

A cross-sectional survey with seven universities in United States by Wu, Chatfield, Hughes, Kysh and Rosenbloom (2014) on students' willingness to relate with the library and access services on mobile technology platforms observed that almost all the respondents had the desire to use their smartphones and tablets to access services such as OPAC, library's academic databases, library operational hours, renewal notices because to them mobile internet on their mobile devices is more reliable. Pu, Chiu, Chen and Huang (2015) detected in their study in Taiwan that students have a positive perception with regards to mobile technology-based library services and are enthusiastic in using them at anywhere and anytime. A total of 80% of the

students showed satisfaction in using library services that run on mobile technology. In contrast to this, 28% of the students, however, stated that sometimes accessing mobile technology-based library services on mobile devices is slow and urge that improvement in terms of increasing the speed rate of the systems should be looked at. Additionally, a research by Savitha, Somashekhara and Dange (2017) indicated that non-residents students were using library services provided on mobile technology platforms to complement their studies.

The surest way for academic libraries to stimulate their users to use services provided on mobile technology platforms is to ensure the efficiency of the technology, the quality of contents provided and how easier the services can be accessed.

2.11 Staff Training on Mobile Technology Based Library Services

The human manpower of every establishment is regarded as the most essential resource for the effective performance of the activities of an organization. It is vital for staff to be trained and developed professionally with new skills. Training is regarded as the practice of coaching employees' new skills which are essential in the execution of their jobs. Al-Ajlouni, Athamneh and Jaradat (2010) described training to be "a methodical development of knowledge, competencies, skills and attitudes expected of employees to perform effectively on a given assignment or work". Training of staff should be an ongoing process so as to keep workers up to date with new skills.

Developments in ICT applications in academic libraries with the recent innovation being the use of mobile technology applications to enhance library services have propelled the need for training of staff to acquire diverse skills, knowledge and abilities in relation to the use of ICT tools. It is required of staff of academic libraries to have well-built competencies in the provision

of mobile technology-based library services. Lack of ICT professionals or experts is a key hindrance to the integration of mobile technologies in libraries. In view of this, a survey by Thomas (2010) indicated that though libraries indicate a positive attitude towards mobile web services, only a few had mobile web presence due to low skills among staff. Munro and Stevenson (2015) were of the opinion that the nature of the work of a library in itself in the era of digital contents requires some MT knowledge and hence MT skills are mandatory for library workers to move toward a mobile environment. A research also carried out by Sharma and Sahoo (2014) revealed that librarians should acquire the following skills if they wish to provide mobile technology-based services: create and tailor mobile-optimized contents, familiarize with internet/intranet services like email, SMS, spams prevention, expertise in protecting privacy and security levels, and skills for interacting with users via smartphone applications and mobile-friendly webpages. It must be noted that when library staff are adequately trained with regards to new ICT technologies they become more productive and resourceful considering the present digital age of information.

A study by Saravani and Haddow (2011) to examine library staff competencies and on the job training requirements to develop library staff with the requisite skills, knowledge and experiences to efficiently offer mobile technology-based library services indicated that library staff should be adequately trained. The investigation further revealed that staff should be trained to have fore knowledge about mobile devices functionalities and the kind of mobile devices library users use. Again, librarians should be trained to develop appropriate digital mobile-friendly web contents, have knowledge on e-book reader usages, and mobile devices applications. Similarly, an investigation conducted by Mathews and Pardue (2009) with librarians on their computer competencies towards mobile technology services revealed that the

fundamental information technology competencies required by library staff towards mobile technology services include library automation skills, online database search skills, computer and mobile technology applications, ICT professional development, mobile web development skills and web 2.0 tools skills.

Furthermore, in another study by Saravani (2013) investigating 42 randomly selected library staff from 14 vocational education and training libraries in Australia and New Zealand to ascertain the capabilities and the skills level of staff within the selected libraries with regards to provision of mobile technology-based library services mentioned that a majority of them see themselves as competent users when it comes to mobile technology applications. However, the respondents were quick to add that in order for them to be able to effectively render mobile technology library-based services, library management should further trained them on key skills such as mastery of mobile devices for library services. In the study by Hamad et al., (2018), it was observed that library staff competency level to learn new technological skills to provide MT services was favourable with a total of 72% confirming that librarians are capable of studying contemporary technologies to offer MT services. However, the findings further revealed that about 37% of staff agreed that most of the libraries do not provide appropriate routine trainings for staff including workshops to upgrade their skills with new technological trends in libraries including MT based services.

Bamidele, Omezulor, Imam, and Amadi (2013), In contrast, mentioned in their research that the training and development of workers in the library system seem not to be given the needed attention. They suggested to library heads to build and develop the capacity and the skills of their staff with new technological tools to keep them abreast with revolutions in ICT's and make more

productive. In the same vein, Sharma (2007) emphasized in a study conducted at academic libraries in Nepal that majority of librarians in various universities have low ICT skills which could lead to the lack of appropriate technical expertise and support needed to meet the technological demands of the 21st century library operations. Therefore library management must adequately train library staff on emerging technologies to be cognizant and understand the new service dimension introduced through the use of new technologies in libraries (Adeleke & Olorunsola, 2010; Ayoku & Okafor, 2015).

2.12 Challenges Associated with the Implementation of Mobile Technology Based Services in Academic Libraries

The integration of emerging technologies in academic libraries comes with contemporary opportunities, as well as, new challenges. The novelty of mobile technology in academic libraries has its benefits but nevertheless, it has its implementation challenges. The challenges in technology implementation in Academic libraries have witnessed quite a lot of works in this area. The most ubiquitous factors include:

Lack of assistance from University Management and Stakeholders has been identified as one of the major hurdles facing the integration of new technology in Academic libraries (Amekuedee, 2005; Saxena & Dubey, 2014). Another barrier facing mobile technology adoption in libraries is inadequate funds to support such a project (Haneefa, 2007; Aina, Okunnu, & Dapo-Asaju, 2018). Iwhiwhu, Ruteyan and Eghwubare (2010) reported in their study that libraries in Nigeria could not provide services through mobile devices because of insufficient funds to purchase the needed mobile infrastructures and telecommunication equipment. Similarly, an investigation by Chisenga (2015) discovered that quite a number of libraries in Sub-Saharan Africa lack funds to acquire library systems and maintain it.

Mobile technology integration in academic libraries also requires a lot of ICT facilities and several studies have identified that most often these ICT facilities are inadequate (Rosengberg, 2005; Saxena & Dubey, 2014). In support of this, Chaputula and Mutula (2018) in their study in Malawi revealed that although most of the libraries were willing to offer mobile technology-based services, they still needed more desktop and tablet computers and servers with bigger capacity. Some of the libraries selected for the study accepted resorting to the use of less costly and inappropriate ICT facilities because of financial constraints. Again, many of them indicated that they were using outdated servers that required to be replaced with modern ones.

Another barrier that can be identified with the inception of mobile technology-based library services in academic libraries is the lack of skilled or retained IT experts. Successful implementation of MT services in libraries depends on IT experts that can develop the technology and the system framework that drives such innovation. The human resource requirements in the system design and its implementation are key. However, staffs within academic libraries often do not possess the right kind of technological skills required for the smooth integration of emerging technologies including MT based services (Mulimila, 2000; Suku & Pillai, 2005; Haneefa, 2007; Ghuloum & Ahmed, 2011).

Power fluctuations and Poor Internet connectivity have also been stated by several scholars as a hindrance to ICT and MT applications in academic libraries (Okiy, 2010; Aina, Okunnu, & Dapo-Asaju, 2014; Chaputula & Mutula, 2018). A study by Maranto, Phang and Hartman (2010) revealed that the provision of mobile technology services in academic libraries has not been effective owing to restricted and poor internet access services. In the same vein, Nicholsan (2011) research on mobile technologies in South Africa affirmed most libraries in Africa are not

able to provide services and information via mobile technology platforms because of low internet speed and inadequate power supply. The creation of contents of library services in a format that can be accessed on mobile devices mostly becomes a challenge and this affects the integration of MT in academic libraries. Mobile technology library services should have characteristics that make them accessible on different mobile devices. Notwithstanding this, Travis and Tay (2011) indicated that libraries in the quest to offer services on mobile platforms flounder to differentiate amidst developing to host services on a regular web page and that of mobile device interface leading to failure to achieve the expected outcome.

2.14 Summary of Review

In the nutshell, mobile technologies usage in academic libraries are paramount in today's technological advancements as it brings remarkable benefits to library users in accessing library resources remotely. It has become necessary that academic libraries realize the potentials the implementation of mobile technologies in their operations would bring in helping them to re-engineer their services to meet the needs of their current users who want to have access to boundary less information and services. Many of the literature reviewed under this section sought to highlight the much premium placed on mobile technologies contributions to the educational landscape and most importantly its applications in academic libraries. Academic libraries having been identified as the entryways to academic information by providing effective library services to support teaching, learning and research have to advance in terms of integration of emerging technologies in their operations. Incontrovertibly, mobile technology- based library services are becoming the order of the day in most universities, globally, of which Ghana is no exception.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter describes the methodological procedures that were used in conducting the research. It composes of the research design, population, sample and case selection, instrumentation, analysis and discussion.

3.2 Research Design

Research design is the blueprint for a scientific study that represents the underpinning for the study. Lune and Berg (2010) are of the view that research design is the overall outline for answering the research questions. The study employed the descriptive survey. According to Cooper and Schinder (2011), descriptive surveys depend on direct contact with those persons or a sample of those whose characteristics, behaviours or attitudes are relevant to a specific investigation. The choice for the descriptive survey was influenced by the fact that the researcher was dealing with a large population who were remotely dispersed across the campuses of the selected public universities. Thus, using the descriptive survey enabled the researcher to collect data from the large population at relatively cheaper cost. The descriptive survey design was appropriate because it aids the researcher to ask the right kind of questions from the dispersed population and obtain the relevant information for the study. The use of the descriptive design yields a high response rate which enables a good generalization to be made to the entire population.

Research Approach

Research approach can either be the qualitative, quantitative or mixed method approach (Tashakkori & Teddlie, 2010).

The approach for this study was the mixed method that is both quantitative and qualitative approaches. The choice of the mixed method was informed by the fact that the researcher intended collecting quantitative data (using questionnaire) and qualitative data (using interview) from the respondents. The qualitative approach was used to collect and analyzed data from the library staff purposely selected for the study. The quantitative approach was used to gather and analyzed data from the students' respondents. The researcher used the mixed method approach because using this approach helps in building the strengths of using both quantitative and qualitative data for the study (Cresswell, 2009). The use of the mixed method research approach makes exploitation of the strengths of both methods and the strengths of each method offset the weaknesses in the other.

However, the mixed method studies are complex to plan and conduct. They require careful planning to describe all aspects of research, including the study sample for qualitative and quantitative portions (identical, embedded, or parallel); timing (the sequence of qualitative and quantitative portions); and the plan for integrating data. Integrating qualitative and quantitative data during analysis is often a challenging phase for many researchers (AHRQ, 2013).

3.3 Selection of Cases

For the purpose of this study, the researcher focused on Sam Jonah Library, the University of Cape Coast and Osagyefo Library, University of Education, Winneba. The researcher decided to use these two public university libraries in Ghana because the two universities have a lot of

remote library users due to the several distance module programmes they run on their satellite campus system. They have also shown willingness to embrace new technologies in their operations evident in their ICT infrastructure facilities.

Again, the researcher wanted to get a snapshot of the situation between the old universities and the growing universities. The University of Cape Coast has been in existence for long as compared to the University of Education, Winneba, which is now in the midway and growing. Finally, the libraries were also selected because of their location and accessibility.

3.4 Selection of Subjects

The study covered graduate students of the two universities and some key library staff who are part of management and have deep knowledge concerning the issue. The choice of the graduate students was deemed logical in the sense that majority of the graduate students are working full time and moving to the library in search for their information needs can be an overwhelming task sometimes. They will also be the utmost beneficiaries of such innovation.

Again, since they are done with their undergraduate programmes successfully, they are more familiar and experienced with the usage of collections and services of the library as compared to the undergraduate students. With this, they are in a better position to put forward and make recommendations on library services that can be on mobile technology platforms to serve their information needs. The librarian, the systems librarian, the digital librarian, the head of library IT support and infrastructure and clients services librarian from each of the libraries were selected as the sample size for library staff because they are part of management and per their roles, functions and technical expertise, they can give an in-depth qualitative data needed for the study.

3.4.1 Population

The population represents the entire people that are to be considered for the study. Burns and Grove (2010) defined a population as the entire set of individuals that meet the sampling criteria for a research study. The target population for this study was the graduate students of the two universities and library staff who have in-depth knowledge with regards to the subject matter. The library staff consisted of the university librarian, the head of the library IT and infrastructure support, the systems librarian, digital services librarian and the clients services librarian of the two libraries of interest selected for the study. The University of Cape Coast has graduate students' population of 2,562 (UCC Matriculation Brochure, 2018). The graduate students population for University of Education, Winneba was 1,338 (UEW Matriculation Brochure, 2018). Again the Sam Jonah library, University of Cape Coast had a library staff population of 134 with a breakdown of 16 senior members , 82 senior staff and 36 junior staff (UCC library Staff Directory, 2018). The Osagyefo library, University of Education, Winneba had a library staff population of 50, which consisted of 9 senior members, 25 senior staff and 16 junior staff (UEW library Staff Directory, 2018). The total targeted population for the study was 4,084 made up of 3,900 graduate student's respondents and 184 library staff. The complete breakdown is shown in the table 3.4.1 below:

Table 3.1: Target Population

Institution	Students	Library staff	Total Target population
UCC	2,562	134	2,696
UEW	1,338	50	1,388
TOTAL	3,900	184	4,084

Source: UEW and UCC Staff Directory and UEW and UCC Matriculation Brochure, 2018.

3.4.2 Sample Size

According to Daniel (2012), a sample is the subset of the population that possesses the same attributes as the major population. Marsden and Wright (2010) also indicated that the sample size is the number of observations used in predicting the estimates of the entire population.

Given the targeted student's population from the two universities to be 3,900, it was logical to determine the sample size for a student for the study. The researcher decided to use 10 percent of the student's population and this is justified by the assertion made by Nwana (1992) that when the population is in few thousands a researcher can choose 10 percent of the population. The 10 percent of the total student's population translated to 390 student respondents from the two universities. Again, 10 library staff with in-depth knowledge on the subject matter that is 5 (comprising the university librarian, the head of IT, the systems librarian, the digital services librarian and clients services librarian) from each of the two public university libraries selected for the study constituted the sample size for library staff. The sample size of 10 library staff for the study is justifiable on the grounds that those that were purposively selected were part of management and they are sectional heads within the selected libraries with in-depth knowledge and technical expertise on the issue. Maxwell (2013) and Creswell (2013) also argued that in gathering qualitative data emphasis should be placed on selecting participants and sample size that would aid in yielding the rich information needed for the study. Based on their roles, experience and knowledge, those selected for the study were the best people to provide the needed qualitative data for the study.. Therefore, the sample size for the entire study was 400 consisting of 10 percent of student's respondents (390) and the (10) library staff who were part of management selected for the study.

Table 3.2: Sample Size for Students Respondents

Name of the University	Population	Sample Size
University of Cape Coast(Graduate Students)	2,562	256 (2,562/3,900×390)
University of Education, Winneba (Graduate Students)	1,338	134 (1338/3,900×390)
Total	3,900	390

Source: Field data, 2019

3.4.3 Sampling Techniques

Purposive sampling technique was used in selecting the 10 library staff from the two university libraries for the study. The intent of purposive sampling involves a researcher consciously selecting some respondents to use in a study based on the objective of the study and characteristics of the population (Bhattacharjee, 2012; Cresswell & Plano-Clark, 2011). It is a sampling technique, where the choice of respondents for the study is based on the qualities they possess and the kind of information the researcher wants to generate from them. The procedure of purposive sampling entails the researcher anticipating in advance what information he wants to obtain and embarking on to search or select those who by virtue of knowledge or know-how is ready to provide the needed information. The researcher, therefore, used the purposive sampling method to select the ten library staff based on their knowledge and experience on the issue. The researcher also believes that the use of the purposive sampling strategy in selecting the library staff enabled him to generate the right kind of data for the study. The university librarian, the head of library IT services, the systems librarian, the digital services librarian and the clients services librarian from the two universities libraries were selected purposively for the study because they are part of senior management and based on their experience, knowledge and work

roles they made an insightful contribution to the research. They provided the qualitative data needed for the research.

In selecting the students' respondents to administer the data collection instruments (questionnaire), the convenience sampling technique was used. This sampling technique was used based on the fact that it was difficult in assembling all students at a particular time for any rigorous sampling technique. Besides, the students' respondents were dispersed across the length and breadth of the campuses and were difficult to be seen at one place for any intensive sampling process. According to Saunders, Lewis and Thornhill (2012), convenience sampling is a non-probability sampling method that relies on data collection from population members who are conveniently available to participate in the study. Convenience sampling is a form of sampling where the first available primary data source will be used for the research without additional requirements. In other words, this sampling method involves getting participants wherever you can find them and typically wherever is suitable (Saunders, Lewis, & Thornhill, 2012). The central premise associated with convenience sampling is that the members of the target population are homogeneous.

3.5 Data Collection Instrument

Data collection instruments are fact-finding mechanisms and are strategies used for data collection. The various data collection instruments include an interview, questionnaire, observation among others. Both quantitative instrument that is a questionnaire and qualitative instrument that is interview were used to collect data for this study. The researcher used both quantitative and qualitative data collection instrument because of the kind of information the researcher wanted to gather for the study.

3.5.1 Questionnaire

The quantitative instrument used for the data collection for the students' respondents was the questionnaire. A questionnaire is an instituted set of questions used to gather people's opinions and attitude on a specific topic (O'Leary, 2004). Questionnaires provide a relatively cheap, quick and efficient way of obtaining large amounts of information from a large sample of people. Data can be collected relatively quickly because the researcher would not need to be present when the questionnaires were completed (Dudovskiy, 2017). This is useful for large populations when interviews would be impractical.

However, a problem with the questionnaire is that respondents may lie due to social desirability and most people would want to present a positive image about themselves and so may lie or bend the truth to look good. In addition, respondents' may randomly select answer choices without properly reading the questions. To overcome this weakness, the researcher included open-ended questions, in addition, to close-ended questions to further gather the opinions of the respondents. Again, the choice of words for the structure of the questions was made simple and easy to understand.

3.5.2 Interview

The qualitative instrument used for the data collection was the semi-structured interview through a self-developed interview guide. A well planned out interview should generate relevant, accurate and objective information (Kumekpor, 2002). The Semi-structured interview was adopted for this study. A semi-structured interview is a type of interview in which the interviewer does not strictly follow a formalized list of questions. The researcher will ask more open-ended questions, allowing for a discussion with the interviewee rather than a straightforward question and answer format. The interviewer may prepare a list of questions but

does not necessarily ask them all, or touch on them in any particular order. The researcher or interviewer uses them instead to guide the conversation. In some cases, the interviewer will prepare only a list of general topics to be addressed, called an interview guide. Depending on how the interviewee answers, the interviewer may ask follow up questions to gain a more in-depth understanding.

The researcher personally carried out the interview with the library staff from the two university libraries selected for the study focusing on the issues captured under the objectives for this study. The researcher used voice recorder gadgets to record the responses from the respondents and this was made known to them before the interview. In addition, a field notebook was used in addition to the tape recorder.

3.5.3 Pre-Testing

The administration of the data collection instrument with a small set of respondents to ensure that the data collection instruments are appropriate is what is termed as pre-testing. The pre-testing was conducted at the University of Ghana, Legon to test the effectiveness of the data collection instrument that was used for the study. A total of twenty (20) questionnaires were distributed to graduate students using convenience sampling to get their views on the topic. Also, two (2) library staffs with in-depth knowledge on the subject matter were interviewed. The pre-testing was done to ascertain the questions' validity and the likely suitability and reliability of the research instruments that were used for the study.

3.5.4 Mode of data collection

In order to have approval and conduct the study in the selected areas, the researcher obtained an introductory letter from the Department of Information Studies, University of Ghana to seek

permission from the authorities of the two public universities (UCC and UEW) in order to engage the respondents for the study. The researcher engaged some staff of the two selected universities to aid in the distribution and collection of administered questionnaires to the students' respondents. The data from the students' respondents was collected in a span of one month because of the busy schedules of some of them. The researcher personally interviewed the library staffs that were selected for the study to elicit the needed data from them.

3.5. 5 Sources of Data

The researcher relied on both primary and secondary sources to gather information for the studies. The interview and the questionnaire provided the primary source of data. Data from earlier research on the topic and similar topics helped the researcher in gathering secondary data. They included data from print journals, online academic databases, books, magazines, reports and other allied sources that were considered useful for the study.

3.6 Data Analysis

Data analysis means organizing and interrogating data in ways that allow researchers to see patterns, identify themes, discover relationships, develop explanations, make interpretations, mount critiques, or generate theories. It often involves synthesis, evaluation, interpretation, categorization, hypothesizing, comparison, and pattern finding (Hatch, 2002). The data that was collected using the questionnaire was first edited to correct errors. It was then collated, coded and analyzed descriptively using the Statistical Package for Social Sciences (SPSS) version 22.0 into frequencies and percentages. The data that were generated through the questionnaire were assigned with appropriate codes and analyzed. The results were presented in the form of tables, pie charts and bar charts showing frequencies and percentages of responses given by the respondents.

The recordings of the interview were transcribed and grouped under a range of themes and qualitatively analyzed through the thematic analysis approach. The qualitative data that were transcribed from the audio recordings were compared with the notes that were taken during the interview to ensure the validity of the audio recordings.

3.7 Ethical Considerations

All studies involving human interactions have ethical implications. Babbie and Mouton (2001) postulated that in dealing with respondents the researcher must strive to unearth the truth but must do so not to infringe on their rights. Based on this reason, the researcher sought ethical clearance and obtained an introductory letter from the Information Studies Department, University of Ghana to gain permission from the administrators of the institutions used for the study. Additionally, the researcher carefully explained the purpose, objectives and data collection procedure to the respondents and emphasized that their participation was voluntary. Any form of inducement to partake in the study by respondents was avoided. Privacy, anonymity and dignity of all respondents were of importance to the researcher and therefore all respondents were assured of their confidentiality. Data collected were used strictly for academic purpose. The use of discriminatory, offensive or unacceptable language in the formulation of the questionnaire and during the informal interview were avoided by the researcher. Again, there was proper acknowledgement of all the sources used for the study.

In summary, the University of Ghana's code of conducting research was adhered to.

CHAPTER FOUR

PRESENTATION OF DATA AND ANALYSIS

4.1. Introduction

This chapter looked at the data presentation and analysis. All the data from the field for the study were organized and analyzed. The main thrust of the study aimed at ascertaining the adoption and implementation of mobile technology- based library services in academic libraries in Ghana with concentration on the Sam Jonah library, University of Cape Coast library and Osagyefo library, University of Education, Winneba. Specifically, the study focused on seven objectives. The objectives three and five of the study were quantitatively analyzed. The objectives two, six and seven were analyzed qualitatively whilst the first and fourth objectives were analyzed both quantitatively and qualitatively.

The analysis of data gathered from the questionnaire were done using frequencies and percentages and presented under six thematic areas. The first thematic area focused on an overview of the socio- demographic characteristics of the respondents. The other four themes covered students' awareness and appreciation for the use of mobile technology-based library services, students' proficiency in the use of mobile devices , library services that the respondents would want to be delivered to them through mobile technology platforms, and respondents' willingness to use mobile technology-based library services.

In total, 390 copies of the questionnaire for the research study were distributed to graduate students in the University of Cape Coast (256 questionnaires) and the University of Education, Winneba (134 questionnaires). Two Hundred and Twenty-Four (244) responses were received from the students in the University of Cape Coast giving a response rate of 95.3%. One Hundred and Twelve (112) completed questionnaires were received from students in the University of

Education, Winneba giving a response rate of 83.5%. In total, 356 questionnaires out of 390 distributed to the sampled population were received giving an overall response rate of 91.2%. The response rate of 91.2% is consistent with the findings of Babbie (2010) and Dennis (2003) who were of the view that a response rate generally hovering around 80% and above is ideal for survey research. The researcher began with the quantitative analysis of the data before moving onto the qualitative analysis.

The quantitative analysis was done under the following sections based on the research objectives of the study. Section 4.2 looked at the socio-demographic characteristics of the students respondents, section 4.3 focused on the level of awareness and appreciation for the use of mobile technology-based library services in the academic libraries at the selected universities, followed by section 4.4 which was on students' proficiency in the use of mobile devices. Subsequently, section 4.5 concentrated on the library services that can be delivered via mobile technology platforms at the selected academic libraries, section 4.6 presented data analysis on students willingness to use mobile technology- based library services in the selected academic libraries

4.2 Socio-Demographic Characteristics of the Students Respondents

This section highlights the demographic characteristics of respondents used for the study. It basically comprises the biodata of the respondents.

4.2.1. Gender of the Students Respondents

Gender is the range of attributes relating to, and contrasting between, masculinity and femininity. In research, gender distribution is very essential as it can possibly influence the interpretation of

the findings. In this regard, the researcher asked the respondents to indicate their gender and this is illustrated in Table 4.1:

Table 4.1: Gender Distribution of the respondents

	ALL (NET)		UEW		UCC	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Gender						
Male	226	63.5	79	70.5	147	60.2
Female	130	36.5	33	29.5	97	39.8
Total	356	100.0	112	100.0	244	100.0

Source: Field data, 2019

Table 4.1 indicates that a total of 356 student responses were received. Out of the 356 respondents, 226 (63.5%) were males and 130 (36.5%) were females. The 112 students' respondents from UEW were made up of 79 (70.5%) males and 33(29.5%) females. In the case of UCC, out of the total number of 244 students' who responded, 147 (60.2%) were males and 97 (39.8%) were females. This suggests that majority of the respondents involved in the study were males from both universities.

4.2.2 Age of the students' respondents

The rationale for the involvement of ages of respondents in a study assists to provide the average age distribution with which the researcher worked. In view of this assertion, the researcher explored into the age range of the respondents. Table 4.2 indicates the age distribution of students' respondents from both institutions.

Table 4.2: Age of the students' respondents

Age	ALL (NET)		UEW		UCC	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
20-25 years	115	32.3	25	22.3	90	36.9
26-30 years	134	37.6	47	42.0	87	35.7
31 years and above	107	30.1	40	35.7	67	27.4
Total	356	100.0	112	100.0	244	100.0

Source: Field data, 2019

According to Table 4.2, the maximum age range was '26-30' with 134 (37.6%) respondents whilst the lowest was '31 and above' with 107 (30.1%) responses. The highest age range of respondents from UEW fell in the 26-30 age range with 47 (42.0%) responses whilst the lowest response came from the age range '20-25' with 25 (22.3%) responses. On the contrary, UCC had the highest students' respondents within the 20-25 age range with 90 (36.9%) responses. The least student respondents from UCC fell in the 31 and above age range with 67 (27.4%) responses. It is noticeable from Table 4.2 and the analysis that majority of the respondents used for the study fell within 26- 30 years.

4.2.3 Type of degree pursued by students' respondents

Appreciating the type of degree pursued by the student respondents was essential for a study of this nature in the sense that at the graduate students level, there are variations as to the type of degree pursued by them. The researcher, therefore, inquired into the type of degree students' respondents were pursuing by asking them to indicate them. Table 4.3 shows the type of degrees pursued by student respondents from both universities:

Table 4.3: Type of degree pursued by students' respondents

Degree Type	ALL (NET)		UEW		UCC	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
M Phil.	100	28.1	29	25.9	71	29.1
MA	100	28.1	33	29.5	67	27.5
Med	98	27.5	30	26.8	68	27.9
MBA	22	6.2	10	8.9	12	4.9
MSc.	23	6.4	5	4.5	18	7.4
PhD	13	3.7	5	4.5	8	3.3
Total	356	100.0	112	100.0	244	100.0

Source: Field data, 2019

The analysis from Table 4.3 indicates that the majority of the respondents' were pursuing Masters in Philosophy (MPhil) and Masters in Arts (M.A) respectively with 100 (28.1). Ninety eight (27.5) of the respondents were pursuing Masters in Education (M.Ed), 22 (6.2%), 22 (6.2%) were on the Master of Business Administration Program (MBA). In addition, 23 (6.4%) were from the Master of Science Programmes (M.Sc) whiles 13 (3.7%) were pursuing Doctoral degrees (PhD). The findings depict that there was a fair representation of students across the various programmes at the graduate level from all the two universities.

4.3 Level of Awareness and Appreciation for the use of Mobile Technology-Based Library Services

Awareness is a vital step in the adoption of any innovation (Kotler, 1999). Unless a user becomes aware of and then develops an interest in product innovation, he or she cannot adopt such. This is more so for mobile technology delivery systems for library services where the traditional alternative, though riddled with many inefficiencies, works just fine. One of the major objectives of the study was, therefore, to assess the level of awareness and appreciation for the use of mobile technology-based library services in the selected academic libraries. The study sought to

find answers to a number of issues that pertains to the level of awareness and appreciation for the use of mobile technology-based library services.

4.3.1 Awareness that mobile devices can be used to access library services in universities

The researcher firstly sought to find out whether respondents were aware that mobile devices could be used to access library services in universities as a way to assess the level of awareness and appreciation for the use of mobile technology- based library services. Table 4.4 shows their responses:

Table 4.4: I am aware that mobile devices can be used to access library services in universities.

Institution	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
UCC	14 (5.7)	19 (7.8)	16 (6.6)	95 (38.9)	100 (41.0)	244 (100.0)
UEW	3 (2.7)	3 (2.7)	4 (3.6)	45(40.2)	57 (50.9)	112 (100.0)
Total	17 (4.8)	22 (6.2)	20 (5.6)	140 (39.3)	157 (44.1)	356 (100.0)

**Percentage in brackets*

Source: Field data, 2019

Table 4.4 shows that 157(44.1%) out of the 356 respondents strongly agreed that they were aware that mobile devices could be used to access library services in universities, 140 (39.3%) agreed that they were aware that mobile devices can be used to access library services. Twenty 22 (6.2%) disagreed and 17(4.8%) strongly disagreed. Twenty (5.6%) were neutral that they were aware that mobile devices could be used to access library services in universities. Comparatively, 100 (41.0%) of the respondents in UCC strongly agreed they were aware that mobile devices could be used to access library services in universities, as against 57 (50.9%) in

UEW. Furthermore, 95 (38.9%) of the respondents in UCC agreed that they were aware that mobile devices could be used to access library services in universities, as compared to 45 (40.2%) in UEW. This implies that the majority of respondents from both universities were aware that mobile devices could be used to access library services in universities. Further analyses made to probe deeper into the level of awareness and appreciation for mobile technology-based library services showed a deep appreciation for such services by students

4.3.2 Upgrade my Skills to Suit and Appreciate Mobile Service Technological Changes undertaken by my University Library

The researcher, firstly, sets out to investigate if respondents would like to adopt and upgrade their skills to suit and appreciate any mobile technological changes undertaken by their university library. Tables 4.5 showcases the respondents’ responses as to whether they are able to upgrade their skills to appreciate any mobile technological changes undertaken by their university library:

Table 4.5: I would like to adapt and upgrade my skills to suit mobile service technological changes undertaken by my university library

Institution	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
UCC	2 (0.8)	6 (2.5)	10 (4.1)	124 (50.8)	102 (41.8)	244 (100.0)
UEW	1 (0.9)	2 (1.8)	9 (8.0)	47 (42.0)	53 (47.3)	112 (100.0)
Total	3 (0.8)	8 (2.3)	19 (5.3)	171 (48.0)	155 (43.6)	356 (100.0)

Source: Field data, 2019

Table 4.5 shows that with regards to respondents’ level of awareness and appreciation for the use of mobile technology- based library services, 155 (43.6%) ; 171 (48.0%) strongly agreed and agreed respectively that they would like to adapt and upgrade their skills to suit any mobile

service technological change that would be undertaken by their university library. In contrast, 3 (0.8%) and 8 (2.3%) strongly disagreed and disagreed respectively that they would like to adapt and upgrade their skills to suit any mobile service technological change undertaken by their university library. Nineteen (5.3%), out of the 356 respondents decided to stay neutral.

In comparative terms, 102 (41.8%) respondents from UCC strongly agreed that they would like to adapt and upgrade their skills to suit mobile service technological change done by their library as opposed to 53 (47.3%) from UEW. There was no significant difference between those who strongly disagreed and disagreed at the institutional level. The analysis shows that more than half of the respondents would like to adapt and upgrade their skills to suit any mobile service technological change undertaken by their library.

4.3.3 Subscribing to Library Services if they are offered on Mobile Technology Platforms

The findings on whether respondents would subscribe to library services if they are offered on mobile on mobile technology platforms are presented in Table 4.6:

Table 4.6: I would subscribe to the library services if those services were to be offered on mobile technology platforms

Institution	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
UCC	2 (0.8)	3 (1.2)	10 (4.1)	102 (41.8)	127 (52.0)	244 (100.0)
UEW	1 (0.9)	2 (1.8)	10 (8.9)	44 (39.3)	55 (49.1)	112 (100.0)
Total	3 (0.8)	5 (1.4)	20 (5.6)	146 (41.0)	182 (51.2)	356 (100.0)

**Percentage in brackets*

Source: Field data, 2019

The results from the findings indicate that 182 (51.2%) of the respondents strongly agreed that they would subscribe to library services if they are offered on mobile technology platforms, 146 (41.0%) agreed, 20 (5.6) were neutral, 5 (1.4%) disagreed and 3 (0.8%) strongly disagreed. The

findings show that 328 (92.2%) of the respondents would appreciate and use mobile technology-based library services if they are implemented by the academic libraries. The results further show in comparative terms that 127 (52.0%) respondents from UCC strongly agreed that they would subscribe to library services if they are offered on mobile technology platforms as against 55 (49.1%) from UEW. Three (4.1%) respondents from UCC disagreed while respondents who disagreed from UEW were 2 (1.8%). Furthermore, 1(0.9 %) of UEW respondents and 2 (0.8%) of UCC respondents strongly disagreed while 8.9% (UEW) and 4.1(%) (UCC) respondents were neutral.

4.3.4 Introducing Mobile Technology- Based library Services to Friends

The researcher in finding out whether respondents were aware and appreciated the use of mobile technology- based library services also inquired from respondents if they would introduce mobile technology-based library services to their friends if they are implemented by their libraries. Table 4.7 presents the data on respondents' level of agreement as to whether they would introduce mobile technology-based library services to their friends:

Table 4.7: I would like to introduce mobile technology-based library services to my friends

Institution	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
UCC	7 (2.9)	12 (4.9)	23 (9.4)	128 (52.5)	74 (30.3)	244 (100.0)
UEW	1 (0.9)	2 (1.8)	13 (11.6)	54 (48.2)	42 (37.5)	112 (100.0)
Total	8 (2.3)	14 (3.9)	36 (10.1)	182 (51.1)	116 (32.6)	356 (100.0)

**Percentage in brackets*

Source: Field data, 2019

The analysis of data from the field as depicted in Table 4.7 indicates that 182 (51.1%) of the total respondents sampled from the two tertiary institutions agreed that they would introduce mobile technology-based library services to their friends, followed by 116 (32.6%) who strongly agreed

to the statement. However, 14 (3.9%) and 8 (2.3%) of the total respondents from the two tertiary institutions disagreed and strongly disagreed respectively that they would like to introduce mobile technology- based library services to their friends. More respondents in UCC, 128 (52.5%) agreed that they would recommend mobile technology-based library services to their friends than their counterparts in UEW, 54 (48.2%). The indication of the findings is that majority of the respondents from the two universities agreed that they would recommend mobile technology-based library services to their friends and that there were no major differences between the universities in relation to respondents responses.

4.3.5 Mobile Technology Enabling Library Service/Resource to be accessed from many

Mobile devices

Respondents were asked by the researcher to demonstrate the extent to which they agree and appreciate the notion that they would like mobile technology implementation in their libraries because it affords them opportunity to access a single library resource/service from many mobile devices. Responses on this is presented in Table 4.8:

Table 4. 8: I would like mobile technology in my library because a single library resource/service can be accessible from many mobile devices

Institution	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
UCC	2 (0.8)	6 (2.5)	16 (6.6)	119 (48.8)	101 (41.4)	244 (100.0)
UEW	5 (4.5)	7 (6.3)	17 (15.2)	47 (42.0)	36 (32.1)	112 (100.0)
Total	7 (1.9)	13 (3.7)	33 (9.3)	166 (46.6)	137 (38.5)	356 (100.0)

Source: Field data, 2019

Deducing from Table 4.8, it was clear that majority of respondents agreed that they would like mobile technology in their library because a single library resource/service can be accessed from many mobile devices as 166 (46.6%) of the respondents agreed and 137(38.5%) respondents

strongly agreed from the two universities. However, 13 (3.7%) and 7 (1.9%) of the 356 sampled respondents disagreed and strongly disagreed that they would like mobile technology in their library because a single library resource/service can be accessed from many mobile devices. Thirty three 33 (9.3%) of the respondents were neutral.

Segregating the data by university, it was revealed that 119 (48.8%) respondents from UCC agreed that they like mobile technology in library because it enables a single library service/resource to be accessed from many mobile devices as against 47 (42.0%) respondents from UEW. In the same manner, respondents who strongly agreed with the statement from UCC were 101 (41.4%) as opposed to 36 (32.1%) from UEW. Contrarily, 10.8 % (6.3%) disagreed and 4.5% strongly disagreed) of UEW respondents and 3.3% (2.5% disagreed and 0.8% strongly disagreed) of UCC respondents indicated contrary view.

4.3.6 Appreciating Mobile Technology Based Library Services because it has no Geographical Restrictions

With regard to the information on whether respondents appreciate mobile technology based library services because it has no geographic restrictions, the following findings were discovered and presented in Table 4.9:

Table 4.9: I appreciate mobile technology based library service because it has no geographical restrictions

Institution	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
UCC	4 (1.6)	8 (3.3)	14 (5.7)	101 (41.4)	117 (48.0)	244 (100.0)
UEW	4 (3.6)	6 (5.4)	12 (10.7)	46 (41.1)	44 (39.3)	112 (100.0)
Total	8 (2.3)	14 (3.9)	26 (7.3)	147 (41.3)	161 (45.2)	356 (100.0)

Source: Field data, 2019

In connection with respondents' appreciation and use of mobile technology based library services because it has no geographical restrictions, 161 (45.2%) of the respondents from UCC and UEW strongly agreed that they would appreciate mobile technology based library services because it has no geographical restrictions, 147 (41.3%) respondents from both universities agreed that they would appreciate mobile technology based library services because it has no geographical restrictions. Respondents who indicated neutrality from UCC and UEW were 26 (7.3%). Comparatively, 117 (48.0%) and 101 (41.4%) of the students' respondents from UCC respectively strongly agreed and agreed that they appreciate mobile technology- based library services because it has no geographical restrictions as compared to 44 (39.3%) and 46 (41.1%) in UEW. Four (4) respondents each from the study institution strongly disagreed that they appreciate mobile technology based library services because it has no restrictions. In summary, majority of the respondents from both institution agreed that they appreciate mobile technology-based library services because it has no geographical restrictions.

4.3.7 Designing mobile technology based websites and apps makes university libraries more interactive

Respondents were asked to indicate their agreement or disagreement that, through designing mobile technology- based website and app, their university library make its services more interactive by adding chat sessions, blogs and social interfaces. The findings in this regard are illustrated in Table 4.10:

Table 4.10: Through designing of mobile technology based website and app, my university library makes their services more interactive by adding chat rooms, blogs, social interface, etc.

Institution	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
UCC	9 (3.7)	18 (7.4)	48 (19.7)	89 (36.5)	80 (32.8)	244 (100.0)
UEW	4 (3.6)	6 (5.4)	17 (15.2)	43 (38.4)	42 (37.5)	112 (100.0)
Total	13 (3.7)	24 (6.7)	65 (18.2)	132 (37.1)	122 (34.3)	356 (100.0)

**Percentage in brackets*

Source: Field data, 2019

The results from Table 4.10 depict that a total average of 254 (71.4%) respondents from both UCC and UEW agreed that through designing mobile technology based website and app, their university library will make its services more interactive, with 122 (34.3%) and 132 (37.1%) responding “strongly agreed” and “agreed” respectively. In addition, 65 (18.2%) of the respondents from UCC and UEW took a neutral position. With reference to the analysis at the university level, 89 (36.5%) and 80 (32.8%) of respondents from UCC agreed and strongly agreed that university libraries will make their services interactive when they design mobile technology based website or app as against their mates from UEW with a representation of 42 (37.5%) and 43 (38.4%). However, 24 (6.7%) and 13 (3.7%) of the total respondents from the two institutions disagreed and strongly disagreed that through mobile designing of mobile technology based website and app, their university library will make their services more interactive. More respondents disagreed in UCC than in UEW. On the average, a large number of the respondents agreed that if their libraries design mobile technology application websites or apps it would make their services more interactive and efficient.

4.3.8 Summary

In sum, respondents agreed to the statements about the level of awareness and appreciation for mobile technology- based library services with the grand average of 297 (83.4%) respondents indicating that they are aware that it is possible for them to access library services through mobile devices, 328 (92.2%) of the respondents agreed that they would subscribe to library services if they are offered on mobile technology platform. Two hundred and ninety- eight (83.7%) revealed that they would like to introduce library services that are delivered through mobile technology platforms to their friends, 326 (91.6%) would like to adopt and upgrade their skills to suit any mobile technological change that would be done by their university library. The percentage of respondents who agreed to appreciate mobile technology based library services because it has no geographical restrictions was 86.5% (308). Again, 254 (71.4%) indicated that their university libraries can become more interactive by building mobile technology- based websites and apps that incorporate chat room, blogs and social media interfaces. The majority of respondents 303 (85.5%) indicated that they would like mobile technology in their academic libraries because a single library resource/service can be accessed from many devices. It is, therefore, concluded that students in the University of Cape Coast and University of Education, Winneba, have high level of awareness and appreciation for the use of mobile technology- based library services and are ready to use the services if implemented by their libraries.

4. 4 Students' Proficiency in Relation to Mobile Devices Usage

Another objective of the study was to ascertain students' proficiency in relation to the use of mobile devices. Without the requisite skills in the use of mobile technology, students will be unable to effectively utilize library services that are offered by their institutions through the technology platform. It is not just enough to invest in the provision of mobile technology based

library services but ensuring that end users are able to fully take advantage of the services is crucial. The researcher, therefore, sought to assess the skills (proficiency) of students in the use of current mobile technologies. Mobile technology devices consist of internet enabled devices such as smart phones, handheld computers, PDA's, iPod, cell phones, e-book readers and tablets. Respondents were asked a number of questions based on this objective. These include:

The type of mobile device owned by students respondents and whether they have internet access on these mobile devices, the number of times respondents use mobile device applications in schools, and respondents' reasons for the use of mobile devices in school. Furthermore, other questions the researcher asked were: how proficient respondents were with the use of mobile devices, whether respondents are able to use mobile devices to send or receive text messages (instant messaging), whether respondents can use their mobile devices to send or receive e-mail, respondents' ability to use mobile devices to search and download academic related information for studies and whether respondents can use their mobile devices to access social networking sites.

4.4 .1 Type of mobile device owned by student respondents

Mobile devices comprise handheld tablets, smart phones, iPod, cell phones, PDA's and e-book readers. The researcher, therefore, sought from the respondents, the type of mobile devices owned by them and whether they had internet access on their mobile devices. The findings on the type of mobile devices owned by respondents and whether they had internet access on them are presented in Table 4.11 :

Table 4.11: Type of mobile device owned by respondents with internet access

Mobile device	N	Frequency	Percent
Smart phones	356	335	94
Tablet	356	102	29
Regular cell phone	356	100	28
Personal Digital Assistant (PDA's)	356	58	16
E-Book Reader	356	52	15
iPod	356	33	9
Respondents with internet access on their mobile device	N	Frequency	Percent
YES	356	351	98.6
NO	356	4	1.4

Source: Field data, 2019

The results as can be seen from Table 4.11 show the type of mobile device owned by respondents and the availability of internet access on them from both universities. It is interesting to note that from multiple responses, 335 (94.0%) of the student respondents from the two universities own smart phones, 102 (29%) have tablet, those with regular cell phone were 100 (28%), personal digital assistant ownership rate stood at 58 (16%) and the number of students with e-book readers and iPods were 52 (15%) and 33 (9%) respectively. It is evident from the findings that majority of the respondents own more than one mobile device. Again, an inquiry was made to ascertain whether respondents had internet access on their mobile devices. The analysis revealed that out of the total number of 356 student respondents who were used for the study, 351 (98.6%) had internet access on their mobile devices with only 5 (1.4%) of them indicating that that they did not have internet access on their mobile devices. This indicates that the use of mobile devices to access the internet was very common among students.

4.4.2 Number of times participants used mobile devices in school

Figure 4.1 establishes the number of times respondents from both universities use mobile devices

Number of times mobile devices are used by respondents in school

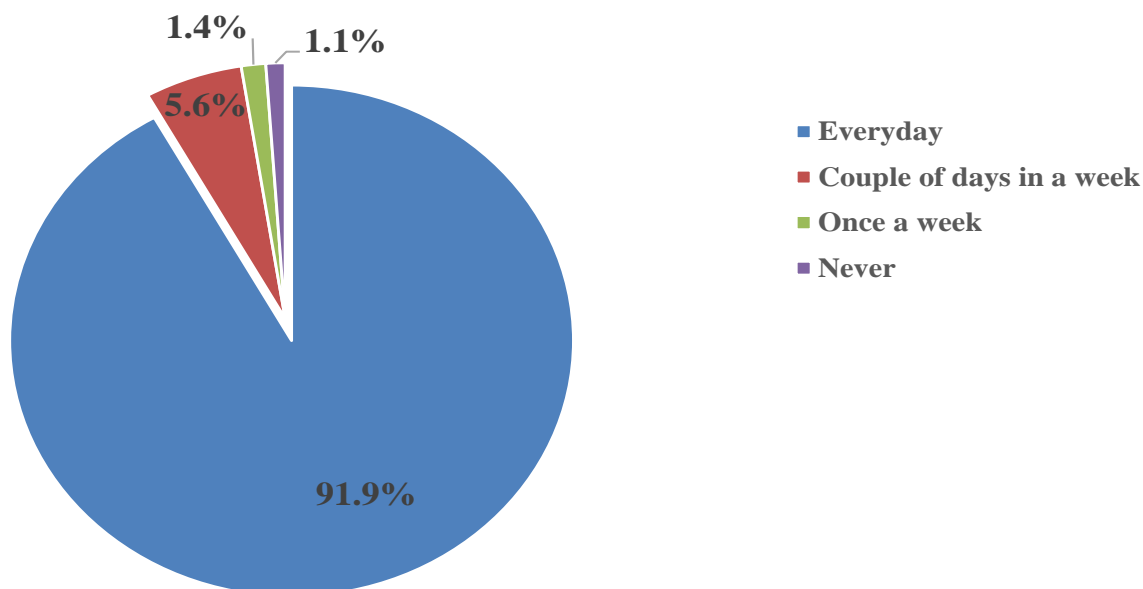


Figure 4.1 Number of times participants used mobile devices in school

Source: Field data, 2019

The results in Figure 4.1 shows that 327 (91.9%) of the participants used mobile device everyday in school, 20 (5.6%) used mobile devices a couple of days in a week in school, 5 (1.4%) of them used them once a week and 4 (1.1%) indicated that they had never used mobile devices in school before.

4.4.3 Reasons students use mobile devices in school

Respondents were asked to indicate the reasons why they used mobile devices in school and the results are summarized in Table 4.12 below:

Table 4.12 : Reasons students use mobile devices in school.

Reasons for Using Mobile device	N	Frequency	Percent
Because of educational purpose	356	213	59.8
Because of needs	356	145	40.7
Because mobile device is popular	356	67	18.8
Because of curiosity	356	43	12.1
Other	356	42	11.8

Source: Field data, 2019

The results showed that 213 (59.8%) indicated that they used mobile devices for educational purposes, 145 (40.7%) used them because of needs. Sixty seven (18.8%) revealed that they used mobile devices because mobile devices were popular, 43 (12.1%) used mobile devices because of curiosity and 42 (11.8%) indicated that they used them because of other reasons. It is clear from the findings that majority of the respondents used mobile devices because of educational needs.

4.4.4 Respondents Proficiency Level in the Use of Mobile Devices

The researcher decided to find out from the respondents their level of proficiency when it comes to the use of mobile devices. The findings from the data analysis are presented in Figure 4.2:

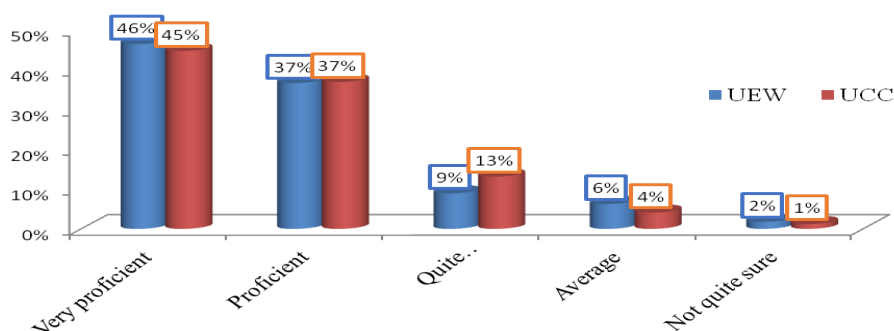


Figure 4.2 Respondents' Proficiency level with the use of Mobile Devices

Source: Field data, 2019

The result in Figure 4.2 show the proficiency level of the students in both UCC and UEW. It was observed that respondents from both universities were very proficient with the use of mobile devices. From the results, 37% and 45% of UCC students indicated they were proficient and very proficient respectively, 82% were at least proficient with the use of mobile devices. Similarly, 37% and 46% students from UEW indicated proficient and very proficient in the use of mobile devices respectively while 83% were at least proficient in the use of mobile devices. It could be concluded that majority of students from both universities were proficient in the use of mobile devices.

4.4.5 Respondents' ability to use mobile device to send or receive text messages (Instant Messaging)

Having examined how proficient respondents were in the use of mobile devices, the researcher went further to investigate the level of proficiency of students in the use of mobile devices by asking respondents to indicate the extent to which they agree or disagree that they can use their mobile devices to send or receive text messages. Table 4.13 presents responses on the ability of respondents to use their mobile devices to send or receive text messages (Instant Messaging):

Table 4.13: I can use my mobile device to send or receive text messages/SMS (Instant Messaging)

Institution	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
UCC	5 (2.0)	2 (0.8)	13 (5.3)	67 (27.5)	157 (64.3)	244 (100.0)
UEW	2 (1.8)	1 (0.9)	0 (0.0)	34 (30.4)	75 (67.0)	112 (100.0)
Total	7 (1.9)	3 (0.8)	13 (3.7)	101 (28.4)	232 (65.2)	356 (100.0)

**Percentage in brackets*

Source: Field data, 2019

With reference to Table 4.13, a total of 335 (93.6%) respondents from the two institutions agreed that they could use their mobile devices to send or receive text messages, with 232 (65.2%) and 101 (28.4%) responding “strongly agree” and “agree” respectively. From the same Table, 75 (67.0%) respondents from UEW strongly agreed that they used their mobile devices to send or receive text as compared to 157 (64.3%) in UCC. Those who strongly agreed and disagreed from both universities were really insignificant with 7 (1.9%) and 3 (0.8%) “Strongly agreeing” and “agreeing” respectively. Cumulatively, the findings indicate that a large portion of students agreed that they could use their mobile devices to send and receive text messages.

4.4.6 Respondents’ ability to use mobile device to send or receive electronic mail (e-mail)

The researcher also posed a question to respondents to ascertain whether they agreed or disagreed that they could use their mobile devices to send or receive email. The findings are presented in Table 4.14:

Table 4. I4: I use my mobile device to send or receive email

Institution	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
UCC	5 (2.0)	3 (1.2)	9 (3.7)	77 (31.6)	150 (61.5)	244 (100.0)
UEW	2 (1.8)	1 (0.9)	4 (3.6)	47 (42.0)	58 (51.8)	112 (100.0)
Total	7 (1.9)	4 (1.1)	13 (3.7)	124 (34.8)	208 (58.5)	356 (100.0)

**Percentage in brackets*

Source: Field data, 2019

The results in Table 4.14 show that a significant number of 208 (58.5%) respondents with 150 (61.5%) from UCC and 58 (51.8%) from UEW were in strong agreement as against 7 (1.9%) who strongly disagreed that they used their mobile devices to send and receive e-mail from both universities. Furthermore, 124 (34.8%) respondents, with 77 (31.6%) from UCC and 47 (42.0%)

from UEW, agreed that they used their mobile devices to send and receive e-mail whilst 13 (3.7%), (9 (3.7) from UCC and 4 (3.6%) from UEW) , neither agreed nor disagreed that they use their mobile devices to send or receive e-mail. Four (1.1%) and 7 (1.9%) respondents from UEW and UCC disagreed and strongly disagreed respectively that they used their mobile devices to send and receive email. The analysis shows that the majority of respondents from both universities agree that they can use their mobile devices to send and receive email.

4.4.7 Respondents’ ability to use mobile devices to search for and download online academic information related to studies

In order to find out if respondents could use mobile devices to search and download academic related information for studies, the researcher sought data from the respondents in that regard.

Table 4.16 shows data on how respondents agreed or disagreed that they can use their mobile devices to search for and download academic related information:

Table 4. 15: I use my mobile device to search for and download online academic related information

Institution	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
UCC	4 (1.6)	8 (3.3)	3 (1.2)	73 (29.9)	156 (63.9)	244 (100.0)
UEW	2 (1.8)	2 (1.8)	4 (3.6)	36 (32.1)	68 (60.7)	112 (100.0)
Total	6 (1.7)	10 (2.8)	7 (2.0)	109 (30.6)	224 (62.9)	356 (100.0)

**Percentage in brackets*

Source: Field data, 2019

In Table 4.15, 224 (62.9%) out of 356 respondents, (156 (63.9%) from UCC and 68 (60.7%) from UEW) , strongly agreed that they could use their mobile devices to search for and download academic related information online for their studies. Again, 109 (30.6%) of the

respondents, with 73 (29.9%) from UCC and 36 (32.1%) from UEW, agreed that they could use their mobile devices to search for and download academic related information for their studies whilst 3 (1.2%) respondents from UCC and 4 (3.6%) from UEW took neutral positions. Six (1.7%) respondents from the two institutions strongly disagreed that they used their mobile devices to search for and download academic related information whilst 8 (3.3%) respondents from UCC and 2 (1.8%) from UEW disagreed that they could use their mobile devices to search for and download academic information. The analysis from Table 4.16 revealed that a large percentage of student respondents from UCC and UEW agreed that they could use their mobile devices to search for and download academic related information for studies.

4.4.8 Respondents’ ability to use mobile devices to access social networking sites

The researcher “sought to find’ out from the student respondents their ability to use their mobile devices to access social networking sites such as facebook, blogs, twitter, instagram, youtube etc. The findings are illustrated in Table 4. 16:

Table 4.16: I can use my mobile device to access social network sites (Twitter, instagram, facebook, blogs and youtube)

Institution	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
UCC	6 (2.5)	4 (1.6)	9 (3.7)	75 (30.7)	150 (61.5)	244 (100.0)
UEW	2 (1.8)	1 (0.9)	4 (3.6)	38 (33.9)	67 (59.8)	112 (100.0)
Total	8 (2.3)	5 (1.4)	13 (3.7)	113 (31.7)	217 (60.9)	356 (100.0)

Source: Field data, 2019

With regard to whether respondents could use their mobile devices to access social network sites, a significant proportion of 217 (60.9%) respondents from both institution strongly agreed that

they used their mobile devices to access social networking sites, 113 (31.7%) of the respondents agreed that they can access social networking sites with their mobile devices. Eight (2.3%) respondents from the two institutions strongly disagreed that they could use their mobile devices to access social network sites, 5 (14%) respondents disagreed. For UCC, 150 (61.5%), and 75 (30.7%) of the respondents strongly agreed and agreed respectively that they could use their mobile devices to access social network sites as against 67 (59.8%) and 38 (33.9%) respondents in UEW respectively. Neutral responses were 13 (3.7%) from both institutions.

4.4. 9 Summary

In summary, majority of the respondents agreed to the statements about proficiency with regards to use of mobile devices. Majority of them, 335 (94.0%) own smartphones, 102 (29%) have tablets, 100 (28%) owns regular phones, 58 (16%) have PDA's and 52 (15%) were in possession of E-book readers. The analysis further shows that respondents own either one or more than one mobile device. The use of mobile devices to access the internet was very common among students (98.6% of students) , with 327 (91.9%) of them doing so daily. The primary reason students use mobile devices in school was for educational purposes [213 (59.8%)] . Furthermore, an impressive average of 95.5% of respondents indicated that they are proficient with the use of mobile devices. Three hundred and thirty- three (93.6%) of respondents agreed that they can use their mobile devices to send or receive messages, 332 (93.3%) indicated their agreement to the use of their mobile devices for sending or receiving email. Most respondents 330 (92.6%) agreed to the use of their mobile devices for social networking purposes. The respondents' ability to use mobile devices to search for academic information and download them for studies was rampant among students. Three hundred and thirty- three (93.5%) agreed to this. It is, accordingly, observed that students from the two universities were proficient with the use of mobile devices.

4.5 Library services that can be delivered via Mobile Technology Platforms

One of the objectives of the study was to identify library services that can be delivered on mobile technology platforms at the selected libraries. Having a clear knowledge of the Library services that students want to access on mobile platforms is vital in designing mobile technology based library services that would be patronized.

As indicated by Searcher (2010) and Paterson and Low (2011), library services that can be delivered on mobile technology platforms are library services that can make use of smart phones and other mobile devices such as computer tablets, cell phones, e-book readers and PDA's. They include services such as mobile online public access catalog (MOPAC), mobile e-journal, mobile databases, short messaging services (SMS) for reference services, mobile collections (e-books, audio materials), social media services, mobile digitized thesis and mobile library tour/instructions (Kroski, 2008; Hung & Chanlin, 2015; Ghosh, 2016).

With choices of MOPAC (mobile online public access catalog), book reservations and renewal services, mobile e-books collections, mobile library text messages or short SMS and email services, mobile e-journal and databases, mobile reference services, study room reservations, social networking services, mobile audio visual materials, mobile digitized theses and dissertations, mobile alerts on list of new library materials arrivals and mobile library instructional guides and virtual tours, respondents were asked to indicate if they would be interested in these services to be delivered on mobile technology platforms or they would not be interested.

4.5.1 Mobile Online Public Access Catalogue (MOPAC)

The responses received in relation to whether respondents would be interested or not in MOPAC are presented in Table 4.17:

Table 4. 17: Mobile Online Public Access Catalogue (MOPAC)

Institution	Interested	Not Interested	Total
	N (%)	N (%)	N (%)
UCC	189 (77.5)	55 (22.5)	244 (100.0)
UEW	91 (81.3)	21 (18.8)	112 (100.0)
Total	280 (78.7)	76 (21.3)	356 (100.0)

Source: Field data, 2019

From Table 4.17, 280 (78.7%) of the respondents indicated that they would be interested in accessing their library's catalogue on their mobile devices as against 76 (21.3) who indicated that they would not be interested. Comparatively, those who indicated that they would be interested in such services at the institutional level were UCC, 189 (77.5%) and UEW, 91 (81.3%). The total respondents from UCC and UEW who indicated they would not be interested were 55 (22.5%) and 21 (18.8%) respectively. On the whole, more than half of the respondents revealed that they would be interested in using their mobile devices to access the library catalogue if they are provided by the library.

4.5.2 Mobile Library text messages or short SMS and email services

Respondents were asked to indicate whether they would be interested in using their mobile devices to access library text messaging services or email services and the findings are shown in Table 4.18:

Table 4. 18: Mobile Library text messages or short messaging service (SMS) / Email Services

Institution	Interested	Not Interested	Total
	N (%)	N (%)	N (%)
UCC	191 (78.3)	53 (21.7)	244 (100.0)
UEW	83 (74.1)	29 (25.9)	112 (100.0)
Total	274 (77.0)	82 (23.0)	356 (100.0)

**Percentage in brackets*

Source: Field data, 2019

As shown in Table 4.18, most respondents, 274 (77%) from both universities declared that they would be interested in library text messaging (SMS) or email services. Despite this huge number, 82 (23.0%) of the respondents from the two universities had contrary opinion and indicated that they would not be interested in a service of that nature. Analyzing the responses at the university level, 191 (78.3%) and 53 (21.7%) respondents from UCC as against 83 (74.1%) and 29 (25.9%) respondents from UEW indicated that they would be interested and not interested, respectively, in library mobile SMS/Email services . It is obvious from the analysis that a large number of respondents from both universities would be interested to use library SMS/Email services if they are offered on mobile technology platforms.

4.5.3 Mobile Reference Enquiry Services (including live chat with the librarian remotely for assistance)

The use of mobile technology has become a powerful way to provide reference enquiry services and rapidly share library collections and services with remote library users. Student respondents used for the study were, therefore asked, to indicate whether they would be interested in mobile technology- based library reference enquiry services or they would not be interested. The study established respondents' responses as illustrated in Table 4.19:

Table 4.19: Mobile Reference Enquiry services (including live chat with librarians remotely for assistance)

Institution	Interested	Not Interested	Total
	N (%)	N (%)	N (%)
UCC	209 (85.7)	35 (14.3)	244 (100.0)
UEW	92 (82.1)	20 (17.9)	112 (100.0)
Total	301 (84.6)	55 (15.4)	356 (100.0)

Source: Field data, 2019

The results in Table 4.19, disclosed that a significant majority of 301 (84.6) students respondents indicated that they would be interested in mobile technology based library reference enquiry services. However, 55 (15.4%) respondents from both UCC and UEW took a divergent position and indicated that they would not be interested in that service. The results further disclosed that 209 (85.7%) of the respondents at UCC were interested in mobile technology based library reference service as opposed to 92 (82.1%) from UEW. Thirty five (14.3%) respondents from UCC were of the opinion that they would not be interested in a library service of that nature whilst those who shared the same view from UEW were 20 (17.9%).

4.5.4 Mobile Electronic Books Collections

The researcher wanted to find out if respondents would be interested in mobile versions of electronic books or not. The information in Table 4.20 presents respondents' feedback on whether they would be interested or not interested in mobile e-books collections:

Table 4.20: Mobile E-book collections

Institution	Interested	Not Interested	Total
	N (%)	N (%)	N (%)
UCC	216 (88.5)	28 (11.5)	244 (100.0)
UEW	93 (83.0)	19 (17.0)	112 (100.0)
Total	309 (86.8)	47 (13.2)	356 (100.0)

Source: Field data, 2019

On mobile e-books collection, 309 (86.8%) of the respondents from the two universities indicated that they would be interested in mobile e-books collections if they are offered on mobile technology platforms by their respective university libraries. Surprisingly, out of the total number of 356 students who were used for the study, just 47 (13.2%) took a different position and declared that they would not be interested in mobile e-books collection if they are offered on mobile technology platforms. In comparative terms, 216 (88.5%) of the respondents from UCC revealed that they would be interested in mobile e-books collections if such services are to be delivered by their library as opposed to 93 (83.0%) from UEW.

Respondents who declared they would not interested in e-books being offered on mobile technology platforms by their libraries, at the institutional level stood at 28 (11.5%) for UCC and 19 (17.0%) for UEW. On total average, the majority of the respondents indicated that they would be interested in mobile e-books if they are to be delivered on mobile platforms by their universities.

4.5.5 Mobile academic databases and e-journals

An increasing number of publishers and academic libraries are designing mobile versions of their web pages and creating digital contents of collections that can be accessed on mobile devices platforms on the go. Through the study, the researcher asked the respondents to indicate whether they would be interested in mobile e-journals and academic databases or basically search mobile academic databases /e-journals for scholarly information. The data analysis of this type of information is depicted in Table 4.21:

Table 4. 21: Mobile academic databases/e-journals

Institution	Interested	Not Interested	Total
	N (%)	N (%)	N (%)
UCC	222 (91.0)	22 (9.0)	244 (100.0)
UEW	105 (93.8)	7 (6.3)	112 (100.0)
Total	327 (91.9)	29 (8.1)	356 (100.0)

**Percentage in brackets*

Source: Field data, 2019

Table 4.21 indicates that 327 (91.9%) of the respondents from both universities responded that they would be interested in mobile versions of academic databases and e-journals whilst 29 (2.9%) revealed that they would not be interested in a service of that nature. The results further showed that, per university analysis, there were 222 (91.0%) respondents from UCC with affirmative response that they would be interested in mobile versions of academic databases and e- journals, as compared to 105 (93.8%) respondents from UEW. Twenty- two (9.0%) respondents and 7 (6.3%) from UCC and UEW respectively, indicated they would not be interested in mobile versions of academic databases and e-journals if they are provided by their libraries.

Cumulatively, it was noticeable that a large segment of the student respondents were interested in having mobile versions of academic databases and e-journals provided by their libraries.

4.5.6 Mobile Digitized Dissertations and Thesis

Academic libraries allow their users to have access to their institutional repository contents. These include in-house institutional students' thesis, dissertations and projects works which are stored in the universities' local repository. The researcher wanted to find out if respondents would be interested in having mobile version of the contents of some of these digitized thesis and dissertations accessible on their mobile devices. The findings on this are presented in 4.22 below:

Table 4.22: Mobile Digitized project/dissertation/thesis

Institution	Interested	Not Interested	Total
	N (%)	N (%)	N (%)
UCC	216 (88.5)	28 (11.5)	244 (100.0)
UEW	96 (85.7)	16 (14.3)	112 (100.0)
Total	312 (87.6)	44 (12.4)	356 (100.0)

**Percentage in brackets*

Source: Field data, 2019

From Table 4.22, it shows that when it comes to mobile digitized thesis and dissertations, 312 (87.6%) of the respondents were interested and would want their university library to provide the service on mobile technology platforms, as compared to 44 (12.4%) who were not interested. A higher percentage of students' respondents from UCC 216 (88.6%) were interested as compared to 96 (85.7%) from UEW. Twenty-eight 28 (11.5%) respondents from UCC and 16 (14.3%) respondents from UEW indicated that they would not be interested if their university libraries should provide mobile versions of institutional thesis and dissertations. On the whole, a huge number of the respondents showed interest in having mobile technology based library service of that nature.

4.5.7 Book Reservations and Renewal of Borrowed Books

The aim of the researcher was to find out if respondents would be interested in their libraries providing a mobile technology based service that allows them to remotely make reservations for specific books they want to borrow and at the same time be able to use mobile technology to renew the due dates of borrowed library materials. The findings are presented in Table 4.23:

Table 4. 23: Mobile Book reservations /Renew Borrowed library books

Institution	Interested	Not Interested	Total
	N (%)	N (%)	N (%)
UCC	176 (72.1)	68 (27.9)	244 (100.0)
UEW	82 (73.2)	30 (26.8)	112 (100.0)
Total	258 (72.5)	98 (27.5)	356 (100.0)

**Percentage in brackets*

Source: Field data, 2019

With regard to Table 4.23, 258 (72.5%) of UCC respondents and UEW respondents expressed that they would be interested in using their mobile devices and mobile technology in making book reservations and renewing borrowed books from their libraries if the service is provided by their library. However, 98 (27.5%) of the respondents indicated that they would not be interested in that service. In comparison, of the positive responses, 176 (72.1%) were from UCC and 82 (73.2%) were from UEW. On the other hand, 68 (27.9%) and 30 (26.8%) of respondents who were not interested came from UCC and UEW respectively. It was clear from the analysis that the majority of the student respondents expressed interest in a mobile technology library service that would enable them to remotely borrow and renew library materials.

4.5.8 Mobile Library Instructional Guides and Virtual Tours

Mobile technologies are being adopted in academic libraries to offer instructions, orientations and virtual tour for library patrons. According to Margam and Dar (2017), librarians in academic libraries are carving and disseminating instructions on the usage of library resources in audio and video formats that are accessible on mobile devices. In addition, mobile library virtual tour and instructions are new innovative ways of guiding remote users to effectively appreciate and use the resources and services of a library. The researcher aimed to discover if the respondents would

be interested in mobile library instructional guides and virtual tours if they are to be provided by their university library or they would not be interested. Table 4.24 highlights the respondents' responses with regard to this:

Table 4.24: Mobile Library instructional guides and virtual tours

Institution	Interested	Not Interested	Total
	N (%)	N (%)	N (%)
UCC	187 (76.6)	57 (23.4)	244 (100.0)
UEW	87 (77.7)	25 (22.3)	112 (100.0)
Total	274 (77.0)	82 (23.0)	356 (100.0)

**Percentage in brackets*

Source: Field data, 2019

As shown in Table 4.24, out of the 356 respondents, 274 (77.0%) indicated that they would be interested in mobile library instructional guides and virtual tour, with 187 (76.6%) respondents from UCC and 87 (77.7%) from UEW. Again, 82 (23.0%) out of the 356 revealed that they would not be interested in that service. At the institutional level, more respondents in UCC 57 (23.4%) were not interested in this type of service, as against 25 (22.3%) in UEW. On a whole, the analysis shows that the majority of the respondents from the two universities showed that they would be interested to use mobile library instructional guides and virtual tour service if they are provided by their university.

4.5.9 Mobile Social Networking Services (library facebook updates, twitter feeds, podcast, blogs etc)

Mobile technology- based social media library services provide an avenue for academic libraries to devise and offer varied innovative services and information for their user community and stimulate them to share research ideas and knowledge (Casey & Savastinuk, 2006; Penzhorn & Pienaar, 2009; Mahmood and Richardson, 2011). They include library blogs, wikis, social networking sites and podcast. With this in mind, the researcher asked the respondents to state

whether they would be interested in accessing social network based library services on mobile technology platforms. Table 4 .25 presents the responses of the respondents:

Table 4.25: Social Networking (library facebook updates, twitter feeds, podcast, library News, Events and Blogs)

Institution	Interested	Not Interested	Total
	N (%)	N (%)	N (%)
UCC	180 (73.8)	64 (26.2)	244 (100.0)
UEW	84 (75.0)	28 (25.0)	112 (100.0)
Total	264 (74.2)	92 (25.8)	356 (100.0)

**Percentage in brackets*

Source: Field data, 2019

It was observed from the findings in Table 4.25 that 264 (74.2%) of the respondents from the two universities indicated that they would be interested in mobile technology- based social networking library services, provided they are delivered by their libraries. Contrarily, 92 (25.8%) of the respondents used for the study indicated otherwise that they would not be interested in that library service if they are to be offered on mobile technology platform.

On the basis of institutional comparison, 180 (73.8%) respondents from UCC indicated they would be interested as opposed to 84 (75.0%) from UEW. Sixty- four (26.2%) and 28 (25.0%) of the respondents from UCC and UEW, respectively, said they would not be interested in that service. The analysis shows that a greater percentage of the respondents used for the study indicated that they would be interested in mobile technology -based social networking library services provided they are delivered by their libraries.

4.5.11 Summary

In order of preference, the top most library services to be on mobile technology platforms that were of interest to the respondents based on ranked percentages include; mobile e-journals and academic databases (91.9%), mobile digitized thesis and dissertations (87.6%), mobile electronic books collections (86.8%), mobile reference enquiry services (84.6%), mobile online public access catalogue (78.7%), mobile library instructional guides and tours (77.0%), mobile library text messages or email services (77.0%) and mobile technology based social media services (74.2%).

4.6 Students Willingness to Use Mobile Technology- Based Library Services

In developing mobile applications for mobile technology based library services it is important to consider the perspectives of the users and examine their willingness to use the service. Therefore, as part of the objectives of the study, the researcher also sought to examine the willingness of students to use mobile technology based library services. To gain answers to students' willingness to use mobile technology based library services, the respondents were asked to choose answers from options on a five-point Likert scale to a series of questions.

4.6.1 Respondents' willingness to Access Mobile Technology- Based Library Services from Anywhere, Anytime

The researcher asked the respondents to indicate the level of willingness ranging from strongly agree to strongly disagree whether that they will access mobile technology based library services from anywhere, anytime. The results are presented in Table 4.26:

Table 4.26: I am willing to access mobile technology based library services from anywhere, anytime

Institution	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
UCC	9 (3.7)	4 (1.6)	10 (4.1)	123 (50.4)	98 (40.2)	244 (100.0)
UEW	2 (1.8)	9 (8.0)	4 (3.6)	49 (43.8)	48 (42.9)	112 (100.0)
Total	11 (3.1)	13 (3.7)	14 (3.9)	172 (48.3)	146 (41.0)	356 (100.0)

**Percentage in brackets*

Source: Field data, 2019

From Table 4.26, it can be confirmed that the majority of respondents, 318 (89.3%), from the two universities “strongly agreed” and “agreed” that they are willing to access mobile technology- based library services from anywhere and at any time with the components of responses being 172 (48.3%) for agreed and 146 (41.0%) for strongly agreed. However, 24 (6.8%) of the respondents from both universities “strongly disagreed” and “disagreed” that are willing to access mobile technology based library services from anywhere, anytime. Fourteen (3.9%) of the respondents were neutral.

Analysis on university level indicate that 123 (50.2%) of respondents from UCC agreed that they are willing to access mobile technology based library services from anywhere anytime as opposed to 49 (43.8%) from UEW. Respondents who took the strongly agreed position were 98 (40.2%) from UCC as against 48 (42.9%) from UEW. Furthermore, 13 (5.3%) respondents from UCC “strongly disagreed” and “disagreed” as compared to 11 (9.8%) from UEW. In the nutshell majority of the respondents indicated that they are willing to access and use mobile technology-based library services from anywhere, anytime.

4.6.2 Respondents' willingness to Access Mobile Technology- Based library because mobile internet is more reliable

The respondents were asked to indicate if they are willing to access mobile technology based library services because mobile internet is more reliable. Table 4.27 gives the breakdown of their responses:

Table 4. 27: I am willing to use mobile technology-based library services because mobile internet is more reliable

Institution	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
UCC	5 (2.0)	12 (4.9)	27 (11.1)	120 (49.2)	80 (32.8)	244 (100.0)
UEW	5 (4.5)	11 (9.8)	12 (10.7)	57 (50.9)	27 (24.1)	112 (100.0)
Total	10 (2.8)	23 (6.5)	39 (10.9)	177 (49.7)	107 (30.1)	356 (100.0)

**Percentage in brackets*

Source: Field data, 2019

Table 4. 27 shows that 177 (49.7%) of the respondents from UCC and UEW agreed that they are willing to use or access mobile technology- based library services because mobile internet is more reliable. Respondents who indicated affirmative responses that they strongly agreed that they are willing to use mobile technology- based library services because mobile internet is more reliable were 107 (30.1%). On the other hand, 23 (6.5%) out of the total 356 students used for the research had a contrary view and disagreed. In addition, 10 (2.5%) respondents from the two institutions also strongly disagreed. Thirty nine (10.9%) respondents were neutral.

In comparative terms, it is depicted that 82.0% (32.8% strongly agreed and 49.2% agreed) of UCC respondents were willing to access/use mobile technology based library services because mobile internet is more reliable, more so, than UEW (75.0%: 50.9 strongly agreed and 24.1

agreed). Disparately, 6.9% (4.9% disagreed and 2.0% strongly disagreed) of UCC respondents and 14.3% (9.8% disagreed and 4.5% strongly disagreed) of UEW respondents had a contrary opinion. The findings imply that the majority of students from the two universities are willing to use or access mobile technology based library services because mobile internet is more reliable.

4.6.3 Respondents’ willingness to have internet enabled mobile devices in order to enjoy mobile technology based library services

The findings on respondents’ willingness to have internet enabled devices in order to enjoy mobile technology based library services are presented in Table 4.28:

Table 4. 28: I am willing to have internet enabled mobile device in order to enjoy mobile technology based library services

Institution	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
UCC	11 (4.5)	11 (4.5)	27 (11.1)	118 (48.4)	77 (31.6)	244 (100.0)
UEW	1 (0.9)	5 (4.5)	14 (12.5)	50 (44.6)	42 (37.5)	112 (100.0)
Total	12 (3.4)	16 (4.5)	41 (11.5)	168 (47.2)	119 (33.4)	356 (100.0)

**Percentage in brackets*

Source: Field data, 2019

As it can be observed from Table 4.28, substantial percentage of the respondents 47.2% (168) and 33.4% (119) took the agreed and strongly agreed positions and revealed that they are willing to have internet enabled mobile devices in order to enjoy mobile technology based library services if implemented by their university library. Sixteen (4.5%) out of the total respondents disagreed and 12 (2.4%) out of the total respondents strongly disagreed. For UCC, 118 (48.4%) and 77 (31.6%) agreed and strongly agreed that they are willing to have internet enabled mobile devices to enjoy mobile technology based library services as against 50 (44.6%) and 42 (37.5%) respondents in UEW respectively. Again, a small fraction of 11 (4.5%) and 11 (4.5%) of the

respondents in UCC showed that they strongly disagreed and disagreed respectively that they are willing to have internet enabled device to enjoy mobile technology based library services as opposed to 1 (0.9%) and 5(4.5%) respondents in UEW respectively.

4.6.4 Respondents’ willingness to be trained on how to use mobile technology application to search for library resources or services

Respondents were asked if they were willing to be trained on how to use mobile technology application to search for library resources and access library services. The rationale behind this question was to examine if the respondents were willing to use mobile technology based library services should they be implemented by their university library. Table 4.29 discloses responses on respondents’ willingness to be trained on how to use mobile technology application to search for library resources or services:

Table 4. 29: I would like to be trained on how to use mobile technology application to search for library resources/services

Institution	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
UCC	8 (3.3)	10 (4.1)	16 (6.6)	113 (46.3)	97 (39.8)	244 (100.0)
UEW	4 (3.6)	5 (4.5)	7 (6.3)	47 (42.0)	49 (43.8)	112 (100.0)
Total	12 (3.4)	15 (4.2)	23 (6.5)	160 (44.9)	146 (41.0)	356 (100.0)

**Percentage in brackets*

Source: Field data, 2019

With respect to respondents’ willingness to be trained on how to use mobile technology application to search for library resources and access library services, an average total of 306 (85.9%) of the respondents from UCC and UEW “strongly agreed” and “agreed” that they are willing to be trained on how to use mobile technology- based library services, as against 27

(7.6%) who “strongly disagreed” and “disagreed”. Twenty- three (6.5%) were neutral. The results indicate that the respondents from the two tertiary institutions (UEW and UCC) were willing to be trained on how to use mobile technology- based library services.

4.6.5 Respondents’ willingness to access mobile technology based library services as it is user friendly

When asked if respondents were willing to access mobile technology- based library services as it is user friendly, the feedback was encouraging. One hundred and eighty- three (51.4%) of the respondents from UEW and UCC agreed that they were willing to access mobile technology - based library services because of its user friendliness, 114 (32.0%) respondents strongly agreed. Only few respondents 4 (1.1%) and 16 (4.5%) strongly disagreed and disagreed. Comparing responses at institutional level, 125 (51.2%) and 85 (34.8%) respondents from UCC respectively agreed and strongly agreed, as opposed to 58 (51.8%) and 29 (25.9%) from UEW. Generally, it was observed from the findings that a large section of the respondents are willing to access mobile technology- based library services because of its user friendliness and the reason may be due to the fact that it can be accessed wherever there is internet access.

Table 4. 30: I am willing to access mobile technology based library services because of its user friendliness

Institution	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
UCC	3 (1.2)	7 (2.9)	24 (9.8)	125 (51.2)	85 (34.8)	244 (100.0)
UEW	1 (0.9)	9 (8.0)	15 (13.4)	58 (51.8)	29 (25.9)	112 (100.0)
Total	4 (1.1)	16 (4.5)	39 (11.0)	183 (51.4)	114 (32.0)	356 (100.0)

**Percentage in brackets*

Source: Field data, 2019

4.6.6 Respondents’ willingness to access mobile technology- based library services because it has the capability to reach both regular and distance students or library users

In an attempt to discover students’ willingness towards the use of mobile technology based library services, they were asked to indicate whether they were in agreement or disagreement that they are willing to access mobile technology- based library services because it has the capability to reach remote library users. The data on this is statement is presented in Table 4.31:

Table 4.31: I am willing to access mobile technology based library services because it has the capability to reach both regular and distance students or remote library users

Institution	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
UCC	3 (1.2)	3 (1.2)	15 (6.1)	117 (48.0)	106 (43.4)	244 (100.0)
UEW	1 (0.9)	4 (3.6)	6 (5.4)	41 (36.6)	60 (53.6)	112 (100.0)
Total	4 (1.1)	7 (2.0)	21 (5.9)	158 (44.4)	166 (46.6)	356 (100.0)

Source: Field data, 2019

Table 4.31 reveals that 158 (44.4%) of the respondents from the two universities agreed that they were willing to access mobile technology based library services because it has the capability to reach remote library users (both regular and distance students), 166 (46.6%) respondents strongly agreed whilst 7 (2.0%) and 4 (1.1%) took a divergent view and indicated that they disagree and strongly disagree that they were willing to access mobile technology- based library services because it has the capability to reach both regular and distance students. In addition, 21 (5.9%) of the respondents were neutral. The results implies that majority of respondents from UCC and UEW were willing to access mobile technology based library services because they believe it has the capability to give opportunity to remote library users to access library resources and services.

4.6.7 Summary

Cumulatively, respondents agreed to the statements about willingness to use mobile technology-based library services with magnificent average percentage of 325 (89.3%) of the respondents indicating that they would access mobile technology-based library services from anywhere and anytime, 284 (79.8%) demonstrated that they would access mobile technology library services because mobile internet is more reliable. Two hundred and eighty-seven (80.6%) of the respondents agreed that they would invest in acquiring the requisite mobile devices needed to access mobile technology-based library services. 306 (85.9%) of respondents agreed that they would want to be trained on how to use mobile applications to access library services. Similarly, the majority of the respondents, 297 (83.4%) , agreed that they will use Mobile Technology Library Services because they are user-friendly. The percentage of respondents who agreed that they were willing to use such services because they are accessible to both regular and distance students was 324 (91%). It is, therefore, concluded that students from the two universities have willingness to use mobile technology- based library services if their libraries are to implement it.

4.7 Interview with library management and principal IT staff from the two selected academic libraries

After analyzing the quantitative data from the student respondents, the researcher sought for more insight into the research topic by conducting face to face interviews with five purposively selected staff from each of the academic libraries. The researcher ensured that the participants were well informed about the objective of the interview and that the environment was ideal for the interview activity. In order to ensure anonymity, personal data that didn't have any effects on the outcome of the interview were not recorded. The responses from the interviewees were recorded, transcribed and interpreted on the thematic patterns in line with the objectives of the

study. The responses were also cross- checked with the notes the researcher took during the interview to ensure conformity.

The first section of the interview focused on eliciting responses on socio-demographic characteristics of the participants which looked at the gender, age range, level of education, job title and number of years of service (tenure). The second part of the interview looked at the objectives of the study.

1. Awareness and appreciation for the use of mobile technology based library services
2. Preparedness of library management towards the adoption of mobile technology based library services
3. Library services that can be delivered via mobile technology platforms
4. Training and skills of the staff for the adoption and implementation of mobile technology based library services
5. Challenges associated with the adoption and implementation of mobile technology based library services

The qualitative data was analysed thematically under the following sections with respect to the objectives of the study. The Section 4.9 looked at the socio-demographic characteristics of the interviewees', Section 4.10 , focused on the level of awareness and appreciation for the use of mobile technology-based library services, followed by Section 4.11 which was on assessing the preparedness of library management towards the adoption and implementation of mobile technology- based library services. Subsequently, Section 4.12 concentrated on the library services that can be delivered via mobile technology platforms, Section 4.13 presented interviewees' responses on training and skills of the staff for the adoption and implementation of

mobile technology-based library services and lastly Section 4.14 looked at challenges associated with the adoption and implementation of mobile technology- based library services.

4.8 Socio-Demographic Characteristics of the respondents

The background demography of respondents were obtained from the first part of the interview. The data generated in that part basically covered gender, age range, level of education, job title and number of years of service (tenure). The following members of management of the University of Cape Coast Library were interviewed: The University Librarian, the Head of Library IT Infrastructure and Support, the Digital Librarian, the Systems Librarian and the Clients Services Librarian. The response rate from the University of Cape Coast library was therefore 100%. In the University of Education, Winneba, the following members of management of the Library were interviewed: The University Librarian, the Systems Librarian, the Head of IT Infrastructure and Support and the Clients Services Librarian. The response rate was 80%.

The University of Cape Coast has the Sam Jonah Library as its main academic Library while the University of Education, Winneba has the Osagyefo Library as its main academic Library. In terms of age of the respondents, 5 fell within '31-40' age range, followed by age range '41-50' with 3 and age range '30 and below' with 1. The age distribution of Sam Jonah library, UCC were evenly spread with 2 within age '31-40' and age '41-50' with 2. There was 1 person within the age range of '30 and below' from Sam Jonah library, UCC. In Osagyefo library, UEW, 3 of the respondents fell in the age range '31-40', followed by age '41-50' with 1.

With regards to level of education, 2 of the interviewees with 1 from Osagyefo library, UEW and 1 from Sam Jonah Library, UCC held the Master of Philosophy degree in information

technology and information studies. In terms of Master of Science degree in information technology we had 3 respondents that is 2 from Sam Jonah library, UCC and 1 person from Osagyefo library, UEW. There were 2 Doctor of Philosophy holders one from each of the selected academic libraries. In likewise manner, 2 of the interviewees from the two selected academic libraries held Master of Arts degree in library and information studies. It was noted that all the respondents had the requisite qualifications for their positions.

The researcher also inquired into the numbers of years the interviewees have served within their respective libraries. Out from the total of 9 interviewees who were used for the study, 8 of them had served for 15 years and above with only one interviewee from Sam Jonah library, UCC serving below 15 years. This suggests that the majority of the interviewees have experience with regard to knowledge in technological transformations in the academic libraries landscape.

4.9 The Level of Awareness and Appreciation for the use of Mobile Technology-Based library Services

One of the objectives of the study was to assess the level of awareness and appreciation for the use of mobile technology based library services. The researcher asked the respondents some questions with regards to the level of awareness and appreciation for the use of mobile technology based library services at the libraries.

4.9.1 Understanding the concept of Mobile Technology Based Library Services

Understanding the concept of mobile technology based library services is a key stride towards appreciating and implementing the innovation in academic libraries. For the researcher to know the participants' level of understanding concerning mobile technology- based library services, they were asked to explain the concept briefly in their own words.

Sam Jonah library, UCC Interviewee 1:

“My understanding of mobile technology based library services is that, it is an aspect of library services delivery which is not physical this time around but it is mobile technology and you know we have a lot of mobile technology; internet enabled mobile devices which are used for communication and so to what extent can it be used to also render library services. That is the general overview that I have about mobile technology based library services”

Sam Jonah library, UCC Interviewee 2:

“It is the use of mobile devices or mobile technology to provide library services to users”

Sam Jonah library, UCC Interviewee 3:

“Basically mobile technology based library services is one that allow users to access library services remotely with mobile devices; so, these devices will aid the users to access library services remotely without necessarily coming to the library”

Sam Jonah library, UCC Interviewee 4:

“Mobile technology-based library services include smart alert services, instant messaging for reference services, the possibility of suggesting a purchase, library and instructions and virtual tours, MOPAC, otherwise known as mobile MOPAC and others”

Sam Jonah library, UCC Interviewee 5:

“It is the use of mobile devices or mobile technology to provide library services to remote users”

Osagyefo Library, UEW Interviewee 1:

“When we talk about mobile technology based library services it is the application of mobile services or mobile application in terms of information and dissemination for improvement in library services”

Osagyefo Library, UEW Interviewee 2:

“It is usage of mobile devices as a mean to facilitate the activities or anything that is actually taking place in the library”

Osagyefo Library, UEW Interviewee 3:

“The use of mobile application services to run library services. You know our current library system is moving away from a traditional way of doing things”

Osagyefo Library, UEW Interviewee 4:

“My understanding of mobile technology based library services is the use of mobile devices like smart phones, tablets/iPod in accessing or providing library services”

The results indicated that respondents from Sam Jonah library, UCC and Osageyfo library, UEW had a high level of understanding and appreciation of the concept of mobile technology based library services. Their responses were exact, apt and relevant.

4.9.2 Level of staff Awareness for the Use of Mobile Technology Based Library Services

This sub-section sought to ascertain the perspective of the respondents on the level of staff awareness for the use of mobile technology- based library services in their institution. The followings were their responses:

Sam Jonah library, UCC Interviewee 1:

“Awareness, yes I will say that to some extent staff are aware in the same way as mobile operations enhancing other services in other sectors. I am very sure that they are aware that or it is used to render library services. Their awareness is extremely high”.

Sam Jonah library, UCC Interviewee 2:

“So let me start by saying that in 2009, a research was done at the University of Cape Coast and it shows that almost 90% of the students were using mobile technology services to aid their academic work; that’s about 9 years ago. It tells you that if students are that exposed to such technology, then its evidence to tell you that the staff too must be aware of a system like that. So, I would say that the level of awareness is so high within the library”.

Sam Jonah library, UCC Interviewee 3:

“With staff awareness on the knowledge about mobile technology based library services I would say 50:50. “Okay if I’m grading it on a scale of one to ten, I would say about 5 (50%). That is about half of the staff have knowledge about it”.

Sam Jonah library, UCC Interviewee 4:

“Extremely high knowledgeable about it. Infact majority of the staff are aware that libraries elsewhere in the advanced countries have such services”.

Sam Jonah library, UCC Interviewee 5:

“On a percentage wise I will rate staff awareness for the use of mobile technology based library services as above 85 percent”.

Osagyefo Library, UEW Interviewee 1:

“They might be aware, but because there had not been any official way of introducing it into the system, people are very skeptical about it”. Either way every staff uses some sort of mobile device”.

Osagyefo Library, UEW Interviewee 2:

“It is very minimal, if not nil. Staffs are not really aware of such technology in the library probably because it has not been implemented. Although I strongly believe they have been using mobile technology in other areas of their life”.

Osagyefo Library, UEW Interviewee 3:

“Yes some of the staff are aware especially those within the IT units of the library. They are more enthusiastic when it comes to technology of such nature”

The respondents averagely rated the level of staff awareness for the use of mobile technology based library services as above 85 percent; one respondents said about 90%, another said 85% and third respondent said extremely high knowledgeable.

Management is of the view that the non-management staff of the libraries, in general, have some level of awareness of the technology. However, since there has not been a conscious effort to sensitize the staff in the two academic libraries on the benefits of the technology, there might be some level of scepticism towards it, especially, among the non-IT staff. On the whole, the results suggested that majority of the staff are aware of mobile technology -based library services.

4.9.3 Patronage level by students and other users for mobile technology -based library services should it be implemented

When management staff were asked to assess the level of patronage by students and other users should mobile technology services be deployed, they indicated that patronage would be very high. These were their responses;

Sam Jonah library, UCC Interviewee 1:

“Students will love to patronize. I am speaking like a student; anyway, I am a student too. It will make studies very easy if I can get access to services I want in my dorm, in my hostel and even in my house, so students will patronize it very well”.

“In terms of other users, they will be very glad. I think they will be our highest users because it will enable them have access to materials and services they need to, not only prepare their lecture notes”.

Sam Jonah library, UCC Interviewee 2:

“They will patronize it very well. Not only to access the services but to take on their responsibilities as well”.

Sam Jonah library, UCC Interviewee 3:

“I think it would be high just like the staff; the students are also using the mobile devices for other services in other sectors of their life so if it is also applied into library services it would be highly patronized”.

Sam Jonah library, UCC Interviewee 4:

“It would be highly patronized”

“In terms of other users like faculties, lecturers or any external users, it will also be high”

Sam Jonah library, UCC Interviewee 5:

“Very high”

Osagyefo Library, UEW Interviewee 1:

“In relating to the patronage I will say if the mobile technology based library services is implemented, academic library users that is students and other users within the university community will make maximum use of them because of the convenience of such technology”

Osagyefo Library, UEW Interviewee 2:

“Once it is a library service that you can just access anywhere with your mobile device it will be highly welcome by our students and other users. In the sense that in any place you could have access to information from your library without need of coming to the library”.

Osagyefo Library, UEW Interviewee 3:

“Yes they will. This is because, everything that we do, you have to try and plan and planning as I said you need to orient the users. Let them know that it is now part of them and they cannot do away of them. If you let them know that it is not option but now part of our services they will use it all the time”.

Osagyefo Library, UEW Interviewee 4:

“They will patronize it. I have no doubt about that. Our current users are now more digital inclined and technologically abreast with new innovation”

Some of the reasons respondents from both academic libraries gave for this assessment are:

1. The use of smartphones among students is pervasive and they are using them to access services in other areas of their lives such as registration for course work and banking.
2. The majority of students are youthful, technologically savvy and have the greater propensity to adopt new technology than the general population.
3. Since mobile technology use is pervasive among students, libraries can offer some of their services solely on mobile platforms.

4.9.4 Implementation of mobile technology-based library services and how it will help in service delivery in the library

The respondents were of the views that, the implementation of mobile technology library services will help improve library service provision in many ways. Some of these are as follows:

1. It will bring convenience to both students and staff. Students can have fast access to library information from anywhere and library staff can serve many users quickly.
2. It will reduce the dependence on physical books since students will have access to e-books. This will bring cost savings as a smaller number of physical books have to be procured.
3. It will promote scalability. The move to mobile technology library services will mean less reliance on physical library resources. Electronic library resources require less space to store than physical resources hence, the current available space can be used to host more resources

It was observed from the analysis that the management of the two libraries had a good level of awareness of the current trends in librarianship including developments in the use of mobile technology for library services. They expressed enthusiasms towards the technology; and in the words of one management staff of the University of Cape Coast, “*It is an essential service*”. All management staff unanimously expressed their desire to have this technology deployed in their libraries.

4.10 Preparedness of library management towards the adoption and implementation of mobile technology-based library services

One of the objectives of the study was to assess the preparedness of management of libraries in the University of Cape Coast and the University of Education, Winneba towards the adoption of Mobile Technology Based Library services. The researcher was interested in discovering the capacity of management members to manage the implementation of mobile technology based library services, the compatibility of the technology innovation with the current technology

services, availability of personnel with requisite skills for the innovation, availability of infrastructure and budgetary and financial commitment.

Interviewees were asked questions in relation to the above objective to elicit data to assess the preparedness of library management towards the adoption of mobile technology-based library services.

4.10.1 Compatibility of mobile technology based library service with existing library services

When asked whether mobile technology based library services was compatible with the existing library services they indicated that they were highly compatible. They said that the university has sufficient environment to adopt any technological innovation. The individual responses were as follows:

Sam Jonah library, UCC Interviewee 1:

“They are. Almost all, currently almost all the systems we’re running are mobile compatible only that we are need to put the right systems in place. We are trying to create our website to fit into the mobile device size, our ‘catalogue’ same, our ‘institutional repository’ same and so almost everything we are having now can easily fit in if we are supposed to change any to mobile contents’

Sam Jonah library, UCC Interviewee 2:

“As it stand now the services that we render and transferring them or doing that via mobile platforms are not going to face any issue with compatibility. There isn’t going to be any conflict of transferring whatever we are doing in the manual to the electronic mean and even to the electronic means via mobile devices”

Sam Jonah library, UCC Interviewee 3:

“If you look at the fact that we want to improve our presence on social media and the fact that a lot of people access social media via mobile devices then you can say that there is that kind of synergy or compatibility in that aspect”

Sam Jonah library, UCC Interviewee 4:

“The library has a website which can be assessed on mobile devices to some extent though had not been specially designed to be rendered on these devices. I should say when we are ready to transfer our contents to fits on mobile devices we wouldn’t have issues with compatibility”.

Sam Jonah library, UCC Interviewee 5:

“There are still some contents that are not compatible”.

Osagyefo Library, UEW Interviewee 1:

“Yes it is. Nowadays traditional library services is fading away and emerging technologies like mobile technology that you are working on is very good. As libraries we have made strides in terms of digital contents and I think our services can easily be converted to mobile versions with the right systems in place”.

Osagyefo Library, UEW Interviewee 2:

“Mobile technology based library services would be compatible with the existing electronic library services; E-journals, e-reference, would be very much compatible with mobile technology systems”.

Osagyefo Library, UEW Interviewee 3:

“I can say that our systems and services are very much compatible with mobile technology system”

Osagyefo Library, UEW Interviewee 4:

‘Though we have not implemented mobile technology based library services yet, but with the existing technology we have and what we expect to do in the future it very compatible’.

4.10.2 Management preparedness in terms of enough trained personnel with the requisite skill for mobile technology innovation

To have an idea of management preparedness for the implementation of mobile technology-based library services, questions were asked to find out if management have enough trained personnel with the requisite skills for the MT innovation. Their responses were as follows:

Sam Jonah library, UCC Interviewee 1:

“Because technology is changing, knowledge is changing, and to be abreast with technology and knowledge you must to have had those trainings often but it is not being done that way so though personnel are trying to reach the level of technology on their own, with the management not being able to push-up or help the personnel, the knowledge is still not up to the optimal level”.

Sam Jonah library, UCC Interviewee 2:

“Well, we need more IT based people, qualified people which at the moment are not available...”

“Our whole library we have 2 qualified IT people so far in the library and In-house and Out-house training is not something that is done often or it non-existent, I shouldn’t say often”.

Sam Jonah library, UCC Interviewee 3:

“Yes most of the professional staff are capable of using the technology”.

Sam Jonah library, UCC Interviewee 4:

“Yes I think we have and we will also be having such. Why I think so; probably currently the top of our IT personnel in the library may not be able to solve all our IT issues but the university

itself has people who understand the system and we always given a hand. When we don't have immediately, we consult them and they are ready to offer their service to us so it is not a problem and in future too we are expecting to beef up our IT to some level with IT personnel who understand almost all the systems we're running so I feel like now and the future we're prepared too"

Sam Jonah library, UCC Interviewee 5:

"To some extent we have qualified people for such innovation"

Osagyefo Library, UEW Interviewee 1:

"I will say no. we don't have enough trained personnel with IT background to implement the technology". But in the future it possible since management gave scholarship to about three people who went to school to read ICT and they are now back and they are helping with ICT issues"

Osagyefo Library, UEW Interviewee 2:

"Personnel with the requisite are not really enough but there is room for improvement and more training can be organized to build staff capacity to able to manage innovation of such nature".

Osagyefo Library, UEW Interviewee 3:

"The library as a unit we don't have enough trained personnel with IT background for the innovation but we can always rely on the IT personnel's from the university since we have been collaborating with them".

Osagyefo Library, UEW Interviewee 4:

"Management will need to train more staff to build on their capacity to acquire the needed requisite IT skills for mobile technology implementation"

The study found out that both libraries do not have the full skills set needed to adopt mobile technology library platform. Both libraries have very few well-trained IT personnel, and these do not have the specializations required to deploy and manage such platforms.

4.10.3 Library Management preparedness in terms of available space and infrastructure (ICT equipment) required for adoption of mobile technology- based library services

A follow up question was asked about the preparedness of library management in terms of infrastructure (ICT equipment) and available space for the implementation of mobile technology based library services. Here, there were varied responses from respondents from the two libraries.

The study found that the Sam Jonah Library of UCC does not face as much infrastructure constraints as the Osagyefo Library of UEW if they decide to roll out mobile technology based library services. The University of Cape Coast is currently investing in a data centre which will have facilities to support the provision of e-services by the Sam Jonah Library. With additional capital outlay, the Library should be able to roll out mobile technology-based library services successfully.

Infrastructure is more a limiting factor at the Osagyefo library, UEW. The library is lacking in ICT infrastructure such as computers, scanners and servers; and there is no space to house such ICT infrastructure even when they acquire them.

This is what some respondents from Sam Jonah Library, UCC and Osagyefo library, UEW had to say.

Sam Jonah library, UCC Interviewee 2:

“Yes, I think so because currently the phase one of the data centre, they are planning to even have enough redundant storage for almost all sectors for the university which run high data, like the MIS. The library currently runs on a “big data”, with enough ICT infrastructure including high speed servers”.

Sam Jonah library, UCC Interviewee 3:

“Yes, because we are already a hybrid library and we do some of our operations using enough ICT infrastructures and we have available space as well. There is some level of readiness”

Sam Jonah library, UCC Interviewee 5:

“The university’s library has digital initiatives so any technology deployed in the library would have space and infrastructure provided university management yield to and make provision”.

Osagyefo Library, UEW Interviewee 1:

“The university library lacks infrastructure in terms of ICT equipments to the extent that most management members sometimes use their own devices like laptops to work. But I know managements are working harder to provide IT infrastructure like computers, scanner, servers, etc to support the implementation of new technologies just that tendering issues have been delaying the process.”

Osagyefo Library, UEW Interviewee 2:

“We don’t have enough. They are planning to bring more of ICT infrastructure into the system. Truly speaking you know technology always is changing and technology is always making away with space. That is how technology is just to makes things easier for man to live, so I know for sure that as for the library we don’t have space and ICT infrastructure, but when the mobile technology based library services is implemented we would be able to maximize the little space”.

Osagyefo Library, UEW Interviewee 4:

“We can do with what we have even though available ICT infrastructure and space are not enough. But we need such technology, therefore we need to find ways to create space and get more ICT infrastructure to implement the technology”

4.10.4 Preparedness of Management in terms Budget and financial commitment in the Adoption of Mobile Technology Based Library Services

The management of the two libraries believe that the financial resources needed to adopt the technology can be sourced but then the management of their respective Universities must be convinced about the technology. These were some of the views from the respondents;

Sam Jonah library, UCC Interviewee 1:

“Management, I am sure they are willing, but the finances are not available for them to adopt mobile technology”

Sam Jonah library, UCC Interviewee 4:

“ We’re not so much in a position to do so much regarding mobile technology however if the need be, that’s the catch word here; if the need be, we can go and solicit funds because once it will help the library for us to reach our patrons in a very convenient way, we will go ahead and do it”

Sam Jonah library, UCC Interviewee 5:

“Management, I am sure they are willing, but the finances are not available for them to adopt mobile technology”.

Osagyefo Library, UEW Interviewee 1:

“Funding may be available but management must be fully convinced so as to buy the idea for funds to be made available or released during the implementation process or for the sustainability after the implementation”.

Osagyefo Library, UEW Interviewee 3:

“Even though management would fully support the innovation 100% but the system is complex; library department is not autonomous and therefore budget approval has to go through very tough time”.

Osagyefo Library, UEW Interviewee 4:

“In my fair view I can say that financial commitment to library services is not so much encouraging as it supposed to be”.

4.11 Library services that can be delivered on mobile technology platforms

The researcher sought to determine which of the services offered by the libraries can be delivered through mobile platforms. It was found that all the service provision by the libraries can be delivered using mobile technology. However, both libraries do not currently have a single service specifically designed to be delivered through mobile technology though few of the web resources can be accessed through internet-enabled mobile devices. Management of both libraries indicated that there are plans to introduce services using mobile platforms in the future.

Table 4.35 shows services that management of the two libraries plan to introduce on mobile technology platforms in the future:

Table 4.32: Services to be offered on mobile technology platforms

Sam Jonah Library, University of Cape Coast	Osagyefo library, University of Education
<ul style="list-style-type: none"> • Mobile Digital repository (thesis and dissertation) • Mobile Online Public Access Catalogue • Ask a Librarian (Referencing Services) • SMS alert services for new arrivals • Mobile databases and e-journal collections • Selective dissemination of information • Audiovisual services • Mobile instructional guides and tours • Social Media Services 	<ul style="list-style-type: none"> • Ask a Librarian (Referencing) • Social Media Services • SMS awareness creation of new arrivals • Mobile Digital Collections (E-books) • Mobile E-resources • Mobile Online Public Access Catalogue • Mobile instructional guides and tours

Source: Field data, 2019

4.12 Training and skills of the staff for the adoption and implementation of mobile technology-based library services

The study found out that both Libraries had not had any training for their staff for the adoption and implementation of mobile technology-based library services. The respondents from the Sam Jonah Library of the University of Cape Coast bemoaned the lack of the culture of training for the staff with respect to emerging technologies. Hence, though the staff of both libraries are aware of mobile technology-based library services, their understanding of the implementation of the technology is modest at best.

Therefore, staff would require training to become proficient in handling the technology if it is to be introduced, particularly, IT staff who would need to specialize in order to design and implement a delivery system based on the technology. Here were some of the interviewees' views:

Sam Jonah library, UCC Interviewee 1:

“As a librarian, I have never participated in any mobile technology training”

Sam Jonah library, UCC Interviewee 2:

“No, specifically because I haven’t gone to one of the that is probably hands-on but I have been part of a training where these technologies have been mentioned but I haven’t gone to a training program where you are taught how to design mobile app or website for a library service”

Sam Jonah library, UCC Interviewee 3:

“No, there hasn’t been any training like this. The reason being that, we don’t have the system in place now. But I am sure when proper training is organized for staff before and after the implementation process they will be able to assist library users to use such service”.

Sam Jonah library, UCC Interviewee 4:

“Staff of UCC library needs more training before they can proficiently implement and manage mobile technology based library services to help clients. The problem in IT that people don’t get in Ghana here is that you need regular training to be abreast with currents trends but lack of the culture of training is affecting our work”.

Osagyefo Library, UEW Interviewee 1:

“Well I must say that is not enough, yes is not enough. We have a lot of training on other digital initiatives and all that but that is not still enough. The staff needs additional training to be well vest in mobile technology issues to implement and manage it in the library”.

Osagyefo Library, UEW Interviewee 2:

“I think that we still need to train staff further. You know per our job, for that matter technology related job, it is so dynamic and things are changing day in and day out. Therefore management needs to keep on updating the knowledge of the professionals so that they could handle such innovation successfully when it comes on board.”

Osagyefo Library, UEW Interviewee 3:

“No, library staff will need further training on technology of such nature. I am sure when proper training is organized for staff before and after the implementation process they will be able to assist library users to use such service”.

Osagyefo Library, UEW Interviewee 4:

“There hasn’t been any training on mobile technology for staff. The reason being that we don’t have the system in place now”.

4.13 Challenges associated with the adoption and implementation of mobile technology-based library services

The implementation of mobile technology based library services in both libraries will not be without challenges. Having this in mind, respondents were asked to state the challenges they believe will militate against the implementation of the technology. On challenges that can militate against the implementation of mobile technology based library services, respondents’ responses are tabulated below:

Table 4.33: Challenges that can militate against adoption and implementation of mobile technology- based library services.

Sam Jonah Library, University of Cape Coast	Osagyefo Library, University of Education, Winneba
<ul style="list-style-type: none"> • Lack of policy framework for the adoption of the technology • Clearing the hurdle of University Management in accepting to adopt the technology since it will involve an additional capital outlay • Bureaucratic processes dragging or derailing implementation after a decision to adopt the technology • Skills gap. Training required 	<ul style="list-style-type: none"> • Financial constraints • Issue of sustainability • Lack of IT infrastructure • Power fluctuations and intermitted power outages • Bureaucracies in policies regarding technological innovations • Untrained staff • Lack of commitment from staff. • Poor / Inadequate internet bandwidth

Source: Field data, 2019

A follow- up question was asked to seek information from respondents on the measures that can be adopted to cushion against these anticipated challenges that could possibly affect the

implementation of mobile technology-based library services in Sam Jonah Library, UCC and Osagyefo Library,UEW.

The following measures were recommended by respondents to resolve the challenges that will hinder the implementation of mobile technology-based library services in university libraries:

1. Library management must make a very convincing case to University management for the adoption of the technology. Respondents suggested that there should be prior consultation with stakeholders while hatching the plan of mobile technology services delivery. This was about seeking to engage the key players to let them know what the library intend to do and possibly put up the framework for the implementation.
2. Using internally library generated funds to support the running of the technology platform to ensure sustainability
3. Provision of regular training for staff and recruitment of new staff to bridge the skills gap
4. Have stakeholder involvement in the design and implementation of the technology system to ensure a smooth deployment and reduce bureaucracy.
5. Conscientizing students, staff and other users on the need for mobile technology based library services.

CHAPTER FIVE

DISCUSSION OF FINDINGS

5.1 Introduction

The study sought to ascertain how mobile technology-based library services can be adopted and implemented in Academic libraries in Ghana with particular reference to Sam Jonah Library, University of Cape Coast (UCC) and Osagyefo Library, University of Education, Winneba (UEW). Some findings have been made and are discussed in this chapter. The discussion of the findings was based on the objectives of the study. Specifically, the study set out to assess the level of awareness and appreciation for the use of mobile technology- based library services in the above mentioned libraries, assess the preparedness of library management towards the adoption and implementation of mobile technology based library services in academic libraries at the selected universities, to identify the students' proficiency in relation to mobile devices usage, identify the library services that can be delivered on mobile technology platforms at the above mentioned academic libraries, examine the willingness of the students towards the use of mobile technology based library services in the academic libraries at the selected universities, to identify the requisite training and skills of the staff and lastly, to identify challenges that may impede the successful adaptation and implementation of mobile technology based library services in the two libraries. The discussion is presented under the following headings:

- i. Level of awareness and appreciation for the use of mobile technology- based library services.
- ii. Preparedness of library management towards the adoption and implementation of mobile technology -based library services.
- iii. Students' proficiency in relation to mobile devices usage.
- iv. Library services that can be delivered on mobile technology platforms.

- v. Students' willingness towards the use of mobile technology based library services.
- vi. Staff training and skills required for the adoption and implementation of mobile technology based library services.
- vii. Challenges associated with the adoption and implementation of mobile technology based library services.

5. 2 Level of Awareness and Appreciation for the use of Mobile Technology Based Library Services

According to Kumbhar and Pawar (2014), the delivery of library information through mobile technology platforms has gained recognition both in literature and in practice because of its benefits including its interactive capabilities, easy access to information, time saving, personalized services, user participation, as well as limitless access to library resources.

Despite these benefits that the technology brings, the level of awareness and appreciation for its use by both potential users and librarians is an important factor that needs to be considered by the management of academic libraries in deciding whether to deploy and implement these technologies. Zaunbrecher, Kowalewski and Ziefle (2014) argued that with increasing technologies that people are confronted with, the acceptance of those technologies and the extent to which people are eager to appreciate and use these technologies are serious issues and this needs not to be neglected. Awareness plays a key role in the adoption of any innovation (Kotler, 1999).

This study, therefore, assessed the level of awareness and appreciation for the use of mobile technology- based library services among graduate students and library management of the University of Cape Coast and University of Education, Winneba.

5.2.1 Awareness of Mobile Technology Based Library Services

The study revealed that, library management interviewed have a high level of awareness of MT library services and they also indicated that awareness of MT library services among the non-management staff of the two libraries are above average. They, however, stated that although library staff are aware of the value of MT library services in the academic library settings, mobile technology library services have not been implemented yet in their respective libraries. In terms of the graduate student respondents, it was found out that majority of them were aware of MT- based library services and the level of awareness was similar in both Universities. These results resonate with the findings of Washburn (2011), Saravani and Haddow (2011), and Hamad et al (2018) who reported that there is a high level of awareness of MT library services among library staff and patrons.

5.2.2 Appreciation for the use of Mobile Technology Library Services

The results of the study also found a deep appreciation for the use of mobile technology based library services among management of the Sam Jonah Library of the University of Cape Coast and the Osagyefo Library of the University of Education. They indicated a strong interest in adopting this technology in their respective libraries. The above results confirm the findings of Bornhold (2014) and Thomas (2010) that librarians appreciate the use for MT in rendering services.

On the part of the student respondents, this research revealed that, they understand and appreciate the value of MT based library services to their academic activities. The favourable attitude of respondents towards mobile technology-based library services stems from their belief that these services would offer them several unique advantages. Clearly, the findings showed that there is profound appreciation and demand for MT based library services among graduate

students of the University of Cape Coast and the University of Education, Winneba, which is yet to be met. These findings are similar to the results of the studies of Karim, Darus, and Hussin (2006) ; Washburn (2011), and Dresselhaus and Shrode (2012). These authors argued that library patrons, particularly students, were subscribing to MT- based library services and they appreciate the use for it. They stated that library patrons have the conviction that the MT provides them with boundary-less access to library services, afford them the opportunity to have interactive services and be able to access a single library resource/service with varied mobile devices.

5.3 Preparedness of Library Management for the Adoption and Implementation of Mobile Technology-Based Library Services

Adekunle, Omoba and Tella (2007) hold the view that the successful implementation of new technologies in information centres is basically influenced by the preparedness of management and other stakeholders towards such integration. The study, therefore, assessed the preparedness of library management of the Sam Jonah Library, UCC and the Osagyefo Library, UEW for the adoption of MT- based library services. The general findings indicated a strong will among library management for the adoption of the services. However, that of University management may be sluggish.

These finding are in agreement with the results of the study by Saravani and Haddow (2011) in Australia and New Zealand. This study found a keen interest among managers of academic libraries in these institutions to offer mobile technology based services to library users. Similarly, a research conducted by Chaputula and Mutula (2018) revealed that all the libraries examined in Malawi indicated that, their management are prepared to deliver MT library services. Again, in corroborating the findings, Shonhe (2019) in a study of selected Botswana's public libraries

found that ninety-six percent (96%) of the librarians selected for the study had a positive attitude towards technology adoption particularly with mobile technologies.

In spite of the keen interest showed by managers of the Sam Jonah, UCC and the Osagyefo libraries, UEW for the adoption of MT based library services, there are key constraints that leave them currently in a state of unpreparedness. Key among them is human resource constraints and lack of requisite ICT infrastructure. Both libraries have very few well trained IT personnel to enable them to successfully adopt MT- based library services. The few IT personnel available do not have the necessary specialization in mobile technology applications. Though the University of Cape Coast is investing in the infrastructure required to support ICT including MT services, additional capital investment is required. Infrastructure is more severely lacking in the Osagyefo library. The library lacks basic equipment such as computers, scanners and servers, and available IT infrastructure is very inadequate. In support of this, Sampath-Kumar and Birada (2010) in a study of ICT use in colleges in Karnataka, India found that though management of these colleges are willing to adopt ICT and emerging technologies in their libraries, ICT use is not at optimum in these colleges. The reasons were attributed to lack of financial resources and inadequate human capital. Again, in a study to understand mobile technology use for library service at Capital University in South Africa, Iyamu and Mtshali (2013) found that the technology infrastructure that the library had was outdated.

The management of Sam Jonah Library and the Osagyefo Library believe that the financial resources needed to adopt mobile technology based library services can be sourced if strong and convincing case can be made to persuade University management as there are competing needs for limited financial resources.

5.4 Students' proficiency in relation to mobile devices usage

In terms of students' proficiency in relation to mobile devices, the study found out that there is high proficiency level among graduate students in the University of Cape Coast and the University of Education, Winneba in the use of mobile devices. Majority of them, 335 (94.0%) own smartphones, 102 (29%) have tablets, 100 (28%) own regular phones, 58 (16%) have PDA's and 52 (15%) are in possession of E-book readers

A greater percentage of student respondents 333 (93.6%) use their mobile devices to send or receive messages. Three hundred and thirty- three (93.5%) students also indicated that they use their mobile devices for academic research purposes while 330 (92.6%) of respondents indicated that they use their devices for social media purposes. This concurs with the views of Lo, Cho, Leung, Chiu, Ko and Ho (2016) in their study in Hong Kong that students are competent in the use of smart mobile devices and they indicated that out of a total of 51 students surveyed, 43 could access internet services and information on these mobile devices. Similarly, Illako (2017) opined in a study in Makerere University that "over 96% of the students own internet enabled mobile devices and they were proficient in terms of their usage". In another study, Dahlstrom, Walker and Dziuban (2013) also reported that, the possession of mobile devices has increased among university students and there is tremendous proficiency in its usage for accessing and retrieving online academic information. In supporting the view, Cassidy, Colmenares, Jones, Manolovitz, Shen and Vieira (2014) indicated in their findings in a study conducted on students in United States that, 98.4% of students own mobile phones, 82.9% own tablets and 84.4% own e-book readers and all of them showed proficiency in using these devices to access academic information, send or receive text and access social media services.

Additionally, the findings of the study also resonate with the studies conducted by Alfawareh and Jusoh (2014), who observed high ownership rate of mobile devices and high competency rate in terms of their usage among Saudi Arabia University students.

The technical skill set of students in the use of mobile technology should therefore not be a hindrance in the adoption and implementation of mobile technology-based library services.

5.5 Library Services that can be delivered via Mobile Technology Platforms

Management of academic libraries in the University of Cape Coast and the University of Education, Winneba need to be aware of the mobile technology-based library services that are most valued by students. Sharma and Sahoo (2014) opined that it is necessary to have a carefully planned study to know the kind of services to be provided on mobile devices as a prerequisite for implementing MT- based library Services. Knowing these will enable academic libraries in these institutions to design their mobile technology systems to effectively provide services that meet the needs of students. Based on this assertion, one of the objectives of the study was to identify from students the library services they would prefer to access on mobile technology platforms as well as to inquire from the library management of the two academic libraries, which of their current library services they plan to deliver through mobile technology platforms.

With regard to the preferences of the student respondents, the study revealed that 327 (91.9%) and 312 (87.6%) of the respondents from the two universities would prefer mobile e-journals/ academic databases and mobile digitized thesis/ dissertations respectively as type of library services that they would want to access on mobile technology platforms. The same views were shared by the management of the two libraries who have plans to introduce these services in the future. The above findings corroborate with literature which noted that, major academic libraries

in China had designed mobile interface that allows library users to use mobile devices to access their digitized institutional repository and browse through the library's academic databases and e-journals (Li, 2013).

In addition, students respondents from both institutions, 309 (86.8%) and 301 (84.6%) showed keen interest in the use of mobile electronic books and mobile reference enquiry services respectively if they were to be implemented by their libraries. The study also discovered that management of the two libraries also exhibited their willingness to provide mobile reference enquiry services and mobile e-books collection as MT- based library services. These results resonate with studies by Lippincott (2009); Goh (2011), and Smith, Jacobs, Pearce, Collard and Whatley (2010) who opined that mobile reference enquiry services were extensively in the known to most of the students and they preferred to use the services to get reference assistance from the librarians.

The findings further showed that library management from both academic libraries plan to introduce the following mobile technology- based library services in the future; mobile online public access catalogue (MOPAC), mobile library instructional guides and virtual tours, mobile SMS alert services and email services for awareness creation of new arrivals and selective dissemination of information and mobile social media based services. When the student respondents were questioned about their interest in accessing these services on their mobile devices when implemented, the findings again revealed that 280 (78.7%) would be interested in MOPAC, 274 (77.0%) would be interested in mobile library instructional guides and virtual tours, 274 (77.0%) would be interested in mobile SMS and email services and 264 (74.2%) would be interested in mobile technology based social media services. The findings concur with the assertions by Canuel and Crichton (2011) that librarians in Canada provide mobile forms of

their OPAC. Paterson and Law (2011), and Cummings, Merrill and Borrelli (2010) also reported in their studies that 60% of students at Edinburgh University in UK and 58.4 % at Washington State University, USA prefer accessing the OPAC using their mobile devices. Baggett and Williams (2012) observed in another study that more than one third of the respondents use mobile technologies to access social media services provided by their libraries. Again, Tenopir (2009) ; Kroski (2008); Jowitt (2008) ; and Murray (2010) identified in their study that all libraries selected provide videos and audio MP3 files of library instructions and virtual tours that can be accessed with mobile devices via YouTube and iTunes channels and over 71.1% of the respondents were in support of this service.

5.6 Students' willingness to Use Mobile Technology Based Library Services

The study also assessed the willingness of the graduate students to use mobile technology- based library services. The willingness to use mobile technology based library services is an important factor that needs to be considered by libraries in their attempt to adopt and implement such services.

The results of the study indicated that the majority of the students were willing to use mobile technology-based library services. For instance, 335 (89.3%) of the respondents expressed their willingness to access library-based services using mobile devices at anytime and anywhere. The revelation confirms the study results of Pu, Chu, Chen and Huang (2009), that students have a positive desire to use mobile technology-based library services and they are enthusiastic in using them at anywhere and anytime. The findings also showed that the greater number of the respondents, 297 (83.4%), agreed that they will use Mobile Technology –based Library Services because they are user-friendly.

Two hundred and eighty four (79.8%) demonstrated that they would access mobile technology-based library services because mobile internet is more reliable and 287 (80.6%) of the respondents agreed that they would invest in acquiring the requisite mobile devices needed to access mobile technology-based library services. In corroborating these findings, a study by Wu, Chatfield, Hughes, Kysh and Rosenbloom (2014) on students' willingness to access library services on mobile technology platform, found out that almost all respondents had the desire to use their smartphones and tablets to access such services because to them mobile internet is cheap. Those who were not using such services expressed the readiness to acquire the requisite mobile devices in the future in order to access MT library services provided by their library. In addition, most respondents, 306 (85.9%) agreed that they would want to be trained on how to use mobile applications to access library services.

The findings further revealed that respondents from both institutions, 297 (83.4%), agreed that they would use Mobile Technology- based Library Services because they are user-friendly. This is in line with a research by Joo and Choi (2015) which reported that library users will prefer to access library resources via online and specifically on their mobile devices when the system that drives such services is user friendly and interactive. The percentage of respondents who also agreed that they were willing to use MT- based library services because they are accessible to both regular and distance students was extremely significant per the findings which was 324 (91%). In support of this, Savita, Somashekhara and Dange (2017), reported that academic libraries should harness the advantages of mobile devices to support distance learning, and research activities in e-learning environments.

5.7 Staff Training and Skills required for the Adoption and Implementation of Mobile Technology- Based Library Services

Lack of requisite skills is a key hindrance in the adoption of mobile technologies by academic libraries. According to a survey by Thomas (2010), though libraries indicate a positive attitude towards mobile web services, only a few had mobile web presence due to low skills among staff. Libraries desiring to deliver MT library services need a well trained human resource base that can design, build and manage the IT architecture required to deliver these services. In addition, librarians need to have basic ICT skills. According to Sharma and Sahoo (2014), librarians should acquire the following skills if they wish to provide mobile- technology based services:

1. Create and tailor mobile-optimized contents
2. Familiarity with internet/intranet services like email, SMS, spams prevention.
3. Develop expertise in protecting privacy and security levels
4. Skills for interacting with users via smartphone applications, mobile-friendly webpages, third-party intermediary clients
5. Skills relating to training and user orientation to market these services to users

The study found that Sam Jonah Library, UCC and the Osagyefo library, UEW are lacking in adequate human resource with the requisite ICT skills. The study found a lack of a culture of training for staff. Hence, though most of the staff have awareness on MT based library services, they lack the necessary skills to effectively use to deliver these services if introduced. This corresponds with the views of Bamidele, Omezulor, Imam, and Amadi (2013) and Hamad et al (2018) that the training and development of workers in the library system seem not to be given the needed attention. Similarly, Sharma (2007) opined in a study conducted at academic libraries in Nepal that the majority of librarians in various universities have low ICT skills which could

lead to the lack of appropriate technical expertise and support needed to meet the technological demands of the 21st century library operations.

Therefore, the institutionalization of skills training workshops is required for staff to upgrade their skills to be abreast with emerging technologies.

5.8 Challenges associated with the adoption and implementation of mobile technology based library services

The implementation of mobile technology-based library services invariably comes with challenges. The study identified a number of challenges associated with the implementation of mobile technology- based library services in the Sam Jonah library, UCC and Osagyefo Library, UEW. These include the following:

1. Lack of policy framework for the adoption of the technology
2. Clearing the hurdle of University management accepting to adopt the technology since this requires huge capital outlays
3. Bureaucratic process dragging or derailing implementation after a decision to adopt
4. Lack of requisite skills on the part of library staff
5. Financial constraints
6. Poor or inadequate internet bandwidth
7. Issue of sustainability
8. Lack of IT infrastructure
9. Unreliable power supply and intermittent power outages
10. Lack of appreciation for the technology among library staff

These challenges corroborate the findings identified by studies in other academic libraries. For example, Amekuedee (2005); Saxena and Dubey (2014) identified the lack of support from University management as a major constraint for the integration of ICT and mobile technologies in academic libraries. Haneefa (2007); Iwhiwhu, Ruteyan and Eghwubare (2010); Aina, Okunnu, and Dapo-Asaju (2014), and Chisenga (2015) found out that, lack of finances have constrained the adoption of mobile technology based library services in academic libraries. Studies by Mulimila (2000) ; Suku and Pillai (2005) ; Haneefa (2007); Ghuloum and Ahmed (2011), and Hamad et al (2018) found that staff of academic libraries often do not possess the right kind of ICT skills needed for the smooth deployment of emerging technologies. The findings also confirmed what Okiy (2010); Aina, Okunnu and Dapo- Asaju (2014), and Chaputula and Mutula (2018) had also discussed about power fluctuations and poor internet bandwidth acting as a hindrance to ICT and MT applications in academic libraries.

In sum, the Sam Jonah and Osagyefo libraries have a number of challenges which can constrain the adoption and implementation of mobile technology based library services. These constraints are not unique to the two libraries but are often reported especially among academic libraries in Sub-Saharan Africa.

CHAPTER SIX

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

In this chapter, the overall summary and conclusion drawn from the study are presented. Based on the key findings, conclusion and appropriate recommendations are made on what needs to be done to adopt and implement mobile technology-based library services in academic libraries in Ghana with particular reference to Sam Jonah Library, University of Cape Coast and Osagyefo Library, University of Education, Winneba.

6.2. Summary of Major Findings

This study was carried out under the following objectives:

1. To assess the level of awareness and appreciation for the use of mobile technology-based library services in academic libraries at the selected universities.
2. Assess the preparedness of library management towards the adoption and implementation of mobile technology- based library services in academic libraries at the selected universities.
3. To identify the students' proficiency in relation to mobile devices usage.
4. To identify the library services that can be delivered on mobile technology platforms at the selected academic libraries
5. Examine the willingness of the students towards the use of mobile technology- based library services in the academic libraries at the selected universities.
6. To identify the requisite training and skills of the staff for the adoption and implementation of mobile technology based library services at the selected academic libraries.
7. To identify the potential challenges associated with the adoption and implementation of mobile technology based library services at the selected libraries

The major findings of the study were as follows:

6.2.1 Awareness and Appreciation for the use of Mobile Technology-Based Library

Services in Sam Jonah Library, UCC and Osagyefo Library, UEW

The study found a high level of awareness of mobile technology- based library services among graduate students and among the library management of Sam Jonah library, UCC and Osagyefo library, UEW. The findings further revealed that, awareness of MT based library services among the non-management staff of the two libraries were above average. Also, out of the total number of 356 graduate students who were used for the study from the two universities, 83.4% indicated that they were aware that it is possible for them to access library services through mobile devices.

With regard to appreciation for the use of MT based library services, both the students and library management have a high appreciation for the technology with 92.2% of students indicating that they would use the services if introduced by their libraries while 83.7% revealed that they would introduce the services to their friends when they are implemented by their libraries. In addition, 91.6% of the students would like to adapt and upgrade their skills to appreciate any mobile technological change done by their university library, 86.5% indicated that they would appreciate MT based services because it would not have any geographical restrictions to access them when implemented and 71.4% agreed that MT based library services would make their libraries more interactive.

Library management also showed a strong desire for deploying mobile technology in their libraries. They described MT based library services as “*(an) essential service*” and said the technology must be implemented. Moreover, they also expressed the view that if mobile

technology- based library services are adopted in the two libraries, they would be highly patronized by library patrons.

6.2.2 Preparedness of library management towards the Adoption and Implementation of Mobile Technology- Based Library Services in Sam Jonah Library, UCC and Osagyefo Library, UEW

The study found a strong will among library management of both universities towards the integration of mobile technologies in their libraries. However, the findings revealed that the will of University Management is sluggish as they linger on when it comes to releasing funds for technological innovations in the libraries, in spite of its benefits.

The study also found that both libraries have digitized most of their collections and automated some of their services and these are currently being offered electronically through their traditional websites. There is, therefore, no issue of non-compatibility between current service offerings and the technology needed to deliver these services using mobile devices; if a decision is made for the adoption.

Moreover, the findings of the study revealed that, despite the strong will and availability of content electronically to offer MT- based library services, both libraries are in a state of unpreparedness for the adoption of the technology because of a number of challenges. Key among them are human resource constraints and lack of needed ICT-related infrastructure.

6.2.3 Students' Proficiency in relation to Mobile Device Usage

With regard to students' proficiency in relation to mobile devices usage, it was found out that a large number 94.0% of the respondents from UEW and UCC own smartphones, 29% had tablets, 28% own regular phones, 16% had PDA's and 15% were in possession of e-book readers. It was

discovered that the majority of the respondents own more than one mobile device. Again, findings revealed that, the use of mobile devices to access the internet was very common among students (98.6% of students) with 91.9% accessing internet on their mobile devices daily. Over 59.8% used their mobile devices for educational purposes, 93.6% can use their mobile devices to send and receive messages, 93.3% were capable of sending or receiving email with their mobile devices, 92.6% can access social media platforms with their mobile devices and 93.5 % of the respondents were capable of using their mobile devices to search for academic information and download them.

The study, therefore, found a high level of proficiency with the use of mobile devices among the students with 95.5% of respondents indicating that they were proficient with the use of mobile devices.

6.2.4 The Library Services that can be delivered on Mobile Technology Platforms

The findings of the study revealed that both libraries do not currently offer any of their services on mobile technology platforms. The study further showed that according to the management of Sam Jonah and Osagyefo Libraries, the services that they can deliver through mobile technology platforms include mobile referencing services, mobile digital content of local institutional repository, mobile online public access catalogue (MOPAC), mobile e-journals and academic databases, mobile SMS services for new arrivals and selective dissemination of information. Other services include mobile instructional guides and virtual tours, mobile audio visual materials and mobile social media services.

The study also found out that the student respondents shared the same views with library management and indicated that they would be interested in the above mentioned library services

if they were to be offered on mobile technology platforms. The findings indicated the following as the MT- based library services graduate students would prefer: mobile e-journals and academic databases (91.9%), mobile digitized thesis and dissertations (87.6%), mobile electronic books collections (86.8%), mobile reference enquiry services (84.6%), mobile online public access catalogue (78.7%), mobile library instructional guides and tours (77.0%), mobile library text messages or email services (77.0%) and mobile technology based social media services (74.2%).

6.2.5 Skills and Training of Staff for the Adoption and Implementation of Mobile Technology- Based Library Services

The findings of the study showed that lack of requisite skills is one of the key hindrances for the adoption and implementation of MT based Library Services in both the Sam Jonah Library and the Osagyefo Library. The findings revealed that both libraries have too few IT staff and these do not have the specializations required to design and manage the technology platform needed to deliver MT based library services. It was also found that there is a culture of lack of training for library staff on emerging technologies in both universities.

6.2.6 Students' willingness to Use Mobile Technology Based Library Services

The study found that majority of students in UCC and UEW were willing to use MT based Library services if introduced. The main reason for the high willingness to use MT based library services is that they believe the technology will bring them convenience as it would enable them to access library information anywhere and at any time. The findings showed that a grand average of 89.3% of the respondents indicated that they would access mobile technology-based library services from anywhere and anytime if it was introduced by their libraries, 79.8%

demonstrated that they would access mobile technology library services because mobile internet is more reliable while 80.6% agreed that they were willing to invest in acquiring the requisite mobile devices needed to access mobile technology-based library services.

In addition, the study revealed that 85.9% of the respondents were willing to be trained on how to use mobile application to access library services, 83.4 % agreed they were willing to use mobile technology based library services if introduced because they would be user-friendly and 91.0% of them were willing to use the services if implemented since the services to them would be accessible to both distance and regular students.

6.2.7 Challenges associated with the Adoption and Implementation of Mobile Technology-Based Library Services

The study revealed that the challenges that library management envisage to militate against the adoption of MT library services in Sam Jonah library, UCC and Osagyefo library, UEW were lack of policy framework for the adoption of the technology, bureaucratic processes derailing or dragging the implementation after a decision to adopt is reached, lack of interest from University Management to invest in IT innovations. Other challenges identified by the study include lack of requisite skills on the part of staff, financial constraints, poor internet connectivity and inadequate ICT infrastructure.

6.3 Conclusion

In conclusion, it is noted that using mobile technology to deliver library services is the new trend in library service provision in academic libraries around the world. This is because the technology enables users to have their 'libraries in hand', that is, being able to access library services anywhere and anytime using their mobile devices. This research sought to ascertain the adoption and implementation of Mobile Technology Library Services in Ghanaian academic

libraries with a focus on the Sam Jonah library, UCC and the Osagyefo library, UEW. The findings of the study established that there is a strong awareness of mobile technology- based library services among graduate students and library management as well as non- management library staff of the two libraries. Again, the study found a high appreciation for the use of MT based library services among both graduate students and library management. Library management unanimously showed a strong desire to integrate this technology in their libraries and graduate students expressed deep appreciation to use MT based library services if it is implemented.

Furthermore, the study found out, that the academic libraries in UCC and UEW are currently in a state of unpreparedness to adopt mobile technology- based library services because of constraints such as inadequate ICT-related infrastructure and poor human resource base with the requisite skills in mobile technology applications for library service delivery. Additionally, students were proficient with the use of mobile devices and demonstrated a strong will to use mobile technology based library services, should they be implemented by their libraries.

On the library services that can be delivered on mobile platforms, student respondents were interested in mobile e-journals and academic databases, mobile digitized local institutional repositories, mobile reference enquiry services, mobile online public access catalogue (MOPAC) and mobile electronic books collection. Other services preferred by students include SMS alert for new arrivals, mobile library instructional and virtual tours and mobile social-media services.

This study has also led to the uncovering of the potential challenges that can obstruct the successful implementation of mobile technology- based library services in Ghanaian academic libraries. When the challenges identified in the findings are properly addressed, they may be used

as the foundation for the successful implementation of mobile technology in academic libraries in Ghana.

6.4. Recommendations

Based on the findings and outcomes drawn, the following recommendations are put forward by the researcher for the successful adoption and implementation of mobile technology- based library services in academic libraries in Ghana.

6.4.1 Human Resource Development

The study found that both libraries lack the human resource with the requisite skills to successfully adopt and implement MT based Library Services. The number of IT personnel in the libraries are too few and the current crop of IT staff do not have the specializations needed to design, build and manage the IT architecture needed to deliver mobile technology- based library services.

It is, therefore, recommended that the Sam Jonah and Osagyefo libraries put in place a program to continuously develop their human resources through recruitment and professional training. The IT staff should be sponsored to take further education in order to upgrade their skills or the libraries can seek partnership with other libraries (international success cases) through an exchange program to get some form of training for their staff on mobile technology related skills.

There must also be a culture of training for the entire library staff to ensure that they keep abreast with trends and changes in technology in relation to library service provision.

6.4.2 Development of Policy Framework for the Adoption of New Technologies

University organizational behaviour determines how particular innovations are adopted and implemented. Adoption is not just about the technology but also ensuring that end users use the technologies in ways that improve their practices. Even the most technologically ready university is unlikely to achieve successful adoption if it does not pay attention to the cultural components of readiness (Karp and Fletcher, 2014).

The multiplicities of factors that affect the adoption and implementation of new technologies require that the Sam Jonah Library, UCC and the Osagyefo library, UEW both develop comprehensive policy frameworks that ensure that they have successful experiences with new technologies. One of the challenges identified by the study was the absence of such policy frameworks. Such policy frameworks will tie in the various factors and address them holistically by ensuring that the adoption and implementation of MT based library services are successful.

6.4.3 Investment in ICT Infrastructure

The study found out that the Sam Jonah and Osagyefo library do not have adequate ICT infrastructure to support the adoption and implementation of MT based library services. Issues such as poor internet bandwidth, lack of advanced ICT infrastructure and power fluctuations were found to be obstacles to the adoption and implementation of the technology.

It is, therefore, recommended that library management in consultation with the university management and ICT directorate of the University invest more in ICT infrastructure

6.4.5 Making a case to University Management for MT based library services

The study found that while management of the academic libraries in UCC and UEW have a strong desire for the implementation of MT based library services, there are indications that

university management may be lukewarm towards supporting the initiative. This is because the capital outlay from them for technological innovations in the library has not been forthcoming despite the immense benefits such technological integrations bring to the academic and research activities of the universities.

Library management in both libraries are, therefore, urged to make a strong and convincing case for the adoption of the technology to the university management. Making a strong case to the university management and other stakeholders would help them to get the financial assistance they need.

6.5 Suggestions for further studies

1. The study focused on library management, IT staff and graduate students, future studies can concentrate on non- management library staff and other library users such as undergraduate students and academic staff since they also form a vital part of the library system and play significant roles when it comes to technology innovations and usage in the libraries.
2. This study was limited to Sam Jonah Library, UCC and Osagyefo Library, UEW in the Central Region in Ghana. Further studies could be replicated in other academic libraries in Ghana.

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APPENDICES

APPENDIX A

UNIVERSITY OF GHANA

SCHOOL OF INFORMATION AND COMMUNICATION STUDIES

DEPARTMENT OF INFORMATION STUDIES

Adoption and Implementation of Mobile Technology Based Library Services in Ghanaian Academic Libraries

Dear Respondent,

This questionnaire seeks your opinion on the topic: *Adoption and Implementation of Mobile Technology Based Library Services in Ghanaian Academic Libraries: A study of Selected Public Universities*. The purpose of the study is to ascertain how mobile technological-based library services can be adopted and implemented by Ghanaian Academic Libraries. Your response to the questions will be treated confidential. The study forms part of my academic work in school. In order for my study to be successful, your participation will be highly appreciated. Please do NOT discuss your answers with anyone else. Tick (✓) or supply an appropriate response where applicable.

Section A: Biographical Information

1. Gender: A. Male B. Female
2. Age: A. 20-25 B. 26-30 C. 31 and above
3. University: A. UEW B.UCC
4. Please indicate the type of degree programme pursuing
 MPhil B. M.A C. M.Ed D. MBA C. M.Sc

Section B: Awareness and Appreciation for the use of Mobile Technology-Based Library Services

10. Indicate in one of the boxes a tick (✓) to show the extent to which you agree to the statements below using the following guide: Strongly Disagree (SD); Disagree (D); Neutral (N) Agree (A); Strongly Agree (SA).

S/N	STATEMENT	SD	D	N	A	SA
	I am aware that mobile devices can be used to access library services in universities.					
	I would like to introduce mobile technology-based library services to my friends.					
	I would like to adapt and upgrade my skills to suit and appreciate any mobile technological change done by my university library					
	I would subscribe to the library services if those					

	services were to be offered on mobile technology platforms					
	I appreciate mobile technology based library services because it has no geographical restrictions.					
	I would appreciate mobile technology in library because a single library resource/service can be accessed from many mobile devices					
	Through designing of mobile technology based website and app, my university library makes their services more interactive by adding chat rooms, blogs, social interface, etc.					

Section C: Students’ Proficiency in Relation to Mobile Devices Usage

5. Which of the following mobile Device do you own? (*Tick as many as applicable*)

- A. Smart phones [] D. Personal Digital Assistant (PDA’s) []
- B. IPod [] E. Regular Cell phone []
- C. Tablet [] F. E- Book Reader []

6. Do you have internet access via your mobile device? A. Yes [] B. No []

7. How many times do you use mobile device application in school?

- A. Everyday [] C. Once a week []
- B. Couple days in a week. [] D. Never []

8. Reasons students use mobile device application in school?

- A. Because mobile device is popular [] B. Because of Curiosity []
- C. Because of needs [] D. Because of education purpose []
- E. Others, Specify.....

9. Indicate in one of the boxes a tick (✓) to show the extent to which you agree to the statements below using the following guide: Strongly Disagree (SD); Disagree (D); Neutral (N) Agree (A); Strongly Agree (SA).

S/N	STATEMENT	SD	D	N	A	SA
	I use my mobile device to send or receive text messages/SMS (Instant Messaging)					
	I use my mobile device to send or receive email.					
	I use my mobile device to access social networking/sites					

activities (e.g. MySpace, Twitter, Instagram, facebook,youtube)						
I use my mobile device to search and download academic related information online for studies.						

10. How proficient are you in the use of mobile devices?

- a. Very proficient [] b. Proficient [] c. Quite proficient/familiar [] d. Average []
 e. Not quite sure [] f. Not proficient []

Section E: Library Services that can be delivered Via Mobile Technology Platforms

11. Which library services would you like to access on your mobile phone/device using mobile based technology? Indicate in one of the boxes a tick (✓) to show the extent to which you agree to the statements below using the following guide: Interested (I); Not Interested (NI).

S/N	TYPE OF LIBRARY SERVICE	INTERESTED	NOT INTERESTED
	Check the library catalogue for available books (MOPAC)		
	Mobile E-book collections		
	Mobile Library text messages or short messaging service (SMS) / Email Services		
	Mobile academic databases and e-journals (Search academic databases/e-journals for scholarly information with mobile devices)		
	Mobile Reference Enquiry services (including live chat with the librarian remotely for assistance)		
	Mobile based Social Networking Services (facebook updates, twitter feeds, podcast, library News, Events and Blogs)		
	Mobile library instructional guides and virtual tours		
	Mobile Book Reservations and Renewals		
	Mobile digitized project/dissertation/thesis		

Section F: Student Willingness Towards the use of Mobile Technology Based Library Services

13. Indicate in one of the boxes a tick (✓) to show the extent to which you agree to the statements below using the following guide: Strongly Disagree (SD); Disagree (D); Neutral (N) Agree (A); Strongly Agree (SA).

S/N	STATEMENT	SD	D	N	A	SA
	I am willing to access mobile technology based library services from anywhere, anytime					
	I am willing to access mobile technology-based library services because mobile internet is more reliable					
	I am willing to access mobile technology based library services because of its user friendliness					
	I am willing to access mobile technology based library services because it has the capability to reach both regular and distance students or remote library users					
	I am willing to be trained on how to use mobile technology application to search for library resources/services					
	I will like to have internet enabled mobile device in order to enjoy mobile technology based library services					

APPENDIX B

**UNIVERSITY OF GHANA, LEGON
SCHOOL OF INFORMATION AND COMMUNICATION STUDIES
DEPARTMENT OF INFORMATION STUDIES**

Interview Guide for Library Management and IT staff

Adoption and Implementation of Mobile Technology Based Library Services in Ghanaian Academic Libraries

Dear Sir/Madam,

I am Ebenezer Acheampong, an MPhil student at the School of Information and Communication Studies, Education, at the University of Ghana. I am conducting a research on the *Adoption and Implementation of Mobile Technology Based Library Services in Ghanaian Academic Libraries*. I would be grateful if you could spare a little time to answer the following questions to help me have a fair idea on the above research topic. The information being sought is purely for academic purposes and under no circumstances would it be disclosed to any person.

Thank you.

SECTION A: BIOGRAPHICAL INFORMATION

1. Gender

A. Male []

B. Female []

2. Please, indicate age range

A. Below 31 [] B. 31- 40 [] C. 41 – 50 [] D. 51 and above

3. Level of education

A. Masters (M.A / M.Sc / M.Ed / Phil) [] B. PhD []

C. Others (please specify)

4. What is your job title?

5. Please indicate your institution

6. Please, for how long have you been working at the library?

SECTION B: Awareness and appreciation for the use of mobile technology based library services.

7. What do you understand by the terms mobile technology- based library services?

8. What is the level of staff awareness for the use of mobile technology based library services in this institution?

9. How about the patronage level in general?

A. In terms of students

B. In terms of other library Staff

C. Other users

10. How will the implementation of mobile technology-based library services help in service delivery in the library?

SECTION C: *Preparedness of library management towards the adoption of mobile technology based library services*

11. How compatible are the existing library services with mobile technology in this library?

12. In your opinion, do you think management has enough trained personnel with the requisite skill for such innovation?

13. Are there available space and infrastructure (ICT) required for mobile technology library services?

15. Do you think budget and financial commitment in the adoption of mobile technology based library services are available?

SECTION D: *Library services that can be delivered on mobile technology platforms.*

14. Do we have any of the library's services currently accessible through mobile technology?

15. If mobile technology based library services are not available are there any plans in the nearest future for such services?

16. Which mobile technology based library services would appeal to most students?

SECTION E: *Training and skills of the staff for the adoption and implementation of mobile technology based library services*

17. Has library staff received training on mobile technology based library services in this institution?

18. How would you describe the level of understanding/knowledge of mobile technology of the staff?

19. Is the level of knowledge of staff that would be responsible for the implementation and management of mobile technology based library services enough to ensure successful implementation of the technology?

SECTION E: *Challenges associated with the adoption and implementation of mobile technology based library services*

20. What imminent challenges would you envisage in the adoption and implementation of mobile technology based library services?

21. What measures are necessary to resolve the challenges that will hinder the implementation of mobile technology based library services in university libraries