

**UNIVERSITY OF PRETORIA**

**Implementation of mobile technology based library service: a case study of  
University of Cape Coast.**

**Mini-dissertation**

**By**

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**Submitted in partial fulfilment of the requirements for the Carnegie MIT  
Stream B degree**

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## DECLARATION

I, Theophilus Kwamena Ocran declare that this mini-dissertation is my own work and that I have duly referenced all sources used and it has not previously been submitted to any academic institution for award of a degree.

## **DEDICATION**

This mini-dissertation is dedicated to my wife Yvonne and my two sons: David and Alva

## ACKNOWLEDGEMENT

As the holy book enjoins us to give honour to whom honour is due, I would firstly thank God, the Lord Almighty for seeing me through the changing scenes of MIT journey, the grace of God made the difference. I thank Lord for His faithfulness.

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## **LIST OF ABBREVIATIONS**

<b>AISI</b>	<b>African Information Society Initiative</b>
<b>CDMA</b>	<b>Code Division Multiple Access</b>
<b>CILIP</b>	<b>Chartered Institute of Library and Information Professionals</b>
<b>DSL</b>	<b>Digital Subscriber Line</b>
<b>ECAR</b>	<b>Educause Centre for Applied Research</b>
<b>EDGE</b>	<b>Enhanced Data Rates for Global Evolution</b>
<b>E-learning</b>	<b>Electronic learning</b>
<b>EPROM</b>	<b>Entrepreneurial Programming and Research on Mobiles</b>
<b>4G</b>	<b>Fourth Generation</b>
<b>GPRS</b>	<b>General Packet Radio Service</b>
<b>GSM</b>	<b>Global System for Mobile Communication</b>
<b>HDML</b>	<b>Handheld Device Markup Language</b>
<b>HIV</b>	<b>Human Immuno Deficiency Virus</b>
<b>HTTP</b>	<b>Hyper Text Transfer Protocol</b>
<b>ICT</b>	<b>Information Communication and Technology</b>
<b>ITU</b>	<b>International Telecommunication Union</b>
<b>LDCs</b>	<b>Least Developed Countries</b>
<b>MAMA</b>	<b>Mobile Alliance for Maternal Action</b>

<b>M-learning</b>	<b>Mobile learning</b>
<b>MMS</b>	<b>Multimedia Messaging Service</b>
<b>MIT</b>	<b>Massachusetts Institute of Technology</b>
<b>MOPAC</b>	<b>Mobile Online Public Access Catalogue</b>
<b>NCA</b>	<b>National Communication Authority</b>
<b>OPAC</b>	<b>Online Public Access Catalogue</b>
<b>PDA</b>	<b>Personal Digital Assistance</b>
<b>QR</b>	<b>Quick Response</b>
<b>SMS</b>	<b>Short Message Service</b>
<b>SNS</b>	<b>Social Networking Site</b>
<b>SRIMS</b>	<b>Student Records and Information Management Systems</b>
<b>TDMA</b>	<b>Time Division Multiple Access</b>
<b>UCC</b>	<b>University of Cape Coast</b>
<b>UNECA</b>	<b>United Nations Economic Commission for Africa</b>
<b>UNESCO</b>	<b>United Nations Educational, Scientific and Cultural Organization</b>
<b>WIFI</b>	<b>Wireless Fidelity</b>
<b>WiMAX</b>	<b>World Wide Interoperability for Microwave Access</b>

## ABSTRACT

Current trends in libraries especially in the academic library require remote and boundary less access to library services. Mobile technology has been recognised as the single most embraced technology in the world. Implementing this technological innovation will bring a lot of relief to students in University of Cape Coast and the University community in general.

The study attempts to investigate the preparedness of University of Cape Coast Library to implement mobile technology-based library service. The pilot study involved six management members from the library and fifteen students comprising ten undergraduate and five postgraduate students. Interview guide was used as a tool for data collection. The interview guide was grouped under four headings: perception of mobile library service on campus, students' proficiency and strategies for successful implementation and imminent challenges. The data collected was qualitative in nature.

The study shows that majority of the students possess more than one smartphone. A finding is that the use of these smartphone goes beyond receiving and making calls and texting.

Management members of the library expressed their willingness, showed maximum support and readiness to have such facility in the library.

After the study, it was recognised that:

1. Almost every student had at least one mobile device which is a smartphone and can be used to access library service.
2. Though proficiency level among students was high, there would still be the need for library management to train users to fully appreciate the use of these gadgets in accessing library services.
3. Students and management expressed their willingness to patronise such services. They also showed positive perception regarding mobile phone based library services.

The recommendation made after the study was that students should be educated to know the benefits that come with the use of mobile device to access library services while library personnel should be adequately trained for such services. Management should allocate more resources for successful implementation the resources.





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## CHAPTER ONE

### INTRODUCTION AND OVERVIEW

#### 1.1 Introduction

In the quest to meet and solve life basic challenges has informed and led to the invention and the use of information technologies (Ademodi & Adepoju, 2009; CILIP, 2015). Information and Communication Technologies (ICTs) have been the main drivers of the world's developmental agenda (ITU, 2015; Homby, 2001). ICTs have removed barriers and promoted fast communication and interactions across boundaries. Jackson *et al.*, (2011) have observed that the internet has transcended the barriers of gender, race, income and socio-demographic characteristics. They then assert that the educational playing field has been levelled by this resource due to its availability anytime, everywhere and to anyone. It is seen as a major player for academic institutions to develop better services as the world moves towards a knowledge-based economy (Bon, 2007).

The increasing availability and affordability of internet-enabled handheld devices have affected people's mode of searching, receiving and interacting with information. Barriers which hitherto made it impossible for information to be shared freely have been mediated by the rapid development of information and communication technology, leading to inter-cultural and interdisciplinary information sharing (Coyle & Thorson, 2001). Due to the convergence of swift technological improvements with cheaper connectivity and faster data transmission, there has been an increase in the adoption and use of mobile devices and mobile technologies (Villoldo & Salom, 2012; Pope *et al.*, 2011).

Mobile devices such as smartphones, iPod, PDA's, netbook, tablet computers, gaming devices and e-readers have affected the lives of people by changing the manner in which communication is done. CILIP (2015) recalls that in 2014, the use of mobile devices to access the internet overtook the use of desktop for the same purpose. Smartphones that are examples of mobile devices have now become the first preferred choice for people to communicate and share information. With less than a billion in 2000, global cellular subscriptions have increased to seven billion in 2015. Mobile technologies facilitate and provide the platform for information

dissemination and retrieval by the use of mobile devices such as smartphones, tablets, netbooks and laptops (Liu & Briggs, 2015; Little, 2011). Since they do not use wires or cables but radio waves instead, they are very portable and thus, preferred by lots of people (Homby, 2001).

These emerging technologies have transcended the fields of social and financial engagements, and have now influenced the operations in many academic environments. Pope *et al.*, (2011) observed that the adoption of mobile technology has been rapid in many tertiary education campuses. Also confirming this observation, Dahlstrom, Walker and Dziuban (2013) posit that ownership of mobile internet devices between 2011 and 2013 increased steadily by 25%, whereas the use of smartphones for academic purposes has doubled. In the wake of these developments, library users have also resorted to the use of mobile devices to access the internet; forcing many libraries to introduce mobile communication technologies into their services. This confirms the assertion that any move by libraries to enhance the quality of their services and closely connect with patrons cannot be complete without considering the use of mobile technologies (Mills, 2009; Kumar, 2014).

Kumbhar and Pawar (2014) recount the digital journey of libraries as having transitioned from traditional libraries to hybrid libraries, and then to automated libraries, mediated by digital archiving, library 2.0 and mobile phone services. Prior to the emergence of ICTs, the kind of information provision done in libraries was through newspapers, microforms and slides among others. However, with the increase in scientific knowledge, telephones and computers for internet connectivity and the global system for mobile communication have modified the operations of libraries (Edison, 2002; Seymour, Ritz & Cloghessy 1987; Homby, 2001; Iwhiwhu, Ruteyan, & Eghwubare, 2010; Vishwakarma, 2013). But if librarians are to continue to make substantial contributions as information disseminators, they will have to understand and exploit current ICT infrastructure and emerging technologies in delivering services to their clientele (Ikhemuemhe, 2005).

Kumbhar and Pawar (2014) assert that mobile technologies have introduced a “Libraries in hand” trend. They suggested that since libraries are currently creating digital contents accessible on computers, such digital collections could be made available on mobile platforms.



The consideration of how to make library services available on mobile platforms has gained recognition both in literature and in practice by virtue of the benefits it brings. The mobile initiative brings with it the interactive capabilities, easy access to information, time saving, personalised services, user participation as well as limitless access. On the whole, mobile technology-based library services include SMS alert service, instant messaging for reference service, the possibility of suggesting a purchase, library instructions and virtual tours, OPAC on mobile phones, in-house search, research consultation and instruction, journal finder applications, news and events, reference service, new title preview and institutional repositories (Speight, 2009; Connolly, Cosgrave, & Kosturski, 2011; Chan & Fu, 2009). These services can be expanded with the addition of social media tools such as Twitter feed, WhatsApp, Facebook, and the use of augmented reality and QR codes which can be used to access subject pages. Apart from these services, libraries around the world have introduced mobile technology to be integrated into information literacy instruction. The service based technology such as Skype and Face Time according to Walsh (2012:105) is a “window to another world” offer of a lot of opportunities to distance students.

## **1.2 Problem statement**

The popularity of mobile technologies, coupled with the advantages it brings, is encouraging many academic libraries to adopt these technologies (Speight, 2009; Connolly, Cosgrave, & Kosturski, 2011). Academic and research libraries the world over are adopting technology in their operations since client satisfaction is greatly enhanced by the removal of the barrier of physical location (Tess, 2013). Many libraries are adopting innovative ways of providing mobile interfaces and their applications so as to be effective in terms of delivery of service to patrons. The ever increasing availability of mobile devices has led to the conversion of some of these services into smartphone-adaptable features. Lippincott (2010) believes that these technologies will only be useful when much emphasis is placed on contents and services.

Not much has been done to capitalise on the increasing penetration of smartphones on university campuses in Ghana (Internet Society, 2014; Surrey, 2015; Dutta, & Bilbao-Osorio, 2016). In a study to ascertain the usage of mobile technologies for social media based library services in a Ghanaian university, Akeriwa, Penzhorn and Holmner (2014) discovered that not only do

respondents have a favourable attitude towards mobile phone-based library services, but also, with the right infrastructure and technical know-how of personnel, this service can be offered unhindered.

Established in 1962, and with an initial population of 155, the University of Cape Coast (UCC) continues to be Ghana's preferred institution for training of personnel for the education sector. In response to the changing phase of contemporary human resource needs of Ghana, UCC is now a leader in Health, Agriculture, Law and Business education with current population shown as follows:

	Library staff	Undergraduates	Postgraduates	<b>Total</b>
Population	230	18913	1,068	<b>20, 211</b>

The sources of these figures were obtained from the (UCC Library Guide, 2012) and (UCC-SRIMS, Record Book 2016).

University of Cape Coast Library has a library system which comprises the main university library (Sam Jonah Library), departmental libraries as well as libraries in halls of residence.

The UCC Library System has a modern library with a capacity of 750,000 volumes of books with a reading space for 2,000 people as well as other satellite libraries in the departments and halls of residence. The library is positioned to provide and meet most information needs of clients within the campus community and beyond with a range of services including lending, reprographic, user education, inter-library loan and document delivery and electronic support (University of Cape Coast Library Guide, 2012). UCC's library system is partially automated with services such as the Online Public Access Catalogue and other electronic resources. The increasing adoption of technology including Online Public Access Catalogue (OPAC), subscription to e-journals, institutional repositories among others demonstrate the readiness of the library to embrace technology in its operations. This notwithstanding, the library is yet to make any of its services available and accessible on mobile platforms.

A study by Dadzie (2009) pegged the proportion of University of Cape Coast students with internet-enabled mobile phones at 92%. With the continuous reduction in the prices of

smartphones, it is safe to conclude that many more students possess such handsets. Despite this huge potential for libraries to consider rendering library services via mobile phones, this phenomenon is yet to receive attention.

It is in view of this situation that the study seeks to find out how the University of Cape Coast Library could implement mobile based library services for its users.

### **1.2.1 Aim of the study**

The study seeks to ascertain how library services could be adapted and made available at the University of Cape Coast.

### **1.2.2 Sub-questions**

- What library services is the library considering implementing on mobile platforms?
- How trained are library staff in the design and implementation of mobile-based library services?
- To what extent are stakeholders involved in the implementation of mobile based library services?
- How proficient are students in the use of smartphones?
- What kind of library services do students expect on the mobile devices?
- What challenges confront libraries in implementing mobile based library services?

### **1.2.3 Objectives of the study**

These objectives were set in order to meet the aim of the study:

- To explore the library services being considered by UCC Library for implementation on mobile platforms;
- To assess the level of training of library staff in the design and implementation of mobile-based library services;
- To ascertain the level of involvement of stakeholders in the implementation of mobile based library services;

- To find out the proficiency of students in use of smartphones and other mobile devices; and
- To determine the kind of services expected by students to be made accessible via mobile devices.

### **1.3 Limitations of the study**

This study did not look at the software and other architectural designs of mobile platforms and their development. It only focused on the human interface issues on the application of mobile technologies.

### **1.4 Methodology**

The study was situated within the qualitative school of thought and is underlain by the Case Study research design. An exploratory investigation of this nature demands that much attention is focused on the details emanating from respondents.

#### **1.4.1 Pilot study**

Mobile based library service provision is a novelty in sub-Saharan Africa, and in Ghana, though some libraries are embracing the concept, it has not fully gained the needed attention. Hence, any study to explore this phenomenon, ideally, should be all-encompassing. However, due the logistical challenges and time constraints, the study focused on University of Cape Coast as a case. The present study affords an opportunity to test the robustness of the research method with the view to applying it to a larger, national, study.

#### **1.4.2 Scope of the study**

As one of the oldest public universities in Ghana, the University of Cape Coast Library was chosen due to the fact that it has the enabling digital environment for the take-off of mobile-based library services. Having successfully deployed digital initiatives such as the OPAC, e-resources and the institutional repository, it is believed that complementing with mobile library services is within the capacity of the University. Again, since it is the place of work of the researcher, it makes it practically convenient for the researcher to conduct an inquiry within the context of resource limitations.

### **1.4.3 Population and sampling**

This study engaged key library management staff and some undergraduate and postgraduate students who patronise the library. The respondents who are library management were selected purposively due to their ability to address the issue at stake. There was also a convenience sampling of graduate and undergraduate students of the university who patronise the university library.

### **1.4.4 Data collection methods**

Semi-structured interviews and observation were relied upon to elicit data from respondents. The items comprising the interview guide as well as the observation check list were fashioned to relate to the objectives of the study.

### **1.4.5 Data analysis and presentation**

The interview will be audio-taped and transcribed together with the outcome of the observation and then analysed thematically.

### **1.5. 0. Value of the study**

This study is potentially significant to academic library managers, information professionals and the body of literature relating to mobile technologies.

To academic library managers, the study provides a unified coherent document to the approach or strategies in implementing mobile-based library services.

Again, the study will inform practitioners in the library profession regarding how to keep their clients in this era of information explosion in which the library is seemingly losing its place in information provision.

Above all, this study will contribute to the body of knowledge on not only mobile library services but also the application of mobile technologies in other equally important facets of life.

### **1.6.0. Definitions of key terms**

Some terminologies worth explaining are Information and Communication Technologies (ICTs), mobile (based) library services, academic libraries, and library automation.

#### **1.6.1. Information and Communication Technologies (ICTs)**

ICT has been defined as a field of work and study that “includes technologies such as desktop and laptop computers, software, peripherals and connections to the Internet that are intended to fulfil information processing and communications functions” (Statistics Canada, 2008).

The definition of ICT according to UNESCO is “the combination of Informatics technology with other related technologies, specifically communication technology” (UNESCO, 2002). For the purpose of this work, ICT will be said to be the newest technologies such as computers, broadband (internet), mobile devices that facilitate information processing and communication through storing and retrieving.

#### **1.6.2. Mobile Technologies**

Mobile technology such as PDA’s, smartphone and tablets are devices that allow one to create, access, organise and manipulate data in so many ways and forms from a point without any wire or any support connected to a particular spot (Regas, 2002). Mobile technology is a term that is used to describe all the various cellular communication technologies like Handheld Device Markup Language (HDML), Enhanced Data Rates for Global Evolution (EDGE), Code Division Multiple Access (CDMA), Time Division Multiple Access (TDMA), General Packet Radio Service (GPRS) and Global System for Mobile Communication (GSM) (B”-“Far, 2005:634). In this study, mobile technology will be referred to as conduit and platform that makes communication and information dissemination possible.

#### **1.6.3. Mobile devices**

According to Barnhart and Pierce (2012), mobile devices are “networked, portable and handheld...” They are devices that are not only used for voice calls but also to listen to music, reading and watching videos (West, Hafner and Faust, 2006). La Counte (2013: 5-7) posits that “The reality is that mobile devices can refer to essentially any device that someone uses on the

go” In this study, mobile devices will be referred to as a tools (smartphones, netbooks, laptops, tablets and iPads) that facilitate information transfer and communication.

#### **1.6.4 Mobile library services**

Mobile library services are services that utilise cellular phones and any other mobile devices such as smartphones and tablets to present an innovation and opportunities for libraries and information for everyone regardless of age and geographical location (Searcher, 2010).

According to Paterson and Low (2011), they are library services that can only be accessed through mobile device. For the purpose of this study, library services are services rendered through mobile devices for library patrons.

#### **1.6.5. Academic Libraries**

Academic libraries are libraries found in educational institutions mostly comprising universities, colleges, research institutions among others (Prytherch, 2000). The aim of academic libraries is mostly to support teaching, learning and research endeavours of that institution. They are often regarded as a hub of knowledge due to the information resources found there.

#### **1.6.6. Library Automation**

Library automation may be said to be employing ICT and its application in the daily operations and activities of the library to ensure efficiency in its service delivery. According to Jayaprakash and Balasubramanni (2011) most libraries in their formative stages in automation prioritise house-keeping activities such as serial control, circulation control, acquisition and cataloguing. They observed that these activities are considered to be basic in building stronger foundations for successful advanced automated library service.

### **1.7 Division of chapters**

The entire study is organised into five chapters, Chapter 1 to Chapter 5, as described below:

**1.7.1 Chapter One:** This chapter entails the overview; setting the tone for the entire work. It covers the problem statement, research questions, scope of work and definition of key terms among others.

**1.7.2 Chapter Two:** The main conceptual issues regarding mobile based library services have been explored in the second chapter, Chapter Two. While describing further some key terminologies, the chapter focuses on some empirical issues regarding aspects of the subject matter under enquiry.

**1.7.3 Chapter Three:** Issues regarding the method for the study are captured in this chapter. It focuses on the choice of the study area, the population of the study, sample size and sampling technique, research instruments, methods of data analysis as well as the ethical issues emanating from the study.

**1.7.4 Chapter Four:** The data from the field are presented in a simple and coherent manner in this chapter.

**1.7.5 Chapter Five:** This chapter, after giving the summary and conclusions from the study, outlines some recommendations to some identified actors to implement.



## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Introduction

In delving into a novelty application like the use of mobile technology to access library service, a number of concepts/topic need to be discussed in order to put the study into proper perspective. Topics considered include, but are not limited to, the role of mobile phones in improving access to education, the role of mobile phones in promoting new learning and broadband penetration in Africa and Ghana. The main thrust of the study was to find out how academic libraries can use mobile technology to access, utilise and improve service delivery to library patrons with the use of mobile devices. This will contribute to bridging the gap of the digital divide (Zickuhr & Smith, 2012). High increase in mobile technology penetration as indicated by Dahlstrom, Walker and Dziuban (2013) shows that mobile technology plays a vital role in enhancing the quality of services for academic purposes.

#### 2.2 The role of mobile phones in improving access to education

According to UNESCO (2012) the popularity of mobile phones across the world indicate a potential to support education through teaching and learning that will bring about education system transformation. Ferry (2009) observes that mobile phones such as smartphone can facilitate the access of web based contents, remix, share and collaborate with others in order to access rich media for global consumption. In the United Kingdom (UK), mobile phones according to Cui and Wang (2008) are used for storing and retrieving of academic information such as e-books and instructional materials, bringing effectiveness to teaching and learning. Other benefits higher education can have through use of mobile phones include, but are not limited to, due date for assignment, venue for lectures and information about time table (Liaw, Halala & Huang, 2010). In China according to Cui and Wang (2008), web pages of teachers are made available for students. Again online English learning resources are made accessible with the use of mobile phone. The use of mobile phone contributes to the improvement of teaching, Utulu (2012) revealed that in Nigeria, most students use mobile phones to engage lecturers on academic issues, sharing knowledge among students in various faculties and accessing the

library online public access catalogue OPAC. A study done in Makerere University by Kajumbula (2006) showed that students normally used mobile phones for academic purposes such as tutorials date, venue for lectures among other information. According to Kafyulilo (2012), mobile phones are recognised to be the most common and most accessible technological tools in colleges and universities in Tanzania, though much has not yet been achieved in terms of their use for academic purposes.

The handiness and portability of mobile phones ensures learning at all times irrespective of one's geographical location. The ubiquity of these devices makes it possible for those within the low income bracket to access educational services and their resources, thereby closing the gap between the poor and rich in society (Van Weert, 2005).

Most developing countries are now giving much attention to mobile infrastructure than to very expensive landline infrastructure (Motlik, 2008; Sharpels, Taylor & Vavoula, 2007: 224; Traxler & Dearden, 2005). This could be attributed to the fact that applications for mobile phone are easily accessible user friendly and cheaper (Motlik, 2008).

According to Davis (2012:6-8), 'Mobile phones are much more common and are increasingly starting to resemble computers.' Some developments regarding mobile phones in education are provision of published books with the use MXit which is facilitated by instant messaging platforms, the use of solar powered interactive white board and cell phones and tutorials through text messages. "Commenting on the popular Dr. Math tutoring service, which won the Technology in Government in Africa (TIGA) award in 2011, eLearning Africa notes, 'The TIGA Awards are an initiative of the United Nations Economic Commission for Africa (UNECA) and the Government of Finland. They recognised African governments and institutions which are using ICTs effectively in public service delivery in fulfilling UNECA's African Information Society Initiative (AIS)' (eLearning Africa, 2012)". Nokia, a leading mobile phone company came up with an innovation that allows teachers the ability to access content for lesson while individual learning is made possible. This innovation demonstrated that in 2010 grade 10 pupils had shown 14% math skills improvement (Nokia, 2010). Nokia successfully developed a module known as Entrepreneurial Programming and Research on Mobiles (EPROM) programme in Sub-Saharan Africa, this was made possible by Massachusetts Institute of Technology (MIT). The

EPROM programme was experimented in three East African countries namely Kenya, Uganda and Rwanda. The objective of EPROM was to ensure that programming for mobile phone curriculum is made available through mobile technology which will foster both research and entrepreneurship.

### **2.2.1 The role of mobile phones in promoting new learning**

For the purpose of this discussion, mobile learning (mLearning) will be defined as accessing education through mobile technology with the use of a mobile device.

Mobile phones in education have led to a new paradigm of evolution known as mobile learning (Muyinda, Mugisa & Lynch, 2007).

According to Mottiwalla (2007:592), mobile learning “combines individualised learning with anytime and anywhere learning.” Mobile learning is described as the use of portable electronic devices such as smartphone and tablets in accessing and sharing information; it is shaping the way learning takes place as well as how curriculum instruction is given or delivered (Geist, 2011; Miller, 2012). Rossing *et al.*, (2012) opined that mobile learning offer unique opportunities for users in accessing readymade information irrespective of their location.

The application of m-Learning apart from facilitating students learning can also support and foster collaboration among students and lecture (Huang, Hwang, & Chang, 2010).

Regarding mobile learning projects in South Africa, a study done by UNESCO (2012) observed that mobile phones were used to support the teaching of biology subjects.

There are a lot of conveniences in accessing education through mLearning; learners are able to pursue their studies through their own schedule of time.

Mobile learning has gained the validation of many researchers as it has the potential to facilitate engagement and support discussion in classroom setting (Rossing *et al.*, 2012). As an example of mobile learning devices e-readers are considered to be effective in the consumption of information, and researchers are exploring the depth of e-readers usages. E-reader is described as

an electronic device that is used as a learning technology in the field of education which provide or make it possible to access or open books digitally (Multimedia & Internet at School, 2010). The popularity of e-readers according to Sari, Lanham and Pan (2015) among students of higher institutions of learning are due to its flexibility, convenience and portability.

Schuler, Hutchins and Lashell (2012) observe that mobile learning device such as tablet PC helps students to understand key concepts and to support their personalised learning experience. They emphasise again that mobile technology creates a cooperative learning environment for students. It also gives students the needed platform to share information in the most efficient manner and increases the sense of accountability.

According to Visser and West (2005:123), mLearning makes it possible for those who see cost of education as a barrier to access education for the betterment of their lives. This is so especially for those in the rural areas where educational infrastructure is poorly-developed or not in existence. Mobile technologies have been regarded as the cheapest technologies as compared to

Keegan (2002:7) stresses that mLearning create a huge impact on educational outcomes by facilitating access and making distance learning much more convenient through utility and applicability. Quality educational materials are made easily accessible with decrease in cost while ensuring efficiency and effectiveness of education.

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There are a lot of conveniences in accessing education through mLearning; learners are able to pursue their studies through their own schedule of time.

A survey conducted by Educause Centre for Applied Research, ECAR (2012) on mobile technology in higher education shows that adoption of mobile technology in higher institutions of learning is driven by students. According to the survey, 67% of the students indicated that mobile phones play a major role in academic success.

The ubiquitous nature of mobile technology among students of high institutional learning presents a unique opportunity for academic institutions to explore its potentials. Pew Research Centre (2014) shows that 83% of adults that fall within the ages of 18 to 29 own smartphones. According to the report, ownership among college students is even higher. Dahlstrom and Bichsel (2014) observe that 86% of undergraduate students owned smartphone since last year and almost half (47%) owned tablets. Mobile technology which is considered as an integral part of students' daily lives has transformed their way of seeking information, communication and to a large extent, how they learn. Its unique features and capabilities such as connectivity, cameras and GPS among other things provide great potential for academic experience (Berking, Birtwhistle & Gallagher, 2013).

Through mobile technology platforms, learners are not restricted whatsoever in terms of geographical locations or boundaries. According to Chen et al., (2013), the growing interest of mobile technology presents new opportunities for learners that are found either within or outside the classroom.

Proponents of new learning which is facilitated by mobile phone argue that these gadgets facilitate personalised learning. Thus, they are responsible for both difference and diversity through which learning occurs. They support situated learning during ongoing course of learning activity. According to Kukulska- Hulme and Traxler (2007:184-186) and Traxler (2007:7), mLearning facilitates and champions authentic learning; it focuses on real world situation and considers projects that are of real concern and interest to the learner. Mccontha and Praul (2008) observe that mLearning though a relative new tool supports both teachers and students to be able to explore and navigate the concept of distance learning. MLearning affords an opportunity where learning is viewed in a small manageable formats and can be accessed anywhere. According to Wagner and Kozma (2005), the enormous possibility of mLearning has direct effect on learning, since technology enhances and strengthens students' motivations and consolidates the importance of learning to performance.

MLearning through mobile technology facilitates lifelong learning. The possibility of mLearning occurs across time and place where learners have the opportunity to apply what they learn in one area to develop another area or another environment (Sharples, Taylor & Vavoula, 2005:2-4; 2007:222-223). MLearning as opined by Dela Pena-Bandalaria (2007) is totally different from a

traditional education setting; there is greater knowledge transfer from teacher to student. MLearning gives wider platform to students for active participation, thereby ensuring that the learning process becomes constructive rather than instructive. According to Traxler (2007:5), mLearning through mobile technology describes learning that is not “just-in-case”; that focuses on the production of a knowledge bank but rather, “just-in-time”, “just enough” or “just-for-me”. Brown (2003:2) is of the view that mLearning that seeks to support new learning goes beyond the mere possession of information. It rather seeks to enable learners to locate, exploit and evaluate already existing information. Mobile devices also facilitate and deepens knowledge-centered learning, giving full understanding to a specific subject matter than just recalling or memorising a large body of information and using it as a form of new learning for integration and interconnection. Again, through mobile device, assessment-centered learning is made possible. This allows solid feedback in the learning process giving learners an idea as to what needs to be improved or learned next. According to Geddes (2004), mLearning facilitates quick feedback, maintains a learning appeal and provides the necessary and required motivation that is not present in the traditional education setting. Mobile devices have been at the forefront to support community-centred learning; learning that is recognised to be of value and relevance to social perspective. Through mLearning, achievement of socio-economic goals that hitherto confronts communities has been successfully achieved (Sharples, Taylor & Vavoula, 2007:223; Wagner & Kozma, 2005:83-85).

As it has been established by theories of new learning that social interaction deepens effective learning, mobile devices should be seen and recognised as a conduit for collaborative learning irrespective of one’s geographical location. Mobile technology allows learners to build and establish conversation line, resolve impeding issues and differences, create a platform that seeks common interpretation and understanding (Nyiri, 2002; Sharples, Taylor & Vavoula, 2007:225-226). MLearning encourages learners to improve both literacy and numeracy skills and bring existing abilities to the fore. Again, through mLearning, learners are able to identify easily where they need assistance and support, encouraging independent and collaborative learning experience. It also combats resistance to ICT, bridging the gap between mobile phone literacy and ICT literacy, engaging reluctant learners to be focused in much longer periods and lastly raising self-confidence and self-esteem of learners (Balasundaram & Ramadoss, 2007; Abozeid, 2011).

### **2.2.2 Mobile devices, students and learning**

Mobile devices are recognised as tools that facilitate information access. These include laptops, tablets, computers, both net and note book computers and smartphones (Walsh, 2012; Vandi & Djebbari, 2010:15). According to Lippincott (2010: 206), mobile devices include MP3 players and cameras as well as e-book readers. They are described as internet enabled devices used for “storing, identifying and carrying information on the user” (Vandi & Djebbari, 2010:16).

Interaction between librarian and students takes place in various places such as information literacy classes, desk services and in some cases cyberspace. Students view mobile device as an instrument that creates digital contents rather than as device to access content. Thus, students are able to use smartphones to respond to a “tweet” question posed by a lecturer, make short videos, take photo shots and make class audio recording. These devices as opined by Hey et al., (2007:447) can help students on field trip research to “capture authentic educational multimedia data, in context, that have previously been unavailable. Data captured in context permit sharing and remembering experiences upon return to the classroom.

... using multiple forms of data capture, for example, supporting photographs with audio recordings and student notes can assist students and teachers in seeing the whole picture of a learning experience.”

Through outreach to faculty, librarians will have the innovative skills coupled with the necessary technological skills to teach students about so many ways smartphones can be used to access information for assignment and research. They will also be able to teach them about various software tools for the organisation of information on their devices and the application that is required of them. An application such as Lecture Tools will offer more functionality where a lecturer can ask students engaging questions that will require the use of images and other complex approach. According to McCrea (2009), an application such as Hotseat allows or welcomes comments or questions with the use of laptops or mobile devices during class hour. Faculty members have now realised that this application encourages participation when a topical issue is discussed among students. Students from Purdue University who uses these facilities can share information, create enabling environment for interaction between themselves and lecturer



as well as study group members. This facility can only thrive in an academic environment where mobile devices are used extensively for academic instructions.

It is believed that as smartphone prices fall, students will find more streamlined ways to locate and access information. These devices offer a lot of opportunities for students to be active in learning and encourages the social nature of learning. Academic librarians can engage students in competitions or contests for app development so as to make services more useful for their patrons.

### **2.3 Accessing library services**

When accessing library resources remotely via their library websites, undergraduates and faculty generally reported utilising many of the same services: searching the home catalogue, searching databases for articles, and learning about library hours of operation (Don Dickenson & Denver Colorado State Library, 2006).

Postgraduate students access other facilities like the Ghana-Korea Information Access Centre and WiFi hotspot at selected places on campus for internet access where students can use their laptops and mobile phones to access these databases (Kwadzo, 2015).

Seeholzer and Salem (2011) also add that students expressed more interest in using their mobile devices to interact with library sources and services than expected. They wanted to use their smartphones for searching databases and the library catalogue, as well as staying informed by the library staff.

California Digital Library (2010) found out that mobile users use the library services to find known materials or quick pieces of information and they were already using online databases and catalogues on their mobile devices. Respondents were in favour of accessing the library catalogue from mobile phones. This was in addition to accessing information such as library opening hours, location, contact information and borrowing record. Such mobile library services were therefore recommended for implementation.

Mobile apps and responsive web design to the library user has its pros and cons. Current findings revealed that in some generic contexts, apps are growing more popular than mobile web systems



(Arthur, 2014). Gedye (2013) argued that apps are stand-alone and good for viewing some journals on mobile devices. However, their drawbacks have been identified as the difficulty in downloading the app, partial compatibility only with some devices, usually designed for browsing not searching and many apps working effectively only with single sites. Some students expressed more interest in using their mobile web device to interact with library resources and services than anticipated. Results showed interest in using research databases, the library catalogue and reference services on the mobile Web as well as contacting and being contacted by the library using text messaging (Seeholzer & Salem, 2011).

While using vendor-developed applications as an important strategy, most libraries will find that developing a mobile-compatible library website is necessary (Dresselhaus & Shrode 2012).

### **2.3.1 Mobile library service**

Mobile devices which include smartphones, iPads and the likes of tablet computers and other smart devices are gaining grounds and increasingly proliferating in society in general and the academic environment in particular, contributing immensely in the way information is handled; thus, organised, received and disseminated. It is for this reason that academic libraries must adopt mobile services which will leverage significant innovation with regards to technological changes.

Kumbhar and Pawar (2014) recount the digital journey of libraries as having transformed from traditional libraries to hybrid libraries, and then to automated libraries, which have also developed further due to digital archiving, Library 2.0 and mobile technology services.

Kumbhar and Pawar (2014) assert that mobile technologies have introduced a “Libraries in hand” trend. They suggest that since libraries are currently creating digital contents accessible on computers, such digital collections could be made available on mobile platforms. According to them Short Message Services or text facilities have often been relied upon by academic libraries to publicise their products and services such as new arrivals, due dates and renewals among others. The consideration to make library services available on mobile platforms has gained recognition both in literature and in practice by virtue of the benefits it brings. The mobile

initiative comes along with its interactive capabilities, easy access to information, time saving, personalised services, user participation as well as limitless access.

Though the concept of mobile library is not new, according to Smith and Jacobs (2010), mobile library referred to a vehicle purposely designed for library use. The aim of this type of library was to provide library service and other information needs to those in rural areas that lacked a library building. Needham and Ally (2008) are of the opinion that with the advent of mobile technology, mobile library has been coined to refer to all the information services that mobile devices offer. These include access to online catalogues, user suggested apps downloadable e-books, audio materials, access to databases, text notification and text references (Kroski, 2008).

In Ghana, the mobile library service is yet to gain prominence since mobile technology is not pervasive as compared to the developed world. Furthermore, the fact still remains that new technology always come along with some difficulties, of with which mobile technology is no exception.

According to Aharony (2013), these hindrances include but are not limited to slow speed of the Internet, expensive technology requirement, staffs with low skills and expertise and network congestion faced by a limited number of service providers. In buttressing the point above, Adetero (2010:40) observed that infrastructure is recognised as the main problem for new technology implementation. Effective information management will, to a large extent, depend on information and communication technology. Most African countries lack the basic information on infrastructure required to support development.

A study conducted by Kamba (2011:67-68) in Africa “shows that 85 per cent of the libraries provide less than one computer for every 100 students and 36 per cent provide less than one computer for every 500 students whilst 15 per cent of the libraries are not connected at all”. Armah (2009:87) opined that most technology that exists in academic environments is not explored to its full potentials. He noticed that internet usage in most libraries in Ghanaian Universities shows that most students and faculty members only use it for sending and receiving personal e-mails without any academic and intellectual activities such as research or collaboration in information sharing. Mobile library services that are familiar in the Ghanaian context are text, QR code and other social media tools (Palumbo, 2014).

Library services must quickly and flexibly adapt to mobile culture (Goggin, 2006). The value of smartphone as tool has been recognised and advocated by Starkweather and Stowers, (2009); Little, (2011) and Jensen, (2010) to enable users of the library to access library services. One example of these library services has to do with text-a-Librarian services which is seen as a very effective means and ways of satisfying client needs quickly and in a more convenient way.

Lombardo, Morrow and Le Ber (2012) have investigated the advantages of the use of QR codes in communicating or relaying important messages to library patrons. Treasure hunts for library users with the use of QR codes have also been developed by (Cummings, 2013). The presence of social media in libraries especially in academic libraries is gradually gaining grounds since these tools are regarded as a convenient way of delivering a wide range of resources and services (Penzhorn & Pienaar, 2009; Mahmood & Richardson, 2011). Some of these tools that are familiar in the library environment include; instant message for reference, blogs, podcast and social networking sites.

- **Instant message for reference:** These are applications which allow effective communication. Through this application information on directories, both synonyms andonyms and others such as meaning and definitions can be accessed from digital libraries. According to Chua and Goh (2010); Harinaarayana and Raju (2010), instant messaging offer enhancement of reference services to library clients since enquiries are immediately responded to.
- **Blogs:** Many academic libraries rely mostly on blogs, blogs mainly contain scholarly opinion or academic point of view that are recent and not out of date. Alexander (2008) opined that blogs are used by academic staff and researchers as an information source of a particular subject area that are relevant to their academic endeavour. Academic libraries can therefore rely on blogs to create specific subject area. These blogs can serve as a platform for the dissemination and broadcasting of news and other important information in the library (Chua & Gog, 2010; Harinarayana & Raju, 2010). According to Mahmood and Richardson (2011) these blogs ensures the facilitation, promotion and marketing of library services.

- **Podcasts:** These are applications that allows and support information dissemination. It enhances the delivery of library services and can also support tutorials on how to make effective use of library resources and services such as OPAC, the use of search engine and the rest (Harinarayana & Raju, 2010).
- **Social Networking Sites (SNS):** Social media and social networking sites such as Facebook, Twitter among others are extensively used in sharing and marketing library services. Again they also facilitate the sharing of videos and photos through the creation of databases that are image based (Harinarayana & Raju, 2010; Mahmood & Richardson 2011).

Mobile phones have affected the lives of people by changing the manner in which communication is done. Since they do not use wires or cables but radio waves instead, they are very portable and thus, preferred by lots of people (Homby, 2001).

## 2.4 Broad band penetration in Africa and Ghana

Information and Communication Technologies have been the main drivers of the world's developmental agenda such as the United Nation's Millennium Development Goals ITU (International Telecommunication Union, 2015).

According to ITU, International Telecommunication Union (2015) more than two-thirds of the world population (seven billion of the global population) live in areas with mobile broadband network and cheaper ICT services. With these unprecedented statistics, it is sad to say that more than half of the population is not making good use of the internet and other ICT services. Mobile broadband networks have reached 84% of the world's population with only 67% that are found in the rural areas.

Broadband access entails the high speed wired access to the public internet at downstream speeds not less than 256kilobits per second. Penetration rate, which is the percentage of a country's population that are subscribers, has often been used as the benchmark to measure progress at ICT advancement (Geoffrey 2011). ICT Facts and Figures from ITU, International Telecommunication Union (2015) indicate that 47% of people in the world use internet and only one out of seven people that are found in least developed countries (LDCs). One billion internet

users are found in the developed regions while 2.5 billion users are found in the developing world.

Ghana, with an estimated population of almost 27 million, has approximately 8 million internet users, representing 29.6% of the total population. Ghana is living up to its broadband policy of 'Broadband Wireless Access' which was adopted in 2010 (ITU & UNESCO, 2015).

Mobile-broadband subscription in developing countries has increased to double digits rates, with penetration rate of 41%. It is being estimated that mobile-broadband subscriptions will reach 3.6 billion by the end of 2016.

Mobile internet penetration in Ghana as at the end of April, 2014 stands at 54.09% comparing this to the country's population of 26,354,769 (Sarpong, 2016).

#### **2.4.1 Mobile penetration in Africa, Ghana and UCC**

According to Adepetun's (2015) assertion on Africa's mobile penetration, it is estimated that 67% of Africa's population which represent 1,113 billion people, now possess mobile phones.

A report by Ericsson mobility (2015) opined that the overall mobile subscription in Sub-Saharan Africa was approximately 80% in 2015. By 2021, mobile subscription is estimated to reach 100% (Ericsson mobility report, 2015). This estimation is mostly as a result of increasing level of urbanisation and growing investment in terms of rural network coverage to be undertaken by mobile operators. The report indicates that the growth of smartphone ownership and the unavailability of fixed broadband have made mobile broadband the cheapest way to connect to the Internet.

A report by Pew Research Centre (2015) shows that in 2002, access to mobile phone in Africa was one in ten in Tanzania, Uganda, Kenya and Ghana. Ownership of mobile phones has grown exponentially. Mobile phones are now common in South Africa and Nigeria as they are in United State (US). Smartphones in Africa are however not widely used even though ownership of such phones in South Africa is about 34% and 27% in Nigeria. The report went further to indicate that smartphone ownership is still less common in countries such as Tanzania and Uganda as it is still in a single digits as a percentage compared to ownership in the US (64%) as at 2014.

Africa has one of the greatest increases in mobile data use and this is even expected to increase further (ITU, 2015). In 2002, only 8% of the Ghanaian population had access to mobile phones. Today, access to mobile phones has increased to 83% which is more than a tenfold increase over previous years. This growth is also replicated in Kenya, Tanzania and Uganda where the survey was conducted.

According to The African Report magazine by Laary (2016), “Ghana’s mobile phone penetration rate increased to 127.63% after the country’s voice subscriber base climbed to over 35 million in December 2015 from 34 million registered in the previous month.” Latest figures released by national communication authority (NCA), the regulatory body that oversees mobile technology infrastructure in Ghana indicate that there has been an increase of mobile subscriber base from 34, 400,153 in 2015 to 35, 008,387. Thus, there is a voice penetration rate of 127.63%. According to the regulator, both voice and mobile data market share trends from mobile data subscriber have also increased from 17.73 million to 18.03 million, increasing access rate to 65.74%. This has been attributed to the expansion of network coverage and increasing availability of affordable, cheap smartphones mostly from Asia and especially from China.

Even though mobile operators in Ghana often complain about the backdrop of high cost and operational pressure, they benefit immensely from the support of solid regulatory framework, together with a loose market.

Lippincott (2010) observes that even though mobile services provided by libraries often involve access to information, it is still not lost on libraries to focus on the use of mobile devices to create digital content. In other words, libraries always have a choice to develop mobile friendly websites to their services or create mobile apps which offer similar services.

Gillwald, Milek and Stork (2010) believe that although fixed broadband or internet access through desktop computers is declining, mobile phone ownership for the same purpose is increasing. Much as many people first ever accessed the internet at the workplace, schools and universities and public access facilities such as internet cafes, the situation currently is that many people in Africa now access internet through their mobile phones (Caperon, 2015). Mobile phones have therefore overtaken by the use of internet cafés in most places in Africa.

This interpretation of mobile is largely indicative of the activity currently underway at the Library. In most libraries which have mobile services, the focus has often been on broadcast-only website rather than two-way conversation between the library and users or among users. Hence, libraries are encouraged to embrace the new era of rendering service through mobile devices.

Though mobile library service is novelty in University of Cape Coast Library, mobile penetration in the University stood at 92% as far back as 2009 (Dadzie, 2009).

## **2.5 Mobile technology**

Kim, Mims and Holmes (2006:79) define mobile technology as “technology that uses radio frequency spectrum in any band to facilitate transmission of text data, voice, video, or multimedia services to mobile devices with freedom of time and location limitation”.

According to Epstein (2013:16), mobile technology is considered to be the single most rapidly embraced technology in the history of the world. He affirmed that “cellphones are very convenient, easy to carry, and readily integrated into a user’s routine and many people have their phone with them during all working hours.”

Through mobile technologies, communication and information access have been made timely to users. Again, the introduction of this technology has brought about a novel way of accessing and handling information in the library.

Communication technology that facilitate information access and service provision via mobile devices includes Bluetooth, Global System for Mobile Communication (GSM), General Packet Radio Service (GPRS), and Third Generation (3G) (Vandi & Djebbari, 2010 :15).

### **2.5.1 Mobile technology education in Africa**

The popularity of mobile devices found in society are increasingly changing how information is organized, received and disseminated (Caperon, 2015).

The chartered Institute of Library and Information Professionals (CILIP) (2015) reports that in 2014, the use of mobile devices to access the internet became so popular thereby overtaking desktop use for the first time. Smart phones are now regarded as first screen customer’s access to communicate, research and share.



Mobile devices are reshaping customer experience as well as changing the entire process (CILIP, 2015). Libraries have always continued to rely on channels such as telephones, cellular networks, cable television and the internet to get their services across to their clients.

ICT has brought about effective communication and interactions across boundaries. According to Ademodi and Adepoju (2009), the use of information technologies has immensely contributed in solving basic life challenges. Librarians and academic librarians especially will be able to appreciate the exploit of emerging technologies and other ICT infrastructure if they continue to contribute and position themselves as information disseminators (Ikhemueh, 2005).

Jackson et al., (2011) have observed that the internet has transcended the barriers of gender, race, income and socio-demographic characteristics. They then assert that the educational playing field has the potential to doing this due to its availability everywhere and to anyone. It is seen as a major player for academic institutions to improve as the world moves towards a knowledge-based economy (Bon, 2007). University libraries have applied the internet in areas such as online data repositories, library catalogues, journals, news services and information literacy (Chan & Fu, 2009).

Access to the internet on smartphones is mostly through wireless fidelity (WIFI) or cellular connections whereas WiFi networks are faster, they tend to be more restricted than cellular networks which can be accessed wherever there are phone signals. Currently, worldwide interoperability for microwave access (WiMAX) which is the first 4G mobile wireless technologies have the abilities to cover greater distances at high speeds for many users. It also comes with endless applications like WIFI internet connectivity that are made available with the help of IP enabled devices such as mobile phones and some specific cameras (WiMAX, 2012). Apps, which are native third party applications are built for particular smartphone platforms. They increasingly become essential part of smartphone technology. As opposed to mobile websites, apps rely on a smartphone's built-in features, such as cameras and microphone and other in-built features (Murphy, 2010). Typical examples of apps include Facebook, WhatsApp, Google Maps, Twitter among others (Nielsen, 2010).

Mobile websites are also very important platforms on mobile devices. They are considered as websites which are derived from the internet but created particularly for mobile tough screen



devices due to their finger-friendly layouts and light weight pages (Taptu, 2010). According to Miller, Vough and Jennings, (2012) and Zylstra, (2011) extensive research has been done on the success of applications for mobile devices on the enhancement of a patron experience in the library environment.

Arthur (2014) opined that the use of apps is becoming more popular as compared to mobile web systems. Research done by Gedye (2013) show that apps which are standalone are good for accessing some journals with mobile devices.

A report by Wangalwa, (2014) shows that Kenya possesses the highest bandwidth per person. The country also has the fastest speeds and very cheap or low internet rates in the Sub-Region. According to International Telecommunication Union (ITU, 2013) averagely all developing countries including Ghana are expected to have a penetration rate of mobile phone at 90% and expected to hold almost two-thirds of the world's 2.3 billion subscription of mobile-broadband. This development has been corroborated by another study which indicate that seven Sub-Saharan African nations have two-thirds of its adult population owing mobile phone, the study again shows that mobile phones are cheaper in Nigeria and South Africa as in USA (Pew Research Centre, 2015).

Mobile broadband in Africa is seen as a very important tool since internet is mainly accessed through mobile devices. An example is found in Kenya where internet accessibility is up to 99% via mobile devices. According to GSMA intelligence report (2014), the downward price for smartphone and ever increasing demand and appeal for social network sites contribute immensely to the adoption of mobile phone and mobile broadband internet.

Access to mobile technology has been recognised internationally to give opportunities to the youth to enter the digital realm thus taking teaching and learning to a higher level (UNICEF, 2012).

### **2.5.2 Mobile technology in academic library**

Mobile communication is said to be the only technology that has been embraced and received massive acceptance in the developed and the developing countries within a short spate of time (Castells, 2007; UNDP, 2012). According to Choy (2010), these devices have become an integral

part of students study activities in most universities and other higher learning institutions. Libraries especially academic libraries are coming up with strategies for designing mobile technology-based services so as to meet the ever changing sophistication that characterises their information needs and requirements of their patrons (Lippincott, 2010; Vila, Galvez and Campos, 2010). The following are some of the strategies embarked by some academic libraries.

**2.5.2.1 Mobile interfaces and online public catalogue:** Libraries in their quest to offer tailor-made services are developing and providing access to mobile versions of their OPAC to their clients in order to render timely and without barrier services and resources to their patrons. These services include collections and e-journals as well as time for opening the library (Murray, 2010; Vila, Galvez and Campos, 2010).

According to Vila, Galvez and Campos (2010:327), mobile OPAC (MOPAC) ensures fast and quick retrieval of an item. Paterson and Low (2011:418) confirmed that 60% of students interviewed opined that it is convenient to search the catalogue anytime and anywhere.

**2.5.2.2 Mobile collections and databases:** According to Lippincott (2010), database publishers are using innovative strategies for mobile version of their databases for their clients to access both e-books and e-journals via their mobile devices. These databases are said to be mobile friendly as they easily interface with mobile devices (Murray, 2010:241; Bucznski, 2008). These publishers include social science research networks and music online services that provide access to both video and audio recording (McKiernan, 2010). Ebscohost provides a mobile interface for Ebsco products which according Hadro (2009) is considered to be very useful for mobile library platform. Murray (2010:242) states that e-books readers make it possible to access these databases irrespective of their geographical location.

**2.5.2.3 Mobile instructions and mobile tours of the library:** Fresh students who embark on their academic journey each year are introduced to instruction services in the academic library. These services such as library orientation and information literacy are the services libraries provide through mobile devices. Kroski (2008:35) observed that Youtube can be a best example for library tour videos. Another tool for making mobile instruction services possible is the use of podcast. Murray (2010) and Choy (2010) stated that the content of podcast provides immense benefits to both distance students and those studying abroad. Awareness services such as “Guide

by call” and “self-service” library instruction services also contribute to adding value to the services that are already available (Murray, 2010; Kroski, 2008).

**2.5.2.4 Short message system reference:** SMS reference is widely known among mobile technology in academic library services. Paterson and Low (2011) opined that this service seeks to provide services to patrons from any location. It allows a library patron to send a text to a librarian with the use of their mobile phones. The librarian can also send a text to patrons by way of alerting them of the availability of new arrivals, reserved books and any other library news (Pearce, Collard & Whatley, 2010:250). SMS appeals to both librarians and students. In order not to invade the privacy of students, Vila, Galvez and Campos (2010:331) advise that students be made aware by librarians before a message is sent. Again, they observe that some reference queries go beyond SMS. However, such mobile reference services facilitate and ensure that synchronous reference transaction is performed in the quickest and convenient way.

### **2.5.3 App usage versus smartphone web browse**

A study done by Tally (2012) comparing the preferences of apps and smartphone browser indicated that anytime students want to check the outcome of the weather, they use the application (apps) for the weather rather than the web browser. It came out that students find the apps more convenient than the browser. Another study revealed that 85% of the students will go for the apps for the weather rather than use the smartphone browser. Bowen (2012:5) also stated that students prefer to spend a lot of time on mobile applications rather than using a web browser. He opined, “overall, students reported spending more time using mobile apps, and as students become more advanced in their use of smartphones, the gap widens-the amount of time spent using mobile apps increases, while the amount of time spent using a smartphone browser remains relatively consistent”.

The widespread usage of apps led eMarketer’s (2012) to carry out research on the type of apps most college students find interesting, convenient and receive high patronage. The study showed that most students use apps for communication and social media. According to the study, 21% of

the college students use smartphone for communication while 19% of them engage in use of social networking apps, especially Facebook which is the most used.

## **2.6 Opportunities**

In the view of the International Telecommunication Union (2012), the internet provides access to social interventions such as financial inclusion through mobile banking and healthcare in many developing countries, which were previously inaccessible to the poor. In furtherance of this, Kim, Kelly and Siddhartha (2010) intimate that in middle and low income countries, a 10% increase in internet connectivity leads to a 1.38% increase in economic growth. It has however been observed that in the case of developing countries, the rate of fixed broadband is very slow; causing mobile broadband to become the alternative (Katz, 2012; ITU, 2012; Mulas, 2012).

## **2.7 Challenges**

A very significant factor for the success of mobile technology-based library services is the technology which drives the service. Technology tends to influence the type and amount of content displayed. Currently, most mobile devices are limited by their speed and storage capacities.

Another issue has to do with the design of the format. Not all contents on a desktop computer can be replicated on mobile platforms. A lot of reorganisation of texts, images, graphics, tables and other features would have to be done in order for a document to be fit for access on mobile devices.

Also, problems arise in the bid to separate the content of the library service from the format of the mobile device. Ideally, a mobile library should be device independent and should work on diverse mobile devices. It has also been realised that libraries often fail to distinguish the differences between designing to host services on a normal website and that of a smartphone interface leading to failure to yield the desired impact (Travis & Tay, 2011). It has however been established that in the mobile environment, what may be compatible or convenient in one library might not necessarily be the case in another library since the information needs of users differ.

A survey by Thomas (2010) on mobile sites and libraries indicate a positive attitude and readiness to have mobile web presence. Nevertheless, only a few had mobile sites available owing to reasons such as low budgetary allocations, lack of prioritisation, low skills, confusing architecture and negative perceptions of users about the service.

Privacy is also another worry for mobile technology in the library. This is because client personal information could be exploited by third parties such as law enforcement agencies and those who commit identity theft. Mobile technology in creating more services, tend to expose the user to potential invasion of privacy.

A study conducted by Chisenga (2015) on library users, ICTs and libraries in Sub-Saharan Africa shows that most libraries lack funds to purchase library systems; those who have succeeded in acquiring commercial library systems or managed to automate some or all functions lack the required funds needed for upgrade and maintenance of such library systems. Anytime libraries fail or are unable to pay for either maintenance or license fees regarding software systems, they forfeit the opportunity to access technical support and the necessary updates from their vendors. This difficulty leads most libraries to stop subscribing or abandon the software system completely and shop for a less expensive software system instead. These less expensive software systems include Open Source systems with a larger user base so that expertise can be shared.

## **2.8 Proposed strategies for implementation**

In implementing a mobile strategy in an academic library, there is the first need to recognise who constitute the stakeholders and which reason determine their needs, culture, and desires. It is often advised that libraries plan, develop and implement their mobile-based library services with the following groups in mind:

1. Students
2. Faculty
3. Prospective students
4. Staff
5. Campus visitors

6. Donors
7. Alumni
8. Parents
9. Corporate research collaborators

Based on the identification of the audience, various segments of these stakeholders could be prioritised with their desired needs. EDUCAUSE (2010) suggests that the audience of a university library could mainly be grouped into internal and external audience. Students, faculty and administrative staff as well as researchers or campus visitors constitute the internal audience of an academic library. In some cases, students want libraries to provide services which make them access information sources whilst staying connected with others. That is, the library platform should help them to e-mail, text, access social networking sites and location-based services, and search the internet (Horrigan, 2009).

It is also believed that for any digital initiative to succeed there is the need for thorough education before, during and after implementation (Jiyane & Mostert, 2010; Unwin, 2005). Information literacy skills could be promoted by librarians by utilising group text messaging platforms, and in the future, through videoconferencing and smartphone apps.

## **2.9 Conclusion**

Mobile technology usage in academic environment presents tremendous benefits in accessing library services. With the various topics reviewed, it comes to light that mobile technology plays a vital role in academic libraries. The role of mobile technology in education promotes lifelong learning and presents an opportunity for academic institution to explore its potentials. Mobile technology devices to a large extent have become popular and are regarded as an important tool that is changing the way information is organised, received and disseminated. Through mobile technology, mobile learning (mLearning) is made possible where learners are able to improve upon their literacy and numeracy skills through mLearning. The gap that exists between mobile literacy and ICT literacy are bridged thereby, ensuring self-confidence among learners (Balasundaram & Ramadoss, 2007; Abozeid, 2011).

## CHAPTER THREE

### RESEARCH METHODOLOGY

#### 3.1 Introduction

The study sought to examine how library services could be made accessible on mobile devices by the University of Cape Coast Library. This methodology section addresses the processes and strategies through which the objectives of the study were achieved. Issues such as the research design, study population, sampling and sample size, instruments of data collection, data analysis as well as ethical considerations are what pertains in this chapter.

#### 3.2 Research approach

The study was underpinned by the Qualitative School of Thought. This is a research philosophy in which a complex, holistic picture is built about a phenomenon whereby the researcher analyses words, reports detailed views of informants in a natural setting (Creswell, 1998). The implementation of library services to be accessible on mobile devices in a library such as the UCC Library requires a deep understanding of the issues which drive such a project. In the bid to understand the diverse roles of the individuals and the various strategies in implementing mobile library services, a qualitative approach is considered appropriate.

#### 3.3 The case study design

Babbie and Mouton (2002:528) insists that empirical research requires a plan which outlines the various circumstances and procedures for collection and analysis of data. Through case studies various studies are conducted at each level of the research process. This helps researchers to develop ideas for extensive research. They also serve as channel for a range of research methods. Thus, they are non-prejudicial with regards to any other type of research (Murphy, 2014). This study employed the case study research design which provides for the construction of an in-depth description of the features or attributes of a particular phenomenon (Hamel, Dufour & Fortin, 1993; Sarantakos, 2005). Since it is flexible, case studies introduce new and unexpected results during an empirical inquiry thus widening the scope of the study (Creswell, 2009). It has been observed that responses from case studies provide more realistic responses

than a purely statistical survey (Stake, 1995; Flyvbjerg, 2001b & Creswell, 2009). Case studies are primarily associated with the fields of anthropology and sociology and could either be single or multiple-case designs.

The case study research design has been adopted in many inquiries pertaining to the adoption of digital initiatives in libraries, digital archiving, institutional repositories and digital libraries. Applications of case study methodology have been done by several researchers to study institutional repositories because by their nature, institutional repository research relies heavily on qualitative methods of inquiry.

A major challenge of case studies is that the measure of construct validity becomes very difficult. That is, the extent to which a measurement corresponds to the concepts under study, is problematic in case study research (Giddens, 1981; Flyvbjerg, 2001a). The effects of this challenge could be mitigated by the use of multiple sources of evidence (Yin, 2003). Reliability in case studies is improved by the development of the case study protocol and the consistent use of uniform procedures. Stake (1995) and Yin (2003) identified sources of evidence in case studies as documents, archival records, interviews, direct observation, participant observation and physical artifacts.

Case studies could be single or multiple. Single cases are often employed to confirm or refute a theory or to represent and explore a unique or extreme phenomenon that was hitherto inaccessible (Yin, 2003). However, in applying single-case designs, great care needs to be taken to avoid misrepresentation and to maximise the use of data drawn from key documents and people. A single case, unless carefully selected, may fail to represent the object of study, while dependence on a single case renders a study incapable of providing a generalisable conclusion (Hamel, Dufour and Fortin, 1993; Tellis, 1997).

Multiple-case studies, on the other hand, follow replication logic. Each individual case in multiple case studies consists of a complete study, in which facts are gathered from various sources and conclusions drawn from them. Multiple cases strengthen the results by replicating the pattern-matching; increasing confidence in the strength of the theory. Applications of case study methodology have been done by several researchers to study institutional repositories



because by its nature, institutional repository research relies heavily on qualitative methods of inquiry.

### **3.4 Selection of research location**

The University of Cape Coast Library System comprises the Sam Jonah Library (the main library), the college, faculty and departmental libraries as well as the libraries in the halls of residence. Much as all these libraries provide services for clients, this study of the implementation of mobile-based library services focuses on the main library of the university. The choice of the setting of the study is apt because the Sam Jonah Library serves as the central node through which all policies for the other satellite libraries are run.

Sam Jonah Library already drives the digital initiatives of the university including the Koha library management software, institutional repository, Online Public Access Catalogue and the electronic resources. It is envisaged that in serving the academic community, of which most are on the distance education programme, the implementation of mobile-based library services by the Sam Jonah Library will position the university to deliver its academic mandate.

### **3.5 Target group and sampling**

#### **3.5.1 Introduction**

The concept of target group and sampling goes beyond human subjects to include documents, artifacts, activities, social actions, archival records and physical artifacts. To Nueman (2006), population in research refers to the larger unit with similar characteristics from which a sample is taken. In most cases, the population and its size cannot be wholly included in the inquiry; a proportion of it is used. This portion of the population used in a study is called a sample, and is obtained through a process called sampling (Sarantakos, 2005).

#### **3.5.2 Target population**

In this study, library staff and students of the University of Cape Coast are relied upon to provide information. The library staff, who are largely of management status have been included due to their depth of knowledge on mobile-based library services. The study engaged resident undergraduate and post-graduate students as respondents. It is believed that both categories of

students are technologically-aware, and their perception could be helpful in any attempt to study the implementation of mobile based library services in the University. Again, students are the main users of the mobile-based library services, hence, it is appropriate to assess their level of proficiency and how a service of this nature will affect their patronage of the library services in general.

### 3.5.3 Sampling procedure

Purposive sampling was relied upon to select the key library officials which included the University Librarian, the Deputy Librarian, the Client's Service Librarian, the Digital Librarian and two principal assistants of the Digital section of the Library. This brought the number to six in all.

Ten undergraduate students were randomly selected from among students studying at the undergraduate section of the Library and same method was relied upon for postgraduate students who study at the Post Graduate Section, the Research Commons. The use of two non-probability methods made it practically possible for respondents to be selected and included in the study.

### 3.5.4 Sample size

The library staff purposively selected were six in all. For the students' category, 10 undergraduate and 5 postgraduates were used in the case study respectively. These altogether sum up as shown in the table below:

	Library staff	Undergraduates	Postgraduates	Total
Population	230	18913	1,068	20, 211
Sample	6	10	5	21

The sources of these figures were obtained from the UCC Library Guide, (2011) and the UCC-SRIMS, Record Guide (2016).

Boyce and Neale (2006) are of the opinion that in qualitative interviews, a smaller sample size gives enough evidence that goes beyond a very small number of people without imposing the

hardship of endless data gathering, especially when researchers are constrained with time and other factors. It often works well when it is supplemented with participant observation.

Green & Thorogood (2009:120) observed that "the experience of most qualitative researchers is that in interview studies little that is 'new' comes out of transcripts after you have interviewed 20 or so people".

According to Powell and Connaway (2004), in qualitative research, sample sizes are relatively small compared to quantitative studies as the aim of a qualitative study is to obtain depth, complexity, rich and understanding rather than to generalise.

### **3.6 Data collection methods**

In the view of Hsu and Sandford (2007), data collection refers to the tools or means by which a researcher attempts to measure variables or items of interest. They again posit that apart from instrument design, selection, construction and assessment, the concept as well covers the conditions under which the designated instruments are administered. It is therefore essential that a detailed description of the means through which data was gathered from the desired sources is covered under this caption.

#### **3.6.1 Semi-structured interview guide**

Semi-structured interviews were used to elicit primary information from respondents. This type of interview ensures that respondents are asked the same range of questions in order to allow any form of elaboration which may arise in the context-specific situation. In the view of Sarantakos (2005), interviewing, as a form of questioning, uses verbal inquiry as the core technique for collecting data. Also, Patton (2003) argues that the interview process gives an avenue for a researcher to probe and ask questions to elaborate on the topic whilst remaining conversational and situational.

#### **3.6.2 Advantages of interview**

Interviews allow the researcher to probe further to clarify issues for better understanding. It is also flexible, thus allowing the unique conditions of a particular study location or situation to be factored into the study. Again, the researcher is able to get certain relevant information from the

non-verbal communication such as body language and gestures. Sometimes, this non-verbal communication gives enough evidence to validate and buttress a point or position.

### **3.6.3 Disadvantages of interview**

A number of limitations have been adduced in the use of interview in social research for the collection of data (Sarantakos, 2005; Kumar, 2005; Powell & Connaway, 2004). In most situations, a considerable amount of time is spent on very few subjects, participants or respondents. Also, this method always needs the physical intervention of the researcher, unlike surveys which do not necessarily need the researcher to be with the respondents. Furthermore, disclosing certain details to an interviewer is very difficult unlike surveys whereby the respondents responds to an inanimate paper.

### **3.6.4 Instrumentation**

According to Hsu and Sandford (2007), instrumentation is considered as the way or means by which tools are employed by the researcher to measure important variables during the data collection process. The study sought to use qualitative method in collecting different sources of data from the library management and students from University of Cape Coast. The interview, which was semi-structured were used to elicit primary information from the 21 respondents. According to Sarantakos (2005), semi-structured interview ensures uniformity, provides avenue for the uniqueness of the respondents, situations and the environment where information is gathered. Two separate interview guides were used; one section for students and the other section for the library management respectively.

## **3.7 Application of interview questions to the study**

Library staff and students (undergraduate and postgraduates) were engaged in the interview. With the library staff, they were approached earlier by the researcher to fix a convenient time and venue for the interview. This was necessary to enable both the researcher and the respondent to prepare for the actual day. Regarding students, since the process of inclusion was accidental sampling, those who agreed to be included in the study were engaged in the discussion as to how

to get the best information from them for the study. Whereas a few agreed to be interviewed on the same day, eleven out of the fifteen proposed a later date. They duly turned up on the scheduled dates. On the whole, the interview with the selected library management and staff as well as the students occurred between 5<sup>th</sup> and 12<sup>th</sup> of August, 2016. The interview guide for the library management and staff entailed the demographic data of respondents, perception regarding mobile technology based library services, strategies for implementing mobile technology-based library services and challenges in implementing mobile technology-based library services. Apart from the background issues of the student respondents, their perception regarding mobile technology-based library services, proficiency of their use of mobile-based technologies, strategies for success as well as some possible challenges which will confront the implementation of mobile technology-based library services were also examined.

Together with two trained field assistants, the interviews were conducted with the responses recorded through note taking and audio recording. Interviews with the students occurred at an irregular time, unlike those of the library staff which often occurred during lunch break (1:00 p.m.) and after close of work (5:00 p.m.). After each interview session, the audio recordings as well as a photocopy of the notes were immediately sent as email attachment into my inbox. This was a precautionary measure against any permanent loss of the field data.

### **3.8 Data analysis and interpretation**

#### **3.8.1 Case analysis**

Due to the fact that qualitative research results in large amounts of richly detailed data, which often times is contextually laden, research result must be reduced to represent the major themes or categories of the topic of study (Creswell, 2009). The data from the interview were recorded through note taking and audio recording. In order to harmonise and ensure validity, the notes were compared with the transcribed audio records. The transcribed interviews were read through and coded according to the respective themes to bring out the emerging patterns and categories which provided the basis of analysis. In doing this, the entire transcribed interviews were placed

into a single MS Word document. After this, a simple table was created and populated with the following columns:

- Unique ID (done to achieve a greater level of anonymity);
- Transcribed data
- Theme, categories and subcategories that the data record fit in;
- Page and line number from the MS Word document.

### **3.8.2 Case report**

Further clarification, when deemed appropriate, was sought from respondents to ensure that their views have not been misrepresented. Once satisfied, the themes, categories and sub-categories became the foundation for the development of the case study report. The report comprised direct quotation as well as indirect or general attribution.

### **3.8.3 Validity**

A key factor for a research to be reliable is for the instrument to measure what it is supposed to measure (Creswell, 2009; Kumar, 2005). To achieve this, not only was enough explanation made to respondents to ensure clarity but also, their clarification was sought in areas where misrepresentation of facts or opinions was likely to occur.

### **3.8.4 Ethical Considerations**

The researcher agrees with Fraenkel and Wallen (2000) about the need to hold information acquired from respondents in confidence. In furtherance of this, study respondents were adequately informed and their permission sought before being included in the study and a letter of introduction shown to disclose the researcher's identity. Also, the instruments were duly assessed and reviewed by the Ethical Review Board of the Department of Information Science of the University of Pretoria before being administered. To add to high level confidentiality and trust, respondents were accorded the opportunity to comment on the draft report or transcribed interviews. Furthermore, all sources of literature used for this study were duly acknowledged in accordance with the tenets of academic honesty, copyright and fair use.

### **3.9 Conclusion**

The chapter described how the 21 persons engaged in the study were chosen and how the interview approach was relied upon to elicit information for the study through the case study research design. It further explained how the recorded data were analysed to write the case study narrative, observing all ethical concerns. The next chapter presents the case report emanating from the collection and analysis of data.

## CHAPTER FOUR

### DATA ANALYSIS AND PRESENTATION

#### 4.1 Introduction

This chapter describes the analysis and presentation of results obtained from the study. The study made use of only an interview guide as data collection instrument. Analysis of data for this section was gained from students. Thus, undergraduate and postgraduate students (Masters and PhD) and library management staff. The discussion of the findings is tabulated which follows the format of the interview guide.

#### 4.2 Demographic information

Demographic information from the interviews was critical on the grounds that it lead to better comprehension of the qualities of respondents under study. The reason for including the bio data of the respondents in this chapter was to give substantial information about the respondents and gain some understanding of their unique needs. There were two categories of respondents that were involved in the study: the students (undergraduate and postgraduate) and library management staff from the University of Cape Coast. The respondents were classified for further deliberation in terms of academic and study levels, duration in service or study, area of specialisation and other issues regarding use of mobile device by under students and library management staff, as separately shown below. The summary of background issues of the students is presented in Table one, Appendix 2.

#### 4.3 Level of Respondents

The study had a sample size of twenty-one respondents where fifteen were students (ten undergraduate and 5 postgraduate students) and six of the respondents were staff of the library management of the University of Cape Coast. The reason for asking the level of the respondents was to discover if the views of students differ from those staff and whether undergraduate students have different views from postgraduates.



#### **4.4 Knowledge of Students of mobile device**

The researcher asked undergraduate and postgraduate students whether they possess mobile devices. The study revealed that all the fifteen students possess a mobile device. A follow up question was asked with regard to what kind of mobile device they possess: the responses showed that all the fifteen students possess smartphones. The names of some smartphones the respondents mentioned they possess include Infinix, Nokia Lumia, ITEL tablet, Samsung tablet, Dell and Blackberry. Also, when asked whether they possess other forms of mobile device, the findings showed that three of the respondents had more than two smartphones in their possession. When the respondents were asked why the majority of people possess smartphones, their responses were as follows; used it for surfing the internet, academic activities and for communication. From the above findings on the knowledge of students about mobile device, a good representation of the respondents had knowledge about mobile devices and smartphones. The respondents knew the basic function of mobile devices or smartphones at the University of Cape Coast.

#### **4.5 Duration of service for library Management**

The duration of service of library management was very important to the study because it helped to obtain reliable and relevant information. The study revealed that only one of the library management personnel had served for the duration of five years. Out of the remaining five library management staff, one person had served for thirty-three years, two persons had also served for twenty-five years and the other two persons had served for twenty and fifteen years respectively at the University of Cape Coast Library. The result therefore suggest that a good number of the library management staff had served for more than fifteen years which implies that they have rich work experience at the University of Cape Coast Library; only one person had a limited working experience.

#### **4.6 Area of specialization for library Management**

It was imperative to obtain information from the respondents relating to their area of specialization because it enabled the researcher to know whether the respondents were in a good position and had knowledge in relation to library management. The study revealed that six of the

library management staff had different areas of specialization at the University of Cape Coast Library. Their areas included Information systems development and management and scientific communication, digitization and readers service, IT and programming, system librarian, digital librarian and system librarian, cataloger and information provision. The findings above therefore revealed that all the six of the library management staff at the University of Cape Coast Library operated with each other because they provided services that relate to information technology to their users at the University Library.

#### **4.7 Perception of Students regarding mobile phone-based library services**

This section was to investigate students' perception on mobile phone based library services at the university of Cape Coast. A tabular summary of the interview guide can be found in Table 2, Appendix 2.

The respondents were asked whether they have ever accessed library services from the University of Cape Coast from their laptop? It showed that ten students out of the 15 students interviewed access library services from their laptop. This shows that most respondents undergraduate and postgraduate students at University of Cape Coast do access library services to search for information to do their assignments, write articles and write-ups related to their subject areas. Some of the respondents said they used their laptops to access “digitized thesis and journals” from the University of Cape Coast library web page.

Furthermore, students at University of Cape Coast were asked whether they were aware that some library services could be accessed through mobile devices. Most of the respondents were not aware about accessing library databases, and that searching for information and journals could be done by use of their mobile phones. They said they have theoretical knowledge through the information literacy class and have practical experience. However, most of the respondents revealed that they were not aware that library services could be accessed through mobile devices. They were of the view that more publicity should be distributed about the services the library wants to offer.

In response to the question about the kind of services respondents wished the library made accessible through mobile devices, they wish to be able to access databases, journals, digitized

thesis and relevant books related to their subject area without necessarily going to the library building. Providing this could potentially save respondents time and also make it easy to move around with study material on their mobile devices.

Also, respondents at the University of Cape Coast were questioned about their preference with respect to mobile apps and mobile accessible websites. Their replies revealed that most of the respondents preferred a mobile accessible website. It is easy to access and not limited to a smartphone: an internet-enabled phone can be used to access library resources. However, only a few of the respondents agreed that a mobile app should be used in the delivery of library services.

Students were questioned on the benefits they will derive from mobile phone-based library services. It revealed that students from the University of Cape Coast knew the benefits they will derive if mobile phone-based library services were implemented. They explained that it would be easier to search and access information anywhere and it would save them time from moving from one location to the other in a search of learning or research materials and also getting access to many materials on one device was beneficial.

#### **4.7.1 Proficiency of Students in Mobile Phone Usage**

With regard to proficiency of students in the usage of mobile phones at the University of Cape Coast, various questions were asked in the interview under this section. The answers obtained are presented in a table which can be referred to in Table 3, Appendix 2.

Students at the University of Cape Coast were asked about how proficient they were in the use of smartphones. The findings indicated a good representation of the respondents were familiar and had a practical knowledge of smartphones and were aware with most of the features and the applications on smartphones. One of the students said, “I’m proficient in the use of smartphones, “let’s say I am 70 to 80 % proficient in the use of smartphones”. However, it was noted that two of the respondents had limited knowledge of how to use a smartphone.

Regarding the usage of smartphones, it can be said that students at the University of Cape Coast use their phones for social and academic purposes and many more. Some students responded,

“Mostly social media and calls” and “Aside social media, I use it to study, I download pdfs, ebooks, dictionaries and other useful materials for academics”.

When questioned on whether they use mobile phones for academic searches, the study revealed that a good number of the respondents use their mobile phones for academic searches such as getting relevant articles and write ups, minor searches such as meanings, definition of words and other useful academic materials.

The respondents at the University of Cape Coast were interviewed on how efficient they were in the use of smartphones or laptops for academic purposes. The study showed that students at the University of Cape Coast are more efficient in the use of laptops compared with smartphones because of convenience and comfort as well as a wide screens, which aids academic work. Thus, they were able to retrieve the desired information for their assignments, long essays and write-ups with ease. Typical of the replies was one students view, who said, “for me my laptop takes precedence to smartphone”-because I use laptops extensively for all my academic work. Reasons being that when I use my phone for academic downloads, it freezes, battery runs down, use a lot of data I purchase on the phone too. The laptop has a lot memory capacity wider screens”.

When asked whether their skill was enough to utilise smartphones for academic purpose, the majority of the respondents agreed that they were proficient enough to use smartphones for academic purpose. They said they made use of the applications on their phones without training, hence they were proficient.

When questioned whether extra training was necessary to fully utilise library services at the University of Cape Coast, it revealed that a greater part of the respondents agreed that extra training was needed to fully utilise library services, therefore, helping make efficient use of the service.

#### **4.7.1.2 Challenges**

This section in thesis study answered questions related to challenges in order to anticipate what measures are needed to address the implementation of library services on mobile platforms. The summary of the responses of the interviewees is presented in Table 4, Appendix 2.

Respondents were questioned about the anticipated challenges that will affect the adoption of mobile phone based library services. The findings showed that most of the respondents agreed that in implementing mobile library services, some anticipated challenges will be unreliability of the internet, lack of funds and the screen of mobile devices being too small to read

When questioned how these challenges related to implementation of mobile based library services, the study revealed that the University of Cape Coast Library had to increase its internet connectivity and also collaborate with international partners to secure funds to support the project.

#### **4.7.1.3 Strategies for successful implementation of mobile phone library services**

This section also looked at the strategies for successful implementation of mobile phone library services at the University of Cape Coast. The synopses of the views of the students are presented in Table 5, Appendix 2.

Respondents were asked what strategies the University Library should put in place to succeed in making services accessible on mobile devices. The disclosure revealed that educating students on the range of library services and also ensuring proper foundation for the mobile platform would help for successful implementation.

At the University of Cape Coast, students were questioned on the ways they can help in the successful implementation of library services on mobile device. The study revealed that during the implementation process their views should be sought on which services will appeal to them and also the kinds of services they intend to use on their mobile devices.

### **4.8 Library management staff**

#### **4.8.1 Perception regarding mobile phone-based library services**

This section was to find out perception of mobile phone-based library services at the University of Cape Coast. A tabular summary of the views of the interviewees is presented in Table 6, Appendix 2.

At the University of Cape Coast, librarians were asked about their perception of the implementation of mobile technology based library services. The finding showed that four out of the six librarians have a positive attitude towards the implementation of mobile phone based library services. The librarians agreed that mobile phone technology should be implemented because of its benefits it will bring.

Respondents were also asked about students' perception of library services in mobile devices. Five of the librarians agreed that students' perception about the mobile phone library services was positive. The findings show that librarians see students as eager and ready to use mobile phone services at the library when implemented.

When librarians were asked about the benefits of the implementation of the mobile phone library service, all the six librarians responded that it will be of great benefit to the University at large. The findings show that librarians are aware of the benefits of implementing this mobile technology services as part of the services offered to users. This typified by response of one librarian that "It will make the University in general very visible, people visiting portals, it will also help the University to spread its tentacles to remote areas; that is to say, people don't need to visit the library for library services and it will afford the University to reach many people who will need their services"

#### **4.8.1.2 Mobile technology–based library services**

This section found out about library's services accessible through mobile technology. A brief description of the views is presented in a tabular form in Table 7, Appendix 2.

Librarians at the University of Cape Coast were asked about library services accessible through mobile technology. The findings indicated that e-resources, OPAC and institutional repository are some of the key services offered at the University of Cape Coast Library.

When questioned about how beneficial the aforementioned services have been to the library in serving its users, three of the librarians agreed that the service will help in the easy access to information relevant to their areas of study.

When librarians were questioned on their views about the services that appeal to students most, the librarians responded that it was electronic journal access the OPAC and being able to access information from their institutional email. One of the respondents said “I think the electronic journal and the OPAC will appeal to them most, for postgraduate students, they will need good article and journal for their research work and the OPAC will also help students especially, the undergrad to locate good materials for assignments and other academic task”.

Librarians were questioned about their views about how beneficial the services were to the library users. All the six librarians agreed it was beneficial. They agreed that it saves time and is convenient.

When questioned about the investment the University is making in terms of IT infrastructure of the library, four of the librarians responded that there has been a facelift in the IT infrastructure: the conversion of ICT Centre to a directorate and the doubling of the internet bandwidth of the university.

The respondents were asked what the budget component for the allocation of IT infrastructure is annually at University of Cape Coast. The findings revealed that only three of librarians had an idea about the budget component at the University of Cape Coast. The others had a superficial idea about the budget component.

#### **4.8.1.3 Challenges**

This section answered questions related to imminent and anticipated challenges together with long and short term strategies to address the implementation of library services on mobile platforms. The views of the respondents are tabulated in Table 8, Appendix 2.

Librarians were asked to challenges that would be envisaged for implementation. The six librarians gave their views on the matter: they mentioned some of the imminent challenges to be connectivity and disruption of bandwidth, commitment of personnel from the library and the need for education.

When questioned on whether there were anticipated challenges emerging from other digital initiatives of the library, of the six librarians, one responded that “internet disruption” would be a challenge.

Questions on medium and long term strategy were also asked, the findings revealed that for the short term strategy; short courses should be organised for library staff and online cataloguing should be promoted. For the medium term, library staff should be retrained and funding should be secured from corporate organisation, for the long term annual budget to be increased.

#### **4.8.1.4 Strategies**

This section also looks at requirement for the mobile platform, creating an application or just a website, whether it will be internally done by library staff or outsourced, internally done, what is the level of training of personnel, if outsourced? How prepared is the library to finance, any stakeholders identified? Will the various stakeholders of the university be involved in doing this? A tabular summary of the views of the librarians is presented in Table 9, Appendix 2.

Librarians were asked whether the implementation of mobile phone library services requires conversion of existing services on the mobile platform or it will be entirely new services. The findings revealed the view of all the librarians that it will just be enhancing existing service; not entirely a new service.

When questioned whether their strategy involved creating an application or just a website? the study revealed that four of the librarians agreed that a website will be the best. One of the librarians said, “personally, as far as I’m concerned, if the library will want to streamline and control library services and also ensure visibility of its services and resources, it will be better for the person to log in to the library website and access from there.”

Librarians were questioned whether their strategy involved in implementing mobile services will be implemented internally by the library staff or outsourced. The librarians agreed that currently, it can be done internally but if there is the need for an expert service it will be outsourced. One librarian commented, “Where technical expertise becomes scarce, we will then have to outsource them”.



Respondents were questioned on their strategy involved in implementing mobile services. If it will be internally done, and what is the level of training of personnel required. All the six librarians agreed that their personnel were well able to handle the services if the need arises.

When questioned whether their strategy in implementing mobile services will be outsourced and how prepared the library was to finance, the findings show that most of the librarians were of the view that the management would finance when the need arises.

Librarians were questioned whether their strategy involved in implementing mobile services depends on particular stakeholders, the study showed that all the librarians were of the view that the first stakeholder is the Computer Science department. However, when the IT service required is beyond its abilities the relevant internet service provider is hired.

When questioned how to bring stakeholders on board, the librarians agreed that the various views of stakeholders are imperative when mobile services are to be implemented.

Librarians were questioned on how the initiative will be marketed to the University community and beyond: the findings revealed that the librarians agreed publicity of the services of the library should be done through the University's media, website, seminars and information literacy class amongst others.

#### **4.8.1.5 Conclusion**

In a nutshell, students at the University of Cape Coast own smartphones and make relevant use of their mobile devices to access information from the library. They consider themselves proficient in the use of mobile devices. Both students and librarians have positive perception about the implementation of mobile phone-based library services at the University of Cape Coast. Though a few of them expressed doubts about it, their desire to make use of the service cannot be disputed. They are also knowledgeable about the benefit associated with the use of mobile phone based-library services. This therefore gives an indication that the implementation of mobile phone based library services will be embraced in the library by all stakeholders when the necessary measures are put in place.

## CHAPTER FIVE

### CONCLUSION AND RECOMMENDATIONS

#### 5.1 Introduction

Emerging trends within the library environment makes it imperative for library patrons to access information without boundaries and limitation of physical structure. To be able to access information remotely will require a mobile technology to serve as a conduit for access of all kinds of information. Since these technologies is not available in University of Cape Coast Library, the study sought to find out the library's preparedness and how it will be embraced by library stakeholders, using a guided interview. The discussion situated the data collected and analysed within the context of literature that relates to various topics discussed.

#### 5.2 Discussion of findings of the study

##### 5.2.1 Mobile device ownership at University of Cape Coast

Trends within the domain of Information and Communication Technologies are developing continually; contributing to socio-economic transformation globally. It is worthy to note that will the cost of ICTs is falling, the capabilities continue to be thereby facilitating products and services in many organisations. Mobile technologies, an aspect of ICTs, provide the platform for communication and information retrieval with the use of mobile devices including smartphones, tablets, netbooks, laptops, MP3 players, cameras and e-book readers (Liu & Briggs, 2015; Little, 2011; Kroski, 2008:10). Through the interviews it was established that almost all the students from University of Cape Coast owned more than one mobile devices, hence the need for the library management to take advantage of the situation by implementing mobile service.

##### 5.2.2 Perception of regarding mobile phone based library services

From the above findings, it is evident both librarians and students have positive perception regarding mobile phone based library services. Librarians are of the view that is handy and makes information accessible everywhere. This shows that most respondents (undergraduate and postgraduate) at University of Cape Coast access library services to search for information for their assignments, articles and write-ups related to their subject areas. They also said they use

databases such as Emerald, JSTOR Archival Database, African Journal Online (AJOL), TEAL and AGORA which had information for their area of study. The above findings confirm literature which noted that postgraduate students access other facilities like the Ghana-Korea Information Access Centre and WiFi hotspot area and places within campus with their equipment such as laptops and mobile devices in order to access these databases (Kwadzo, 2015).

The supporting literature record that students mostly used databases with journal articles and library catalogues, they opined that they prefer and only use sites linked to the school because they are approved sites and can be trusted (Columbia Edu., 2001).

### **5.2.3 Proficiency of Students in Mobile Phone Usage**

With regard to proficiency of students in mobile phone usage the survey showed that a great number of students were proficient enough to use their smartphones for academic purposes. This suggests that most of the students know the application and functions of smartphones. Hence, when library service application is developed for smartphones, its usability should not present a problem to the students. This is supported by the results of a study done by Pope *et al.*, (2010) where who observe that the adoption of mobile technology has been very quick and wide-ranging and this has extended to many tertiary education campuses. Dahlstrom *et al.*, (2013) also opined that ownership of mobile internet devices between 2011 and 2013 has increased steadily by a quarter with the use of smartphones for academic purposes increasing by nearly two-folds. Thus, knowledge on how to access, manage, and retrieve online resources appears to be widespread. These findings are add up to the view advanced by Min & Ping (2016) who concluded that since most contemporary college students were born in the 1990s, they are likely to know about various kinds of electronic products and show high proficiency in using smart phones. However, research conducted shows that the number of students who make use of smartphones or tablets to perform their school assignments is relatively small compared to the number of students who own the device. They also revealed that students are not as knowledgeable of the use of mobile phones as device popularity suggests. In short, ownership does not have a direct relationship to proficiency (Wright, 2013; Dahlstrom & Bichsel, 2014).

#### **5.2.4 Challenges**

The findings show that both librarians and students agreed that in implementing mobile library services, some challenges to be encountered will be unreliability of the internet, lack of funds, screen of mobile device too small to read and inadequate knowledge on the part of the librarian. The findings above corroborate the assertion of Akeriwa, Penzhorn and Holmner (2014) that some of the drawbacks associated with the adoption of mobile phone library services are the small nature of phone screens that can make it difficult to read documents, the limited memory space of smartphones and failure of some mobile phones to be able to link to printers records. Issues related to internet connectivity, and untrained library staff can be addressed at some point by the library, however, problems such as low memory and the small size of screens can only be handled at the level of the manufacturer.

#### **5.2.5 Strategies**

Educating students about library services will also ensure there is proper foundation for their use of the mobile platform. For any digital initiative to succeed, there is the need for thorough education before, during and after implementation (Jiyane & Mostert, 2010; Unwin, 2005).

A strategy that can be embarked on to ensure full utilisation of mobile technology platform in the library is to ensure that students are engaged through extra training for them to be familiar with the technology. Lippincott (2010) suggest that academic librarians can educate students on effective ways of accessing information on their mobile devices for research support.

Additionally, they can offer assistance to students to acquire adequate knowledge on the use of software for organizing information on their mobile devices also offering extended services with the use of geographic applications and other information resources that is deemed necessary. Student creative work can be supported as well with the use of the mobile devices, this will call for sound innovative assignments, enough technical understanding on these technologies and outreach to faculty.

Elahi and Islam (2014) suggest that awareness among the library professionals and users is needed to implement such type of project. Gattan and Razek (2014) also confirm that it is important to train students and faculty staff to use digital libraries through mobile phones.

### **5.2.6 Recommendation**

Based on the findings from the interviews, the following recommendations for the implementation of mobile-based library services at the University of Cape Coast are suggested:

1. Student at University of Cape Coast should be educated about the benefits of using mobile-based library services for relevant information.
2. Continuous training should be given to library staff in the implementation of mobile based- library services.
3. The Management of University of Cape Coast should budget or allocate significant amount of money for the implementation of mobile based-library services.
4. The library management should also develop a mobile-based website that meets the specific needs of the users.
5. Management should also develop strategy for the marketing of the mobile-based library services.

### **5.2.7 Suggestions for future research**

A larger number of students at University of Cape Coast needs to be used for similar research as this study was confined to twenty-one students. A study should be conducted to investigate the potential of the mobile web and its usage.

### **5.2.8 Conclusion**

The phenomenon of mobile technology has a potential to contribute to the way information is accessed. Ownership of these device is very popular among college students since they express considerable interest in accessing library resources. Bell (2012), in trying to suggest the future, indicates that libraries should be “working to shape their vision of a preferred future” for themselves Many academic libraries are taking advantage of what these technologies present, and University of Cape Coast Library will have no option other than to embrace this novelty so as to better provide enhanced information needs and services to its stakeholders. The full potentials of these technologies has not yet been explored in Africa due to the fact that, in the view of Makori (2012), IT infrastructure budget allocated to libraries and information centres in Africa is not yet adequate.

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## **APPENDIX ONE**

### **Interview guide for students**

#### **Background issues**

Students' background concerning their programme of study and other specific issues regarding smartphones were what constituted the background issues. These included questions such as:

Sex: .....

Programme.....

Level: .....

Do you have a smart phone?

.....

What kind is it?

.....

Is there any other mobile device you possess?

.....

Do a lot of students have smart phones on campus?

.....

Can we say that almost every student has a smart phone?

.....

#### **Students' perception regarding mobile phone based library services**

Have you ever accessed the library's services from your laptop?

.....

What were they?

.....

Are you aware if some of the library services could be accessed via your mobile device?

.....

What kind of services would you wish the library had it accessible via mobile devices?

.....

Why?

.....

Should it be on a mobile app or on a mobile-accessible website?

.....

How beneficial will it be to students?

.....

**Proficiency of students in the use of mobile phone technologies**

.....

How proficient are you in the use of smart phones?

.....

What do you often use your phone for?

.....

Do you use it for academic searches?

.....

How efficient are you in the use of smartphones for academic purposes as compared to the use of laptops?

.....

How prepared are you for such services? .....

Do you believe that students are proficient enough to utilise such service via their smartphones or mobile devices?

.....

Will students need extra training in other to fully utilise such service?

.....

**Strategies for success**

What should the university library do if they are to succeed in making some of their services accessible through mobile devices?

.....

In what ways should the library involve students in making some of its services available via mobile devices?

.....

### **Challenges**

So far as students are concerned, what challenges do you anticipate will affect the smooth adoption of library services on mobile platforms?

.....

How could they be addressed?

.....



**Interview guide for library management and staff**

This section considered the number of years of service and the area of expertise for management members.

Duration in service: .....

Your area of specialisation.....

**Perception regarding mobile phone-based library services**

The study further examined what the views of management and staff were regarding the general issue of mobile-based library services. These included questions such as:

In your capacity as management member, what do you think about the implementation of mobile technology-based library service?

.....

With your experience in the library environment, what will be the perception of students on mobile technology-based library services?

.....

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

.....

**Mobile technology-based library services**

Are any of the library's services accessible through mobile technology?

.....

If such services are available what are they?

.....  
How beneficial have such services been to the library in serving clients?  
.....

If it is not available are there any plans in the nearest future for such services?  
.....

Which mobile library service will appeal to most students?  
.....

How beneficial will it be to students?  
.....

How committed is the university's investment in IT infrastructure of the library?  
.....

What is the budget component for the allocation of IT infrastructure annually?  
.....

**Strategies**

Will this require the conversion of existing services to be accessible on mobile platforms or it will be entirely new services?  
.....

Will it involve creating an application or just a website?  
.....

Will this be done internally by library staff or it will be outsourced?  
.....

If it is to be done internally, what is the level of training of personnel?  
.....

If it is to be outsourced, how prepared is the library to finance?  
.....

Have any stakeholders been identified in doing this?  
.....

How will the various stakeholders of the university be involved in doing this?  
.....

How will the initiative be marketed to the university community and beyond?  
.....

## Challenges

What imminent challenges would you envisage with the implementation of such service?

.....

Are the anticipated challenges emerging from other digital initiatives of the library?

If yes, what are they?

What short, medium and long term strategy would the library use to deal with these challenges?

.....

## APPENDIX TWO

### Tabular Summary

**Table 1: Background Issues for student**

ID	Level	Do you have a mobile device?	What kind is it?	Is there any other mobile device you possess	Do a lot of students have smartphones on campus?	Can we say that almost every student has a smart phone?
1	Masters	Yes	Nokia Lumia 535)	laptop	Almost every student	“ it has become a fashion even though these phones are expensive in the market, there are cheap Chinese brands that are also good
2	Undergraduate	Yes	infinix,	laptop	Almost every student	recognises it as need “students use it for multi-tasking”
3	PhD	Yes	Tecno G 7.	Samsung phone	most student	almost all students
4	Undergraduate	Yes,	dell phone	smartphone and a laptop	A lot of them	about 60% of students have
5	Undergraduate	Yes	Alcatel tablets	nokia c2 and laptop	a lot of students	every student has it.
6	Undergraduate	Yes	Samsung tablets.	Samsung, cellular	Yes they do	almost all student have it
7	Masters	Yes	infinix	smartphone	a lot of students have it	having a smart phone seems convenient because we rely on the internet for a lot of things
8	Undergraduate	Yes	infinix	smartphone and tablets	Yes	“In this age if you don’t have a mobile device importantly

						smartphone you will be stifled in many ways.”
9	undergraduate	Yes	Samsung	Samsung tablets	Yes I think they do.	majority, “smartphones are the commonest these days”
10	undergraduate	Yes	blackberry	I use a table too	Yes a lot have it.	Yes almost all student has it
11	undergraduate	Yes	infinix s510	laptop	A lot of them do have	Out of 100 student 95 of them has a smartphone. Enable them to do all kinds of communications
12	undergraduate	Yes	Itel tablet	Cell phone and laptop	Virtually all the student has a smartphone	Its a necessity in tertiary institutions. Applications on smartphone such as WhatsApp makes it necessary for students to have smartphone. Some lectures use WhatsApp to disseminate information to their students
13	undergraduate	Yes	Infinix	laptop	Yes a lot have	Useful for academic work, a feature like WhatsApp enables for collaboration and communication
14	PhD	Yes	Samsung tablet	No	Certainly yes	About 90% student use it for academic activities, surfing the internet and other engagement”.
15	PhD	Yes		Smartphones and tablet	A lot have	because it’s fashionable to have a smartphone. Secondly “these student are tech savvy” they like using the social media, google and the likes

**Table 2: Student perception on mobile library service on campus**

<b>ID</b>	<b>LEVEL</b>	<b>Access to library services from laptop</b>	<b>Awareness to access library services on mobile device</b>	<b>Library services preferred on mobile device</b>	<b>Mobile app or mobile accessible website</b>	<b>Benefits to student</b>
1	Masters	digitized thesis and some database	Yes	Books relevant to my discipline, digitized thesis	Both	It will save time. It will also save cost in terms of transportation
2	Undergraduate	No	Am not aware of such services exist in the library.	Not certain	Not certain	Not certain
3	PhD	never used it for any library services	Yes am aware	audio books	I would prefer the library website	It will help the student in the research world, making references, getting updated articles to read.
4	Undergraduate	I accessed TEAL and AGORA, these are databases for agric students and some journal	Yes I am aware	journal or articles	Both	It will make research very easy, student will get up to date information and always be informed of the current situation relative to their discipline
5	Undergraduate	Yeah, every academic information is stored	Am not aware of such services	research information	The app	getting access to academic materials will not be affected by ones geographical locations

6	Undergraduate	Yes I have, it was a database called science direct	access a lot databases such as TEAL, AGORA, Emerald etc	students thesis and relevant books	Website	It could be easily accessible wherever one finds himself
7	Masters	not aware	No I have no idea	search through the collections the library has	prefer website	will afford student the opportunity to know what resources and product library has. This will go a long way to improve research especially for post graduate student.
8	Undergraduate	Yes. I got some thesis of lecturers and other PhD students	hmm for mobile devices I don't know	get information on books we are looking for, instead of going there physically to search for it	the website	This will also make students visit the library frequently.
9	Undergraduate	to access the library web page	Yes very much aware	especially journals	mobile accessible website	At anytime student can get access wherever they may be especially in the library system
10	Undergraduate	search for database called EMERALD, JSTOR, AJOL	Am aware of it but not done it before.	Services that will allow me to access ebooks, get journals and databases	prefer the app	This will provide you with easy access to journal and article without being physically present at the library.

11	Undergraduate	No I have not	I have information about that	online quizzes, these quizzes help us to use our mobile device to write them	an app will be better	It will help student a lot because getting books in the library is difficult. the apps will help you trace where to get it
12	Undergraduate	No not at all	Am aware but not tried before	access novel and other text books.	I think application will do	This will enhance learning since you can access information anytime anywhere
13	Undergraduate	No I have not	Am not aware at all	delivery of soft copies of books	I will go for the website	It will enhance easy studying and learning
14	PhD	access digitized thesis, journals subscriptions	am not too sure about that	institutional repository and the journal subscription with the use of the database	the website will promote visibility	You can be in the comfort of your home, hostel wherever and get access to them without coming to the library
15	PhD	some journals and articles	very much aware	Ebooks	mobile accessible website.	This can be accessed anywhere



**Table 3: Proficiency of Student**

ID		LEVEL	Student proficiency in smartphone usage	Frequent usage of mobile phone	Do you use it for academic searches?	efficiency in terms of laptop and smartphone for academic purposes	Are student proficient to utilise smartphone for academic purpose	Student need for extra training to fully utilize such services
1		Masters	Am proficient in the use of smartphone	Apart from the traditional calling and receiving, I read news online,	I hardly use smartphone for any meaningful academic work.	laptop takes precedence to smartphone because I use laptops extensively .....	Yes I think so because student use their smartphones.... Academic purpose	Well I don't think so because their proficiency on the use of smartphone comes by default
2		undergraduate	Very proficient.	for some research and also do social networking	Not really, only for minor searches such as meanings,.	Not certain	To a larger extent I will say students are proficient enough .....	Yes am sure some training will be needed in other to
3		PhD	am familiar with all the functions.	check my mails, interact my friends on WhatsApp thus academic interaction ....	I don't use it for any extensive academic research	Am not so efficient in using the smartphone as compared to the laptop.	Yes, many students are actually capable	I believe so, there must be some form of education to students
4		undergraduate	Well for my device I know of every function of it.	things mainly for searching information	A lot, it assist me get to information, I only use for academic searches,	Well I prefer my phone to laptop	Yes, because fresh undergraduate ..... that will make them proficient.	Yes, it will be important. ....

5		undergraduate	Am an average user of smartphone.	access mails, engage my academic colleagues on social media	Not at all, I don't use my smartphone for any academic searches	I would say am more efficient with the use of my laptop.	Yes, certainly, as we use it for social media that's the same enthusiasm, we will attach it for academic purposes.	I believe so, they will need to be trained and be abreast with mother trends in mobile technologies.
6		undergraduate	am very proficient	from research purposes to social media to calls to everything	Extensively	Very efficient as I have articulated earlier	Not really, I don't think so.	Yes I think, "even with students portal, students still struggle to use them,
7		Masters	Am most proficient with the use of smartphone	Mostly social media and calls	I rarely use my phone for academic searches	I prefer my laptop	Yes, they are because now with internet student use ..... whole lot of things.	Yeah, but am not sure it should be so much intensive, ....
8		undergraduate	Very proficient with phone	communication, through wifi, social media and access information on the internet.	I use it for academic purposes and academics and socially as well.	am more efficient with the use my smartphone	Not really, I don't think so.	I don't think so, unless there are specific features that are not familiar with us like library system
9		undergraduate	Very proficient	search for information online, reading	Mainly, most of the research I do are normally	because laptop has a wider surface area, I use it for very	Yes, so far as there is wifi connection it	Sure, definitely because seeing them at hot spot areas does not mean they are

				note and social network	done on my mobile device	extensive academic work	makes easier .....	using their phone for the purposes of academics .....need extra training
10		undergraduate	Am very good at smartphones	academic pdfs and I do a lot of social media purposely for news	for sending and receiving mails basically but not for academic purposes	I will prefer laptop because it comes with convenience and its wider screen as well	It will be difficult to tell since I've done no survey	I think so, some form of training must be given out student to fully utilize such services
11		undergraduate	Am most proficient let say 90%	basic things like calls, a lot of social media, use google search engines for my assignment	Not really, am not really exposed to such things as student	Am very efficient with the use of smartphone than laptop,	Definitely, I think using phone for academic purposes will not be different.....	The training is very necessary depending on how complex the app or the website will be .....
12		undergraduate	Am very proficient	for browsing and searching information from the net and also do a lot of social media	That's is when I want to read something in my area of study	smartphone is easier for especially with the tablet it virtually does all that laptop can do	Yes once they are exposed to it, educated they will do very well with it	Yes I think so not all student really know its importance .....
13		undergraduate	Quite proficient	Aside social media, I use it to study, I download pdfs, ebooks	Yes I do	I like to use the smartphone for searches and academic activities in	Yes I believe they are proficient	I don't think so because we are with the phone most at times and this will afford us

						general than the laptop		the opportunity to know everything .....
14		PhD	Very proficient I must admit.	looking out for information on new publication, articles among others	I do, about 70% of my internet data goes into academic searches.	I prefer laptop because I type a lot I find it more convenient	In my opinion about 40% should be .....	I am not sure if they need because in first year they do computing so am sure these aspect will be catered for.
15		PhD	I am very proficient	I use it for searching, texting and surfing the internet.	No I don't	am most efficient with the use of my laptop	Yes I believe so	I should think its necessary

**Table 4: Strategies for success**

ID	LEVEL	Strategies in making services accessible on mobile devices	Should the library involve students in making services successful on mobile device?
1	Masters	proper structures should be put in place, that will ensure that we can get books online should be put in place, digitization of books, articles should be made available.	students' attention should be drawn, students are made aware ... I think they will use it well.
2	undergraduate	There should be awareness, enough awareness from the library management.	Students should be trained, also a need based assessment should be done on the students.
3	PhD	I think that during orientation for fresh student I think there should be some time allocation for this.	a module should be designed and incorporate it into the library's information literacy class .....
4	undergraduate	Develop library apps for students, advocate for electronic library will also be beneficial.	The library should embark on outreach programmes, inform students about current trends .....
5	undergraduate	The library should consult IT expert and table their proposal and see how best they can develop an app for the students.	the library should capitalize the orientation programme and also some other services should be put on the university or the library website.....
6	undergraduate	In my opinion I think such application or software should include lecture note and other materials like exams papers, time tables that will interest student to visit there.	Orientation should be embedded with these module
7	Masters	books that are current and up to date should be made available on the website for us to access.	Students are already involve so far as they are student in the university
8	undergraduate	So if the library is considering this, I think they must well address internet issues on campus	I think we can start conscientise the student first by preparing the students for them to know why mobile based library service, its benefits.....

9	undergraduate	Firstly they should hold a workshop or seminars for student for them to understand, make it accessible not complex so that student can fully utilize it	they should conduct some form of survey among stakeholders ie student to know what exactly they need before they come out with the service.
10	undergraduate	The library should be able to come out with a library app.	They should ask student the kind of services such as the databases they will want to subscribe to that will appeal to them
11	undergraduate	student should be informed about it and also placed such module in the information literacy class	The library can introduce some forum say “a library day” where student will be taken round the library to know what the library has to offer.
12	undergraduate	I think the library should develop an app that will be used mainly for learning and nothing less.	They should create awareness, this will help student to know the type of resources the library has
13	undergraduate	They should ensure reliable network	They should firstly solicit the views from the student to know what will appeal to them
14	PhD	the library should have a platform where news can be circulate around,	You get student groups, broadcast every piece of information, get student reps to be tasked to take this down even to the hall level, departmental level reps
15	PhD	A lot of publicity, they should expand the information literacy programme	The library should liaise with ICT department to give these students practical training.....

**Table 5: Challenges**

ID	LEVEL	What are some of the expected challenges you anticipate?	How could they be addressed?
1	Masters	I think one basic challenge will have to be the internet facility on campus that is data	The central management should make money available to address the network challenges
2	undergraduate	One challenge that I foresee will be distraction from paying attention	No response
3	PhD	Low network within the library	this issue of low network the library management has to take it up to address it
4	undergraduate	Finance will be the number one challenge	The university will have to collaborate with international partners, since they can not only secure adequate funds for such project.
5	undergraduate	Ok not all materials and library resources that are useful in the library can be put on the smartphone or mobile devices	they can start with student project work, making them online, before traditional books and other materials can b
6	undergraduate	Accessibility of internet, “ lack of access to internet will render such project ineffective	Even though internet accessibility is being improved on campus much investment need to be done
7	Masters	Well am sure some student will say they don’t have smartphones or laptops to be able to access these services	Proper structures in terms of implementations should be put in place to forestall problems students may encounter.
8	undergraduate	As I said earlier the internet will be the major the challenge, lack of preparation on the part of the library...	Investment from library management will be a key, library services should be made to conform on what is on the phone
9	undergraduate	A big challenge for me is the surface area of these mobile devices,	The library content or the format or text should be customized to fit surface of these mobile devices.

10	undergraduate	Most student are using mobile phones but not every individual who has it, though they may be few of them, this can pose a challenge	Personnel should be trained, bandwidth must be increased to increase wifi point of access
11	undergraduate	I fear for low patronage since there will be a level of apathy on the part of some students.	Internet connectivity must be increased because student pays for them ...
12	undergraduate	My number one challenge will be for those who don't have smartphone	I suggest the library in collaboration with the university administration should provide each student with a smartphone, they can bill you with it.
13	undergraduate	Challenges such as untrained personnel, bad networks and the short battery life span of these smartphone can hinder smooth running of these services	I will advocate for hybrid services where some of the services can be run physically and other services can be run with the use of these gadget.
14	PhD	networking is major challenge,	I think they should increase the bandwidth on campus, subscribe to high impact factor journals, such as science direct, total environment
15	PhD	These mobile devices uses mainly on wifis, and here on campus these wifi's are not reliable.	it could be addressed by securing a more up to date wifi systems, internet architecture must be improved on campus.



**Table 6: Perception regarding mobile phone based library service**

ID	Perception on implementation of mobile technology based library service	Perception of students on mobile technology based library service	Will the implementation of mobile technology-based library services help in service delivery?
1	I think it holds a great potential for libraries especially academic and research library	I think it will be an area that they will want to explore	Patrons will be able to access relevant and credible information rather than resorting to other sources of their information needs
2	I think mobile technology could play a major role in helping us to serve our clients better.	I believe that when the library brings on board this application and it takes time to market it they will like it and it will help them academically.	It will make the university in general very visible, people visiting portal, it will also help the university to spread its tentacles to remote areas....
3	I will say it's a good idea to implement such initiative but ...	I think most student will prefer that	It will allow student to know the available materials we have in the library, thus visibility will increase
4	Employing this initiative will go a long way to ease us with problems of computer breakdown ...	they will embrace it holistically when they realise its usefulness and benefits.	Service delivery will be enhanced since access to information will not be difficult among student.
5	I think it can enhance traditional library service which we already have....	I think the mobile service will appeal to the younger generation very well	service will be enhanced, services can be offered promptly, and also services can reach a lot of people than the traditional service
6	In this electronic age whatever service that will help students in their information gathering ...	Personally I think they will be excited	student will get information much quicker and also enhancement of service delivery in general

**Table 7: Mobile technology –based library services**

<b>ID</b>	<b>Library services accessible through mobile technology</b>	<b>How beneficial have such services been to the library</b>	<b>Mobile library services that appeal most to student</b>	<b>How beneficial is such services been to clients?</b>	<b>university investment to IT infrastructure of the library</b>	<b>Budget component for the allocation of IT infrastructure annually</b>
1	e- resources and OPAC	I think the e-resources are been used properly by postgraduate students for their research work.	any services that students will consider it to beneficial for their academic work	Able to access such information anywhere means less pressure will be on the library and its staff.	The university has shown some level of commitment over the years, currently the university has 4 stx bandwidth from 1 stx.	Well I can't mention it here but just as even in Ghana many ministries .... complaints of inadequate funding the same apply here,
2	a website and OPAC services.	people who are doing distant education can even access them.	online journals and thesis	access to relevant information for assignment ...aside that patrons will remain current.	The library has acquired a few equipment but I think we need to commit more to it.	what we are given is just a fraction of what we present.
3	OPAC	I think for now what we have to do as a library is to sell our services to our clientele ...	I think the journal and the OPAC	will save the student a lot of time and also convenience as well.	I will say the university is committed, I learnt they just doubled the bandwidth (internet availability) from 1Megabits per second (Mbps) to 4 (Mbps)	I have no idea but what I know is that budget allocation is inadequate
4	OPAC and the repository	I believe it will benefit them greatly	OPAC, repository and the electronic resources and home page of the library and QR code	Aside getting information quickly on OPAC and also accessing the repository with much convenient, QR codes	Progressively I think it getting better, listening to the immediate past vice chancellor he mentioned that IT infrastructure in	It will be difficult for me to give the right figure but those who work at the network corporation center (NORC) they

				will also add positive value on their information search.	UCC have seen massive facelift	confessed that much doesn't come in as they expect
5	OPAC, institutional repository and the library website	patrons of the library will experience enhance, current information can be accessed with ease.	I think most student will want to access information from their institutional email	students become current as to what is going on campus and in the library	UCC's network operating centre (noc) have been beefed up over the years, as we speak now the ICT centre is now directorate of ICTS service so in terms of commitment I think the university has shown that.	I can't tell you because I don't know all that goes into it but what I know for a fact is that we don't get all our budget in full, what we do get is mostly inadequate
6	OPAC	I think congestion and pressure on library resources will be eased up	electronic journal and the OPAC	Very beneficial am sure about this	The university is really committed, in fact the formal VC did a lot of work in terms of ICTs infrastructure investment.	I have no idea

**Table 8: Strategies**

<b>ID</b>	<b>conversion of existing services on the mobile platform or it will be entirely new services ?</b>	<b>Will it involve the creating an application or just a website?</b>	<b>Will this be done internally by library staff or it will be outsourced?</b>	<b>If to be done internally, what is the level of training of personnel?</b>	<b>If to be outsourced, how prepared is the library to finance?</b>	<b>Have any stakeholders been identified in doing this?</b>	<b>How will the various stakeholders of the university be involved in doing this?</b>	<b>How will the initiative be marketed to the university community and beyond?</b>
1	That will depend on the staff we have in the library ...	the two can be used at the same time.	this is a technical area and I will expect an expert advice ...	The library has adequate IT personnel but when it becomes necessary some aspect might be outsourced.	... the library is able to demonstrate to university management that such services is beneficial I believe funds will be released for the library.	Normally the library will write to the IT and computing department first with regards to the issue of major outsourcing	Opinions from various stakeholders will need to be taken into consideration that is students, lecturers and other users	employ all the necessary strategies that are available, the graduate sensitization workshop will be captured in this, ...
2	we will have to adopt a hybrid strategy for such initiative.	At the moment I think combining the two will be the way to go	it will be the combination of the two.	At the moment the library has hired the services of a programmer who has been tasked to train the IT personnels ...	I know the library sponsored the building of area network in previous years ... So am sure yes they may finance	There are procedures in getting stakeholders, the budget should be within some range before the library ...	The university will solicit and asked suggestions from patrons through mails from faculty members and other media ..	Well our clientele are students, faculty members and researchers.
3	I think what we have to do in the library is to try and see	going forward I will advocate for website	everything can be done in the library however if a particular	we have a quite number of IT personnel who can perform a lot of tasks ....	Am sure they will and that will also depends on the availability of funds.	The library has a particular IT company they are normally the ISPs that	As for the student they will be the testing point or the final user	We will employ bazaar strategy within the

	which mobile phones have that laps to our system		expertise is lacking, then we may outsourced			provides IT business solutions to the library.	point because they will go through everything ...	university community...
4	It will be a conversion of existing service, it will not be a new service	initially the website will be the way to go, in the future the two can be combined.	Where technical expertise becomes scarce we will then have to outsourced them.	Personnel in the library especially at the IT section will be up to the task	With the issue of library financing, I think students from the computer department in designing of the app	In this case the stakeholders will be the department of computer science	students from the department of computer science, IT personnel from the library and the library clientele in general	We can use the university community radio for a vast publicity of what the library ...
5	There is no need of changing anything, it's just a matter ... to the existing traditional service.	For me website will be the way to go in terms of visibility of library services.	Am sure as and when it becomes necessary we will decide whether to outsource or do it internally	We have trained personnel who can do it, currently we have engaged the services of a programmer ...	Am sure management will or may want to take up when they are convinced of its importance to the library	Am sure this will not be a problem at all.	Patrons or users of the library will be the main focus, students especially ...	We can learn from what Google did five years ago Google faculty, they held workshops, seminars and a whole lot
6	this is s technical area where I don't have a strong suite there.	will be better for the person to log in to the library website and access from there.	Well I don't have the technical knowledge in this area however if it can be done internally why not?	As I have indicated we have good IT personnel and we can also fall on the computer science department	If it will help in service delivery why not? Am sure they will	I can't say yes or no but am sure the computer science department can offer some technical advice	An open day can be organized at the forecourt of the library where student and stake holders will be invited to participate	I think the institutional emails will be a great tool for marketing

**Table 9: Challenges**

ID	Imminent challenges that would be envisaged for the implementation	Are there anticipated challenges emerging from other digital initiatives of the library?	What will be short, medium and long term strategy?
1	Commitment of staff	No, it has to do with those who will man this initiative. Lack of commitment will certainly disrupt its implementation	Get a lot of staff members on board, those who have exposure should be able to share their knowledge...
2	Finances can be major factor secondly the expertise of the technical team, capacity of the library staff themselves	Not entirely so	... running short in-house courses, The medium term will see to it that more IT staff will be hired to retrain The long term will be forming partnership....
3	finance, able to sell the idea to higher management for them to accept and how our clientele will be able to embrace such initiative	No I don't think so, because so far all the technology in place are been used well	...the library should be able to demonstrate how useful it will be for users and the university in general ... and partner the library and help us.
4	People may not give it their backing, negative questions of can we be done?	No, anticipated challenges will not come from any digital initiatives	...short term the library liaise with computer science department, medium term get a team of student from the computer science department ... train the core library staff ...
5	Imminent challenge will be education, able to convince management about that so that there can be committed staff	No	in a nutshell I think the short, medium and long term should be a dedicated staff who will offer themselves to be trained for such initiative.
6	Definitely it will be connectivity and disruption of bandwidth or the wifi's	Yes, the library's internet disruption	... library's internet connectivity must be managed well and be given a boost. More investment of the library's IT infrastructure must be given a face-lift. ...

### **APPENDIX THREE**

(RESPONDENT 1, master student)

(RESPONDENT 2, undergraduate)

(RESPONDENT 3, phd student)

(RESPONDENT 4, undergraduate)

(RESPONDENT 5, undergraduate)

(RESPONDENT 6, undergraduate)

(RESPONDENT 7, master student)

(RESPONDENT 8, undergraduate)

(RESPONDENT 9, undergraduate)

(RESPONDENT 10, undergraduate)

(RESPONDENT 11, undergraduate)

(RESPONDENT 12, undergraduate)

(RESPONDENT 13, undergrad)

(RESPONDENT 13, undergraduate)

(RESPONDENT 14, phd student)

(RESPONDENT 15, phd student)

#### **Do you have a mobile device?**

R1: Yes it's a Smart phone (Nokia Lumia 535)

R2: Yes I have a smartphone it is infinix, it is a smartphone because I can browse, downloads and also connect friends through social media.

R3: Yes I have, its Techno G 7. Which is internet enabled.

R4: Yes I do have a mobile device which is smartphone, dell phone

R5. Yes I have a mobile device and its Alcatel tablets

R6: Yes I have a mobile device, it's a smartphone Samsung tablets.

R7: Yes I have a mobile device which is a smartphone, infinix

R8: I do have a mobile device it's a smartphone called infinix

R9: My mobile device is a Samsung smartphone

R 10: Am using a blackberry phone which is a smartphone

R11: I have a mobile device called infinix S510

R12: Yes I have a tablet itel

R13: Yes I do have a mobile device its infinix a smartphone

R14: Yes I do it's a Samsung tablet

R15: I have mobile device a smartphone

**Is there any other mobile device you posses?**

R1: Yes apart from smartphone I have a laptop

R2 I have a laptop

R3: Yes I have Samsung phone which is just for receiving and making calls.

R4: Yes I have other phone which is not smartphone and a laptop

R5: Yes its nokia c2 and a laptop as well.

R6: Yes another Samsung, its cellular not a smartphone

R7: Yes, its also a smartphone

R8: I have other mobile device which is also a smartphone and tablets

R9: I have a Samsung tablets

R10: I use a table too

R11: apart from the phone I have the laptop

R12: Yes but its not a smartphone, I have a laptop as well

R13: Apart from my infinix I don't hve any mobile device, I don't know whether laptop can be considered as a mobile device

R14: No

R15 I actually have two smartphones apart from my tablet computers

**Do a lot of students have smartphone?**

R1: Almost every student has a smartphone on campus in my opinion

R2: In a scale of 10 students 9 have smartphone

R3: Yes this time most student use smartphones

R4: A lot of them have it.

R5: Yes of course a lot of students have smartphones

R6: Yes they do



R7: I will say a lot of students has it

R8: Yes, I think smartphone make life easier in terms finding information on the internet and for “mini research”

R9: Yes I think they do.

R10: Yes a lot has it. Because of popularity of social media I think

R11: A lot of them do have I must say

R12: Virtually all the student has a smartphone

R13: Yes a lot have

R14: Certainly yes

R15: A lot have

**Can we say that almost every student has a smartphone?**

R1: Reason almost student has a smartphone is because “ it has become a fashion even though these phones are expensive in the market, there are cheap Chinese brands that are also good

R2: Yes almost every student has a smartphone because students “recognises it as need” students are always with their phone due to “ multi tasking” nature of smartphones.

R3: I can say to a larger extend almost all students have a smartphone.

R4: Well I cant tell you everyone has it but am sure about 60% of students have it

R5: Yes I can confidently say every student has it.

R6: Yes almost all student have it

R7: Most people do because these days we rely on the internet for a lot of things, so having a smart phone seems convenience

R8: Well we can say all but almost all students have it. Majority has it I must say. ”In this age if you don’t have a mobile device importantly smartphone you will be stifled in many ways.”

R9: We cant say all student has it but majority do, “smartphones are the commonest and famous phones around these days”

R10: Yes almost all student has it

R11: Yes I can say out of 100 student 95 of them has a smartphone. This is because of advanced technology we are as a nation and also the smartphone is internet enabled which enable them to do all kinds of communications

R12: I cannot tell for sure but certainly almost every student has a smartphone, smartphone has become a necessity in tertiary institutions. Applications on smartphone such as watapp makes it

necessary for students to have smartphone. Some lectures have used watsapp to disseminate information to their students

R13: Yes we can say that, because its useful for academic work, a feature like watapp enables for collaboration and communication

R14: Well this is hypothetical probably around 90%, this is so because we are in the era of technology aside that its afford student the opportunity to use it for their academic activities, “ I have seen student using these devices for their academic work, surfing the internet and other engagement”.

R15: Yes almost all of them b.cos its fashionable to have a smartphone secondly “these student are tech savvy” they like using the social media, google and the likes

## **Perception on mobile library service on campus**

### **Have you accessed library services on ur laptop?**

Respondent 1 Yes, digitized thesis and some database

R2: NO,

R3: well yes, what I use my laptop for is mostly accessing internet within the library anytime am there but I have never used it for any library services

R4: Yes I have, I accessed TEAL and AGORA, these are databases for agric students, and because am from such department I use my mobile device a lot on these and some other journals as well.

R5: yeah as a research students my laptop is always with me. “ My laptop is like a note pad to me likewise my tablets, every academic information is stored on these gadget”.

R6: Yes I have it was a database called science direct

R7: No am not aware there are library services I could access on my laptop

R8: Yes. I got some thesis of lectures and other phd students

R9: I have used my laptop to access the library web page

R10: I used it to search for database called EMERALD, JSTOR, AJOL

R11: No I have not

R12: No not at all

R13: No I have not

R14: Yes I have, I used it to access digitized thesis, journals subscriptions

R15: Yes I have, they were some downloads using the campus network for some journals and articles

**Are you aware if some library services can be accessed on mobile device?**

R 1: Yes is possible if the necessary structures are put in place, “ I know people are able to access other library resources like Library of congress in the US so similar thing can be done here in UCC.

Interviewer: Do you patronize the library?

R2: I used to patronize the library but now I don't. I prefer to learn in my room because now everything is on google

Interviewer: Should the library decide to put it resources and services on mobile device platform will u visit there?

R2: Sure why not, that will mean that there will not be the need to visit the physical building of the library but can access it anywhere or even in my hostel.

Interviewer: What can the library management do to make the library visiting encouraging to you?

R2: I think if there should be more publicity on the services or what the library offer then I think some of their services will encourage me to visit the library. I am in 4<sup>th</sup> year, I have never heard it that there is a way services of the library that I can access.

Interviewer: How come you haven't accessed library services? We have databases, OPAC, electronic support unit, how come you haven't accessed library services on laptop?

R2: Am not aware of such services exist in the library.

R3: Yes am aware but I can't tell which ones.

R4: Yes I am aware

R5: Am not aware of such services

R6: As far as you are on the University network you can access a lot databases such as TEAL, AGORA, Emerald etc

R7: No I have no idea

R8: hmm for mobile devices I don't know

R9: Yes very much aware

R10: Am aware of it but not done it before.

R11: I have information about that because during our information literacy class we were taught that but I have not had any experience on that ever since.

R12: Am aware but not tried before

R13: Am not aware at all

R14: Not exactly, am not too sure about that

R15: Yes I am, very much aware

**What kind of library services would you wish to have on mobile device?**

R1: What I would wish in terms of library service will be books that are relevant to my discipline, digitized thesis that are put on online so I can access it anywhere, without necessary coming to the library

R3: I would want to access audio books

R4: I wish you could download journal or articles online, I wish they could inform you of any new books that are available or articles from the library.

R5: Well I think the school has a website for accessing research information, coincidentally am not doing my research here, my research site is at Kumasi about 5 hours drive from here, so if there could be any mobile device services it will be appreciated very much as am not on campus.

R6: I would wish students thesis can be made available also other relevant books that's limited can also be made available for students to be able to access, examples like science and agric books

R7: able to search through the collections the library has if you want a particular book without necessary going to the library to spend all the time for searches.

R8: Well I will wish that we could get information on books we are looking for, let say am looking for a book in this domain, I should be locate where this particular book is instead of going there physically to search where you can locate this book.

R9: Most especially journals that have been published within will help

R10: Services that will allow me to access ebooks, get journals and databases

R11: Am aware of that but never tried it myself, in the French department we have online quizzes, these quizzes help us to use our mobile device to write them, I also know of research materials but never used or seen how it is.

R12: I will be very happy if I can access novel, may be because I am a language students and other text books.

R13: Well delivery of soft copies of books, because its not always that we can go to the library, it will bring about convenience where you can just study at the conference of your room

R14: I think this will depend on the type of mobile device the person may be using, if for instance your smartphone can take a lot of data may be you can go and look for the IR its format and then also there are some information you will need the universities IP address before you can get an access so if such services talking of information that requires universities IP can be linked to the students password that will be good, using smartphone cant recognise these IPs hence wont get access, it's a private network that will not allow you, so students ID should be linked with these password in other to get access. So in a nutshell I will prefer the IR (institutional repository) and the journal subscription with the use of the database

R15: ebooks since it's a laborious processes of searching for books in the library ebooks will come in handy. It will save you a lot of time when one has access to books

**Should it be on a mobile-accessible website? Or mobile app?**

R1: Well I think both means will be ok, it does not spoil anything

R3: Personally I would prefer the library website where the data bases can be given for me to access information

R4: Well for me I think both will do since we haven't been able to ascertain that every student has a mobile phone which is smart, having both will be beneficial for all.

R5: I think it will more beneficial on the app, this can be accessed anywhere, sometimes its difficult assessing university website when you are outside the university.

R6: Most at times with application you are limited, limited in space, if they on app, the full context cannot be absorbed but when they are on website you can access the whole documents

R7: I would prefer website or at the student portal where student can access library resources with their student registration number.

R8: I think it should be on the website, this will make it easy. For the apps there are some smartphone which are "user friendly and also will need extra effort before apps can be installed

R9: I think mobile accessible website will be the best

R10: I will prefer the app because you don't need to do any login which can be sometimes cumbersome

R11: Haven it as an app will be better this b.cos with app you download and use it straight away but for the website you have to log in which can be tiring. App will be better in terms of convenience.

R12: I think application will do, you are sure with the app that you are going to retrieve what you want, for website you will have to search and login, it's a bit complicated.

R13: I think I will go for the website, its easy to access the website when you have internet connection.

R14: The moment you talk about an app you may be dealing with two sides, I think such services should be within one embodiment since it's a university project so such service should be in the university library website which should be embedded in the parents university website. We are talking about visibility, putting the library's resources and services on the website will promote visibility. This visibility can only come as a result of marketing what the library has online.

R15: Well it could be both, but for safety and security of the books it will be proper to keep it at mobile accessible website.

### **How beneficial will that be for student?**

R1: It will save time, some of us live very far from campus, so it will bring about convenience

It will also save cost in terms of transportation and again once its online it can be accessed at every moment, its also save space in the library since there will not be the need to go to the library. The mobile version of the OPAC comes with convenience where one can sit at the comfort of his or her residence and locate a book.

R3: It will help the student in the research world, making references, getting updated articles to read, read library bulleting and any other news the library will want to bring to student attention.

R4: It will make research very easy, student will get up to date information and always be informed of the current situation relative to their discipline. Students can make book reservation as well.

R5: Of course I wish to be reading digitized thesis when am away, able to access conference papers and other materials, in this case "getting access to academic materials will not be affected by ones geographical locations".

R6: Library resources and services could be easily accessible wherever one finds himself, the various databases the library subscribe to can be made available.

R7: Very beneficial, so many library product and resources that student even don't know. This will afford student the opportunity to know what resources and product library has. This will go a long way to improve research especially for post graduate student.

R8: It will help, in many occasion "you here student say I can't find the book.in the library. I think getting access into the library will help a lot. This will also make students visit the library frequently.

R9: At anytime student can get access wherever they may be especially in the library system. Also students can engage librarian by asking them reference questions and also know the library opening hours.

R10: This will provide you with easy access to journal and article without being physically present at the library.

R11: It will help student a lot because getting books in the library is difficult, you have to do a lot of searches. At times u will not even find them. Using the apps will help you trace where to get it

R12: This will enhance learning since you can access information anytime anywhere

R13: It will enhance easy studying and learning

R14: You can be in the comfort of your home, hostel wherever and get access to them without coming to the library, mind you the library closes at 10:00 pm that does not mean student should seize learning.

R15: I think some of the services will be a customized service, you can access the library catalogue with much ease and be well informed about the library.

## **PROFICIENCY OF STUDENTS**

### **How proficient are you in the use of smartphone?**

R1: am proficient in the use of smartphone, “let say I am 70 to 80 % proficient in the use of smartphone”. Am able to download, access all the applications and others multimedia services.

R2: Very proficient.

R3: Well for my device I know of every function of it. As s PhD and assistant lecture I can tell you that every student who has a smartphone basically know every function of it.

R4: You will understand that some of the functions and the applications are sometimes not usable in our part of the world. Apart from that am familiar with all the functions.

R5: Am an average user of smartphone.

R6: I use my smartphone for everything so I would say am very proficient. I lost my laptop so I use my smartphone for everything that I would use laptop for.

R7: Am most proficient with the use of smartphone, in a scale of 1 to 5 I will give myself 4.

R8: I am very proficient with phone, I am familiar with the apps on my phone and all the functions as well.

R9: Very proficient

R10: Am very good at smartphones

R11: Am most proficient let say 90%

R 12: Am very proficient

R13: Quite proficient

R14: Very proficient I must admit.

R15: I am very proficient

**What do you often use your mobile phone for?**

R1: Apart from the traditional calling and receiving, I read news online, some small downloads text, pdf though not quite often

R2: I use my smartphone for some research, not detailed one just finding basic information to aide my studies and also do social networking. But in a whole I will say the non-academic aspect over rides that of the academic.

Interviewer: You mentioned earlier that you don't visit the library, but should the library connect student to its Facebook where every information that is deemed trustworthy can be asked the librarian 24/7 will you visit there?

R2: Sure why not? Once its going to be timely and the information is trustworthy. I think that will ease a lot of burden from students

R3: I basically use my smartphone to check my mails, interact my friends on wattapp thus academic interaction with phd colleagues.

R4: I use for many things mainly for searching information so I use it a lot

R5: I use my smartphone to access mails, engage my academic colleagues on social media, " I don't buy newspapers I always access them on my phone"

R6: As I indicated, everything, from research purposes to social media to calls to everything phone can be used for.

R7: Mostly social media and calls

R8: For communication, whether through wifi, social media and access information on the internet.

R9: To search for information online, reading note with my phone and social network as well

R10: I have some academic pdfs on my phone and I do a lot of social media purposely for news

R11: basic things like calls, a lot of social media, use google search engines for my assignment

R12: Almost all the time I use my phone for browsing and searching information from the net and also do a lot of social media with it

R13: Aside social media, I use it to study, I download pdfs, ebooks, dictionaries and other useful materials for academics



R14: Well am a phd student and 24/7 be on the net looking out for information on new publication, articles here and there for the areas am studying and then linking up on my social people thus my colleagues or group through social networking , surfing and all that

R15: Basically apart from the normal calls I use it for searching, texting and surfing the internet.

### **Do you use it for academic searches?**

R1: Most of academic downloads are done on my laptop, I hardly use smartphone for any meaningful academic work. Mostly for social media and others and reading news.

R2: Not really, only for minor searches such as meanings, definitions and the rest.

R3: Well apart from what I said above, nothing more. I don't use it for any extensive academic research

R4: A lot, that's why I prefer phone that can assist me to get information, I don't browse with my phone I only use for academic searches, getting relevant articles, and write ups.

R5: Not at all, I don't use my smartphone for any academic searches

R6: Extensively, I have word, excel, and everything thing in terms of app or functiond a smartphone or laptop has.

R7: I rarely use my phone for academic searches

R8: Its both ways I use it for academic purposes and academics and socially as well.

R9: Mainly, most of the research I do are normally done on my mobile device

R10: I use my phone for sending and receiving mails basically but not for academic purposes

R11: Not really, am not really exposed to such things as student. What student use specifically on mobile device as far as am concern for academic purposes is the google search engine.

R12: That's is when I want to read something in my area of study, I google browse in search for information

R13: Yes I do

R14: I do, about 70% of my internet data goes into academic searches.

R15: No I don't

### **How efficient are you comparing laptop and smartphone for academic purposes?**

R 1: For me I laptop takes precedence to smartphone because I use laptops extensively for all my academic work.

Reasons being that when I use my phone for academic downloads, it freezes, battery runs down, use a lot of data I purchase on the phone too. The laptop has a lot memory capacity wider screens.

R2: For assignment and writing of long essays I would use laptops, but for quick academic information and timely definitions and meanings I would use my smartphone

R3: Am not so efficient in using the smartphone as compared to the laptop.

R4: Well I prefer my phone to laptop. I use dell Streak, its portable, wide screen and I carry it to wherever I go. It assist me a lot

R5: As I indicated earlier I don't use my smartphone for any academic work, so I would say am more efficient with the use of my laptop. I use the smartphone for checking "academic mails only, for instance I heard a news that phds were being bought in Ghana, mails on academic time tables and information that my lecture want to get across is what I normally use my phone for.

R6: Very efficient as I have articulated earlier

R7: I prefer my laptop, am so much familiar with using my laptop for research, I don't use my phone for anything academic.

R8: I think laptop is ok but mobile phones is portable that you can carry along wherever you can go, so I can say am more efficient with the use my smartphone

R9: comparing my mobile device to my laptop I will say I mostly use the smartphone more often but because laptop has a wider surface area, I use it for very extensive academic work

R10: For the laptop you have a wider area to read but phones you can use it anyway, however I will prefer laptop because it comes with convenience and its wider screen as well. I have been using laptop over the years hence I will be comfortable with.

R11: Am very efficient with the use of smartphone than laptop, I use the laptop for typing assignment and other secretarial services but for the smartphone its always with with everyday using the apps and going through the functions, googling for assignments here and there.

R12: The smartphone is easier for especially with the tablet it virtually does all that laptop can do, aside that its portable, you can carry it along with, this make research fun and easy

R13: I like to use the smartphone for searches and academic activities in general than the laptop, the smartphone is portable can be carried away anyway " even as I sit here I am downloading some pdf for an assignment"

R14: I prefer laptop because I type a lot I find it more convenient to use the laptop, and also because of its wider screen is also a factor.

R15: Because I don't use the phone for academic purposes I would say am most efficient with the use of my laptop

**Do you believe students are proficient enough to utilize smartphone for academic purpose?**

R1: Yes I think so because student use their smartphones for a lot of things so they will be equally proficient to use these smartphone for their academic work.

R2: To a larger extent I will say students are proficient enough because most of the applications and functions on there are used by these students without been trained or going for any training programmes, such knowledge can also be transferred if library services are made available on the mobile platform.

R3: Yes many students are actually capable for using their smartphone to do many things, even my daughter in the undergrad uses it so much for academic purposes likewise most students on campus.

R4: Yes because fresh undergraduate students are introduced to computing at the first year, they learn a lot and I believe some of these things get them exposed that will make them proficient.

R5: Yes, certainly, as we use it for social media that's the same enthusiasm, commitment and passion we will attach it for academic purposes.

R6: Not really, I don't think so.

R7: Yes they are because now with internet student use their smartphone phones for a whole lot of things. These applications on the phone no one teaches them how to use them, so if there are such services student can easily use them

R8: Yes, so far as there wifi connection it makes easier, it becomes boring when there is no wifi. Smartphone and wifi goes hand in hand

R9: It will be difficult to tell since I've done no survey on that, I normally see them at hot spot areas searching for wifi's so in a nut shell I will say they are

R10: Definitely, I think using phone for academic purposes will not be different from the laptop as in my opinion student are more conversant with the use of laptop than phone

R11: Yes once they are exposed to it, educated they will do very well with it

R12: Yes I believe they are proficient, nowadays you see student with their mobile devices everywhere to search for information so I believe they are

R13: Yes I think so

R14: In my opinion about 40% should be, those using the smartphone, may be because of the information literacy programme contributes to this

R15: Yes I believe so

### **Will students need extra training to fully utilize such services?**

R1: Well I don't think so because their proficiency on the use of smartphone comes by default, no one teaches them how to use it, so training them will be unnecessary. No one taught me how to use my smartphone, I took time to learn every function and navigate my way through.

R2: Yes am sure some training will be needed in other to equip them adequately in the use of their smartphone to access library services "since its something new on campus".

R3: I believe so, there must be some form of education to students

R4: Yes, it will be important. Even though they may know all the functions, I believe extra training will equip them adequately. My experience has been that anytime I asked students to access journal from their tablets they struggle a bit even though they know all the functions. So I think training is important for them to navigate their way through.

R5: I believe so, they will need to be trained and be abreast with mother trends in mobile technologies.

R6: Yes I think, “even with students portal, students still struggle to use them” they prefer using their smartphone instead.

R7: Yeah, but am not sure it should be so much intensive, they are already familiar with the mobile device hence not detailed training will be required.

R8: I don’t think so, unless there are specific features that are not familiar with us like library system on the phone which is difficult for us to navigate our way through.

R9: Sure, definitely because seeing them at hot spot areas does not mean they are using their phone for the purposes of academics so I will say they will need extra training for the use of mobile device for the purposes of academics

R10: I think so, some form of training must be given out student to fully utilize such services

R11: The training is very necessary depending on how complex the app or the website will be, these training should be added to the information literacy class this will get them exposed.

R12: Yes, I think so not all student really knows its importance “I can confirm that smartphone capabilities and usage on campus are been under-utilized, majority of student use these smartphones only for social media, its potentials are not fully utilised

R13: I don’t think so because we are with the phone most at times and this will afford us the opportunity to know everything that we want to know on the phone

R14: I am not sure if they need because in first year they do computing so am sure these aspects will be catered for. So for me once you get the basics the rest is up to you to learn it on your own

R15: I should think its necessary

## **Strategies for success**

### **What strategies should the university library embark to succeed in making services accessible on mobile devices?**

R1: I think proper structures should be put in place, proper structures I mean facility that will ensure that we can get books online should be put in place, digitization of books, articles should be made available.

R2: There should be awareness, enough awareness from the library management.

R3: If the chance will be given I think that during orientation for fresh student I think there should be some time allocation for this. So that student can be taken through for some of the services that can be offered through the mobile devices and how they can fully utilize it. This should be done the beginning of every academic year.

R4: They library has a responsibility of updating students about current trends as far as accessing information is concerned. Develop library apps for students, advocate for electronic library will also be beneficial.

R5: The library should consult IT expert and table their proposal and see how best they can develop an app for the students.

R6: In my opinion I think such application or software should include lecture note and other materials like exams papers, time tables that will interest student to visit there.

R7: Well what we go to do in the library in general is to look for books, so if we can know the books they have on our phones or laptop, books that are current and up to date should be made available on the website for us to access. Importantly books that relate to our course

R8: I think first and foremost we should look at our internet connections because with the laptop when you go the library you can't even browse, either it has been locked with a password or the connection is not so strong enough to get you connected. So if the library is considering this, I think they must well address internet issues on campus

R9: Firstly they should hold a workshop or seminars for student for them to understand, make it accessible not complex so that student can fully utilize it

R10: The library should be able to come out with a library app. So that student can download the app to get information from the website. The website should be linked to the app, this will help students easily to know the services and the resources the library has by just clicking a botton.

R11: For them to be successful in implementing this service, student should be informed about it and also placed such module in the information literacy class, this will help them to use the service very well

R12: I think the library should develop an app that will be used mainly for learning and nothing less. So when you see student downloading it simply been used for academic purposes

R13: They should ensure reliable network

R14: Am not into internet security am sorry I cannot comment on that, the library should have a platform where news can be circulate around, example to know up coming events, latest information etc to get the student abreast with information and all that. Am sure this will go a long way to help students.

R15: A lot of publicity, they should expand the information literacy programme to absorb such a model thus the use of mobile device to access library services

**In what ways should the library involve students in making services successful on mobile device?**

R1 Well with the structures I mentioned earlier are in place, students attention should be drawn, students are made aware of such services, educated, when the library guide them as to how they can get access to these, I think they will use it well.

R2: Students should be trained, inputs should be solicited from the students and also a need based assessment should be done on the students.

R3: As I mentioned earlier, a module should be designed and incorporate it into the library's information literacy class in other to equip students in the use of such gadget.

R4: The library should embark on outreach programmes, inform students about current trends and also educate students about new ways of doing things. Marketing their products like the databases, journals they are subscribing to

R5: I think the library should capitalize the orientation programme and also some other services should be put on the university or the library website so that students can access them as and when. This can save the library a lot of pressure, the way people cue for space in the library is over, people hardly go to the library to search for information due to the availability of search engines and other sources of information however some of these sources are not credible so in my opinion if mobile library services can be added to the existing services it will be a major breakthrough for the library and also help student to a great extent.

R6: Orientation should be embedded with these module, they will utilize it and make it effective

R7: Students are already involve so far as they are student in the university, so whatever the library plans to do, you involve yourself if you think it will benefits you.

R8: I think we can start consceintise the student first by preparing the students for them to know why mobile based library service, its benefits, the library makes it appealing to students and very attractive with its use, innovative and user friendly

R9: I think before they come out with this service, they should conduct some form of survey among stakeholders ie student to know what exactly they need before they come out with the service.

R10: They should ask student the kind of services such as the databases they will want to subscribe to that will appeal to them.

R11: The library can introduce some forum say "a library day" where student will be taken round the library to know what the library has to offer. At any stage of such implementation, the library should get student involved.

R12: They should create awareness, this will help student to know the type of resources the library has. A customized application should be made available for student, this will appeal to them to visit the library more often.

R13: They should firstly solicit the views from the student to know what will appeal to them

R14: You get student groups, broadcast every piece of information, get student reps to be tasked to take this down even to the hall level, departmental level reps too get the information down, you can use the SRC week to get it across and I believe this can go a long way. Going forward I think the university management has a responsibility of putting in more bandwidth and stop putting password on the wifi b.cos I believe student have paid so at anytime they should be able to use as and when necessary, this will enable student to get to know what is going in the main library. Certain site must be barred once you are on the school network and also student must be conscientise to visit the library page on the university website regularly to be abreast with the hapenings in the library.

R15: The library should liaise with ICT department to give these students practical training in how they can use their mobile device to access services such as digitized books, digitized thesis, and the rest. The library can also engage the services of the postgraduate students to train the first years as a form of orientation

## **Challenges**

### **What are some of the expected challenges you anticipate?**

R1: I think one basic challenge will have to be the internet facility on campus that is data. Some students have data in the halls of residence but majority of students are living outside the halls so it will be difficult to access when one is not on campus.

Another issue has to do with the reliability of these networks, at times within the library you can not even access internet.

R2: One challenge that I foresee will be distraction from paying attention. For instance once student is busy searching for information on his mobile device, a message or notification will pop up to view, this can create a distraction for the students.

Again there are some students no matter what you do they will never use their phone for academic purpose, they are just conservative. They don't like anything new.

R3: Low network within the library, you are poised to download an article for an assignment and the link will just be down for the whole day.

R4: Finance will be the number one challenge, personnel will also be another challenge. The library will have to train its personnel to man this services and making themselves resourceful to students. The University management will have to invest in the library to suit the current trend of an academic library.

R5: Ok not all materials and library resources that are useful in the library can be put on the smartphone or mobile devices, also some of the devices are too small in terms of screen area or surface area since some of the files are big, it will create a problem

R6: Accessibility of internet, "lack of access to internet will render such project ineffective,



R7: Well am sure some student will say they don't have smartphones or laptops to be able to access these services but that will be on the low because almost every student use these mobile devices, again if these services or project is not well planned, they will get problems which will not be attractive for student anymore

R8: As I said earlier the internet will be the major the challenge, lack of preparation on the part of the library, where services on the mobile devices will not be in conformity with what the library claim to offer. Apathy among student. Whether students will interested. Also a situation where all patrons of the library decides to log in, will the connection be able to cater for all the patrons within the library looking out to log in? Challenges library has in the manual system is that some student hide books on the shelves where no one can see it so that when they return the following day they may be able to use it, reasons been that the book may be limited or may be a single copy that everyone will like to use it, so the library system should be made to be properly done so that retrieval of information does not become a problem.

R9. A big challenge for me is the surface area of these mobile devices, its not so comfortable as compare to the laptop. Again some level of ignorance on the part of some students that will make them handicap. Internet connection on campus are not so reliable at times as well. You cannot always depend on it

R10: Most student are using mobile phones but not every individual who has it, though they may be few of them, this can pose a challenge. Again not all the smartphone that are up to the standard to host the mobile base library service which can also be a problem. Again the library personnel are also not well trained to man such service and help students. Low wifi can also hamper this service

R11: I fear for low patronage since there will be a level of apathy on the part of some students. Information may not be carried out properly for them to know that it's a must for them to use.

Again student may have problems of getting what they really need on the platform since library systems may not be properly arranged on the app or the website.

I don't think wifi will be an issue, student can find ways and means to get internet connectivity, the only issue will be whether the services want to offer will be readily available on the platform in my opinion.

R12: My number one challenge will be for those who don't have smartphone, this will lead to apathy on the part of these students who don't have. Secondly, how to convince these students to get on board, there are some students no matter what you do they will not subscribe to this service, thirdly the issue of not having what you claim to have on the system. If I go there and I realise am not getting anything I wont go there again.

R13: Challenges such as untrained personnel, bad networks and the short battery life span of these smartphone can hinder smooth running of these services



R14: Well until it is tried, am not too much in favour of apps, networking is major challenge, during the peak days administrators use them, staff in general use them this poses a major challenge to students, as much as possible the bandwidth can be increased.

R15: These mobile devices uses mainly on wifis, and here on campus these wifi's are not reliable. Other challenges can also be attitude on part of these students, will they read these books on their mobile devices? Attitude can be a major challenge.

### **How could they be addressed?**

R1: The central management should make money available to address the network challenges, wifi services should be strengthened for those student who live in the nearby hostels.

R3: this issue of low network the library management has to take it up to address it because it poses a major challenge for us students.

R4: The university will have to collaborate with international partners, since they can not only secure adequate funds for such project. The library will also engage software developers who can come up with customized apps for such project where student can access the library where they are. They should also make sure its only UCC students who can get access to these apps to avoid infiltration and third party exploitation, therefore its security will need to be enforced adequately.

R5: To start with as useful as it may be they can start with student project work, making them online, before traditional books and other materials can be put on it.

R6: Even though internet accessibility is being improved on campus much investment need to be done, usually you will see student hanging out at vantage point where there are enough internet peak or strong internet presence “ for wifi for their assignment and other social use use”.

R7: Proper structures in terms of implementations should be put in place to forestall problems students may encounter.

R8: Investment from library management will be a key, library services should be made to conform on what is on the phone

R9: The library content or the format or text should be customized to fit surface of these mobile devices. Education must be paramount in the delivery of such services. With the issue of network, the service providers must engaged so that a particular time of the day must be made available for students and patrons to fully benefits the service.

R10: Personnel should be trained, bandwidth must be increased to increase wifi point of access

R11: Internet connectivity must be increased because student pays for them for you to be able to access any form of information on campus.

I don't believe wifi or connectivity will be a challenge because when these services are introduced, when you already know a challenge of a situation you will addressed them before you implement whatever you want to implement. Lectures will greatly benefits from them, this can even aid teaching where lectures can access materials that are up to date ...

R12: I suggest the library in collaboration with the university administration should provide each student with a smartphone, they can bill you with it. This will do away with apathy since everyone has that gadget. The library authority should make sure that all the discipline will be catered for on the app so that each students will not be left behind,

R13: I will advocate for hybrid services where some of the services can be run physically and other services can be run with the use of these gadget.

R14: I think they should increase the bandwidth on campus, subscribe to high impact factor journals, such as science direct, total environment and the rest to help student in their research work

R15: from the technical side it could be addressed by securing a more up to date wifi systems, internet architecture must be improved on campus.

On the part of the student they will need to be conscientize and sensitize more, lecture note and hand out can be digitized and put there, this will encourage them to make good use of the platform.

## Transcription of library management

Librarian (1) C.E.M

Librarian (2) K. BO

Librarian (3) L.K

Librarian (4) KaK.

Librarian (5) Bine

Librarian (6) Paulin

### **BACKGROUND**

#### **Duration in service**

R1: 33 years

R2: 25 years

R3: 5 years

R4: 15 years

R5: 20 years

R6: 25 years

#### **Area of specialization**

R1: Information systems development and management and scientific communication.

R2: Digitization and readers service

R3: IT and programming

R4: System librarian

R5: Digital librarian and system librarian

R6: Cataloger and Information provision

#### **Perception regarding mobile phone based library service**

### **What do you think about the implementation of mobile technology based library service?**

R1: This is an emerging area that I think it holds a great potential for libraries especially academic and research library.

R2: Essentially I personally believe that the traditional library way of doing things is given way gradually to some innovative services that could be given to librarians to clients and I think mobile technology could play a major role in helping us to serve our clients better. So I agree that it's a service that we must all embrace

R3: I will say it's a good idea to implement such initiative but while implementing in this library I will think of the value for services because as at now network on campus is not the best, In my view its not properly managed. So if we should add these mobile devices to the existing network they are going to take a chunk of our bandwidth and again this initiative will require us get an apps as well, currently the UCC LIBRARY runs on open source which is less expensive. If we should go ahead for the mobile initiative we will have to look for apps which might not be found in open source, we will have to customize it to suit our services. In a nut shell I think it's a good idea for the future

R4: Employing this initiative will go a long way to ease us with problems of computer breakdown, server not working in the library etc. It will benefits them because it is handy, they move along with them and they can access quality service wherever they may be.

R5: I think it can enhance traditional library service which we already have, but in the first place we will need to develop the traditional library service taking advantage of the IT facilities available then this initiative thus the mobile technology based library service will come in as addition. Most of the mobile technology service will require android operating systems and not everyone who has such operating system so you don't offer a service to a limited group of people meaning if you don't have android must you be left out? Certainly not so we need to develop our traditional service better especially those of us in the developing countries where we have limited bandwidth, unreliable power supply coupled with untrained staff and basic IT infrastructure. We need to make sure that traditional library services is well developed then the mobile services can be addition.

R6: In this electronic age whatever service that will help students in their information gathering and information seeking will be deemed important and so if such initiative will go a long way to help them in this direction I think it is welcomed provided it is not welcomed.

### **Perception of students on mobile technology based library service ?**

R1: I think it will be a an area that they will want to explore since they are always found with their mobile devices, searching for information on the web or communicating through various social media networks.

R2: I have been dealing with student on internet for close to 20 years and I know they are always craving for new things in new technological ideas and application t make their life simpler and

easier, so I believe that when the library bring on board this application and takes time to market it well they will like it and it will help them academically.

R3: I think most student will prefer that, as you know the youth are more technology inclined most of them prefer getting information at their finger tips at the time they need it.

R4: Since its going to be a new thing in place naturally they may be a little bit skeptical about it, they may have this setback feeling, thus is it going work? Will we be comfortable using them, do we have enough wifi's etc, but am sure in the end with time and good marketing strategy, they will embrace it holistically when they realise it usefulness and benefits.

R5: I think the mobile service will appeal to the younger generation very well than the older generation who refer themselves as BBC "BORN BEFORE COMPUTER", they will not be too attracted to these services

R6: Personally I think they will be excited because you always see them fidgeting with these devices even while they are in a lecture or lectures are ongoing.

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

R1: Patrons will be able to access relevant and credible information rather than resorting to other sources of their information needs, patrons will be well informed about library resources and services. Again such services will ease congestion in the library and help patrons to access library information wherever they may be.

R2: It will make the university in general very visible, people visiting portals, it will also help the university to spread it tentacles to remote areas that is to say people don't need to visit the library for library services and it will afford the university to reach many people who will need their services.

R3: It will allow student to know the available materials we have in the library, thus visibility will increase. Even though UCC library don't have the copy right approval to use soft copies of materials they have, service delivery with such initiative will go a long way to market the library well. It will provide an avenue for students to navigate and search through the library resources anywhere they may find themselves. The copy right issue also applies to the e-resources, though the library has some permission to issue out soft copy of some e-resources however not all e-resources will permit them to issue out the soft copy.

R4: For instance if our OPAC is accessible by student outside the library we there will not be the need to mount so many of them within the library, as it stand now not all the 16 OPAC points are working. Service delivery will be enhanced since access to information will not be difficult among student. Information will be readily available at any time student want it.

R5: When we talk about service delivery we are talking about the entire services the library offers, now implementing mobile service will mean that you are adding to the existing service which will mean that already existing service will be enhanced, services can be offered promptly, and also services can reach a lot of people than the traditional service

R6: What it means is that you don't need to be physically present in the library, more convenience in searching for information, student will get information much quicker and also enhancement of service delivery in general since those who are even off campus can access information readily.

### **Mobile technology –based library services**

#### **Are any of the library's services accessible through mobile technology?**

R1: Currently e- resources and OPAC are what is available however its has not been fully exploited due to the fact that the library has not done enough publicity on it, this can account to the fact that necessary infrastructure for such initiative is not available or in place.

R2: Yes the library has a website, its actually a link to the university's main web page where student can access electronic resources such journal articles full text, student can also access OPAC services. We are now trying to enhance the software we are using to enhance borrowing from wherever the person might be and we are likely to add services that will make their information needs easy and be able to ask librarians any questions relative to their information needs.

R3: Yes our OPAC is accessible, the OPAC which is our management system can be accessed on mobile technology platform. Every mobile device and the way they load app., some devices may not be able to download. Since we have not customized any page to fit mobile browsing on mobile platform, they may not display very well on some mobile technology due to some hardware feature such as ram, memory and other features

R4: Yes, the OPAC is accessible, we recently tried our repository which can also be accessed but the issue has to do with the fact that these OPAC and the repository are currently not design to fit properly on mobile technology device.

R5: Why not? Am very certain if student accessing library service on mobile device with enough data and high bandwidth speed, am sure your browser should be able to access the OPAC and the institutional repository also the library website can also be accessed. The issue will be how it will be displayed on the phone. Since it's a smartphone you should be able to access but its display will be an issue especially when your screen is small. Other link such as any of the social media sites such as Facebook and Twitter can also be accessed. The library will have to develop a content that will be customized to suit the mobile device.

R6: Currently we haven't gotten there but I believe services like the OPAC can be accessed when one uses good mobile device with better speed and enough bandwidth.

#### **If such services are available what are they?**

.....?

**How beneficial have such services been to the library in serving clients?**

R1: Though proper publicity have not been put in place but I think the e-resources are been used properly by postgraduate students for their research work.

R2: The OPAC together with digitized thesis that we put online is open access where people can get it online to access them. Though its has not been there for long time but people who access them speak well of it. I must admit that more publicity is required to get to larger population and use them by so doing, people who are doing distant education can even access them.

R3: I think for now what we have to do as a library is to sell our services to our clientele for them to use them extensively, those who frequent the library knows but not all student are aware of such services, the onus now lies on us to sell our services so that they will know that such services is available

R4: I believe it will benefit them greatly, currently almost all our wireless access point are working perfectly excerpt few ones that once a while it becomes malfunctioning. Once proper interface are designed to fit their mobile device it will benefits student a lot to have easy access of information they require.

R5: As I indicated earlier patrons of the library will experience enhance, current information can be accessed with ease. Accessing information in the library can be exciting because it will require just a click of button rather than walking every day to library to search for a book which sometimes the particular book you are looking for becomes unavailable.

R6: Well when students are able to access services remotely, I think congestion and pressure on library resources will be eased up

**If it is not available are there any plans in the nearest future for such services?**

.....  
.....?

R3: The library has a plan provide a robust IT infrastructure that will absorb all these initiatives in the near future, the system we are building currently will ensure that all the library materials will be available in it.

R6: With my discussion with the librarian at the last management meeting he indicated that there is going to be major facelift of the library once the library has been commissioned officially I believe such initiative will be considered

**Which mobile library service will appeal to most students?**

R1: I believe any services that students will consider it to beneficial for their academic work will appeal to all students in my opinion

R2: Student will need current information for their thesis and other research work so the online journals which are available could help them and bring them current information. The thesis

which they can also access from online can also help them greatly. Essentially what will appeal to them will be relevant information that will help them for their academic journey. Again alert services will also help them.

R3: In my opinion I think the journal and the OPAC, the journal will be much relevant for postgraduate students in accessing articles that are quite recent, also digitized thesis will also appeal to postgraduate students for their research work. The OPAC will also appeal to the undergrad in locating relevant material for their assignment. Through the OPAC search, “students can just walk to the librarian and tell him that I found A,B,C in your server at this time can I have?

R4: What I know personally is the OPAC, the repository and the electronic resources and also the home page of the library. One thing am looking at is the use of QR codes where they can scan it and get access to the website than typing them with errors here and there. It will appeal to them more where issues of error can be getting rid of. Personally am sure such service with regards to QR codes will help them more and also appeal to them

R5: I think most student will want to access information from their institutional email, it is convenient to access any information. The library can capitalize on this to carry out information to student. Its will be an easy platform to send whatever information the library want to send be it new arrivals, seminars, workshops or any information the library will want to carry it along to the student. So in my opinion I think the library using the institutional email will appeal to student.

R6: I think the electronic journal and the OPAC will appeal to them most, for post graduate student they will need good article and journal for their research work and the OPAC will also help student especially the undergrad to locate good materials for assignments and other academic task.

### **How beneficial is such services been to clients?**

R1: Students especially postgraduate students sits in the comfort of their halls and various learning centres to access electronic resources for their research work and I believe they getting relevant information for their work. Able to access such information anywhere means less pressure will be on the library and its staff.

R2: I think having access to relevant information for assignment and other research work will be beneficial, aside that patrons will remain current. It make leaning less burdensome.

R3: This will save the student a lot of time and also convenience as well.

R4: Aside getting information quickly on OPAC and also accessing the repository with much convenient, QR codes will also add positive value on their information search.



R5: Of course students become current as to what is going on campus and in the library, they are abreast with relevant information the library will send also information is timely accessed.

R6: Very beneficial am sure about this

### **How committed is the university investment in IT infrastructure of the library?**

R1: The university has shown some level of commitment over the years, currently the university has 4 stx bandwidth from 1 stx. Undoubtedly the library needs more investment, we have made some investment in the area of IT, we have done it over the years and we will continue to do.

R2: The library has acquired a few equipment but I think we need to commit more to it. I believe when you purpose to go IT you must be ready to spend money. We have a few equipment we are making do with them. Currently as it stand we need more robust technologies to serve our client in a more “user friendly way”

R3: I will say the university is committed, I learnt they just doubled the bandwidth (internet availability) from 1Megabits per second (Mbps) to 4 (Mbps). Accessibility of internet to student have been improved over the years. “I learnt some students are taken up their Allison course” whiles they are having lectures.” This tells you that internet provision on campus has been improved to some extent.

R4: Progressively I think it getting better, listening to the immediate past vice chancellor he mentioned that IT infrastructure in UCC have seen massive facelift, internet availability has been quadrupled since he took up that position. The current vice chancellor emphasized that more investment will be made in IT infrastructure in the coming years, he said that in demonstrating that he has converted the ICT centre to directorate which will see to and augment all the ICT and its related areas. I will so there are more room for improvement but I think they are really doing well I must admit, prospects are high.

R5: UCC’s network operating centre (noc) have been beefed up over the years, as we speak now the ICT centre is now directorate of ICTS service so in terms of commitment I think the university has shown that. IT infrastructure and its applications in the library has progressively increased however there are still more to be done. We the system librarian have to come up with customized application that will ease burden of students and other users in general.

R6: The university is really committed, in fact the formal VC did a lot of work in terms of ICTs infrastructure investment. The current VC who is more technology inclined at his inauguration pointed out number of project he will want to embark, in fact he supervised the conversion of ICT centre to a whole directorate.

### **What is the budget component for the allocation of IT infrastructure annually?**

R1: Well I can’t mentioned here but just as even in Ghana many ministries, department and agencies complaints of inadequate funding the same apply here, financial resources are limited in supply. What we have is just enough to keep the IT department of the library running.

R2: What we are given as annual budget comes from an estimate we make for the year, that gives management an idea of what we need. However what we are given is just a fraction of what we present.

R3: I have no idea but what I know is that budget allocation is inadequate

R4: It will be difficult for me to give the right figure but those who work at the network corporation center (NORC) they confessed that much doesn't come in as they expect but recently with the advent of the directorate of ICT, its director is pushing for a lot of things so I believe going forward things may change. Students are being levied with ICT fees currently so am sure this goes a long way to put up a solid infrastructure on campus. So am sorry I cannot quote the exact figure that is allocated

R5: I can't tell you because I don't know all that goes into it but what I know for a fact is that we don't get all our budget in full, what we do get is mostly inadequate.

R6: I have no idea

### **Strategies**

#### **Will this require the conversion of existing services on the mobile platform or it will be entirely new services**

R1: That will depend on the staff we have in the library, the kind of exposure they have acquired, they will be in a better position to advise on what to do. My expectation will be that what they have been acquired during the continuous professional development (CPD) programme will determine the line of action, whether to convert an entire existing service or advocate for a new service.

R2: Well some of the services we are offering now need to be automated example is cataloguing, we are doing retrospective cataloguing now to put a lot of information online. So I would say we need to bring in newer things at the same time use existing services, thus we will have to adopt a hybrid strategy for such initiative.

R3: As I said earlier depending on the mobile technology you are using, some mobile phones don't need any conversion, they can upload materials like normal desktop computers but other mobile don't do it. The way IT, it is difficult to split mobile technology from main technology, because these technologies lap over each other. Some features of mobile technology can be used on either desktop or laptops and it works. Apps you can download on smartphone can be done on a normal computer and it works, some do work others do not work so these are the lapses I was talking about. It does not necessarily need to convert your whole infrastructure for mobile but sometimes it depends on the kind of mobile phone the person is using so I think what we have to do in the library is to try and see which mobile phones have that laps to our system and try to tell people about the kind of phone that will be compatible with the library system without any intermediary apps, this will save the library a lot of money.

R4: It will be a conversion of existing service, it will not be a new service, the QR codes as I mentioned earlier will be that something that is new, so I think it will be a combination of the

two, existing services which are already there are going to be enhanced to be visible on mobile platform and secondly those that will be introduced thus the QR codes will form the combination of the two.

R5: There is no need of changing anything, its just a matter of developing an application in addition to the existing traditional service. Such an application such as the mobile service is going to enhance the services that the traditional library offers. I personally don't think we need that, what we need is to train the library personnel to ensure all the twittwers, Facebook, LinkedIn and all the application are constantly updated and also ensure that proper content is developed. If it has to be a new books the library has then the acquisition librarian will have to be consulted to make sure that what new books has been arrived, cataloguing section to see what books has been worked on, if its electronic book make sure its linked up to the existing library website. I personally don't think its necessary to convert any service.

R6: Well it will depend on the advice of the expert, this is s technical area where I don't have a strong suite there.

#### **Will it involve the creating an application or just a website?**

R1: I think both has its merits and demerits, I will wish that one will complement the other. So the two can be used at the same time.

R2: At the moment I think combining the two will be the way to go, most patrons who “were born before computers” that's those older generation who students will prefer the website whiles those younger generation will appeal more for the applications (apps). Remember this initiative will not only be for the younger generation though they form the majority.

R3: As I said it will depend on the type of smartphone you are using, for instance if you have smartphone that can't access either an app or website what will be the use? there are some mobile devices with low hardware specification that can't do any download so whether application or download is created for them it will be irrelevant. But going forward I will advocate for website since the library is just a link on the on the main university web page, and for student to get information from the library they pass through the main web page of the university. So for student to get information from the library they will use the university web page, so the website will be the way to go.

R4: Currently I think the library has thought of application but basically it will be a website. In future the computer science department can collaborate with the library and ask student to design apps for library services that will form part of their project work, may be the only issue will be for update or uploads of services. But initially the website will be the way to go, in the future the two can be combined.

R5: If you want to develop a mobile service, when developing a website you should have it in mind and make sure the browser you are using is such that it can be accessed on the mobile phone and this will make all the library services visible. For me website will be the way to go in terms of visibility of library services.

R6: Personally as far as am concern if the library will want to streamline and control library services and also ensure visibility of its services and resources it will be better for the person to log in to the library website and access from there.

**Will this be done internally by library staff or it will be outsourced?**

R1: As I said this is a technical area and I will expect an expert advice from those who went through the CPD program.

R2: Well we have a strategy to do about 50% in house and outsourced the rest, so it will be the combination of the two.

R3: It will depend on the quantum of work that needs to be done, everything can be done in the library however if a particular expertise is lacking, then we may outsourced

R4: Where technical expertise becomes scarce we will then have to outsourced them.

R5: Am sure it can be done internally, my concern has to be the display on the screen will not be clear as many mobile devices have small screen, so there will be the need to engage a programmer to design a customize interface for mobile devices where it can display a clear and quality interface. Am sure as and when it becomes necessary we will decide whether to outsource or do it internally

R6: Well I don't have the technical knowledge in this area however if it can be done internally why not? Because we have some good IT personnel in the library additionally the computer science department can also be of help

**If to be done internally, what is the level of training of personnel?**

R1: The library has adequate IT personnel but when it becomes necessary some aspect might be outsourced. Technology is broad and therefore everyone has its strength so when it demand that some expertise are not found in the library, we will go out to outsource.

R2: At the moment the library has hired the services of a programmer who has been tasked to train the IT personnels in the library after which every level of training will be deployed among the library staff who are not core IT to get themselves equipped, that is to say the programmer will do a trainer of trainer for library staff to ensure proper capacity building. Where the programmer falls short in terms of expertise the library is prepared to sponsor him to go and build capacity and come back to help with his knowledge.

R3: we have a quite number of IT personnel who can perform a lot of tasks again there is a programmer who is schooling the IT staff to sharpened their skills. These IT staff will later trained the core librarians. The only challenge is whether the commitment level of the personnel can be kept intact.

R4: Personnel in the library especially at the IT section will be up to the task however as I said earlier when the need come for us to go out and seek an expert in an area we will do that

R5: We have trained personnel who can do it, currently we have engaged the services of a programmer who is doing brilliantly well.

R6: As I have indicated we have good IT personnel and we can also fall on the computer science department

**If to be outsourced, how prepared is the library to finance?**

R1: Once it has been established that such service will go a long way to promote scholarship and the library is able to demonstrate to university management that such services is beneficial I believe funds will be released for the library.

R2: As far as I know the library sponsored the building of area network in previous years when there was no technical person in the library to that. So am sure yes they may finance, though commitment to IT infrastructure is not adequate at the moment due to lack of funds from main university administration.

R3: Am sure they will and that will also depends on the availability of funds.

R4: With the issue of library financing, I think students from the computer department in designing of the app, they will do it for marks for their project and we get the products, there should some form of MOU, it will be just a collaboration between two department. Google did a similar thing by organizing an apps competition called peer apps competition.

R5: Am sure management will or may want to take up when they are convinced of its importance to the library, usually we are saddled with lack of funds but when It becomes necessary we can write to corporate institutions and other bodies whose mandate is to ensure quality and total education for everyone.

R6: IF it will help in service delivery why not? Am sure they will

**Have any stakeholders been identified in doing this?**

R1: Normally the library will write to the IT and computing department first with regards to the issue of major outsourcing IT project before it is tendered in order to hire competent and credible company. Where the IT project is not considered major, the library will write to internet service providers (the ISPs) in terms of deployment of IT and its related services.

R2: There are procedures in getting stakeholders, the budget should be within some range before the library writes to the directorate of computing and IT.

R3: The library has a particular IT company they are normally the ISPs that provides IT business solutions to the library. But before it gets to the ISPs we the IT staff collaborate with our colleagues from different organization to come on board, when it proves that it is beyond their strength then we engage the ISPs.

R4: In this case the stakeholders will be the department of computer science

R5: Am sure this will not be a problem at all.

R6: I can't say yes or no but am sure the computer science department can offer some technical advice

### **How will the various stakeholders of the university be involved in doing this?**

R1: Opinions from various stakeholders will need to be taken into consideration that is students, lecturers and other users both from within and outside university community will have to be considered. Various stakeholders should be able mention what it appeals to them most with respect to mobile technology based library service.

R2: The university will solicit and asked suggestions from patrons through mails from faculty members and other media for their opinion.

R3: As for the student they will be the testing point or the final user point because they will go through everything that is the build up the alpha test and the beta test and all that and at the end. Although there will be end users there will also be test users this is because when there is a fault that we fail to notice and they are able to identify they will report to us and correct them.

R4: As mentioned earlier, students from the department of computer science, IT personnel from the library and the library clientele in general will be involved in this. The various resources of the library will be displayed on the web page of the institution to promote visibility, later in the future when apps becomes necessary, student from the computer science department will be tasked to design a library application. Library clientele will be asked to come up with suggestions and inputs with regard to what they want that will be convenient to them. On the part of the staff, the clients service librarian will need to be consulted for any information that will be required within the library.

R5: Patrons or users of the library will be the main focus, students especially will be engaged in seminars and short presentation for them during the information literacy class for them to get idea about such initiative

R6: An open day can be organized at the forecourt of the library where student and stake holders will be invited to participate and have a first hand information on what such initiatives entails and also as part the graduate sensitization seminar a session can be included in this to let student know about it prospect.

### **How will the initiative be marketed to the university community and beyond?**

R1: We will have to employ all the necessary strategies that are available, the graduate sensitization workshop will be captured in this, during the orientation programmes for fresh men, this will also be captured. Again the information literacy program will also be included with such initiatives. With faculty memebbers from time to time we will need to engage them with seminars that will be able to address their concern.



R2: Well our clientele are students, faculty members and researchers. With the use of KOHA which is a software which is used to help them access data in the library within that we take fields like telephone numbers, names, email address etc. so we can reach them with these. We can also use text messaging to get to them quicker, those who are researchers and are not on the database can be sought from the library website where such initiatives can be discussed with them, send them messages and ask for feedback

R3: We will employ bazaar strategy within the university community, again once our website is up and doing we will be posting banners do because a lot of student visit the web page,

R4: We can use the university community radio for a vast publicity of what the library has, again the university institutional email which cuts across all the various ranks such as the junior staff, senior staff, senior members and faculty members where bulk sms can be sent across. Banners from the university's website, mini durbar and open day session can be used to create the awareness.

R5: We can learn from what Google did five years ago which I attended, when they were coming up with their application called Google faculty, they held workshops, seminars advertising banners on their website and a whole lot, printing posters and pasting them at the entrance, engaging faculty members with seminars and also using the senior member website to communicate with faculty members and other administrators. Google asked institutions to paste such apps on their website and any institution that want can subscribe to it, am sure we can learn from that.

R6: I think the institutional emails will be a great tool for marketing, again during the orientation session for fresh students they can be orient in this, again the sensitization seminar for postgraduate student can also be a good marketing strategy.

## **Challenges**

### **Imminent challenges that would be envisaged for the implementation**

R1: Commitment of staff

R2: Finances can be major factor secondly the expertise of the technical team, capacity of the library staff themselves

R3: First of all its finance, secondly able to sell the idea to higher management for them to accept and thirdly how our clientele will be able to embrace such initiative

R4: People may not give it their backing, negative questions of can we be done? People may create pessimistic environment for such initiatives, secondary unpreparedness of some faculty and department to lend their support, commitment of personnel from the library

R5: Imminent challenge will be education, able to convince management about that so that there can be committed staff, if staff will have to go for training will the management be willing to release funds. You will need to educate and convince management that this is an initiative that

will help the library in the foreseeable future. This can take the form of presentation for them to be convinced and know that this is the way to go. Another challenge will be to ignore the traditional service and focus on this initiative, this will mean that only the younger generation will patronize the library.

R6: Definitely it will be connectivity and disruption of bandwidth or the wifi's

**Are there anticipated challenges emerging from other digital initiatives of the library?**

R1: No, it has to do with those who will man this initiative. Lack of commitment will certainly disrupt its implementation

R2: Not entirely so

R3: No I don't think so, because so far all the technology in place are been used well, we haven't had much complain. At this point I will say technology used in the library are 85% accepted

R4: No, anticipated challenges will not come from any digital initiatives

R5: NO,

R6: Yes, the library's internet disruption

**What will be short, medium and long term strategy?**

R1: Get a lot of staff members on board, those who have exposure should be able to share their knowledge they have acquired with the other staff so that we will all be able to provide good service delivery.

R2: The programmer the library has hired is running short in-house courses for the IT personnel and those manning strategic areas of the library, those in the satellite libraries are encouraged to catalogue online in other to access resources of the library anywhere and also get them to build capacity. The medium term will see to it that more IT staff will be hired to retrain the library staff and also ensure capacity building and to get updated on the modern way of doing things and tailor them to suit ours. Again from the medium term the library must be able to commit resources, look for funding from the corporate organization when we are able to present a strong case to them

The long term will be forming partnership and collaboration with other foreign institution to partner the library since the budget of the library cannot be relied upon.

R3: In other for higher management to accept such initiative, the library should be able to demonstrate how useful it will be for users and the university in general, collaboration with other well endowed institutions who will be willing to offer and partner the library and help us.

R4: With the short term the library liaise with computer science department, medium term get a team of student from the computer science department who really understand library system and train the core library staff to get them equipped. With the issue of finances, higher management must be made to understand the current trend in library services, let them know the benefits the



university stand to gain and also how beneficial members of the university community will stand to get with such initiative.

R5: Adequate personnel will have to be trained in this area, also mobile service must be reorganized as an additional service to augment the existing service. So in a nutshell I think the short, medium and long term should be a dedicated staff who will offer themselves to be trained for such initiative.

R6: Upgrading of the library's internet connectivity must be managed well and be given a boost. More investment of the library's IT infrastructure must be given a face-lift. The long term strategy should be that the annual budget for IT infrastructure in the library must be increased from what they receive presently.