INVESTIGATION OF LIBRARY USER PERCEPTIONS TOWARDS MOBILE PHONE-BASED LIBRARY SERVICES CASE STUDY: ISLAMIC UNIVERSITY IN UGANDA

NAKKU CHRISTINE
2014-M132-20021

UGANDA MARTRYS UNIVERSITY

December, 2016

Investigation of Library User Perceptions towards a Mobile Phone-Based Library Services. Case study: Islamic University in Uganda

A Postgraduate Dissertation
Presented to
Faculty of Science/department of Information systems
in partial Fulfillment of the Requirements for
the Award of the Degree of Master of Science
in Information Systems

Uganda Martyrs University

Nakku Christine
2014-M132-20021

December, 2016

DEDICATION

I dedicate this research to the Almighty God for everything He has made possible throughout this study. It's been a long journey.

I would also like to dedicate this work to my dear parents Mrs. Ntege Sarah Nakiwala and Mr. Ntege Lawrence who worked tirelessly to see me through my education, for their continuous encouragement and support, emotionally, physically, financially and spiritually.

And to my dear husband and children, Claver, Calvin, Caryn, Clark and Claude who had to spend hours without me, for their understanding, endurance, support and prayers during my studies.

ACKNOWLEDGEMENT

I would like to thank all those who in one way or another directly or indirectly contributed to this project. A research project like this would not have been possible if it was not for the sacrifice, devotion, dedication, patience and kindness of a number of people. It may not be possible to include everyone in appreciation or to individually thank all, to such persons unintentionally missed out I wish to extend my since thanks.

I would like to thank the Almighty God who has enabled me complete this course, for the courage, finances, and wisdom, your name be Exalted on high.

My special and heartily thanks to my supervisor, Dr. Ssembatya Richard for his mentorship, interest, guidance and expertise showed to me throughout the course. His challenges brought this work towards completion. It is with his supervision that this work came into existence. For any faults I take full responsibility. I give deep thanks to Engineer Yiga Stephen for the guidance and support, and the lecturers in the department of Information Systems, for their support and guidance.

Special thanks to the staff of Islamic University in Uganda, for all their input and support, Mr. Mukungu Isaac, Hajj Ssekalema Hamza, my workmates at IUIU Females campus, my fellow course mates for making the course interesting and tolerable.

Finally yet importantly, I would like to thank my family who stood by me and endured all the times I was busy and was not able to give them the usual attention.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OT TABLES

LIST OF ABBREVIATIONS

App.: .....Application

ECAR: ……..…….……...Educause Center for Applied Research

ERP:…….……Enterprise Resource Planning

GSM: .....Global System for Mobile Communication

ICT:.....Information Communication Technology

ID: .....Identity

IDT: …….……Innovation Diffusion Theory

I.M: .....Instant Messaging

IP: ....Internet Protocol

I.T: .....Information Technology

IUIU:.....Islamic in Uganda

IUIUL……..Islamic University in Uganda Library

KMS: .....Knowledge Management Systems

LAN: .....Local Area Network

LIS: .....Library and Information Science

MBLS:.....Mobile Based Library Systems

MMS: .....Multimedia Messaging Services

MOPAC:.....Mobile Online Public Access Catalogue

OCLC: .....Online Computer Library Centre

PC: .....Personal Computer

PDA: .....Personal Digital Assistants

PDF:...…….…….…Portable Document Format

QR:…….……..……..……Quick Response

SMS:.....Short Message Service

UCD:.....User Centred Design

URL:.....Uniform Resource Locator

UTAUT: ……...Unified Theory of Acceptance and Use of Technology.

ABSTRACT

Institutions of higher education have increasingly invested in library management systems to provide a reading environment designed to enhance student learning and research. While there has been an increase in the design and development of Library information systems, many of the systems are not being utilized by the library users to solve their information needs. Most of the systems currently designed are not user centered because the designers of these systems don't really consult the library users before developing the systems. Little effort has been made to investigate the perception and intention to use mobile phone-based library information systems by the library users (Venkatesh, 2012). This research paper aims to present an overview of the perception of the students regarding possible use and implementation of mobile phones in library services for Islamic University in Uganda Library (IUIUL), and to design an architecture that supports library users' perception regarding the possible advantages of implementing mobile based library services in IUIU library. This research adopted the unified theory of acceptance and use of technology (UTAUT) to study acceptance and use of technology in a library user context. The UTAUT theory considers that three key factors; performance expectancy, effort expectancy and social influence are direct determinants of behavioral intention to use technology. The User Centered Design (UCD) was used with a structured questionnaire to conduct the research. The data was collected from different faculty for the balance of the study and findings. The data was collected from three campuses of IUIU. Responses to closed-ended questions were analyzed using the descriptive analysis techniques of SPSS 20.0 and responses to other closed-ended questions were analyzed using general statistics. The result of the study shows that the status of mobile phone usage by the library users of IUIUL is satisfactory. The findings of the study indicate that the students provide their consensus regarding the use of mobile phones in service delivery at IUIUL. This study provides evidence on the actual use of mobile phones by the students of IUIUL for retrieving information and their attitude towards implementing a mobile based library system for IUIUL.

Keywords— Islamic University in Uganda Library (IUIUL), Library Users, Mobile phones.

CHAPTER ONE

1.0 GENERAL INTRODUCTION

During the last decade, mobile usage has become a necessity for the common man because of the many changes in the mobile industry (Wankel and Blessinger, 2012). The basics of our lives has become linked with mobile technology as our day-to-day means of operating have, by necessity, become more mobile Fox, (2010). Mobile devices and applications provide access to information in the comfort of people's homes and offices, using their cellular phones or personal digital assistants. These new devices enable access to information without the limitations of space and time (Aharony, 2013). Therefore, this paper has made an attempt to explore the perception and behavior of the students of IUIU in adopting mobile based library services in their library to enable convenient and quick retrieval of Information from the library.

Despite a seemingly remarkable progress on designing of library systems in IUIU, library user perceptions are not investigated (20th February 2016 IUIU executive board meeting). That is why the researcher did an investigation on library user perceptions and behavioral intentions towards library mobile technologies. With a growing number of people accessing the internet from their pocket, PCs and mobile phones, libraries are investigating ways to deliver their services to mobile phones and other small- screen devices so their customers can access them any time anywhere. This research is about how library users behave and perceive mobile based library technologies. There are a lot of conditions that must be met before new information technologies can be introduced, adopted and spread to higher education institutions. This research intends to use the Unified theory of acceptance and use of technology. Up to today this theory is very topical in many areas of our environment, but we pay special attention of what is its application in higher education institutions. This section focuses on the background of the study, statement of the problem, main objective and the specific objectives of the study, scope, significance of the study, and the conceptual framework.

Today's library users expect speed and immediacy of information discovery, one-stop access to aggregated services, user-generated open content, and personalized, workflow-related delivery of information. Library mobile telephone technologies are widely used in the developed World and have greatly improved information accessibility for library users worldwide (Lippincott, 2013). Mobile telephone ownership has sky rocketed and the library has taken advantage of this venture.

Based on a review of previous user research and system evaluation studies, best practices, and current technological trends, the research goal is to determine an appropriate evaluation model for future research and possible systems solutions. As library users boost Library mobile technology use and validate the goals and funds spent on development, the results can provide collection management departments, technology designers, and funders of all library Mobile technologies the motivation to assess their viability and to build efficient, effective, and competitive library applications to preserve their value as the primary knowledge management system by the Information community (Murray, 2010).

Libraries are facing a considerable challenge of how to keep pace with the rapidly changing technologies and ensure the services they provide fit into the new technologies which are infiltrating society. Mobile computing is changing the way people search receive and interact with information on a daily basis. Libraries are innovating to try to meet the evolving technological challenge they face. Innovations in mobile services include mobile applications to administer library records, text message services reminding users of book return dates, instant chat services. There is no doubt that the potential range of mobile services a library could offer its users is considerable. The advantage the Library has is that in just a few short years Smartphone ownership has skyrocketed and popular use of e-readers has been steadily on the rise. These advanced mobile tools provide portable, instantaneous access to the world of information, across boundaries of subject, discipline and industry (Carlucci, 2011.)

There are many advantages of using Mobile technologies and these are the fundamental reasons for all Libraries to acquire or enhance their Library Management Systems with Mobile Telephone Technologies. According to Fishleder, (2014), Access is the primary benefit of mobile technology, and what's even better is that the main aim of the library is to make information accessible to the library users. Higher Efficiency is the second advantage of mobile technology because a smart phone is a device that has been designed to help people to become more productive and efficient, Library users will go to the library knowing what they want and the location, after using the Mobile Online Public Access Catalogue hence no time will be wasted. The next advantage is increased productivity because it will be easier for Library users to access the Information they desire.

Although the capabilities of using mobile technology are already vast, its growing rapidly and there is ample room for improvement and innovations to help the Libraries better serve its users. Mobile technologies have a lot to offer its users and a lot of research has been done and many mobile applications have been developed but their use leaves a lot to be desired hence an investigation about the user perception and behavior towards mobile telephone technologies. Therefore, the study presents an investigation of the factors that are expected to influence the intention of University students to use mobile phone-based library information systems based on modified UTAUT model. The modified model comprises of constructs represented by several latent variables, namely performance expectancy (PE), effort expectancy (EE), information quality (IQ) and service quality (SQ) and moderated by age, gender and experience in using Library system This research will use the Unified Theory of Acceptance and Use of Technology (UTAUT) and Rogers' (1983) Innovation Diffusion Theory (IDT) to examine Library user behavior and perceptions of intentions of mobile library applications. The results could be a reference for those who plan to introduce Library mobile applications to their libraries.

1.1 Background to the study

Information technology has led to a rapid development in communication, and also facilitated many activities like the easy flow of information from information providers to information users. There is an emergence of mobile phones with much functionality and these devices have been integrated into many activities like mobile money transfers, mobile banking, chatting and many more. Such applications would be used in the library for services like Mobile Online Public Access Catalogues (MOPACs), Short Message Services (SMS), reference, and library websites can be used if the library users have a positive perception towards them (Murray 2011). During the last decade, due to enormous changes in the mobile technology industry, mobile telephone usage has become a necessity for the common man (Wankel and Blessinger, 2012). Mobile applications provide access to information wherever the user is located as long as there is network connection. The increasing usage of mobile devices among university students is making it impossible for libraries to ignore this medium (Nowlan, 2013).

On a daily basis, books are borrowed, returned or even misplaced. A library user may find it difficult to find the right book especially if the book collection is big (Nishant et.al, 2014). The

increasing prevalence of handheld mobile computing devices such as web-enabled cell phones can be used as an advantage by the library to bridge the gap between the library and its users. (Cummings, Merrill and Borrelli, 2010). Libraries have the opportunity to extend new types of services to Library users through mobile devices and to develop, and or otherwise make available scholarly content that is configured for mobile devices (Lippincott, 2010). But these technologies can only be properly utilized after investigating the library user perceptions towards them.

Wilson and McCarthy, (2010) assert that all libraries will be interested in exploring the library services that were developed and adapted for mobile devices and of particular interest to academic libraries will be the building of collaborative relationships with other academic departments to provide services to students. Information may be used by libraries seeking to add mobile technologies in order to enhance their traditional services, making them not only more available, but also more relevant to their users (Murray, 2010).

The invention of mobile applications has been encouraged and many libraries have adopted the use of mobile devices to satisfy the ever increasing needs of the library users and it is used as a way of reaching library users especially those who are outside the campus or far from the campus. This is because many library users now own mobile phones and they have them as they study and do their research. Many Library Management Systems worldwide are enhanced with Mobile telephone technologies to bridge the communication gap between the library and the library users who are spread in various locations (Lippincott, 2010). But these technologies are not used maximally by the library users hence an investigation on the user perception and behavior towards library mobile technologies.

1.2 Mobile Phones and Library Services

The need to meet life's basic challenges and responsibilities has informed the invention and the use of information technologies. Libraries are interested in channels that lead to quick transmission of information, such as telephones and telephone lines, cellular networks, cable television, and the Internet. Information may be used by libraries seeking to add mobile technologies in order to enhance their traditional services, making them not only more available, but also more relevant to their users (Murray, 2010). Paterson and Low (2011) provided quantitative and qualitative data of students' use of mobile devices and to consider the benefit of academic mobile library services to

students.

Mobile Telephone Technology has removed the barriers and promoted fast communication across boundaries. Before the advent of ICT, communication in the library was possible through notices, circulars etc. in libraries' notice boards, means users had to come to library to get the update about the library activities. As scientific knowledge has increased, electronic communication systems began to develop. The library can inform through a single SMS on his users' mobile phones about any new activity. This means it is not necessary for the library users to go to the library to know what is new. Therefore, we can say, now libraries are without walls.

These would support library-to-user, user-to-library, and user–to–user online interactions. It made possible by Global System for Mobile Communication (GSM). Mobile phones have revolutionized the daily lives of people all over the word. The GSM also enhance library operations. The application of telecommunications to an automated library can bring more efficiency of library services on mobile phones. Libraries are investigating ways to deliver their services to mobile phones so their users can access them any time anywhere. Further, mobile phones can be used for sending text message alerts about their reservations becoming available or overdue books (Iwhiwhu and Ruteyan, 2010). All these services are a good base for a good mobile based library system if the library users perceive it that way.

Some of the Universities using Mobile Telephone Technology include the University of Texas Library Mobile Website, University of Alaska Fairbanks that offers audio books through the ListenAlaska web portal, and the University of Virginia, Library Electronic Text Center. In Africa, there is Rhodes University library mobile application and University of Western Cape library mobile application also in South Africa. Libraries can use SMS services for services like SMS if requested book is available (collect messages), SMS reminder if a book is due, requesting a list of loans via SMS, renewing books via SMS, requesting an overview of outstanding fines via SMS, checking the availability of books via SMS, requesting the opening hours of the library via SMS, among others.

Maranto, (2010) states that the vast growth in mobile telephones as a form of ICT in Sub Saharan Africa Countries (SSAC), provides a new model of information access, one that surmounts many

of the traditional barriers to information and may enable Sub-Saharan African development. He proposes that African libraries and librarians should take advantage of mobile telephony to promote access to public and social services, access to literature and literacy, and community involvement. Maranto further states that mobile phones as Information Communication Technology (ICT) shorten the hierarchy of information transmission; the providers of mobile phones are local and the users have direct access (especially if they have Internet-capable phones) to the services mentioned above and to Internet resources. Cell phones are usually simpler to user than computers, and voice access does not require literacy in English. With cell phones, users can access information directly, avoiding the numerous steps/barriers.

Libraries can provide a wide array of mobile services to interested users according to Vollmer, (2010). These services include Mobile online public access catalogs (OPACs); Libraries are providing access to their OPACs via mobile-optimized websites. The New York Public Library Mobile Beta site supports a mobile OPAC and allows users to browse library locations and hours.

Mobile applications; some libraries have developed mobile applications for smart phones.
The District of Columbia Public Library, for example, has developed an iPhone application that includes a mobile OPAC and the ability to place items on hold, and also provides information on Hours and locations of local libraries.

Mobile collections; Third-party content providers are partnering with libraries to deliver audio books, e-books, audio language courses, streaming music, films, images, and other multimedia that can be used on mobile devices. The Overdrive service is supported on numerous mobile devices and has developed an application for BlackBerry smart phones (see http://www.overdrive.com). Duke University has created a free iPhone application called DukeMobile, containing a wealth of information on digital library resources, including extensive access to the library's digital photo archive and other collections.

Mobile library instruction; some libraries are offering library instructional materials and resources via mobile platforms. For example, East Carolina University's "Research First Aid" is a series of podcasts for library researchers on the go. Mobile databases; PubMed for Handhelds is a mobile web portal for the National Library of Medicine

Library Short Message Service (SMS) notifications is another service offered by Libraries using mobile technology. Many libraries use SMS for a variety of purposes, including notification for items available for pickup, due date reminders, information on availability of library materials, provision of call numbers and locations, and others.

1.3 Statement of the Problem

A university library involves attending to queries of registered users 24 hours seven days, informs users when requested book are available, remind library users if a book is due, regardless of their location, renewing of books if still needed, checking the availability of books and letting users know their outstanding fines, help and guide students in searching for the desired information materials. Many mobile based library management systems have been designed to provide these services.

While there has been an increase in the design and development of Library information systems, many of the systems are not being utilized by the library users to solve their information needs. Most of the systems currently designed are not user centered because the designers of these systems don't really consult the library users before developing the systems. Little effort has been made to investigate the perception and intention to use mobile phone-based library information systems by the library users (Venkatesh, 2012). Poor quality research among library users has led to low levels of publications. (20th February 2016 IUIU executive board meeting). Similarly, the Islamic University in Uganda end of academic year library report 2014/2015 demonstrates that the reading culture of the students is very poor and it showed that only 47% of the students use the library module of the ERP. The current system which limits its use to the hours of library operation, the number of computers available for the Library users to access the library module of the ERP are also limited (IUIU Annual Library Report 2015). Power outages make the situation even worse. This leads to theft of books, delays in returning borrowed books and this leads to an increment in overdue fines, and poor internet access also hinders access to information.

In view of this, the researcher saw it important to investigate library user perceptions and intentions towards mobile based library services, because with the current system, it is difficult and time consuming for information to flow between the library and its users.

1.4 Research Objective

1.4.1 Main Objective

The main objective is to investigate the usefulness of mobile phone based library system based on the unified Theory of Acceptance and use of Technology.

1.4.1.1 Specific Objectives

1. To identify the features and properties of services that the library users want to get through mobile technologies from IUIU library.
2. To develop a mobile phone based library information system.
3. To design a library services architecture that supports students' perceptions regarding the possible advantages of implementing mobile based library services in IUIU libraries.
4. To determine the library user perceptions and behavioral intentions towards library mobile technologies.

1.5 Research Model and Hypotheses

Whenever a library implements a new service, she should evaluate the service's effectiveness and patrons 'satisfaction of the service. According to UTAUT, and relevant literature, this paper used a research model as shown in Figure 1 and 9 hypotheses as follows:

1.5.1 Performance Expectancy

Performance expectancy is defined as the degree to which using a technology will provide benefits to consumers in performing certain activities; (Brown and Venkatesh 2005).

H1: Using library mobile technologies helps library users to satisfy their information needs.

1.5.2 Effort Expectancy

Effort expectancy is the degree of ease associated with consumers' use of technology; (Brown and Venkatesh 2005).

H2: Learning how to use library mobile technologies is easy for me.

1.5.3 Social Influence

Social influence is the extent to which consumers perceive that important people (e.g., family and friends) believe they should use a particular technology; (Brown and Venkatesh 2005).

H3: People who influence my behavior think that I should use library mobile technologies.

1.5.4 Facilitating Conditions

Facilitating conditions refer to consumers' perceptions of the resources and support available to perform a behavior (Brown and Venkatesh 2005).

H4: I can get help from others when I have difficulties using library mobile technologies.

1.5.5 Hedonic Motivation

Hedonic motivation is defined as the fun or pleasure derived from using a technology, and it has been shown to play an important role in determining technology acceptance and use (Brown and Venkatesh 2005).

H5: Using library mobile technologies is fun.

1.5.6 Price Value

Price value is an important difference between a consumer use setting and the organizational use setting. The cost and pricing structure may have a significant impact on consumers' technology use. (Brown and Venkatesh 2005).

H6: Library Mobile technologies are a good value for the money.

1.5.7 Habit

Reflects an opportunity to use a target technology and is typically operationalized as the passage of time from the initial use of a technology by an individual. (Kim and Malhotra 2005; Venkatesh et al. 2003),

H7: The use of Library mobile technologies has become a habit for me.

1.5.8 Behavioral Intention

Technology Acceptance Model suggests that an individual's actual use of a given technology is determined by the individual's behavioral intention to use that technology, which provides the most accurate prediction of behavior (Davis et al., 1989). The behavioral intention is hypothesized that:

H8: I will always try to use library mobile technologies in my daily life

1.5.9 Use Behavior

Perceived usefulness is the degree to which a person believes that using a technology will enhance his/her performance (Davis et al., 1989). According to TAM, perceived usefulness is expected to have a direct effect on positive attitude. On the other hand, TAM suggests that perceived usefulness is directly influenced by perceived ease of use; therefore, this study will test the following hypothesis:

H9: I use most of the services offered by library mobile technologies many times in a day.

1.5.10 External Variable

One external variable, advertisement was proposed in this study. A library should advertise any newly provided services so that patron scan be informed and encouraged to use these new services; therefore, advertisement may improve the usefulness and ease of use for users to use a system. Thus, it is hypothesized that:

H 10: Advertisement positively affects perceived usefulness of the library mobile technologies

Below is the research model which shows the relationship between the UTAUT four key constructs (i.e., performance expectancy, effort expectancy, social influence, and facilitating conditions) and how they influence behavioral intention to use a technology.

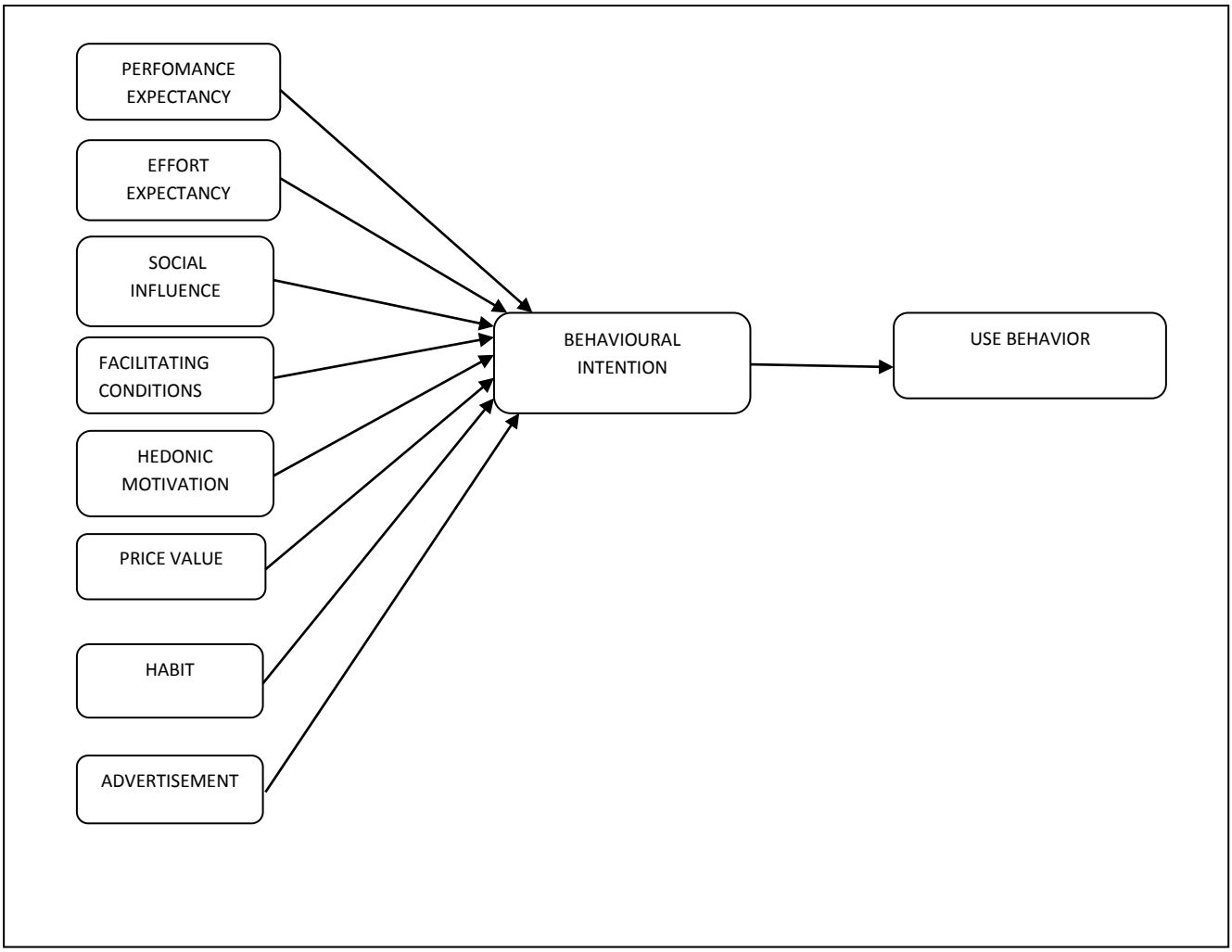


Fig. 1.1 Research model and hypothesis adopted from Venkatesh (2012).

1.6 Scope of the study

The research was carried out at three of the IUIU campuses namely in Mbale, Kampala and Kabojja. Since this is a private university which has existed for 27 years, well situated with good facilities, IUIU students can represent students from other universities. The specific target group was under graduate students from the faculty of Science because this group helped me to measure their library use perception and behavior. And I looked at the relationship between library user perception, behavior and library mobile technologies and the interaction effect of library user

perception and behavior on library mobile technologies. In this study perception means customer experiences or feelings about the product or services provided by the specific organization.

1.6.1 Geographical scope

The project was confined to three campuses of Islamic University in Uganda that are located at Kabojja, Kibuli and Mbale. This focused on the library user perceptions and behavioral intentions towards library mobile technologies

1.7 Justification of the study

The positive effects of the use of library mobile technology strongly depended on students' self-perceptions about their motivation to use the technology. This is a critical issue for the implementation of technology into the library under the assumption that proper technologically oriented materials are developed and library users are ready to use them.

This study was intended to provide research-based evidence on how library users perceive their own use of technology for accessing library information materials. In other words, the purpose of this study was to investigate students' perceptions about their motivation to use library mobile technology for accessing library information.

1.9 Conclusion

University Libraries are looked at as accessible storage for all human knowledge and wisdom, and they are essential providers of important information that lecturers and students base on, to plan and implement the teaching and learning process. It is important to have a view of the perception of users towards the technologies being implemented which will guide the university in its strategic plan. The process of improving research standards requires the sharing and analysis of accurate and timely information. This research used the Unified Theory of acceptance and Use of Technology and the Diffusion Innovations Theory to come up with a model, modern information systems methodologies, techniques, tools and fundamental concepts and key ideas that are essential to the planning, the acquisition of library mobile technologies in both the academic and real world.

With regard to the introduction given above, regardless of the investment of time and materials to build and maintain library mobile technologies, it will have little perceived value if materials are not accessed because users are unaware of its existence or find it difficult to use. The user base must be identified and a connection developed to serve existing users and to engage new users. Once identified, users' motivations and behaviors cannot be assumed so continuous evaluation will remain a priority. In rapidly changing fiscal environments, libraries can remain viable by locating the appropriate investment avenues to improve resources and services to meet users' needs and to create a valuable, dynamic space, serving the global community as its primary source of information. Therefore this research intends to investigate the user perceptions and behavioral intentions towards mobile telephone technologies, and also recommend it to Islamic University in University in Uganda Females' Campus Kabojja, the case study.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The way library users perceive the systems being used by libraries greatly affects the whole library service. The user is therefore very critical to the services of a library. This chapter concentrates on the important themes in developing and investigating user perception and behavior towards the Mobile based library system. These discussed below include: mobile based library system and its significance in view of user perception and behavior in general, the various methodologies and techniques used in this project, which include; IS modeling, IT, Requirements gathering, Development Methodology, the roles of user perceptions in the success of MBLS.

Therefore, this chapter attempts to present an understanding of the significance of MBLS, a review of some of the available library management systems and will recommend possible implementation mechanisms for the system designed .It will also investigate perception and behavior of the library users towards the MBLS. Lastly, this chapter will look at or review the methodology that was used in the research like the research methods, and techniques used.

Unified Theory of Acceptance and Use of Technology is a model developed to study the acceptance of the technology by an individual taking into account, basically, both the perceived ease of use and the usefulness of the technology. One of the most frequently employed models for research into new information technology acceptance. The UTAUT suggests that when users are presented with a new technology, a number of factors determine their decision about how and when they will use it. Based on a review of the literature, Venkatesh et al. (2003) developed UTAUT as a comprehensive synthesis of prior technology acceptance research. UTAUT has four key constructs (i.e., performance expectancy, effort expectancy, social influence, and facilitating conditions) that influence behavioral intention to use a technology and/or technology use.

We adapt these constructs and definitions from UTAUT to the consumer technology acceptance and use context. Here, performance expectancy is defined as the degree to which using a technology will provide benefits to consumers in performing certain activities; effort expectancy is the degree of ease associated with consumers' use of technology; social influence is the extent to which consumers perceive that important others (e.g., family and friends) believe they should use a particular technology; and facilitating conditions refer to consumers' perceptions of the resources and support available to perform a behavior (e.g., Brown and Venkatesh 2005; Venkatesh et al. 2003). According to UTAUT, performance expectancy, effort expectancy, and social influence are theorized to influence behavioral intention to use a technology, while behavioral intention and facilitating conditions determine technology use. Also, individual difference variables, namely age, gender, and experience (note that we drop voluntariness, which is part of the original UTAUT), 2 are theorized to moderate various UTAUT relationships. The lighter lines in Figure 1 show the original UTAUT along with the one modification noted above that was necessary to make the theory applicable to this context.

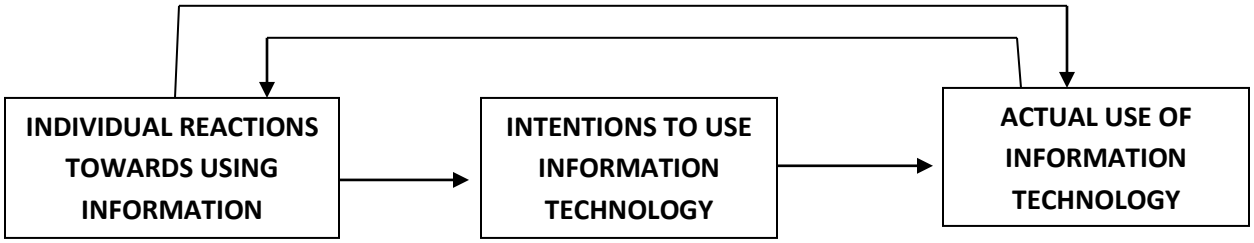


Fig. 2.1: Basic Concept Underlying User Acceptance Models Venkatesh et al. (2003)

The academic library is the nerve centre or the hub around which scholarship revolves. It is an indispensable instrument for intellectual development. A well-stocked academic library is a storehouse of information, or a record of human experience to which users may turn to for data or information. An academic library is the library associated with a degree-granting institution of higher education. Academic libraries are identified by the post-secondary institution of which they are a part and provide all of the following: An organized collection of printed or other materials or a combination thereof; A staff trained to provide and interpret such materials as required to meet the informational, cultural, recreational, or educational needs of clientele; An established schedule

in which services of the staff are available to clientele; and The physical facilities necessary to support such a collection, staff, and schedule Sharma, (2010)

Access to information and the ability to use it more effectively are increasingly becoming very important to every academic Institution. With this new plan, Libraries is strengthening student, faculty, staff and public access to the information resources and services required for teaching, research, and lifelong learning, (Washburn, 2011). Few libraries exist in a vacuum, accountable only to themselves. Before the advent of Information and Communication Technologies (ICTs), communication in the library was done through books, newspapers, microforms, slides, etc. As scientific knowledge increased, electronic communication systems began to develop. The use of telephones and computers led to the Internet.

2.1 Definition of key terms

2.1.1 Mobile technology

This is the technology that is portable; it refers to any device that you can carry with you to perform a wide variety of "tasks". It is technology that allows those tasks to be performed via cellular phone, PDA, vehicles, laptops, etc, (Sharma, 2014)

2.1.2 Mobile Web Sites

These are mobile versions of their Web site that are better optimized for viewing on mobile devices, (Sharma, 2014)

2.1.3 Library

A library is a building or room containing a collection of books, journals and computers for access to electronic information made accessible to a defined community for reference or borrowing. It provides physical or digital access to material, and may be a physical building or room, or a virtual space, or both, (Khan, 2012)

2.1.4 Perception

Perception can be defined as our recognition and interpretation of sensory information. Perception also includes how we respond to the information. We can think of perception as a process where we take in sensory information from our environment and use that information in order to interact

with our environment. Perception allows us to take the sensory information in and make it into something meaningful, (Appannaiah, 2009)

2.1.5 Library user

According to Whittaker, (2011) a library user may be defined as individuals who come to the library to access information. Users are individuals who can be divided into different categories on the basis of tasks assigned to them in a library organization.

2.1.6 Behavior

According to Robins, (2008) Behavior is the range of actions and mannerisms made by individuals, organisms, systems, or artificial entities in conjunction with themselves or their environment, which includes the other systems or organisms around as well as the non-living or physical environment. It is the response of the system or organism to various stimuli or inputs, whether internal or external, conscious or subconscious, and voluntary or involuntary

2.1.7 Mobile Devices

Also known as handheld devices, handheld computers or simply handheld, mobile devices are small, handheld computing devices, typically with a display screen, with touch input and/or a miniature keyboard (Kroski, 2015)

2.1.8 User Interface

This is the space where interaction between users and devices occurs. It is the system by which users interact with a machine. The user interface includes software which is a logical component and hardware which is a physical component, (Maranto, 2010)

2.2 Services Offered by Mobile Based Library Systems

2.2.1 Mobile Technology in Libraries

The mobile Web, simply put, is the World Wide Web which as accessed through a mobile device ranging from a cellular phone to an iPod Touch. It constitutes the entirety of the Internet and is not limited to websites which have been specifically designed for mobile viewing. Handsets and mobile phones which have Web capabilities can search and browse the Internet from anywhere

they can get a cellular signal. Websites which are made especially for the small screen appear as scaled-back versions of their desktop counterparts, often with a numbered menu system for quick access to content. Web destinations which do not have mobile versions appear as if they were squeezed onto the tiny screen, and oftentimes have overlapping menus and links. If accessed by way of a search engine, a website may have some formatting applied to it in an attempt to make it more viewable on a phone.

The most important technology product no longer sits on your desk but rather fits in your hand. (Helft &Vance, 2010). The fabric of our lives has become interwoven with mobile technology as our day to day means of operating have, by necessity, become more mobile Fox, (2010). Mobile devices and applications provide access to information in the comfort of people's homes and offices, using their cellular phones or personal digital assistants. These new devices enable access to information without the limitations of space and time (Aharony, 2013). The key to creating worthwhile mobile library services is to truly meet library users' needs and deliver those services in usable and accessible formats.

Lippincott sees mobile services as an opportunity for libraries: "The challenge for academic libraries is to create compelling information services and to make digital content available in a way that our user community will find not only acceptable, but tailored to their needs" (Lippincott, 2010). In light of trends toward more widespread use of mobile computing devices and smart phones, it makes sense for libraries to provide access to their collections and services in ways that work well with mobile devices (Dresselhaus and Shrode, 2012). In light of this, IUIU-FC library is looking forward to a library system enhanced with mobile applications so that there is convenience of accessing some information using mobile telephones.

Mobile access to library resources is not a new concept; in fact, the first project designed to deliver handheld mobile access to library patrons began eighteen years ago, in 1993, the time of mainframe computers and Gopher. The **"**Library without a Roof" project partners included the University of Southern Alabama, BellSouth Cellular, and Notable Technologies, Library users at participating institutions could search and read electronic texts on their personal digital assistants (PDAs) and search the library catalog while browsing in physical collections. As reflected in the literature, interest in PDA applications for libraries started to pick up around the turn of the twenty

first century. Medical librarians were among the first to widely recognize the potential impact of mobile technologies on librarianship. (Dresselhaus and Shrode, 2012).

In some recent surveys of mobile users of library services according to Gerrity and Bruxvoort (2010), the library catalog was not the most used or desired service. Other services such as looking up library hours, reserving a study room or computer, checking out materials, paying fines, and reading electronic resources were of as much interest as searching the library catalog; in most cases much more important. It may be especially important for special libraries to provide mobile access to user accounts, in order to view the status of checked out materials, check current awareness lists, and to obtain direct access to online resources from a mobile device. Some library apps are doing a particularly good job of delivering those commonly-used, often-requested features in the mobile context. While access to the catalog is still present, quick status checks, information lookups, and mobile contacts are also highly visible.

According to the 2010 Educause Center for Applied Research (ECAR) study, 49 percent of undergraduates consider themselves mainstream adopters of technology. These statistics indicate that skills are increasing and the technological landscape is changing quickly. The ECAR study reports that student computing is rapidly moving to the cloud, another indication of the rapid change in the use of technology. "USB may one day go the way of the eight-track tape as laptops, net books, smart phones and other portable devices enable students to access their content from anywhere. Similarly, IUIU-FC students show interest in adopting new technology.

According to Iwhiwhu and Ruteyan (2010), the data collected from 90 percent of students and 48 percent for staff shows that all the respondents have mobile phones of their own. They subscribe to one of the three major available networks or operators around the university community of Abraka, Nigeria. These networks are majorly MTN followed by Zain and GLO. The Delta State University library provides a number of services to meet user information needs. These include reference, serials, bindery, loan, current awareness, inter-library loan services, and others. According to this report, the library does not provide Internet, OPAC, or GSM. Library users of IUIU-FC library, will benefit more from the mobile telephone enhanced Library Management System because most areas of the campus are connected to a wireless network and for those areas without internet, library users can buy megabytes for 24 hours for as low as 500 Ugandan shillings.

The analysis of the Capital University library in South Africa according to Iyamu, (2013) revealed that the users of the library services have different ways of accessing library services. Some of them access the services manually and others prefer to explore the information systems and technology which are deployed by the library to provide its services. Some of the library stakeholders who prefer to use information systems and technology deployed in the library struggle to do so because of lack of training and understanding on how to use the systems. The scarcity of resources such as computers (PC), space, human resource (limited librarians) affects the quality of service that the library offers to its stakeholders. The internet connection around this campus is by Local Area Network (LAN).

Hence the current system requires physical presence for accessibility and connectivity. There is no flexibility and mobility is limited. Some of the library stakeholders are technologically inclined and the thought of the use of emerging technologies, some of them use mobile technology for banking, registration at IUIU at the beginning of each academic year. This puts IUIU libraries at an advantage due to the fact that the computers are available for the students and every student in their first year does a computer applications course to enhance their computer skills. Since Mobile technology is intended to enhance the library's services, it will provide access to information and resource material (such as e-book) online, at any time and from anywhere.

Cummings, Merrill and Borrelli (2010), state that advancements in data transmission rates and device design have greatly improved the mobile internet browsing experience. Newer products such as the iPhone, the iPod Touch, most modern Blackberries, such as the Bold or the Storm models, and the Palm Pre have integrated the easy downloading, storing and viewing of Portable Document Formats (PDF) documents and Microsoft Office files for word processing and spreadsheet formats. These recent enhancements suggest that future developments and previously mentioned demographic patterns will enable a large number of academic library users to easily use many of these library services from handheld mobile computing devices. Furthermore, these devices are increasingly able to connect to the internet using Wi-Fi connections. In the light of these trends, the interest for the library at IUIU-FC will be type of experience the eventual user will have and what library services will be available to them.

Allan, Et.al (2012), state that Information needs are often not about a ranked list of documents. The user wants information. The information may be scattered across documents, like in the library and it may be explicit or implicit. But providing just the right information to the Library user in the right format is especially not only important but also made easy in a mobile environment.

As smart phones become our users' key information devices, libraries will want to have a significant presence in offering content and services suitable for those devices (Hu and Meier, 2010). The latest technologies in libraries include, versions of library websites, using text messaging to communicate with patrons, developing mobile catalog search, providing access to resources, and creating new tools and services particularly for mobile devices. Mike Teets, vice president of innovation at OCLC, believes "a strong mobile strategy is fundamental to librarians and librarianship" (OCLC, 2010). Libraries are pursuing mobile strategies in order to participate in a general shift towards information access from mobile devices, to reach different locations of users, and to prepare for a future in which mobile devices become even more central to daily life. Hence IUIU-FC is going to follow suit.

As a librarian, I find it important to create services now that will prepare for the growing numbers of smart phone owners. Although it is not evident that many library users are currently accessing library mobile services in large numbers in Uganda today, but nonetheless, I feel a mobile site is essential for a library. This traffic, though small right now, will continue to grow (Trainor, 2010).

Types of mobile devices include Personal Digital Assistant, originally designed for organizing one's appointments and contacts, next most became able to connect to the web, now, and most are phones as well. Examples include Palm, iPhone, Blackberry, iPod Touch. Smart phones are mobile phone that also has computing functionality. Many PDAs are also smart phones. Closeness to the place and moment of information needs can arise at any time, in any place. In the old days, library users often had to wait until they got to a library before they could seriously pursue most of their information needs. Mobile library services make it easier for libraries to respond to information needs where and when they arise (Peters, 2013)

Libraries can better serve their users by embracing the growing capabilities of mobile technology. They can promote and expand their existing services by offering mobile access to their websites and online public access catalogs; by supplying on-the-go mobile reference services; and by providing mobile access to e-books, journals, video, audio books, and multimedia content. Mobile devices and services therefore provide tremendous flexibility for those who wish to take advantage of library services. With a simple 3G connection, a user lying anywhere can access e-books and multimedia content via his or her local library. If a Smartphone can always access a network, content can be continually streamed to the device over the network, providing content on demand and making it unnecessary to maintain a local copy of the material. By going mobile, a library takes a giant step toward offering a round-the-clock service.

The mobile environment can also offer new venues for teaching digital literacy skills to youth as well as adults, and aid libraries in their outreach as consumer educators and e-government access portals. Through the continued adoption of mobile technology, library services can potentially engage traditionally underserved groups as well. For example, while ethnic minority populations are connected to broadband at home less than are other demographic groups, they carry cell phones at the same rate and access the Internet via mobile devices at higher rates than whites
(Washburn, 2011)

When we talk about library mobile apps, the word "library" could mean several different Things; It could mean just the library catalog, other services provided by the library, other services available from the institution of which the library is one part, or it could mean ways in which library resources are made visible in applications constructed by those outside the library world.
Some library mobile apps concentrate on the library catalog. Search and discovery of the catalog can sometimes be implemented relatively quickly, in particular if the system that supports the website for the catalog offers an out of the box mobile solution.
In some recent surveys of mobile users of library services

Schmidt and Ha, (2010) State that the library catalog was not the most used or desired service. Other services such as looking up library hours, reserving a study room or computer, checking out materials, paying fines, and reading electronic resources were of as much interest as searching the library catalog; in most cases much more important. It may be especially important for special

libraries to provide mobile access to user accounts, in order to view the status of checked out materials, check current awareness lists, and to obtain direct access to online resources from a mobile device. Some library apps are doing a particularly good job of delivering those commonly used, often requested features in the mobile context. While access to the catalog is still present, quick status checks, information lookups, and mobile contacts are also highly visible.

2.2.2 Mobile Phone Usage in Uganda

At least 52.3 per cent of Ugandans have access to mobile phones, according to the Uganda Communications Commission 2014 Access and usage of communication services across Uganda study. The above growth, according to the report, translates into more than 19.5 million Ugandans connected to different mobile telecommunications networks. Mobile Telephone Networks and Airtel Uganda have the biggest share with more than 17 million users split between them. The study indicates that mobile phone accessibility in Uganda has been on a curve growth, increasing to 20.7 per cent in 2008 and 46.7 per cent before growing to 52.3 per cent in 2014.

2.2.3 Information Technology in Libraries

Both library and technology are growing organisms. Dynamic nature of technology has significant impact on every aspect of modern life. Information and communication technology (ICT) have particularly provided faster access to information and it is also challenging the libraries to rethink and remodel their services adopting the technological changes. In the past few decades, libraries have adopted ICT and passed through developmental stages like automated house-keeping operations, providing faster access to its collection, and digitization to provide multiple accesses at users' desktop. In the modern world, libraries are not isolated information providers; Web provides wide range of information although the content may not always be free. To standardize its place as an information provider, libraries must not hesitate to adopt all possible new technologies like ICT, Wi-Fi, and mobile communications, to redesign, and transform its services so as to deliver information and its services to the more demanding users whenever, wherever and however they prefer (Malathy and Kantha, 2013).

In present scenario, Social Media is becoming most popular tool in our day to day life and in libraries as well. These advanced mobile tools provide portable, instantaneous access to the world of information, across boundaries of subject, discipline and industry. Libraries are fully engaged in

the process of adapting to increased demand for electronic collections and the ongoing acquisition and archiving of born digital content. Supporting mobile access to these resources is the next step and mobile efforts are under way. Libraries set an example in experimenting with new technology developments; whether it is automation or adopting other information and communication technologies to improve their services.

The rapid developments in Information Communication Technologies (ICT) have given a solid foundation for revolutionary changes in the information handling capabilities of academic libraries and information centers all over the world. People are becoming increasingly reliant on mobile devices for accessing, sharing and discovering their information. This includes the academic resources they need to access from library collections. For libraries, understanding their users' behavior is key to providing valuable services. Mobile technology is the technology used for cellular communication (Parksah and Kanwaljit, 2015).

As per International Telecommunication Union (ITU) ICT facts and figures, 2015, there are more than 7 billion mobile-cellular subscribers. Mobile broadband is the most dynamic market
Segment; globally, mobile broadband penetration has reaches 47% in 2015, a value that increased 12 times since 2007. Percentage of the population covered by a 2G mobile-cellular network has grown from 58% in 2001 to 95% in 2015. 3G population coverage reached 69% in 2015. This passion for mobiles by common man has thrown ample opportunities for libraries to create mobile-friendly library and information services, which may lessen the risk of being left out. The libraries need to switch over from 'physical places' to 'virtual places' to embrace and serve 'digital natives' who prefer their libraries to be where they are and prefer to access and share information from anywhere at any time.

The management of information has long been regarded as the domain of librarians and libraries. Librarians and information professionals are trained to be experts in information searching, selecting, acquiring, organizing, preserving, repackaging, disseminating and serving. However, professionals in information technology and systems have also regarded information management as their domain because of the recent advances in information technology and systems which drive and underpin information management. One of the clearest evidences of this is that the positions of "Chief Information Officer" (CIO) in many organizations are generally held by information

technologists instead of librarians. In fact, most of the work of CIOs has to do with developing and managing the IT infrastructure and systems, not the managing of information.

2.2.4 Mobile Library Websites and MOPACS (Mobile OPACS)

A growing number of libraries are creating mobile versions of their websites for their patrons to access on-the-go. They are offering information about library services and collections, providing access to library catalog search, portable exhibit information, subject guides, e-journals, and library hours, all formatted for the small screen.

2.2.4.1 Ball State University Libraries (http://www.bsu.edu/libraries/mobile)

Ball State University Libraries has established a mobile Web presence which offers library patrons a catalog search, journal search, videos about the libraries, information about library collections and services such as quick links to mobile reference websites pertaining to weather, news, search, sports, and finance.

2.2.4.2The University of Richmond

The University of Richmond Libraries' mobile site enables visitors to search through their tourist catalog, access PC availability information, and submit email, SMS, or IM reference questions.

2.2.4.3 Ohio State Library

Ohio library goers can search the OPLINMobile website to find the closest public library from the state's 250 branch locations.

2.2.4.4 University of Virginia

Library news and events are displayed as clickable links on the University of Virginia Libraries' mobile website, along with exhibitions information, directions, library hours, and a text-only version of their desktop website.

2.2.4.5 Boston University

The Medical Library at Boston University has made all of their subject guides viewable in mobile format, and created search functionality for their e-book titles, e-journal collections, bibliographic databases, and library website as a whole.

2.2.4.6 Innovative Interfaces

Innovative Interfaces has designed a portable version of their OPAC product called the AirPAC, created for patron use on their mobile devices. Libraries using the Millennium integrated library system can opt to use this additional OPAC to provide their users with mobile catalog search capabilities. Through the AirPAC, patrons can retrieve information about the checked out items, due dates, fines, and other personal information, and can search the library catalog, place and cancel holds, and renew items from their cell phones. The AirPAC is being used by **Wayne State University**, the Nashville Public Library, and the Hennepin County Library among others.

In conclusion, going mobile is the way to go for all university libraries, because there are 3 times as many mobile phones in the world than personal computers, mobile makes your content to viewed everywhere, mobile diversifies your audience, mobile enables you to offer new service types, i.e. Location based, mobile enables you to connect to library users in a new medium, mobile is the way of the future and lastly it is easier than you think (Kroski, 2015)

2.2.5 Knowledge Management Systems

As more and more information and knowledge is created and technology develops rapidly, the world has become more knowledge-oriented. Many organizations recognize the role of knowledge as a key source for competitive advantage. A Knowledge Management system is one that provides the user with the explicit information required, in exactly the form required, at precisely the time the user needs it (Aharony, 2011).

Knowledge is a product of human experience and it can be defined as the management of creating sustaining, applying, and renewing knowledge resources of an organization including its relationship with seeker and service provider. Management is the process of coordinating total resources of an organization towards the accomplishment of desired goals of that organization through the execution of a group of inter-related functions such as planning, organization, staffing, directing and controlling (Collison, 2010)

Knowledge Management is a complex process, which deals with knowledge creation, acquisition, packaging and application or reuse of knowledge. Knowledge is invisible, closely related to action and decision, different in thought after processing, spiritual product, identified with existing

environment, transferable through learning, and not duplicable. The management of information has long been regarded as the domain of librarians and libraries. Librarians and information professionals are trained to be experts in information searching, selecting, acquiring, organizing, preserving, repackaging, disseminating, and serving. The library plays a very crucial role in the extension and modification of knowledge.

The growing need for knowledge management has influenced every component and operation of a library. Knowledge management requires more effective methods of information handling, speedy transfer of information and linking of information with individuals and their activities. It demands library users' centered development of information systems and services and customization of information at the individual level. Libraries have been thought of as being expert at collecting and organizing published information. (Kumar, 2010) Hence a Library Management System enhanced with Mobile Technologies will aid the development of information technology (IT) and its applications in Library and Information Centers, because the concept of document management has been changed to information management and again the right amount of information at the right time has long since been an important factor for all kinds of libraries.

2.2.5.1 Major drive of Knowledge Management in academic libraries

According to Priti Jain (2012), the following are the major drivers of KM in academic libraries:

2.2.5.2 Survival factor with increased user demands and competition:

Due to other information providers as competitors, libraries face survival problems and must strive to find innovative ways to provide customer service. KM is the most recent and most discussed survival factor for libraries. According to a study carried out by Sarrafzadeh, etal. (2010), 82.2% LIS professionals regarded KM as a survival factor for libraries to respond to challenges they face in a continuously changing environment. Since KM equips academic libraries with ample facilities to satisfy the continuously changing library customer needs, it is a survival kit and a strategic tool for academic libraries.

2.2.5.3 Increased visibility of libraries

Libraries often have a poor image; they are not visible to their parent organization and work in isolation. The ultimate aim of KM is to achieve an organization's mission. Therefore, all parts of academic institutions including libraries must ensure that KM contributes towards the realization of the organizational mission and vision. Adoption of KM could assist library and information professionals in meeting user needs aligned with the organization's strategic goals and objectives. In addition, KM provides libraries with the opportunity to collaborate with other units in their organizations and hence become more integrated into corporate operations and enhance their overall visibility within the organization (Sarrafzadeh, etal. 2010). KM gives academic librarians with various platforms to collaborate with academia, such as playing a leading role in electronic and open access publications by providing guidance on copyright issues, and self-archiving published articles in institutional repositories. All these activities improve the visibility of academic libraries.

2.2.5.4 Academic libraries as knowledge creating organizations

Academic libraries are perceived as knowledge creating organizations, as a system of integrated activities and business processes that work together collaboratively to facilitate accomplishing overall organizational goals. Academic libraries are the treasure house of knowledge to cater for the needs of scholars, scientists, technocrats, researchers, students and others who are in the mainstream of higher education. Librarians bring a set of values that are fundamental to the long-term survival of scholarship. Librarians care about access and understand that some resources may have value to disciplines and time periods beyond their initiation (Case, 2011). Academia stimulates the creation and transmission of knowledge, and academic libraries have played a significant role in supporting such activities (Kim & Abbas, 2010). Thus, academic libraries are knowledge creating and knowledge-based organizations.

2.2.5.5 Increased value of knowledge in the knowledge economy:

In a study undertaken by Case, (2011), knowledge economy was considered to be one of the important drivers for libraries' movement towards KM. It is noted that the value of knowledge has always been central to library practice, but the new knowledge-based economy places its significance more than ever before. Increasingly, governments and funding agencies are recognizing universities as knowledge industries for creating new knowledge and innovation

through their research. Thus, being the knowledge intensive institutions, some university Librarians have adopted KM and have already expanded their existing roles. By utilizing their traditional skills university librarians are playing a crucial role in dissemination and exchange of knowledge among students and teaching staff in order to enhance learning, teaching and research activities. All of this contributes towards the need for a library management system enhanced with mobile technology so that knowledge is easily transferred.

2.2.5.6 Need of improved library services and customer satisfaction

Another force for adopting KM in academic libraries is the promotion of existing library practices and better services for clientele (Kim & Abbas, 2010). Due to the rapid advancement in information technology and changing needs of customers, there is an increased need for a more improved approach to library service delivery at the academic libraries. KM enables librarians to capture, store, organize, share and disseminate the right information to the right customer at the right time. Customers are paramount and knowledge about them is important for all organizations; no organization can survive without them. It is customer knowledge around which an organization's services and products are focused. The "availability of sophisticated ICT infrastructure combined with emerging mobile telephone technologies constitute major characteristics of many of today's libraries in western universities" Daneshgar & Bosanquet, (2010) and around the world. The two authors classify customer knowledge in academic libraries into (i) knowledge about customers, (ii) knowledge from customers and (iii) knowledge for customers including both explicit and tacit knowledge. It is expected that KM activities will build a greater understanding of customers and their requirements and as these requirements will hopefully lead to the delivery of more appropriate and timely services (Daneshgar & Bosanquet, 2010). Customer knowledge management is central for both improved library services and for high customer satisfaction. Customer feedback informs the provision of library services. Thus, academic libraries are adopting KM to make libraries the centers of customer service. By using the right tools university librarians can empower their customers with the right contents at the right time, in the right format. For instance, using mobile telephone applications, libraries can reach users wherever they are and this can further improve customer service and overall library services.

2.2.5.7 Need to surmount budget constraints

Academic libraries are always constrained with budget declines. As noted by Kim & Abbas, (2010), many libraries suffer from shrinkage of budget and skilled human resources, two of the important factors for any KM project. KM equips academic libraries with abilities to produce more with less and reduces duplication of efforts, for example, using mobile telephone technologies for reference services, a reference librarian can serve multiple users in one time, which is cost and time effective.

2.2.5.8 Information explosion

This is the rapidly increasing amount of information and consequently availability of more information or knowledge to everyone. According to the experts, human knowledge is doubling every thirty two hours. Due to this, we are in a state of information overload and decay of existing knowledge, which is continuously replaced with new knowledge. According to Israel (2010), this information explosion affects library users in a variety of ways; it damages health, leads towards bad decision making and creates information anxiety. In the same way, the information explosion confronts university librarians with many challenges; such as, selection and acquisition of library resources, organization of acquired resources, collection development, cataloguing, and reference services. At the same time it enables users to select from a wide range of resources, Israel, (2010), which creates competition. Information explosion and knowledge growth calls for innovative approaches to manage the right knowledge. Since KM emphasizes on updating of knowledge regularly in order to remove obsolete information and avail the most updated information, using the KM systems academic librarians can overcome the problem of Information explosion to a greater extent by using mobile telephone application which can enable library users to access only the information that will solve their information needs.

2.2.5.9 Make informed decisions

KM equips each person with informed decision making capability. When library users have access to the right information and knowledge, at the right time, using mobile telephone technologies, they will definitely be able to make wise decisions.

2.2.5.10 Establishing best practices

A best practice is "A method or technique that has consistently shown results superior to those achieved with other means, and that is used as a benchmark" (Business Dictionary, 2011). KM is a complex set of processes and procedures, some more successful than others. KM emphasizes the identification of such best practices because tried and tested solutions and practices are always superior over newly introduced ones. Due to long-term experience best practices like library mobile applications, are time and cost effective, they provide operational excellence, and enhance performance capabilities to create competitive advantage. They create a learning environment and reduce on time wastage. However, it has to be noted that no practice is best for everyone and no best practice remains best forever. Academic libraries like IUIU-FC Library should continuously look for better best practices like enhancing their library system with mobile telephone technologies.

2.2.5.11 Reduction in duplication of efforts

Knowledge sharing is one of the most critical components of KM. (Case, 2011). Often academic library practitioners are doing similar things in their own divisions in isolation. A good example of such a practice can be a reference service. Individual librarians continue doing their personal research on how to serve their customers, while they could long establish a reference query database and update it regularly on the receipt of a new query and share it. However, with the advance of technology, there are virtual reference services, such as library mobile telephone applications, which reduce response time and duplication. Using KM applications like library mobile telephone applications reduces duplication of efforts. Time wastage is minimized and all services are time and cost-effective.

Library and information centers should be developed and or modified based on the perfect environment for new media applications. Due to impact of globalization, economic competition and revolution of ICT, the libraries are undergoing tremendous change in its environment. Library mobile applications, ICT tools and techniques, knowledge management systems, internet, web resources, digital libraries have made a significant change in the existing library systems and services. It is a major challenge for the library professionals. Knowledge acquisition is the starting point of knowledge management in Libraries. The application of library mobile telephone technologies enlarges the scope of knowledge acquisition, raises knowledge acquisition, speed and

reduces knowledge acquisition cost.

The utmost goal of knowledge management is to provide users with a variety of quality services in order to improve the communication, use and creation of knowledge. Information about each user can be obtained by analyzing the records of user registration, surveys, circulation and inter library loan, frequently asked reference questions and the use of e-journals and digital resources etc. User satisfaction and needs should be collected through periodical user's surveys. The findings should be used for the planning and redesign of the existing library services. Some of the services of the library such as "new publication alert" and "dissemination of information" should be done automatically by employing the library mobile telephone technology with great efficiency and convenience.

2.2.6 Library Management Systems

A library management system, also known as an automated library system, is software that was developed to handle basic housekeeping functions of a library. The software may be focused on one library system only or may be capable of integrating two or more basic functions. Library automation is the general term that is used when information communications technologies (ICT) are used to replace manual systems in the library. The application of ICT may be to a single function only as in the creation of an electronic catalog or index or to all subsystems in the library. The system may or may not be integrated and may or may not be applied on a local area network. The functions that may be automated are any or all of the following: circulation, cataloging, acquisition, serials management, and reference. When the library management system is sharing a common database to perform all the basic functions of a library, the system is integrated. An integrated library system enables the library to link circulation activities with cataloging, serials management etc. at any given time. It makes use of a file server and clients in a local area network. Most of the library management systems have the following modules: cataloging and OPAC, circulation, acquisitions, serials management and interlibrary loan module (ILL). Such modules if enhanced with mobile applications will help library users and staff in the easy and convenient access of information.

2.3 Features of the Mobile Based Library System at IUIUL

Libraries can design and provide the following specific services on mobile devices, compliance

with the information security policies and standards of the parent organization (Malathy and Kantha, 2013)

2.3.1 SMS and or Texting (Alert Services)

Existing e-mail alert services like bringing new books to the notice of users for suggestion, information of arrival of documents to users, informing availability of reserved documents for collection, appraising about which or when books are overdue, library circulars, e-journals subscribed, change in timings, information about important events, etc., can be upgraded by sending through SMS or text- alert services to meet the information needs of Library users. Such alert notifications are generated automatically using integrated library management system/software. SMS messages can be sent to group of users simultaneously through many free applications.

2.3.2 Formal Education, Distance Learning and E-learning

Students are very resourceful in using their mobile phones and various mobile applications. The IUIUL connected this advantage to lead to implementation of library services through mobile devices to support distance learning, formal education, and research activities in e-learning environment by making the information resources ever-present. The researcher designed IUIU-MBLS keeping social networking sites in mind, which are heavily used by younger generation for interaction, communication, and information sharing. The MBLS also blends with teaching and research practice of colleges/universities, scientific community or other patrons whom they serve.

2.3.3 Instant Messaging for Reference Services

The reference and referral services have already become effective with ICT applications and internet. The mobile devices can further appreciate the service with instant answers like definitions, meanings and other information from digital libraries and web. Since IUIU has its own secure and private ERP network, the libraries made use of this, as it is more reliable and secure. These tools offer mobile customers all of the benefits of virtual reference services without being tied to a website. Librarians can now provide instant answers, and links to articles/references in real time.

2.3.4 E-resources with Mobile Interfaces

Some publishers are already delivering e-books, both text and audio that are accessible via mobile

phones. Using free Plucker e-book viewer, one can access about 20,000 free e-books from Project Gutenberg. Mobipocket of Amazon is one of the standard e-book reader applications and the website has over 40,000 titles (about 11,000 free). A large collection of audio books both free-and subscription- based services are available for download and also transferable to mobile devices. LibroVox is a collection of free audio books from the public domain. OCLC's Net Library collection is providing e-book and audio book titles on library subscription. IUIUL made use of multimedia messaging service (MMS) on mobile devices to share photos, videos, and audio. Most of the e-book publishers provide 24 hour access to the library subscriptions from any internet terminal within the campus, as well on mobile devices, such as iPads, Android devices, and many more. Just like any other library databases, IUIUL users are prompted to log in using user-ID and password, when they are off-campus to access e-books on their mobile devices. One can get daily news on their mobiles either by accessing the web portals or SMS text messaging on their mobile phones. The greater challenge is to provide access to e-journals through mobile phones as the libraries and publishers prefer authentication limited to campus wide IP address. Libraries must convince the publishers to provide user ID and password mode in addition to IP address based authentication to access e-journals on mobiles. Libraries can offer their digital collections (institutional repositories and in-house databases) on mobiles phones that can be accessed remotely.

2.3.5 Mobile Optimized Library WebPages

With the increased use of Internet through mobile, libraries are required to redesign their web pages as mobile optimized interactive and participative library web pages to provide dynamic information services to users on a 24 hours 7days basis via mobile devices. While designing the MBLS the researcher took into consideration the basic models of mobile phones to the smart phones with greater capabilities and functionalities as some of the iPhones and smart phones are compatible to access the web pages designed for larger screens. But the time taken to access is more and downloading is very slow and expensive. To overcome these difficulties, it was necessary to make Mobile-friendly websites by using (cascading style sheets) CSS or auto-detect and reformat (ADR) software, which allows a website to rearrange its content and navigation to suit the size of the screen it is being viewed on. The MBLS was designed to have fewer graphic, so that the page loads much faster and with minimal keyboard operations, to ease the mobile user. In this context text-only websites are easier and faster to navigate and fabricate into new applications.

2.3.6 Library Instructions and Virtual Tours

Library tours, instruction, induction and or orientation programs have been quite significant in bringing the nonusers to libraries and also help the remotely located or users located in different geographical locations. Library users, who don't have time to attend an on-site workshop, can get access to library tours on their mobile devices. Audio/ virtual library tours can be produced fairly quickly, inexpensively, and could reduce the amount of staff time spent helping new users to orient themselves in the library and explaining the facilities available. With the MBLS, It can easily be provided both as downloads from the library website and on mobile devices.

2.3.7 Online Library Catalogs on Mobile Phones

Libraries are required to interact with the software vendors to create mobile compatible WebOPACs . For example, AirPac add-on product will auto detect the type of device you are using and format accordingly the catalogs without graphics for better viewing. libSirsi-Dynix, Innovative and LibraryAnywhere developed by Library Thing have similar options. OCLC's WorldCat Mobile application pilot allows users to search for and find books and other materials available in their local libraries through a web application they can access from a PDA or a smart phone. To provide location-based services, the IUIUL had to use mobile telecommunication system, the internet/web-based OPAC on intranet and geographic system like GPS. Many phones have built-in GPS, which allow users to navigate to locations and, if activated, allow others to find them. OCLC's Worldcat mobile application for iphones makes use of this feature when identifying local libraries. Since the researcher was handling a university with multiple branches like IUIU she capitalized on the GPS function to create custom maps and navigational tools to branch locations.

2.3.8 QR Codes on Mobiles

Quick Response code stands for 'quick response', and basically two-dimensional bar codes that can contain any alphanumeric text and often used to store URLs, text, etc., known as 'mobile tagging'. QR codes are used in commercial tracking, logistics, inventory control, and advertising. Data can be translated into a QR code by any QR generator, many of which are available as free download. Users simply enter the data to be translated, and the generator produces the code, which can then be displayed electronically or in printed format. Decoding the information can be done with any mobile camera phone that has a QR reader, which is freely available online for most devices. Libraries can use QR codes to label books, journals, audio /visual, off prints, add QR

codes in WebOPAC and other places. In IUIUL users with phones that have a camera and free barcode decoder software can take a picture of the barcode, then the software decodes the picture, and translates the data into title, barcode, and location information that can be displayed on the phone. The QR code can be scanned, and saved for further use on mobile. QR codes not only link to websites, but also can be used to send prewritten SMS to phones, transfer phone numbers, and provide further text. They are designed to cope with a high-level of error, hence are suitable for outdoor use.

2.3.9 Mobile-based Library Lending Service

As in banking and financial sectors, IUIUL formulated regulations for using mobiles for circulation of reading materials and maintenance of users account. This wireless solution enables staff to assist patrons in the stacks; checkout materials while off site, such as at campus events, and update inventory items while walking around the library. Mobile phones make ILL and document delivery services between campuses faster and cut-down the time to request/visit different libraries and complement the geographically remote users.

2.4. Students perception regarding the benefits of mobile Based Library Services

2.4.1 User-friendly Aid

Mobile phones help library users to be more familiar with their own devices. This technology helps the users in accessing information quickly and does not require orientation and training. Mobile users are using the facilities on mobile phones like SMS, instant messaging, web browsing, e-mail effortlessly to communicate. Most of the features are pre-installed on mobile devices or option for data plan packages.

2.4.2 Personalized Service

Personalized service helps users to interact with library staff to seek specific information or reference away from library.

2.4.3 Ability to Access Information

Information access from anywhere at any time will be of great help for users who cannot visit the library in person and provides a constant link to required information resources. Library users can use software on mobile phones to get information such that when library updates any information,

phone will be able to receive the new information.

2.4.4 Time Saving

Users need not record information about resources while browsing and searching library resources or wait at library transaction counter to renew, or reserve books and hence the time of the user is saved.

2.4.5 User Participation

Mobile phones enhance participation in a way that Libraries can enrich OPAC by allowing users to incorporate user created content like notes or images uploaded by users.

2.4.6 Location Awareness

Mobile communication enables libraries to offer location-based services/content through global positioning system (GPS) capabilities. Libraries can guide the users to the location of specific document or service through maps and navigational tools.

2.4.7 Limitless Access

All online resources accessible on their desktop also become accessible through mobiles. Libraries can provide to access their digital library on users' mobile phones. Web Online Public Access Catalogue on mobile phones can help users for searching the information from anywhere.

2.4.8 Access to Print-disabled Users

Mobiles communications help providing services orally to vision-disabled and physically-handicapped users.

2.4.9 Short Message Services (SMS)

Short Message Services (SMS) facilities available on all mobile phones, could be used to create awareness amongst the academic library users about upcoming events and new arrivals. Library Software can configure as automatically to send text message alerts for hold, overdue materials and reserved resources available.

2.5 Students perception regarding the drawbacks of mobile Based Library Services

Although mobile Technology holds great promise for library services, there are some limitations or barriers in providing library services

Some of digital content can only be accessed on certain devices, and this can have a setback on learning and library service because it locks some people out.

When you compare mobile based library services to wired Internet service, the mobile based library services have relatively slow transmission speed

Some library users perceive mobile as highly priced so this hinders them from acquiring them.

The limited memory of mobile devices was also cited as a problem

Issues related to trust and security are that some IUIUL users noted that MBLS entrust user information to locations in the cloud that may offer lower levels of protection from that provided by in-house library infrastructure

There was also a problem of finding and accessing the content needed for mobile learners from the Library perspective

Mobile phones are still viewed by the majority of people as devices for making phone calls and text messages, so they often don't associate them with other activities, such as information seeking.

2.5 1Solutions to the drawbacks of mobile based library systems

Libraries should conduct analysis and make smart decisions, such as support staff education, explore partnerships new funding models.

The library staff should tell users about the thousands of free mobile-ready books available from such initiatives as Project Gutenberg

Islamic University in Uganda Library should create opportunities to educate staff, build local expertise, and promote discussion by offering training sessions and professional development options

Islamic University in Uganda should build a solid foundation of knowledge about mobile services within the organization.

Islamic University in Uganda library should host lectures or discussion groups or include such information in their websites, blogs, or newsletters.

2.6 Models and Theories for Perceptions and Behaviour Regarding the Mobile Based Library Systems

2.6.1 Unified Theory of Acceptance and Use of Technology

Information technology accepts researches that gave many competing models for acceptance and use of information and communication technologies, each model with different acceptance of determinants. Each theory or model has been widely tested to predict user acceptance (Venkatesh and Davis, 2000; Thompson et al., 1991). However, no comprehensive instrument to measure the variety of perceptions of information technology innovations had existed until Venkatesh et al. (2003) attempted to review and compare the existing user acceptance models with an ultimate goal to develop a unified theory of technology acceptance by integrating every major parallel aspect of user acceptance determinants from those models. Based on the conceptual and empirical similarities across models, a single model is formulated and now a unified theory of acceptance and use of technology (UTAUT) is often used. UTAUT was tested using the original data and overcoming of the eight individual models was found. UTAUT has become a useful tool that managers need to apply in order to evaluate the probability of success while introducing a new technology and helps in understanding the factors for its acceptance, in order to undertake more active interventions (such as training or marketing) targeted at users who may be less prone to adopt and use new systems (Venkatesh et al. 2003). UTAUT aims to explain user intention to use information systems and subsequently to monitor the behavior of their use. The theory considers that four key factors (performance expectancy, effort expectancy, social influence and facilitating conditions) are direct determinants of intention and usage behavior. Gender, age, experience and voluntary use are set to mediate between the impacts of the four key factors of the intention to use and the behavior (Venkatesh et al., 2003, Figure 2)

The UTAUT theory considers that three key factors (performance expectancy, effort expectancy and social influence) are direct determinants of behavioral intention to use technology, whereas the facilitating conditions are direct determinant for use behavior. The model integrates four intermediate factors like gender, age, experience and voluntary use, which have different impacts on basic constructions. Resuming, we can say that the UTAUT model has four main effects and four intermediate factors. Performance expectancy (PE) which is the degree to which an individual believes that using a particular system would improve his or her job performance. Effort expectancy (EE) is the degree of simplicity associated with the use of a particular system. Social influence (SI) is the degree to which an individual perceives that others believe he or she should use a particular system. Facilitating conditions (FC) is the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of a particular system. Gender roles have a strong psychological basis and are enduring. Age has an effect on attitudes. Effort is expected to be more important in the early stages of new behavior. And voluntariness of use shows if the usage is voluntary or mandated. Modeling factors or mediators affect the four constructs of the model. Gender and age affect the performance expectancy, effort expectancy and social influence. Age and experience affect the facilitating conditions. Experience affects the effort expectancy, social influence and facilitating conditions. Voluntary use affects social influence in UTAUT. (Viswanath, 2012)

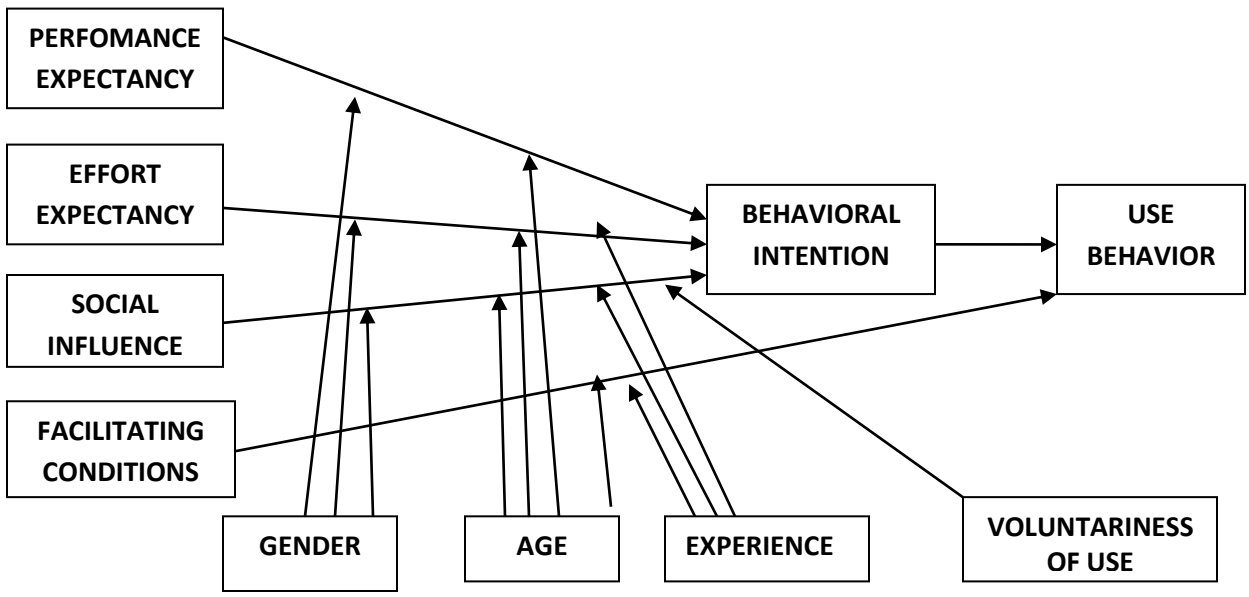


Fig. 2.2: Diagram of UTAUT theory adopted from Venkatesh et al. (2003)

2.6.2 Diffusion of Innovations Theory

Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system. Diffusion is a special type of communication concerned with the spread of messages that are perceived as new ideas. (Rogers, 2003)

An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption. The characteristics of an innovation, as perceived by the members of a social system, determine its rate of adoption. The four main elements in the diffusion of new ideas are:

2.6.2.1 The innovation

Rogers offered the following description of an innovation; An innovation is an idea, practice, or project that is perceived as new by an individual or other unit of adoption (Rogers, 2003). An innovation may have been invented a long time ago, but if individuals perceive it as new, then it may still be an innovation for them. The newness characteristic of an adoption is more related to the three steps (knowledge, persuasion, and decision) of the innovation-decision process that will be discussed later. In addition, Rogers claimed there is a lack of diffusion research on technology clusters. For Rogers (2003), a technology cluster consists of one or more distinguishable elements of technology that are perceived as being closely interrelated.

2.6.2.2 Communication

Communication is the process by which participants create and share information with one another in order to reach a mutual understanding. A communication channel is the means by which messages get from one individual to another. Mass media channels are more effective in creating knowledge of innovations, whereas interpersonal channels are more effective in forming and changing attitudes toward a new idea, and thus in influencing the decision to adopt or reject a new idea. Most individuals evaluate an innovation, not on the basis of scientific research by experts, but through the subjective evaluations of near-peers who have adopted the innovation (Rogers, 2003).

2.6.2.3 Time

The time dimension is involved in diffusion in three ways Rogers, (2003). First, time is involved in the innovation-decision process. The innovation decision process is the mental process through which an individual or other decision making unit passes from first knowledge of an innovation to

forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision. An individual seeks information at various stages in the innovation-decision process in order to decrease uncertainty about an innovation's expected consequences.

The second way in which time is involved in diffusion is in the innovativeness of an individual or other unit of adoption. Innovativeness is the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of a social system.

The third way in which time is involved in diffusion is in rate of adoption. The rate of adoption is the relative speed with which an innovation is adopted by members of a social system. The rate of adoption is usually measured as the number of members of the system that adopt the innovation in a given time period. As shown previously, an innovation's rate of adoption is influenced by the five perceived attributes of an innovation.

2.6.2.4 The social system

The fourth main element in the diffusion of new ideas is the social system. A social system is defined as a set of interrelated units that are engaged in joint problem-solving to accomplish a common goal. The members or units of a social system may be individuals, informal groups, organizations, and/or subsystems. The social system constitutes a boundary within which an innovation diffuses. How the system's social structure affects diffusion has been studied. A second area of research involved how norms affect diffusion. Norms are the established behavior patterns for the members of a social system. A third area of research has had to do with opinion leadership, the degree to which an individual is able to influence informally other individuals' attitudes or obvious behavior in a desired way with relative frequency. A change agent is an individual who attempts to influence clients' innovation-decisions in a direction that is deemed desirable by a change agency (Rogers, 2003).

2.7 User Centered-Design

Deuff, (2013) defines User-centered design (UCD) as a design philosophy where the end-user’s needs, wants and limitations are a focus at all stages within the design process and development lifecycle. Products developed using the UCD methodology are optimized for end-users and

emphasis is placed on how the end-users need or want to use a product instead of forcing the end user to change his behavior to use the product. User-centered design is a common process in software development where typical UCD activities are broken down into four phases in the development lifecycle: analysis, design, implementation and deployment. UCD is a process based upon the understanding of users, their tasks and environments. Typically, users in UCD processes are involved in early stages of system design, and throughout the whole development and product lifecycle. The design is driven and refined throughout an iterative cycle of development and user centered evaluation. The adoption of UCD methods has been discussed over the years, and its value has been promoted not only for usability issues but for making the business case (Deuff, 2013)

2.8 Conclusion

In conclusion, as the use of mobile technology grows, library staff will need to learn and use the technology to serve library users where they are, and libraries will face management, funding, and training challenges in meeting this need. Instead, expert technical knowledge must flow throughout the profession. There is a growing influence of mobile technology in Libraries, especially as network access becomes more affordable and reliable, and mobile applications have seen mainstream acceptance in teaching, learning, and research. This trend will likely continue, and one way libraries can respond to this emerging trend is to make the library's website easily accessible via web-enabled mobile devices. Libraries should make conscious choices about what they want to offer in this arena and act accordingly and only time will tell if a completely mobile-accessible library, in terms of its services and collections, will become common place. From the above review, there seemed to be some good work done on the services that library users want to get from mobile devices, and the library mobile based systems; however no research has been done on library user perceptions and behavioral intentions of library users of IUIU. This therefore will render the current work necessary.

Libraries are fully engaged in the process of adapting to increased demand for electronic collections and the ongoing acquisition and archiving of born digital content. Supporting mobile access to these resources is the next step and mobile efforts are under way. Though these are challenging economic times for libraries to take on new technological initiatives yet librarians across the country and internationally are seeking creative solutions to providing mobile library

services. As mobile technologies evolve, we rely on our own experiences as mobile information consumers, our knowledge and expertise as information professionals and our partnerships with interdisciplinary colleagues to gain insight about the norms and necessities of mobile culture, mobile computing needs and expectations of our users and the emerging vision of the mobile future, defined by each of us working together at the edge of information technology today. Mobile technology has become a benefit to the libraries. A library may reach the remote users effectively through adoption of mobile technology in its services. As for practice, librarians should focus on providing the library users with the appropriate environment and training before introducing a new library technology to them to ensure a successful technology adoption. Preparation should focus on providing the students with the knowledge and resources (facilitating conditions) needed to use the Technology and emphasize the task-related outcomes (performance expectancy) of using the technology.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

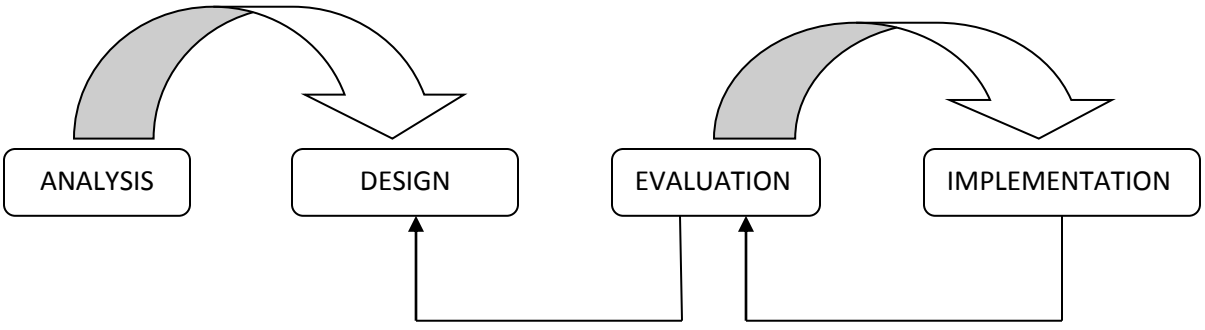
This study employed User-centered design (UCD). This research explored and evaluated the potential for user perceptions and behavior to affect the efficiency and effectiveness of mobile based library systems. The focus was on how library user perceptions and behavior alignment with business strategy could be designed in conformity to a successful mobile based library system.

This chapter describes the various research and development methodologies that were used in this project. This research employed the User-centered design (UCD). According to User focus UCD is a framework of processes (not restricted to interfaces or technologies) in which the needs, wants, and limitations of end users of a product, service or process are given extensive attention at each stage of the design process.

3.1.2 The process for UCD Design

User Centered Design focuses on users from the first step, ensuring that users like and are comfortable with the product from the very beginning. While you are going through this process, it is important to include designers, developers, potential users and anyone else who has a stake in the application. There are 5 stages of the cycle and all development is assumed to be cyclical with products going through multiple iterations over a lifetime.

Fig. 3.1: The User-Centered Mobile Design Approach adopted from User focus.



3.1.2.1 Assessing the Current Situation

Yes, there are more Smartphone and tablet users than Desktop users. But you can't assume that your users want to use your website via those platforms. In fact, recent research suggests that many users (in general terms) use the mobile web for a limited array of things (mainly dating, e-mail, some apps and social media) and that when users have an option – they prefer to do more complex work from their desktops. When designing mobile based system, the problems you are solving are not your own, and so you need to understand the problem. Empathizing with your user is the easiest way to accomplish this. Define your users and ask yourself what they think, feel and do. Get an idea of their problems, their expectations, their goals and their struggles. Ask users to write down problems with their current software. From there, you can start to see trends in complaints from users and anyone else in your group.

3.1.2.2. Understanding Your User

Before you go rushing out to do any design or feature prioritization it's important to understand your users better and in a mobile context. Once you have defined your users and their struggles, you need to define the purpose of your mobile based system and identify the key issues that it will solve. The best test is to write out the purpose of your app. From there, continue to define why you are making the system not how. You need to define your data needs and decide what devices your users will be using and where. Once you have defined your users and the devices they will be using, create a user profile and figure out what his or her typical day looks like. You need to know things like: How do they prefer to access the internet? How much time do they spend interacting with your site at the moment? How much time do they spend online using a mobile access point? What features would be critical for providing a mobile experience? What are they frustrated with in your offering at the moment that could be done better via mobile? What devices are they using to access the mobile web?

3.1.2.2.1 Understanding User requirements

Several data collection tools were used to comprehensively gather all the requirements needed for the investigation of Library user perceptions and behavioral intentions towards mobile based technologies. The requirements for the system were gathered using interviews conducted with key

library personnel, questionnaires were administered to a number of students in the faculty of science, document reviews were carried out on existing data collection instruments and other documents like book cards, reports and library procedure manuals and observation were used as a mechanism to establish the process flows at the three campus libraries. All these provided comprehensive requirements and variables that were required for the investigating the library user perception and behavior towards library mobile telephone technologies.

3.1.2.2.2 Questionnaires

Questionnaires were administered to the Campus heads, all heads of departments, all faculty coordinators, five lecturers from each faculty and students from the faculty of science in their second years, who are all potential library users (Appendix 1). Questionnaires helped me gather responses in a standardized way, and generally it was relatively quick to collect information using questionnaires. The respondents took between 1 to 4 weeks before returning the questionnaires. The Statistical Package for the Social Sciences (SPSS) was used to analyze and manipulate the collected data.

3.1.1.2.3 Oral Interviews

Oral Interviews were held with key library users as a way of filling in any gaps that may not be properly captured in the questionnaires and to gather facts, opinions and speculations of the expected library users. The key staffs interviewed were the Rector, Campus Directors, faculty coordinators, the Heads of Library department and the Computer Lab Officers to gather facts, opinions and speculations. The interviews filled in the gaps that were not captured in the questionnaires; hence they proved the advantage of oral interviews as an opportunity to provide room for probing to obtain the required information. The interviews also helped to seek and clarify diverse views from interviewees that were not clear through the questionnaires.

3.1.1.2.4 Observation

Observation of the library procedures was also carried out to determine how the books are borrowed, how library users behave, how often library users use the library mobile application, how books are stored, how users are managed and how long it takes to borrow or return a book. Four observation visits were made before the final conclusion to provide firsthand information about the procedures and events that occur in the library, and to remove any pretence and biases in

the library work that may be caused due to my presence. Observation was used to help in verifying statements that were made during the interviews, to determine if procedures were operated as specified in system documents and to obtain unbiased data that greatly supplemented the oral interviews. Observation hopefully provided firsthand information about the procedures and events that occur in the library, and was particularly helpful in determining the various work flow processes and procedures.

3.1.1.2.5 Document Review

Existing data collection instruments and documents were reviewed and these included book cards and user borrower records, various reports, testing charts and procedure manuals. The document review provided a broad coverage and helped in collecting all the necessary information and variables required for the new system. It also provided references to all sources used in the library operations giving opportunity to discover gaps and problems with the existing system, new needs and organizational direction. Reports provided and helped in determining an insight to the key variables that were needed, not only those that were captured but this also enhanced accuracy.

3.1.1.2.6 Data Analysis

The key data collected, which was mainly qualitative, was categorized, coded**,** summarized and displayed in a table as a simple analysis to determine the requirements for the system**.**

3.1.1.3. Ideate

Once you have defined your users, devices and other factors, you can begin structuring your system content and workflow. In this phase, generate a lot of ideas. Not all of them will be used, but when defining workflow and design, it is important to have a long brainstorming process. When you know what data you're including in the app, you need to consider how it can be split up into different documents or panels. Define what kind of structure you will use for navigation among all these different parts. Then it's on to prioritizing what goes in to your mobile experience. Your user research will show you what your users want but you also need to consider what the business wants from the process too. You may need to revise and modify components of the experience in order to handle conflicts between users and the business. User experience is essential

but it’s no good if it doesn’t deliver business results. Compromise can be a key part of getting this right.

3.1.1.4. Prototype

Once you have a basic idea about the workflow, it is time to prototype. A prototype is an early sample or model built to test a process and concept. It is meant to be replicated and learned from. During the prototype stage, you want to keep it as low-fidelity as possible (at first).

3.1.1.4.1 Development platforms

3.1.1.4.1.1 Operating system

The study used the Windows operating system with Microsoft Office packages such as Ms Word and Ms Visio.

3.1.1.4.1.2 Hardware

The hardware included windows vista; 2.0+ GHz processor, 2 GB system RAM, and 3 GB free hard drive space.

3.1.1.5 Test

After you have a mockup, it is time to test the app before development begins. This is the best time to gather feedback from your users and see if their goals have been met and see what can be improved. While some of this can simply be done by asking questions, the most critical part of the feedback comes from how users interact with the prototype. Can they accomplish their tasks? Can they easily navigate through the app and find what they are looking for? The best way to perform this type of user testing is to just hand control over to users and have them speak out loudly about their thoughts and decisions as they move through the system.

Fig. 3.2: Project Life Cycle design for the IUIU-MBLS

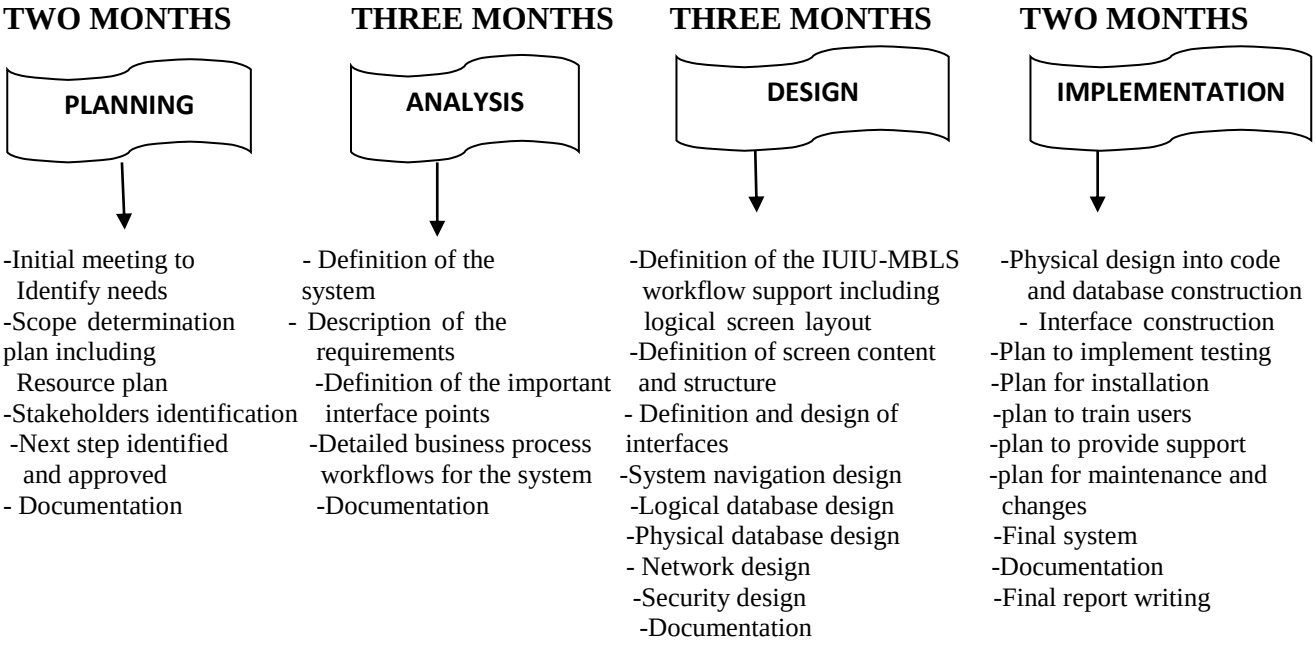


Table 3.1: Project Schedule for the IUIU-MBLS development

TASK	MAIN ACTIVITIES	DELIVERABLES	PERIOD
System Planning and selection	- Identification of need - Determination of scope - Develop data collection tools	- Priorities for system and project -Architecture for data, network, hardware and Information System management - Detailed work plan for project - Specification of system scope - System justification	Aug-Sept 2015
System Analysis	- Determine requirements - Determine design of system - Identify business transactions, actors and roles - Requirements and object model designs	- Description of current system (problems and opportunities) - Recommendation on how to enhance /replace current system - Justification of design chosen for system - Business Transaction list, coordination model and Business Process model - Information and IT infrastructure models - Use-case, Class, Conceptual and activity diagrams	Nov 2015 – Jan 2016
System Design	- Logical design - Physical design - Network design - Security design	- Detailed specifications of system elements - Acquisition plan for new technology - Entity Relationship Diagram - User Interface diagrams	Feb - April 2016
Implementation	- Hardware & software plan - Plan for Programming - Plan for User Training - Final Documentation - Report writing	- Code and documentation - Training procedures - Users manual - Technical manual - Software code	May-June 2016

3.5 Conclusion

This chapter described the various methodologies that were used, to gather comprehensive system requirement specifications for the library mobile tool and investigate its' user perceptions and behaviour; it also gave an overview of the next phases, the deliverables and a detailed schedule for system development. The next section will be the analysis phase where the requirements will be determined, analyzed to determine the appropriate business processes and their transactions and various models will be designed for the intended system.

CHAPTER FOUR

SYSTEMS ANALYSIS

4.0 Introduction

The systems analysis sometimes called the requirements analysis is the process of gathering information about the current system (called the As-Is system), which may or may not be computerized, identifying its strengths and problems, and analyzing them to produce a concept for the new system (called the To-Be system). According to Nowlan (2013), the goal of the analysis phase is to truly understand the requirements for the new system and develop a system concept that addresses them-or decide that a new system is needed or not. Therefore the major objective of this chapter is to define/refine analysis models that were looked at in the previous chapter, into design models by emphasizing the problem statement and including system details such as systems architectural design, user interfaces, the database logical and physical designs, and data management. In this chapter, the researcher designed recommended input and output screens used in the proposed application.

4.1 The Case Study- Islamic University In Uganda

Uganda has got 30 private universities (National Council for higher education 2015), Islamic University in Uganda being one of them. This university was the first private university in Uganda to get a charter in 1988; the university has four campuses situated in Mable, Kibuli, Kabojja and Arua. It also has seven faculties among them the faculty of education, faculty of law, faculty of arts and social sciences, faculty of health sciences, faculty of management studies, faculty of Arabic and Islamic studies and faculty of sciences. Students at IUIU portray a poor reading culture which has affected their academic achievement. This was evidenced in the examiners board meeting minutes in 2014 where 75% second year students got a CGPA of 3.50 and below, 25%

had a CGPA of 3.60 and above with only 2 first class degrees. This showed a decline in the students' academic achievement compared to previous years, which was attributed to students' poor reading culture. (IUIU Joint Examination Board minutes, 9th August 2015) Continued poor reading culture evidenced by poor quality research of students if not checked at an early stage will led to reduced job enrollment among the IUIU graduates in future.

The services of IUIU FCL can only be accessed when the library is open so when it closes, library users have to wait till it is next opened. There is lack of an effective user accessibility to Information and services and this limits the time available to the user for consulting library information materials, the number of computers available for the Library users to access the library module of the ERP are also limited, reading culture of the library users is affected, it leads to poor quality research, there is a poor response to the use of electronic resources, power outages makes the situation even worse, this may lead to violation of copyright laws, this leads to theft of books, delays in returning borrowed books and this leads to an increment in overdue fines , and poor internet access also hinders access to information. (IUIU library report 2014/2015).

In view of this, the researcher discovered that it is difficult and time consuming for information to flow between the library and its users which creates a need to investigate library user perceptions and behavioral intentions towards library mobile technologies.

4.1.1 Mission Statement

The IUIU Females' Campus seeks to function as a premier University Campus that promotes academic excellence, moral uprightness and professional development through teaching, learning, research, good governance and affirmative action in favor of females.

4.1.2 Business Goals/Objectives of the Company

The Library's mobile objectives are statements of what we wish to achieve. They have been formulated within the context of IUIU-FC strategic priorities and information gathered from the interviews conducted encourages the adoption of emerging technologies in support of improved service and corporate efficacy. Identify the services that the students want to get through mobile phones from IUIUL; Measure the present status of using IUIUL through mobile phones; assess the students' perception regarding the possible advantages and possible drawbacks of implementing mobile based library services in IUIUL; locate suitable information retrieval tools for providing better library services through mobile phones in IUIUL.

4.1.3 Description of the library system at IUIUL

The researcher asked participants to brainstorm on the features they would like to see the library provide on mobile devices. Some common points emerged from this discussion, specifically the functionality of a mobile version of the library's catalog, customizable options, personalized information about their library accounts, and being able to text reference questions to a librarian. Participants were interested in having access to the library's catalog on their mobile devices. Participants were interested in being able to search the catalog on their mobile devices and request or place a book on hold from their phone. The researcher was particularly interested in the participants' feedback with regard to their perception and behavioral intentions towards library mobile technologies at IUIU Based on feedback from participants regarding the functionality of the IUIU-MBLS the researcher came up with a mobile based library system. Although participants liked the ability to request materials on their mobile device, the results lists did not offer enough information for each title to make it as useful on a mobile device as participants preferred. With regard to their library accounts, participants in every campus expressed a great deal of interest in being able to access their library accounts from their mobile devices and of being contacted via text messaging when a requested library item was available for pickup and when materials were nearing their due dates. Participants were also interested in receiving text message reminders about upcoming library appointments, such as scheduled meetings with a librarian.

Library users saw themselves doing a variety of tasks on their mobile devices; The basics of the library Web site were considered important for a mobile Web version (hours, directions, locations), but participants desired more advanced items such as research databases and library

catalogs. Even after the participants were cautioned that some sites such as research databases would not be formatted for mobile devices, they were still very interested in having the option to search and read from their mobile devices. It seemed students are more adaptable to functioning on smaller screens than the researcher thought. They were able to express their interest in being able to pick their favorite databases kept recurring from the three campuses. Involving library users in the design and testing of mobile based system helped to ensure that the design and functionality met the needs of the potential users.

In general, library mobile application functions included library notices, search function for lists of books, and today's menu. The IUIU-MBLS can allow users to search, bookmark, link, and highlight general talks, lesson manuals, and other curriculum on mobile devices. For example, the IUIU-MBLS provides a convenient way for users to search content of the mobile based library system on a mobile phone. Users can also find library hours, and contacts, Students then can be able to login with their registration numbers and passwords to borrow and book for a book, the system helps administrators to track all the items library users borrowed using a mobile device.
Indeed, the university MBLS can provide users access to the library catalogue, databases, and library guides from the palm of their hand. Users can also look up library locations, borrower information, library news, and ways to contact librarians.

4.1.4 Analysis of Current System

Before the researcher designed the new system, it was important to study the system that will be improved or replaced .Whitten, 2007 states that it is important to analyze how this system uses hardware, software, network, and people resources to convert data resources, such as transactions data, into information products, such as reports and displays. All would-be information system activities of input, processing, output, storage, and control are done both manually and electronically. Below are some of the problems identified with the existing system. The current system is experiencing problems in executing the business processes such as;

The Library users can only make information selection when they get to the library; The library opening hours for the three campuses is from 8:00 a.m. to 11:00 p.m. in the night. However the libraries close at 1:00p.m. , 4:00 p.m., 7:00 p.m. and 8:00p.m., for 30 minutes to enable the Muslims go for prayers. So the time to access the information resources for the library users is limited to the time the library is open.

There is a challenge of quick information retrieval; this is because the information resources are many. When searching for information resources from the shelves and from the electronic library, a lot of time is spent searching for the required information from the thousands of available resources.

Due to the fact that the library information resources can only be accessed from the library and just a few information resources can be accessed outside the campus the current system has no means of reaching library users who are outside the campus or far from the campus

There is a poor reading culture among library users. The tight schedule of lectures and intensity of some programs like the evening and weekend programmes leave little time for the students to do research. The other problem is giving of handouts to students by lecturers which limits the students need to visit the library. This leads to poor reading culture and poor quality.

Wang et al., (2012) states that the due-day reminder and renewal-request service effectively reduce the amount of overdue fines and overdue rates, as well as indirectly increasing users' willingness to borrow books and thus leading to a higher rate of book circulation. This solves the problem of poor reading culture among library users. Lippincott adds that the mobile phenomenon enables libraries to create new services, as well as reach a greater number of people. Mobile devices and applications provide access to information in the comfort of people's homes and offices, using their cellular phones or personal digital assistants. These new devices enable access to information without the limitations of space and time (Aharony, 2013). However with a growing number of people accessing the internet from their pocket PCs and mobile phones, libraries are investigating ways to deliver their services to mobile phones and other small screen devices so their customers can access them any time anywhere (Mills, 2009). The increase in mobile devices among university students is making it impossible for libraries to ignore this medium (Nowlan, 2013). In light of trends toward more widespread use of mobile computing devices and smart phones, it makes sense for libraries to provide access to their collections and services in ways that work well with mobile devices (Dresselhaus and Shrode, 2012).

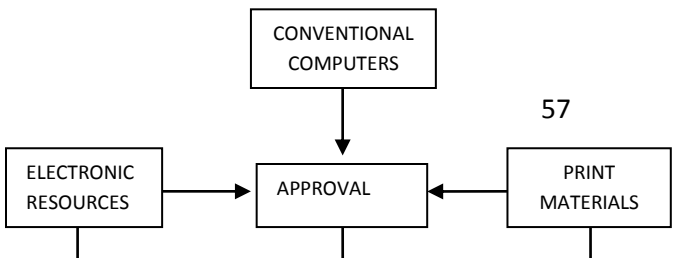


Fig. 4.1: Comparison of the current system with the use of mobile devices

4.2 Scope of the Mobile Based Library Management System

The scope was composed of the different components that make up a system and these included the following; this project was undertaken at IUIU Libraries. It was mainly focusing on the procedures library users take while borrowing books from the library.

4.2.1 Actors

Yana (2015) states that, a library Catalog using Mobile Android is by using UML (Unified Modeling Language). UML is a standard language used to describe and visualize artifacts of the process of object-oriented analysis and design. UML allows developers perform visual modeling, namely the emphasis on the depiction. Visual modeling helps to capture the structure and behavior of objects, simplify the depiction of the interaction between the elements in the system, and maintain consistency between the design and implementation of programming. Yana further cited two actors for his use case diagrams that is Librarian who doubled as the administrator of the system and the library user. Basing on the above the researcher made this Mobile App to consist the following actors;

a) Library users

Students are the ones who login with their credentials so that they can access the list of the books they can borrow from the library according to their faculties.

b) Administrator / Librarian

Administrators here are the ones responsible to update the App, by adding students in the Mobile Application, so that they can access it.

4.3 Hardware

The hardware used here is the android phone version in order to enjoy the services that are offered by the application, since all data retrieved from the server is fetched in the mobile App. According to users survey a good number of them had the android phone version. In addition to the existing computers, more microcomputers since there is computerization are required for the users of the MBLS system to accomplish the day-to-day operations. Servers are also required to provide storage and back end services for the different business processes at the company. Below are some of the hardware requirements needed:

File server for hosting file folders for all the actors and for the file sharing services, database server for hosting the database, networked printers for all print jobs that may be located at different points. Scanners for scanning hard copy documents, back-up hard disks for backing up data on regulated intervals, uninterruptible Power Supply (UPS) units for ensuring uninterrupted power supply.

4.4 Software

Relevant software Applications which managed to achieve this project are as follows. Java. This was responsible for coding the entire project, programming languages that are PHP, Java scripts, etc for enabling the design of interfaces, data entry and report forms, and back end operations, database Management System software that is MySQL. This was responsible for all database querying capabilities, android Studio. This was an **IDE (**Integrated Development Environment**).**

4.5 Network

The Network requirements included the following;

This Application needs some wireless internet connection, in order for the students to access it. It was uploaded to Google Play Store, so that every library user can download it from there

4.6. Identification of Requirements

User-centered analysis and design focuses on the needs of the user to determine things like content, features, functionality, information architecture, content structure, and visual design. The analysis phase of the UCD process closely examines the various underlying tasks performed by the library users in support of the functions and their requirements. The activities in analysis first include defining the process and scope of considerations. The overall goal or mission of the system was clearly identified and defined. In turn, the overall responsibilities of the library users were termed as user requirements. The next step included identifying the functions of the system as proposed by the library users. These requirements are the ones that drove the design concept, which is captured in chapter five described as system design. and then visualized and tested as the prototype.

4.6.1 Library User Requirements

The process of planning, analyzing, designing and implementing the MBLS consisted of steps that included: gathering requirements that described the functional, non-functional and data requirements obtained from the information collected using the data collection instruments. Below are the requirements identified for the system from the library users using the user centered design method.

Functional Requirements

The system was designed to provide and carry out the following functions to its users: The system should be able to register all library users; the system should be able to list all information materials available; the system should have login functionality that will allow users authorized access; the system should be able to allow the authorized users to update, search, insert, delete, and manipulate records in the database; the system should be able to record transactions made per day and also avail such information on regulated time intervals; the system should be able to show the current/available stock when such information is required from it. The system should display messages in pop-up windows with details regarding the status of any operation. If something needs the attention of the user, the system will display the notification message for it. For example, the

completion of booking a book; the system must have lack of bugs and inform the user of every wrong operation.

Non-Functional Requirements

While many of these requirements were not among the core functionality to emphasize, these requirements were nonetheless included in designing the system. The graphical user interface must be easy enough for anyone and all screens should have a similar style. The users will execute specific actions in a certain way. They will find the same options and menus in each screen, while pressing the navigation buttons. The system should show clear and detailed notification messages to the user. The system must be checked for any possible bugs in its operations before it is released to users. Also, it must provide log error messages (notification messages) to users to inform them of any wrong operation. The system should be able to run on all Android devices. The system will be developed to run on all Android devices, such as mobiles, tablets or any other device that uses the Android operating system. The system should request a password for each user account. The system will not display the available features to a user unless he logs in to his account.

The system should have fast response time. The system should provide all its operations very fast. The user must not wait for any operation for a long time. If something needs time to be executed, then a spinning loader will be displayed until the end of the operation. The system must be designed to be able to accept new operations and features. The system must be designed in such a way that any developer can add new operations and features to the source code.

Scalability: The system should allow or accommodate concurrent usage. That is the system should have the potential to accommodate at least ten (10) users and the technology should be able to advance to newer versions or upgrade to modified versions that may be new on the market. Reliability: The system should be able to store large amounts of data and it should have minimal breakdown and if at all it occurs, the system users should be able to put it right without calling for external support. This has been achieved by designing a MySQL database which is able to hold large amounts of data. Security: The security functionality that is emphasis to login using assigned details has been achieved in that the system is able to validate the username and password and if such information is wrong, them the system denies further access and requests for another login attempt. Flexibility: The system has been designed to be platform independent. Using PHP an

HTML-embedded script programming language, enabled the research achieve this functionality because this programming language is used on various operating systems including the most common; Linux and Windows. Manageable: The system will not require many IT/IS specialists to maintain it rather it has been designed and its users trained on the basic maintenance that it may require. Such basic information included a well-documented manual on system installation and maintenance that has been written, and one user was identified and taken through the system design and maintenance such that when need arises, there is a firsthand contact. Usability: The system was designed using PHP with HTML embedded within which is good in designing user-friendly interfaces that are easy to understand and use.

4.6.4 Data requirements

These were defined for purposes such as organizing, storage, and protection of university data, ensuring quality of data, and data being used for important business decision-making, and reporting. These are further explained below:

Data storage

The system should be able to handle large volumes of company data and also accommodate a big number of users while maintaining the normal operating speed.

Data Security

The system should be secure from unauthorized access and also ensure security of its data.

Data Quality

The system should ensure that data quality is maintained.

Data Transfer

The system should allow for easy transfer of data or movement of data between its different users.

Data Accuracy and Usage

The system should ensure data is accurate, available and referred to when making important company decisions.

4.7 Key Assumptions

Availability of support from the designer and the training team; Availability of at least an IT administrator and one database designer spending a lot of time (80%) during the implementation, setup, configuration and training; Availability of trusted servers and a LAN for development, testing and deployment; The university will work closely with the implementation team to ensure

proper functionality of the system; Ensure that the right business processes are properly defined and understood; The system functionality mentioned but not completed will be defined, contained, and managed.

4.8 Risk Assessment

1. Lack of resources especially for the required IT infrastructure.
2. Inability of the university to employ on full time the IT personnel needed to implement the MBLS system.

4.9 Analysis Results

The requirements gathered were critically categorized and analyzed to provide the specifications for the new system and data obtained was categorized and analyzed in the tables below.

Table 4.1: occupation

Occupation	Frequency	Percentage (%)
Students	130	65
Lecturers	35	17.5
Administrative staff	20	10
Librarians	15	7.5
Total	**200**	**100**

Table 4.I indicates that the students constitute the biggest number of library users. The students constitute 64% of the respondents who visit IUIUL through mobile phones sometimes. The administrative staff and lecturers follow with 17% and 9% respectively which is a positive indication for introducing mobile phone based library services for IUIUL.

Table 4.2: sex

Sex	Frequency	Percentage (%)
Male	118	59
Female	82	41
Total	**200**	**100**

Table 4.2 indicates that, more males thus 58.1% prefer to use the library mobile technology. Men tend to rely less on facilitating conditions when considering use of a new technology whereas

women tend to place greater emphasis on external supporting factors. Sex can also moderate the relationship between facilitating conditions and behavioral intention

Table 4: 3 The Mobile Phone Performance Expectancy

Performance Expectancy	**SD (%)**	**D (%)**	**A (%)**	**SA (%)**
I find mobile internet useful in my daily life			13	87
Using mobile internet helps me accomplish things more quickly			7.5	92.5
Using mobile internet increases my productivity			17	83

SD- Strongly Disagree **D-** Disagree **A-** Agree **SA-** Strongly Agree

Table 4.3 shows that 100 % of the library users feel that mobile phones provide library users with a lot of benefits in performing various activities in their search for knowledge 92.5% strongly agree that mobile phones help them to accomplish their tasks more quickly. This indicates that their perception of the mobile phones is positive and they will use them to solve their information seeking needs. Hence this proves that using library mobile technologies helps library users to satisfy their information needs.

Table 4.4 : Library User Effort Expectancy

Effort Expectancy	**SD (%)**	**D (%)**	**A (%)**	**SA (%)**
Learning how to use mobile internet is easy for me.		5.5	11	83.5
My interaction with mobile internet is clear and understandable		3	4.5	92.5
I find mobile internet easy to use		2	9	89
It is easy for me to become skillful at using at using mobile internet		2	7	91

Table 4.4 shows 83.5% strongly agree that learning how to use mobile internet is easy for them. 92.5% stated that mobile internet interaction is clear to them and understandable. However, the minority who disagreed were trained on how to use the mobile internet. Information access from anywhere at any time is of great help for users who cannot visit the library in person and provides

a constant link to required information resources. Library users can use software on mobile phones to get information such that when library updates any information, the phone will be able to receive the new information. Hence the majority of the library users feel that learning how to use the mobile library is easy for the majority of the library users.

Table 4.5: Social influence of mobile devices

Social Influence	SD (%)	D (%)	A (%)	SA (%)
People who are important to me feel that I should use library mobile technologies		5.5	16	78.5
People who influence my behavior think that I should use library mobile technologies		6	12	82
People whose opinions I value prefer that I should use library mobile technologies			9.5	90.5

Table 4.5 shows that the people, who influence the majority of the library users, like family and friends feel that they should use library mobile technologies. This shows that social influence greatly impacts on technology acceptance and use and also on the perceptions and behavioral intentions of the library users.

Table 4.6: Facilitating conditions for library users o use mobile devices

Facilitating conditions	SD (%)	D (%)	A (%)	SA (%)
I have the resources necessary to use mobile internet		5.5	16	78.5
I have the knowledge necessary to use mobile internet		6	12	82
Mobile internet is compatible with other devices I use			9.5	90.5
I can get help from others when I have difficulties in using mobile internet			4	96

Table 4.6 shows that the majority of library users have the support they need to use library mobile technologies. This depicts a positive perception towards the system and this positively impacts on the library user behavior towards the MBLS. Mobile phones help library users to be more familiar with their own devices. This technology helps the users in accessing information quickly. Mobile users are using the facilities on mobile phones like SMS, instant messaging, web browsing, and e-mail effortlessly to communicate. Most of the features are pre-installed on mobile devices or option for data plan packages. Majority of library users can get help from others when they have difficulties using library mobile technologies.

Table 4.7: Hedonic motivation

Hedonic Motivation	**SD (%)**	**D (%)**	**A (%)**	**SA (%)**
Using library mobile technologies is fun			7	93
Using library mobile technologies is enjoyable			9	91
Using library mobile technologies is very interesting			3	97

Table 4.7 shows that the majority of the library users feel that using the IUIU-MBLS is fun, interesting and they enjoy using the system. The system provides them with a lot of benefits in performing various activities in their search for knowledge. With the IUIU-MBLS users need not record information about resources while browsing and searching library resources or wait at library transaction counter to renew, or reserve books and hence the time of the user is saved. Mobile based Library system helps in providing services orally to vision-disabled and physically-handicapped users.

Table 4.8: Price value for mobile devices

Price Value	SD (%)	D (%)	A (%)	SA (%)
Mobile devices are reasonably priced		4	2	94
Mobile internet is reasonably priced			3	97
Mobile internet is a good value for money			5	95
At the current price mobile devices provide a good value		2	9	89

Table 4.8 shows that the majority of the respondents have a positive perception towards the price value for mobile devices because they believe that the benefits of using a technology are perceived to be greater than the monetary cost and such price value has a positive impact on intention to use the technology. Hence we add price value as a predictor of behavioral intention to use a technology. Hence library mobile technologies are a good value for money.

Table 4.9: Habit

Habit	SD (%)	D (%)	A (%)	SA (%)
The use of the Library Mobile technologies has become a habit for me		10	11	79
Am addicted to using the library mobile technologies		11	18	71
I must use library mobile technologies for my research		12	21	67

Table 4.9 shows that the majority of library users state that using library mobile technologies has become a habit for them. This shows that habits greatly impacts on the behavioral intentions of library users.

Table 4.10: Behavioral intentions

Price Value	SD (%)	D (%)	A (%)	SA (%)
I intend to continue library mobile technologies in		2	6	92

future				
I will always try to use library mobile technologies for my research			3	97
I plan to use library mobile technologies frequently			11	89

Table 4.10 shows that the majority of the library users intend to use library mobile technologies in future. This will greatly impact positively on the library users' reading culture. This shows that mobile devices were easily adopted by the library users of IUIU.

Table 4.11 shows 98.5% of the library users want find fun or pleasure from using a library mobile based technology, and it played an important role in directly determining technology acceptance and use.

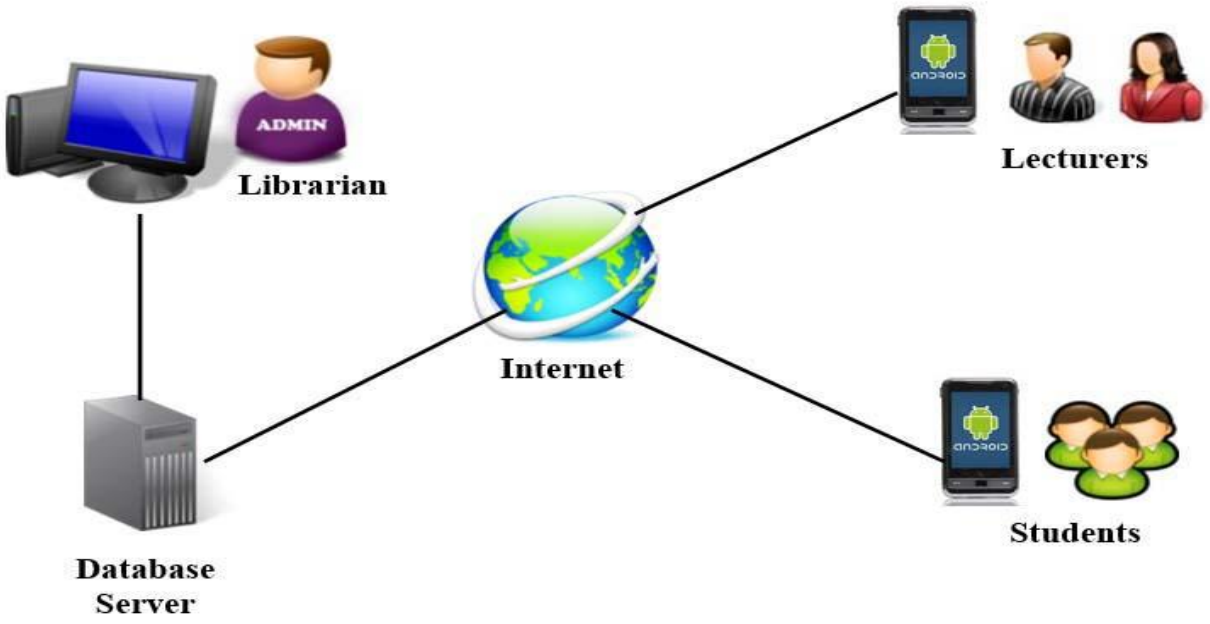


Fig. 4.2: Showing the Proposed high-level Network Diagram for IUIUL

4.10 UML Use-case Diagrams for the IUIU-MLS

These diagrams were to present a graphical overview of the functional requirements provided by a system in terms of users, their goals and any dependencies between user cases. In other words these diagrams were to relate the system to its users and to show the relationship between the different user cases. Below is the use case diagram for my system.

There are two actors, namely, library user and admin. User can be students, teaching and non-teaching staff of the university. Users can search, reserve book, check the availability list and search for electronic books, whereas Admin can upload electronic books, slides, video lectures on different topics and subjects. Increasing collaboration with faculty to offer students more information literacy instruction; enhancing digital access to books. Providing online tutorials for research tools; improving integration of library resources with course management software. The Use-Case diagrams are the system views describing the behavior as described by the users. The Use-Cases are divided into two categories; the detailed roles of each user and the general outlook of the entire IUIU-MLS.

Fig. 4.3: Use-case Diagram for the general outlook of the entire system

The use case diagrams below are an illustration of the user requirements gathered from the users in section 4.6.

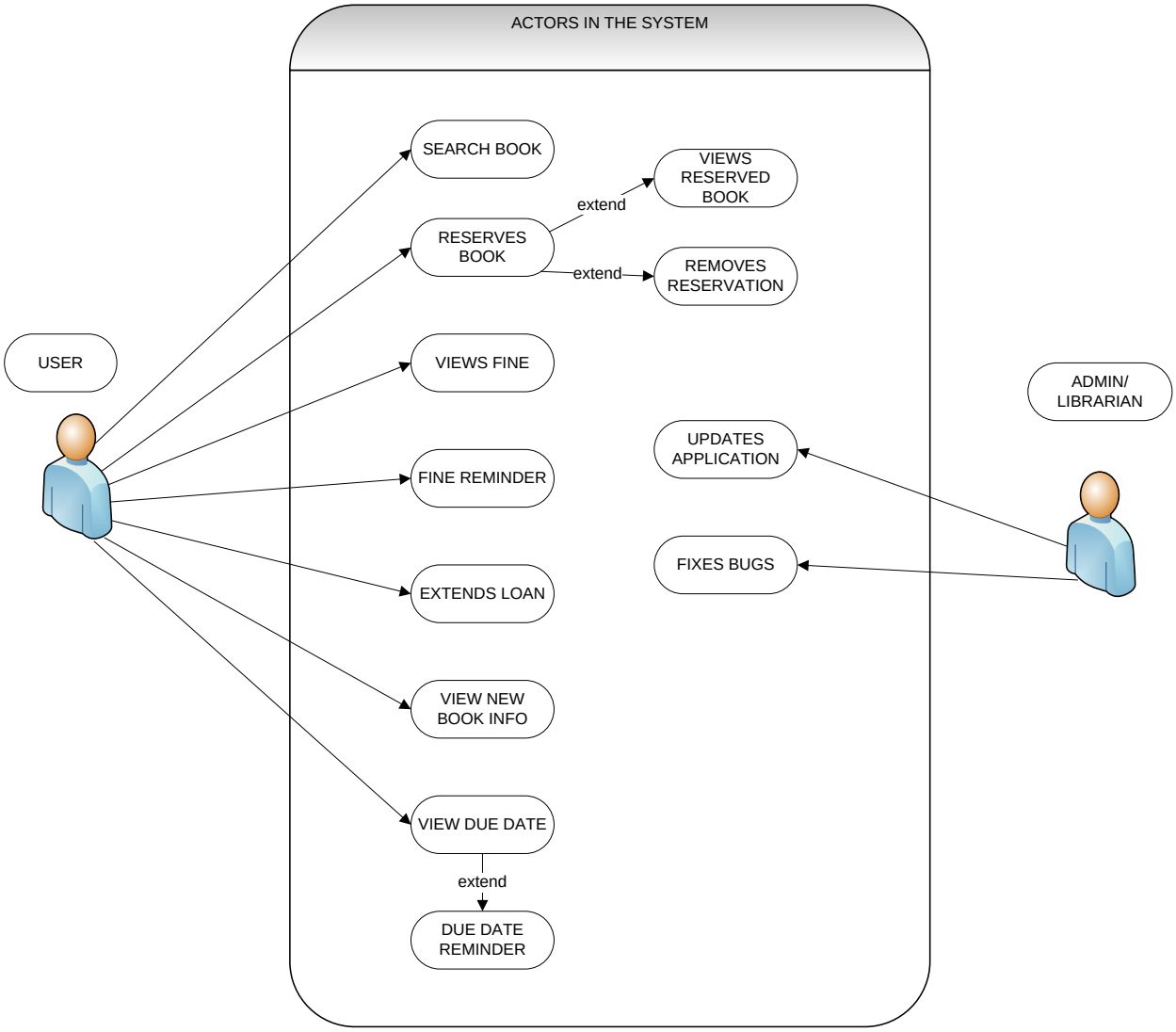
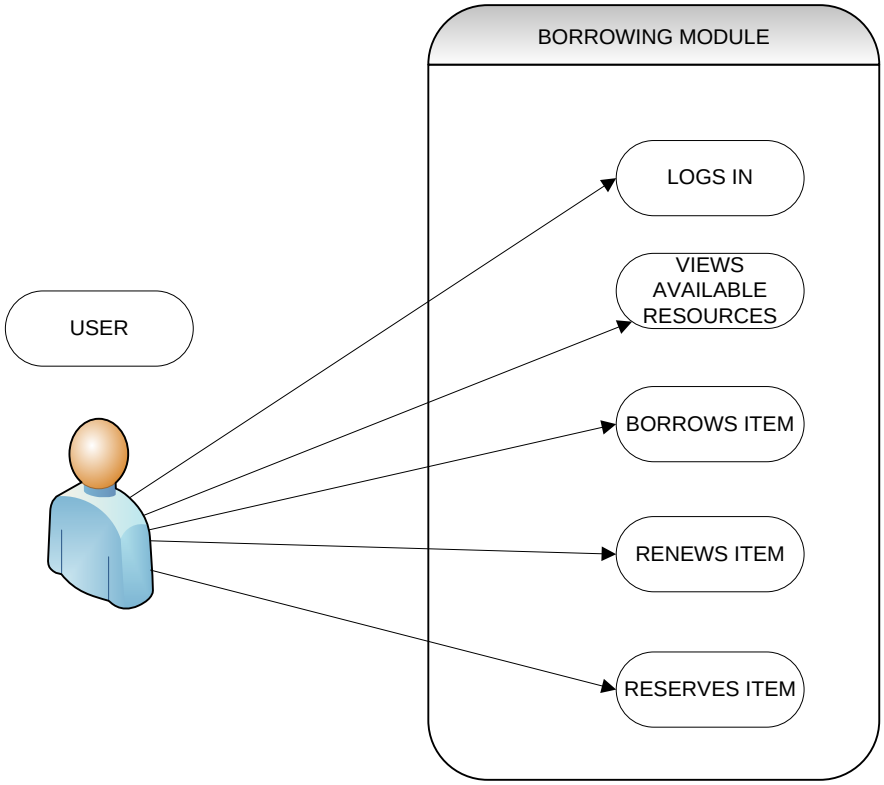


Fig. 4.4: Use-case Diagram for the user borrowing module

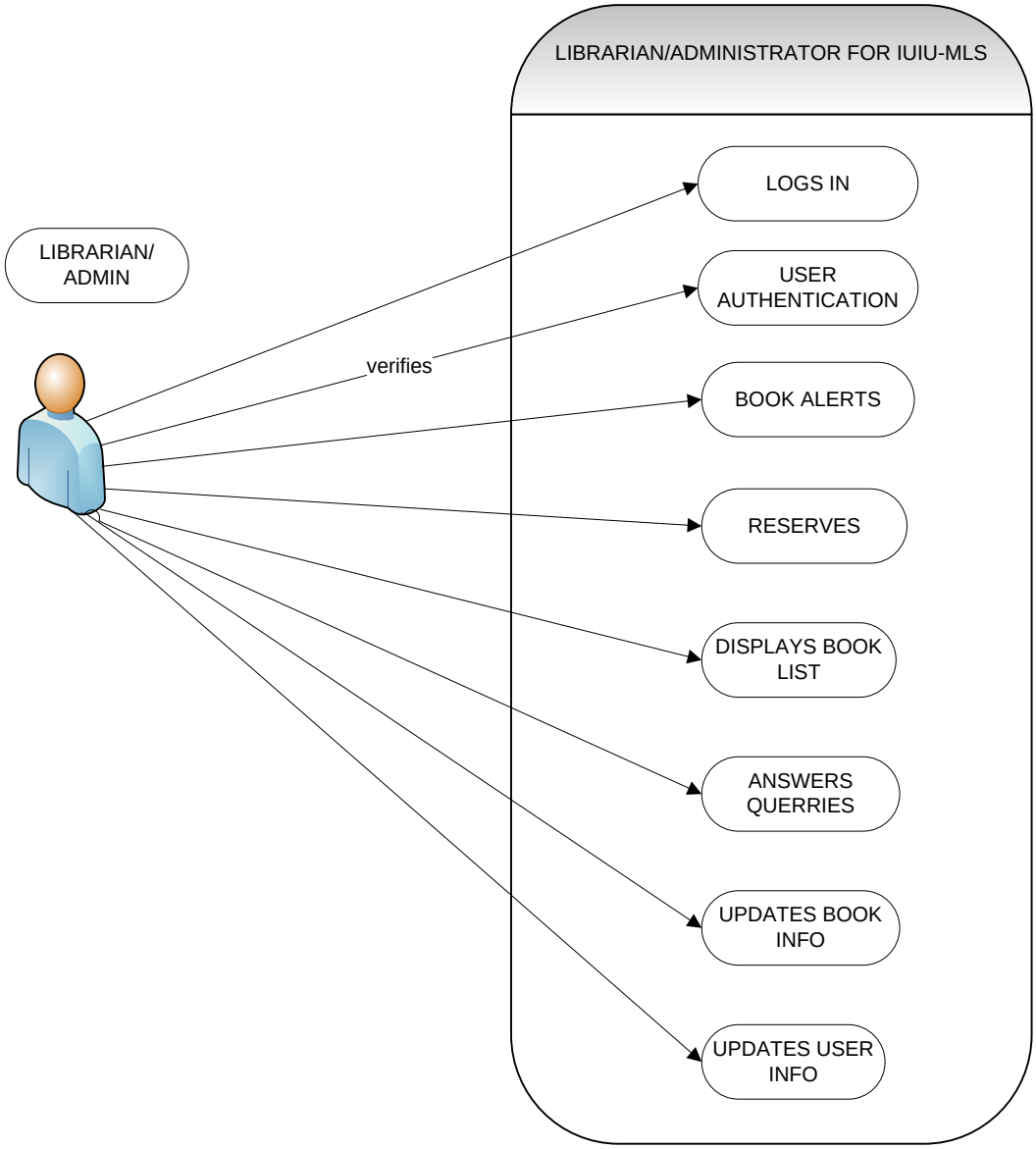


Actor: **Library user**

Description:

The Use-case begins when the user logs into the library mobile system. Then the system allows the registered library user to view the available resources. The library user after viewing the available resources borrows the items they are interested in. When information resources are borrowed but are due for return, the library user renews items borrowed or they extend the dates of return. The library user requests to reserve items they are interested in when they are returned, in case they were not available when they needed them.

Fig. 4.5: Use case Diagram for the Librarian/ Administrator

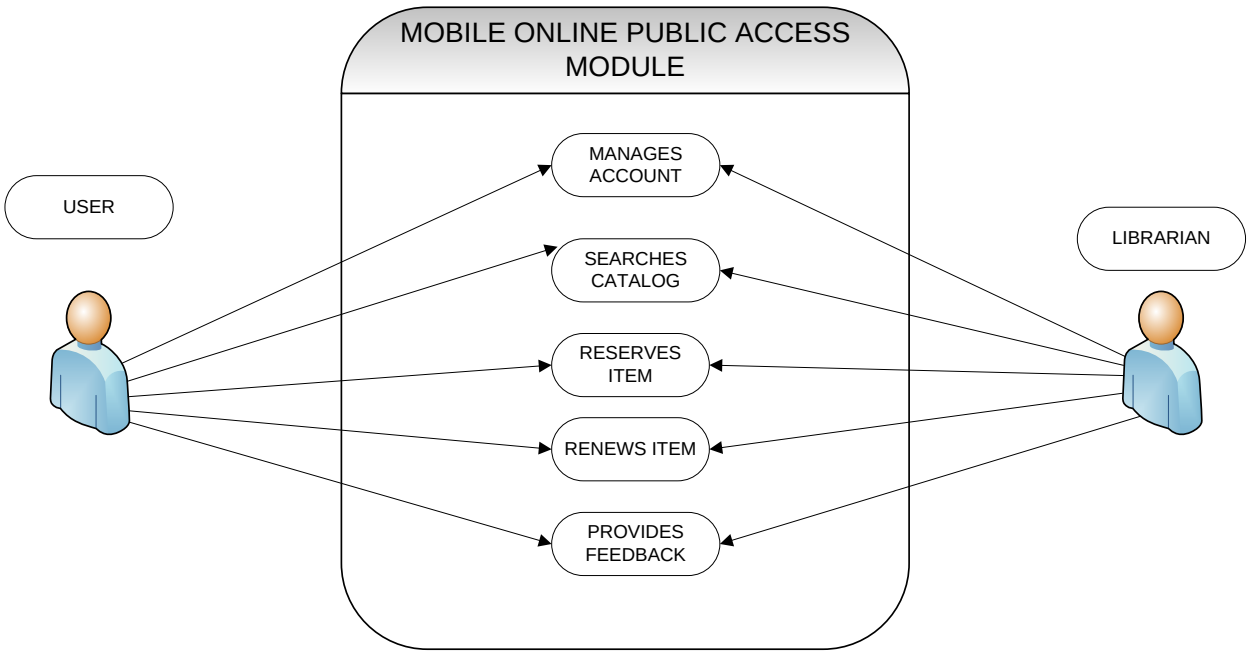


Actor: **Librarian/ Administrator**

Description:

The librarian or administrator logs into the system. They are in charge of verifying the library user authentication. They are also in charge of sending book alerts for new information materials to library users. The librarian reserves information materials when users request for their reserve on first come first serve basis. She or he also displays lists of information materials available. She is responsible for answering user queries. She or he updates information about new and old information materials. The librarian/ administrator is also responsible for updating user information.

Fig. 4.6: Use-Case diagram for Mobile Online Access Catalog



Actor 1: Library user

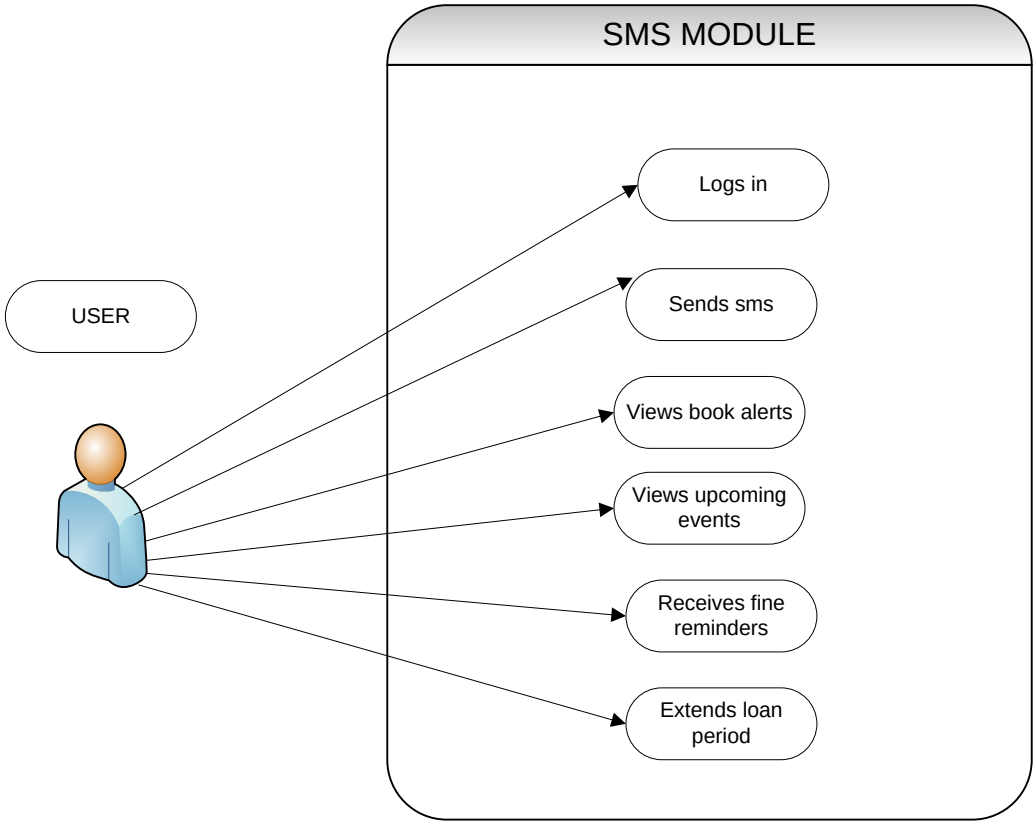
Description:

The library user manages their account like changing passwords. They are responsible for searching the catalog. The library user reserves items in case they need them and they are borrowed. The library user also renews items in case they still want to use them and the date of return is due. The library user provides feedback on the usefulness of information resources

Actor 2: Librarian/ Administrator

The librarian manages user accounts like in authentication and user registration. She or he also searches the catalog. The librarian also reserves items when booked by users. She or he renews items when users request for it and they are not on demand. The Administrator provides feedback to the users when they desire information or as need arises.

Fig. 4.7: Use-Case diagram for SMS Module

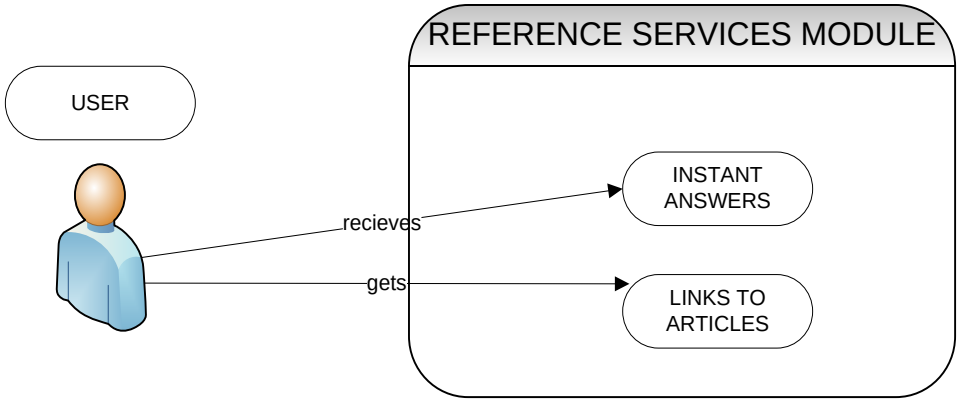


Actor: **Library user**

Description:

The Library user logs on to the library based mobile system. The user sends an SMS. She or he then views book alerts. The library user can also view upcoming events. The library user is able to receive fines reminders. She or he can extend their loan period.

Fig. 4.8: Use-Case diagram for the Reference services Module

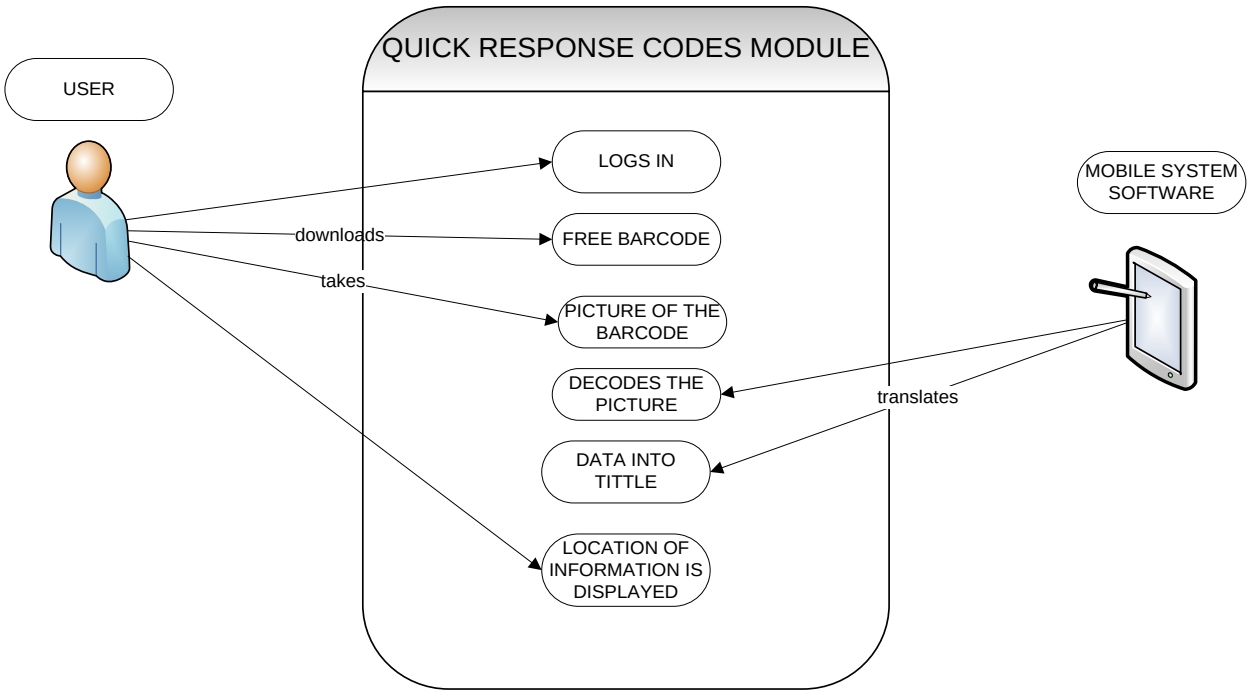


Actor: **Library user**

Description

The library user receives instant answers to any information they want like words from the dictionary or opening hours. Library user can also get links to the articles that they may desire.

Fig. 4.9: Use-Case diagram for the Quick Response Codes Module



Actor 1: **Library User**

Description

The library user logs on to the system. They can also download a free barcode. The user takes a picture of the barcode. The location of the information desired is then displayed to the user

Actor 2: The Software

The software decodes the picture taken into the required format. The software then translates the data decoded into the title that has the require information.

Fig. 4.10: Entity-Relationship Diagram of the MBLS

This was required to understand how the system and its components operate at the database level. That is to say how data flows within the system.

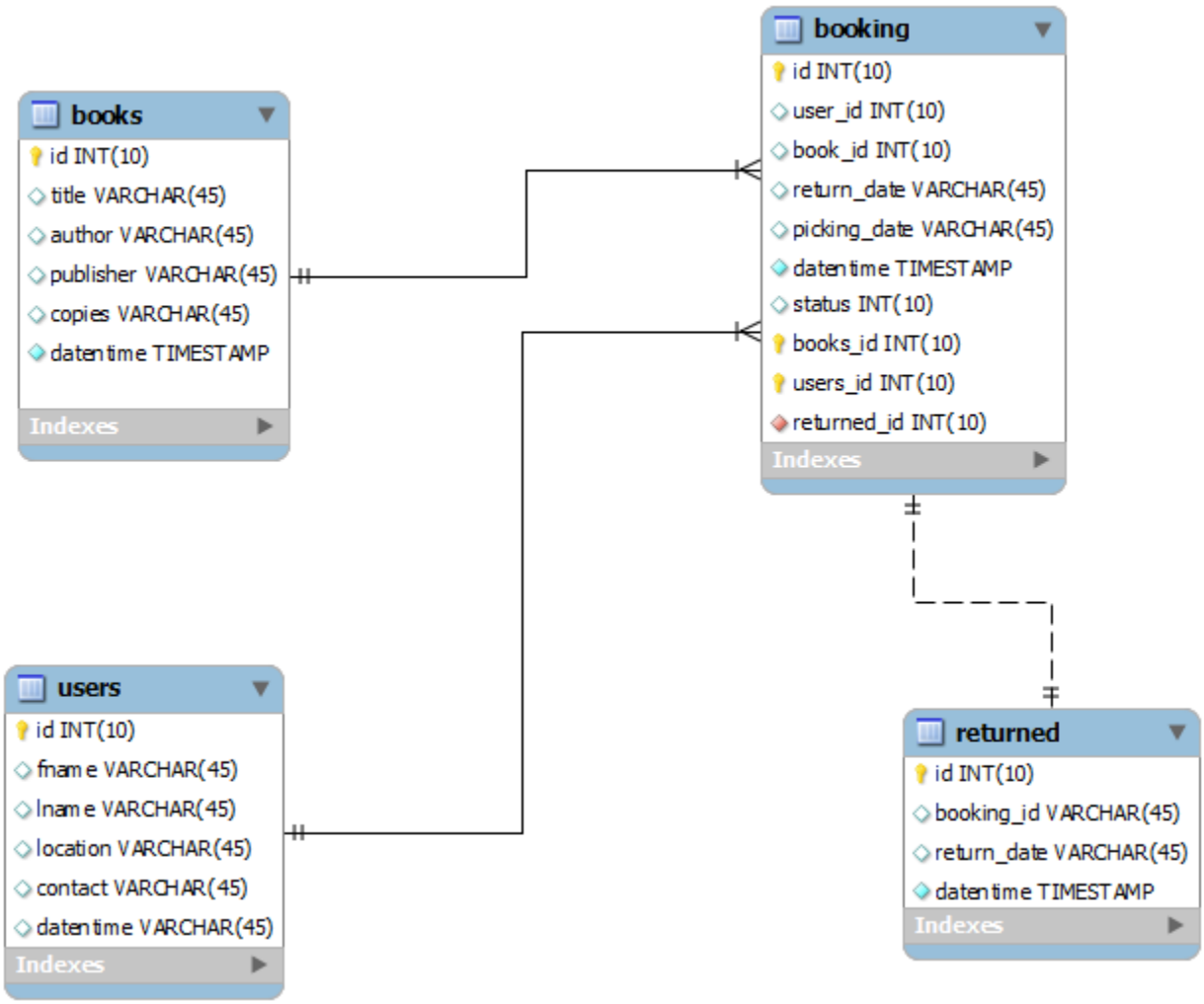
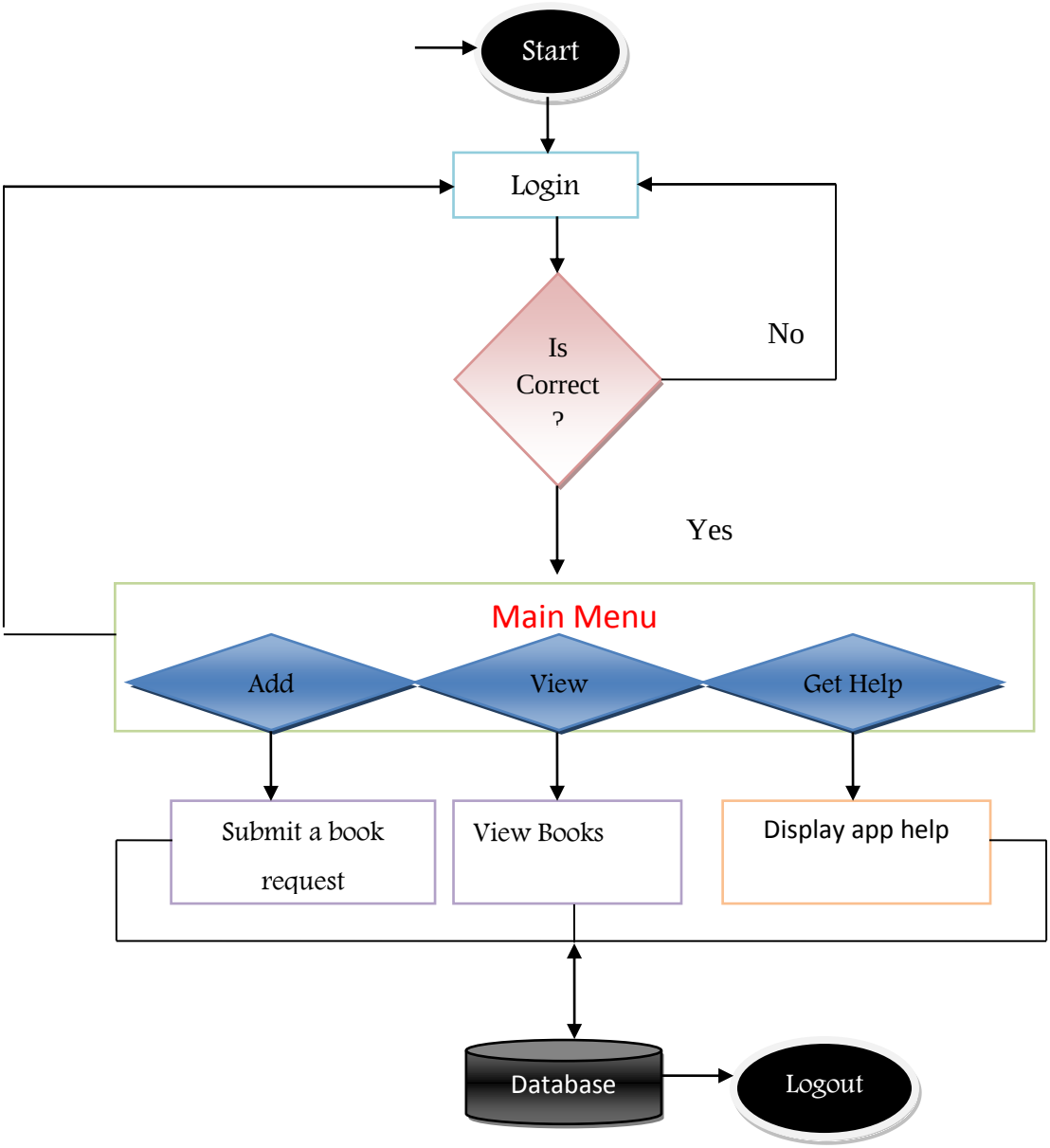


Fig. 4.11: Dataflow Diagram

This graphically represents data flow of the system and can also be used for the visualization of data processing or structured design.



On clicking the icon, a user has to login to access the main menu. Wrong credentials imply login in again. The main menu includes adding a book request, Viewing, and help information. Added or registered info is stored in the database and then finally logging out.

4.15 Acknowledgements

The authors would like to give special thanks to the respondents for their deliberate participation in answering the questionnaire. The authors are also grateful to all of the researchers whose works have been used and analyzed in preparing this paper.

4.16 Conclusion

On the whole, the current study supported the two core variables of the TAM (perceived ease of use and usefulness), as well as personal innovativeness that may predict librarians' and students' behavioral intention to use mobile services in the library. Hence, we should try to continue and strengthen this trend within the LIS community to show library users that the main actors in this field know, master, and use current technological tools. The study found that the main difference between the two groups is Smartphone use. This variable has a great effect on participants' behavioral intention to use mobile services in the library. As noted, Information students make greater use of mobile technology; as a result, their attitudes toward this phenomenon are more favorable.

CHAPTER FIVE

SYSTEM DESIGN

5.1 Introduction

All information gained from the requirements elicitation and task analysis is fed into the development of a design concept in the solution validation phase of the systems User centered design process. This chapter is basically providing the solutions to the problems identified during the previous phase and provides detailed system specifications and the acquisition plan for the proposed technology to be used. The models designed in the analysis phase are used to build the different designs that are the functional design, logical design, physical design, software specification, network model, user interface, and report templates that were used in the implementation of the IUIU-MLS.

5.2 Requirements Design

5.2.1 Functional Design

There should be a process that enables the registration of all library users in the university; there should be a process that enables the generation of a list of information materials procured by the university. There should be a process to ensure proper functioning of the login functionality that will allow users authorized access. There should be a process that enables the authorized users to update records in the database. There should be a process that enables the authorized users to perform some functions such as search, insert, delete, and manipulate records in the database. There should be a process that enables the recording of library user transactions per user and also a process to enable the display of such information on regulated time intervals. There should be a process that allows the display of the current/available stock when such information is required from it. There should be a process to allow users to track the most used information materials so that decision can be made accordingly when doing research. There should a process that enables the system to auto-generate all Identity numbers on registering the different library users for example students ID, lecturers' ID, administrative staff ID, etc There should be a process to store and retrieve all reports in the system. There should be a process to report results in a format that best suits the users. There should be a process that supports searching and editing of system users.

5.2.2 Non-Functional Design

There should be a process that allows many users to use the system at the same time. There should be a process that allows the system to upgrade from old to new/updated software versions. There should be a process that enables the system to run with minimal breakdown and failures. There should be a process that protects the system from virus attacks and unauthorized access. There should be a process that enables the system to run on different operating systems. There should be a process that enables the system to be user-friendly and easy to learn.

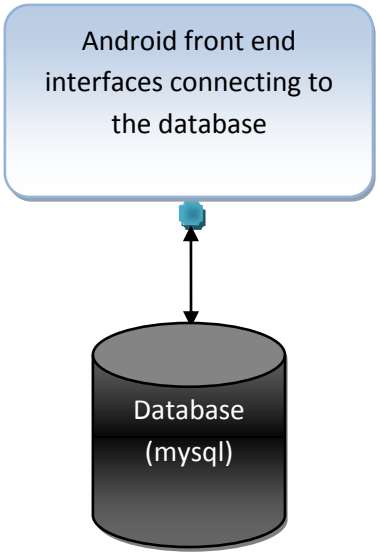
5.2.3 Data Design

There should be a process that allows the system to handle large volumes of data. There should be a process that ensures maintenance of data quality and integrity. There should be a process that allows east transfer and movement of data between different users. There should be a process that ensures data accuracy and availability for reference purposes.

5.3 Design Specifications

This system is a standalone application (Mobile Application) and comprises of two tiers: the front-end interfaces design developed using Java programming language and XML and the back-end which is made up of a database (MySQL Database) which is used for storing data. The system also consists of a running server (MySQL server) which is used to link up the front-end (user) interface to the database through the use of php web services. However the illustration of the design is through program flow diagrams, ER diagrams for the database and the use of open source software. The software used includes, MySQL DBMS, Sublime text for php developments.

Fig. 5.1: diagrammatic representation of the system that was designed.



5.4 Database design

This section describes the different database tables used to store the mobile based system information. Data normalization was carried out on the database and below are the details of the different tables that were extracted.

Table 5.1: Users Relational table details

Field Name	Data Type	Description	Constraints
id	Int(10)	Primary Key	Not null , primary key
fname	Varchar(45)		Not null
lname	Varchar(45)		Not null
password	Varchar(45)		Not null
contact	Varchar(45)		Not null
email	Varchar(45)		Not null
location	Varchar(45)		Not null
datentime	TIMESTAMP		Not null

Table 5.2: books Relational table details

Field Name	Data Type	Description	Constraints
id	Int(10)	Primary Key	Not null , primary key
title	Varchar(45)		Not null
author	Varchar(45)		Not null
publisher	Varchar(45)		Not null
copies	Int(10)		Not null
datentime	TIMESTAMP		Not null

Table 5.3: booking Relational table details

Field Name	Data Type	Description	Constraints
id	Int(10)	Primary Key	Not null , primary key
user_id	Int(10)		Not null
book_id	Int(10)		Not null
return_date	Varchar(45)		Not null
picking_date	Varchar(45)		Not null
status	Int(10)		Not null
datentime	TIMESTAMP		Not null

Table 5.4: returned Relational table details

Field Name	Data Type	Description	Constraints
id	Int(10)	Primary Key	Not null , primary key
Booking_id	Int(10)		Not null
return_date	Varchar(45)		Not null
datentime	TIMESTAMP		Not null

5.5 System interfaces

Fig 5.2: Represents the interface of the actual system when the icon is clicked.

This is the launcher activity that appears first when the application is launched to show the library user the intended use of the application. As seen below, it shows the library user the main navigation options

The above interface can be categorized into two. That is to say the menu bar below (in Fig 5.3) and the screen

Fig 5.3 represents the navigation menu bar

This guides the library user on how to search for information using this system and how they could get assistance in case of failure to get the required service from the system.

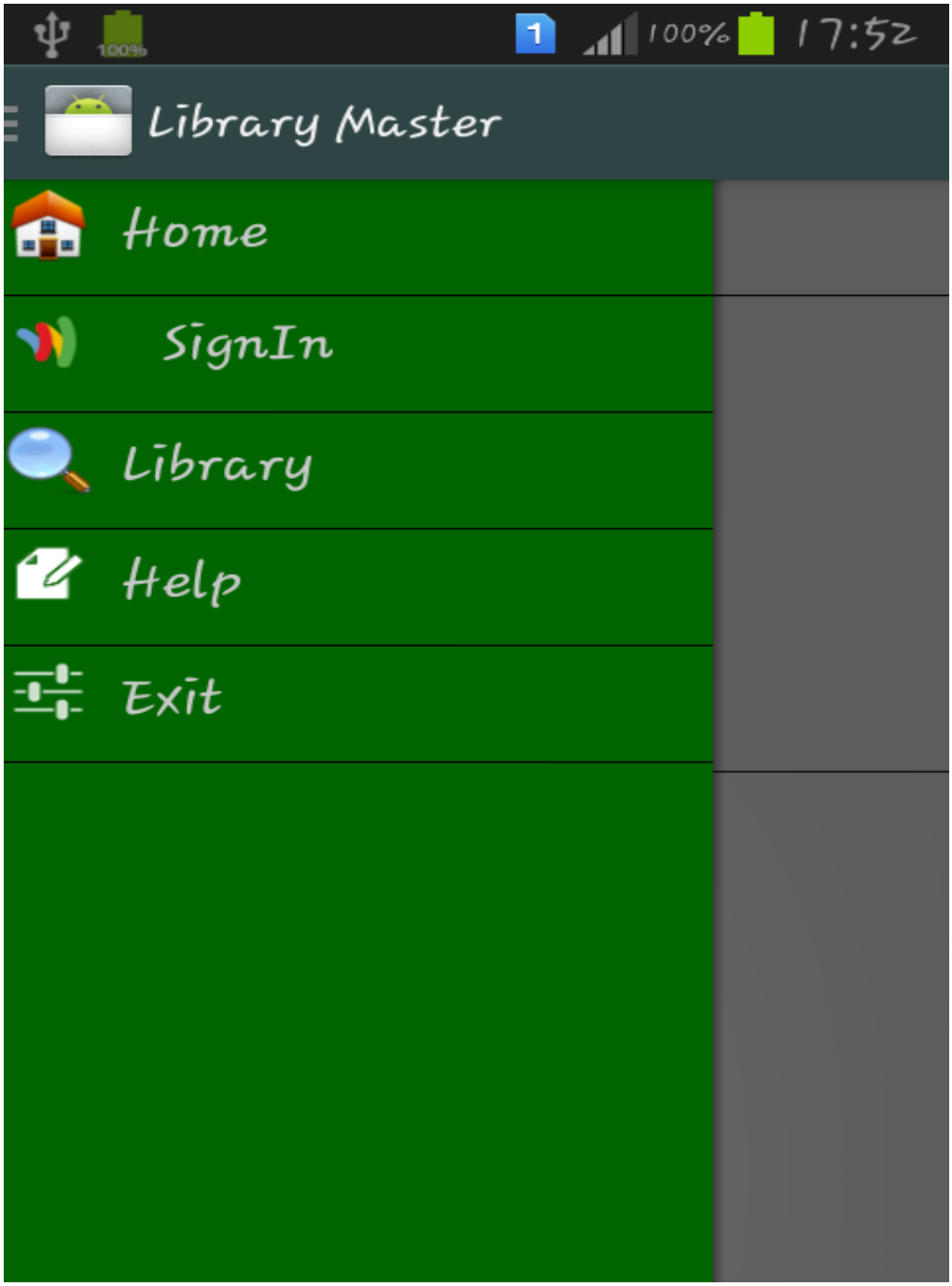


Fig 5.4 Login interface:

This is as a result of clicking the sign in button. On clicking the sign in button you are provided with an interface which has authentication means for u to access systems Main menu. All system users are required to register and be given both an email address and a password. This is implemented for security purposes and also to keep track of the users of the application

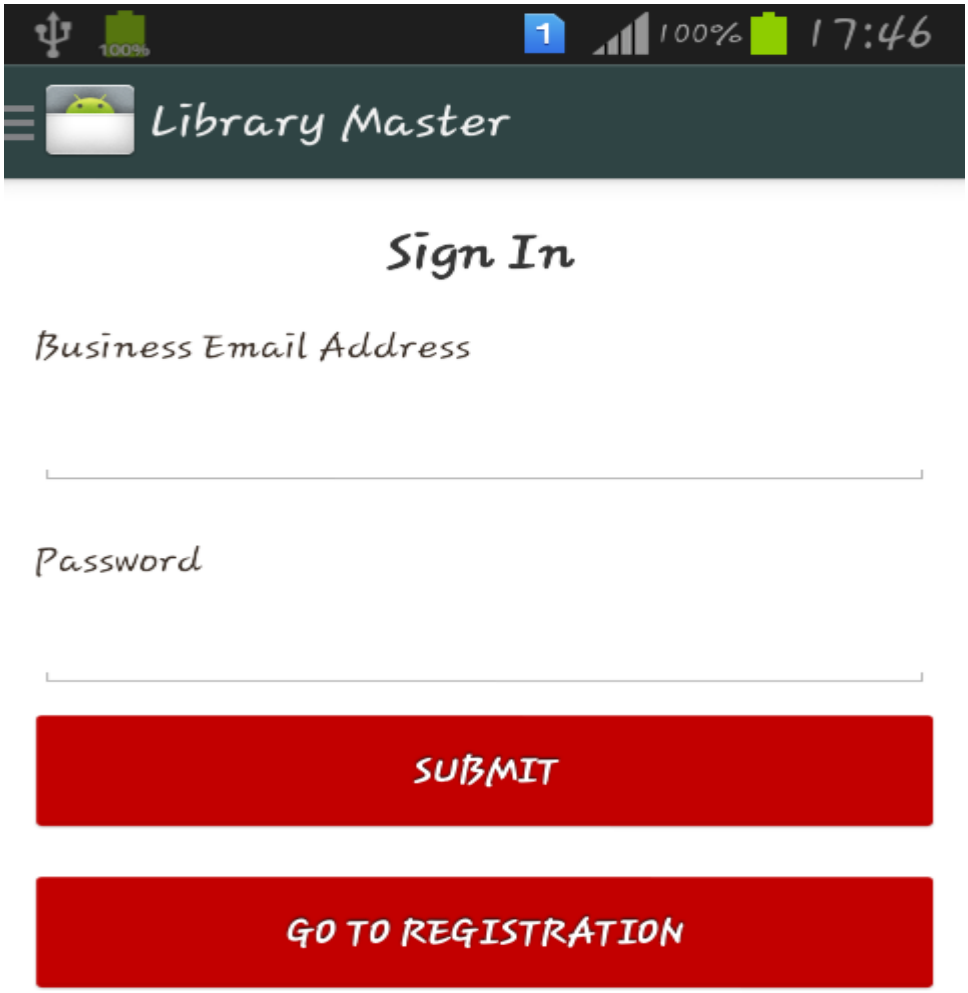


Fig 5.5: User authentication interface

When a wrong pass pin or email is entered, an error notification is displayed. To show you that the password or email you entered is different from the one the system requires. A registration option is also provided so that incase the user is not yet registered he/she can register by navigating to the registration interface.

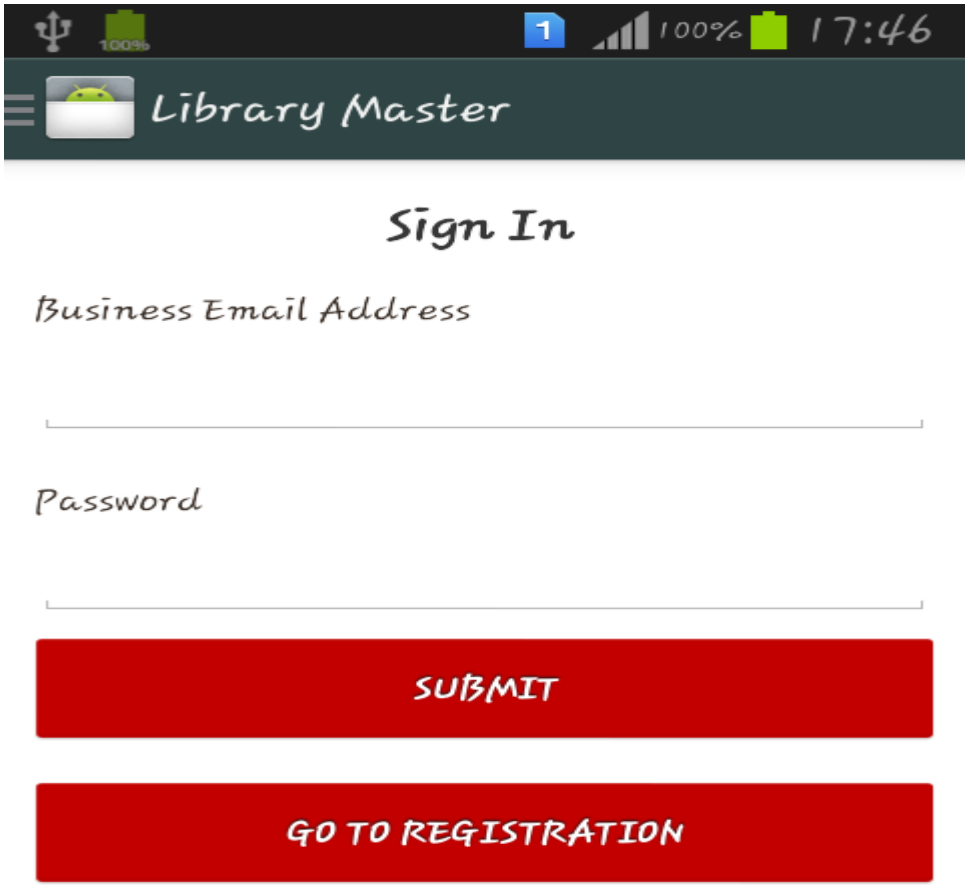


Fig. 5.6: Main menu of the library management mobile application

The figure below shows the main menu both for admin and the normal library users, the option to choose depends on the library users' access level and what the user wants to accomplish for example the librarians will need to navigate to manage library in order to do library management tasks.

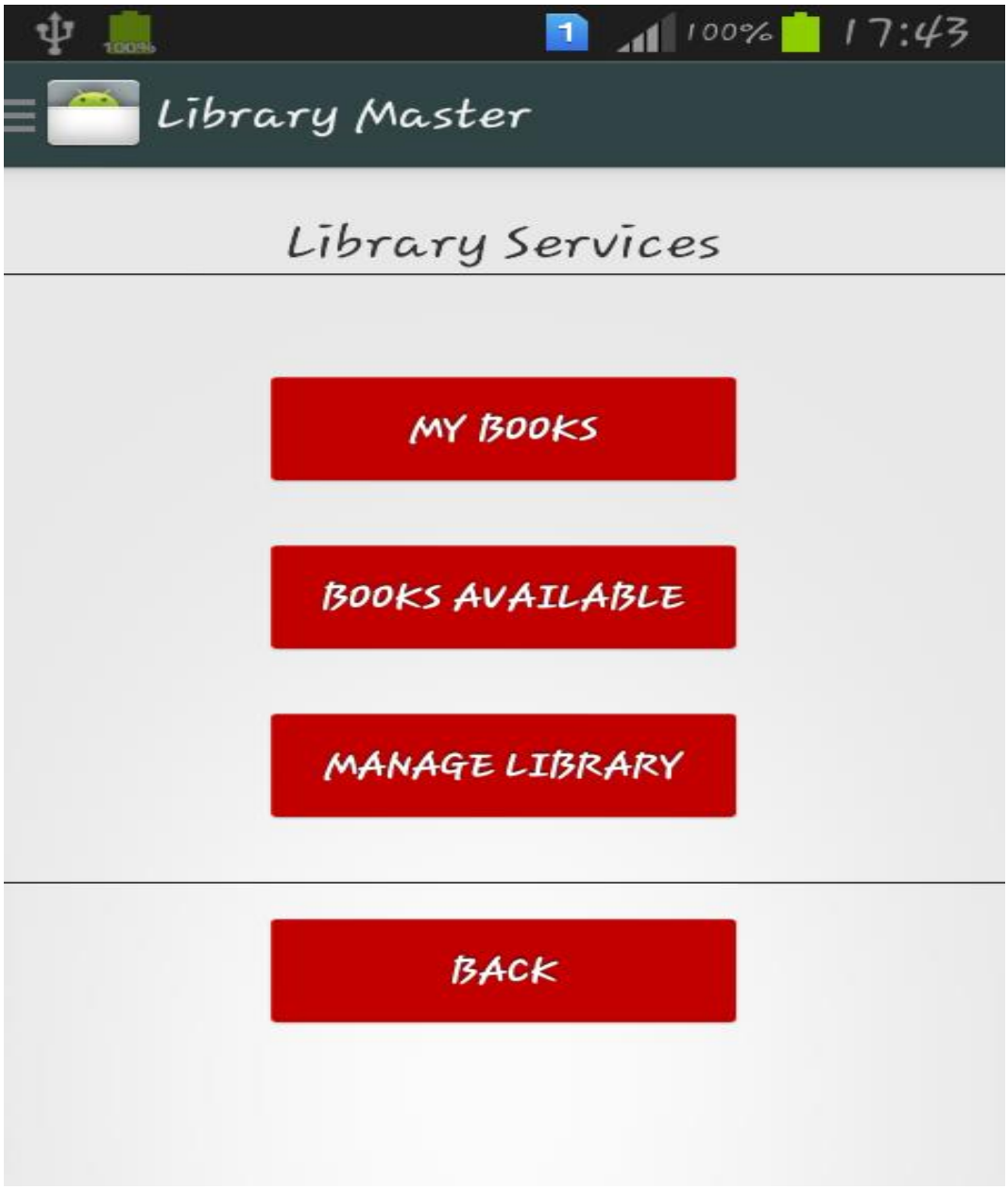


Fig. 5.7: Display of mobile application user's information by the librarian

Display of users' information by the librarian on the mobile application. The interface below shows the users registered on the system. This is useful when the admin needs to know the details of a given registered user.

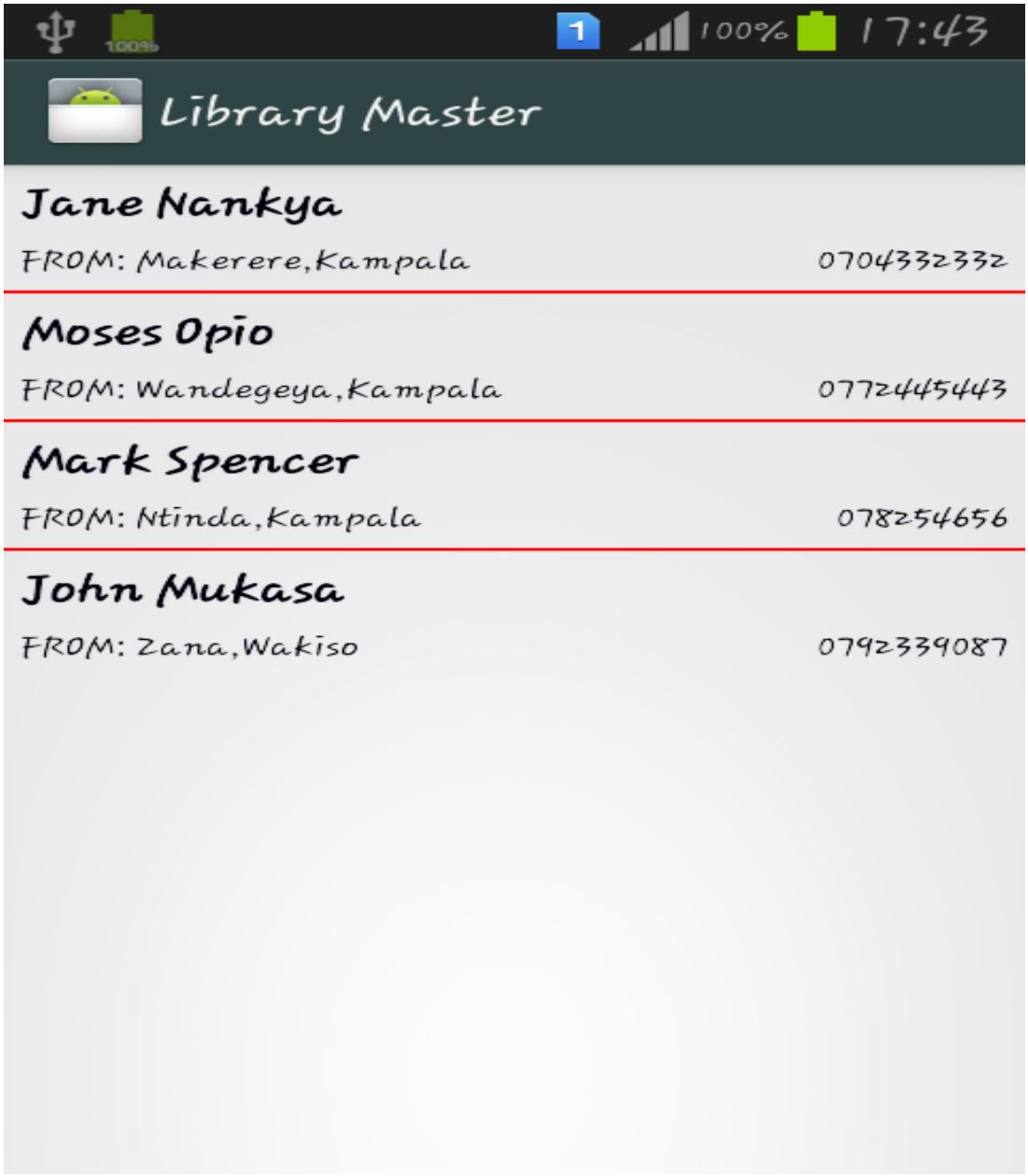


Fig. 5.8: List of books currently taken from the library

The interface below displays the list of books currently taken from the library, the details of the books taken by the users per book. This indicate the name of the book, the author and the copies taken so that the library users can know what information materials are out of the library to enable them to book the information materials on return.

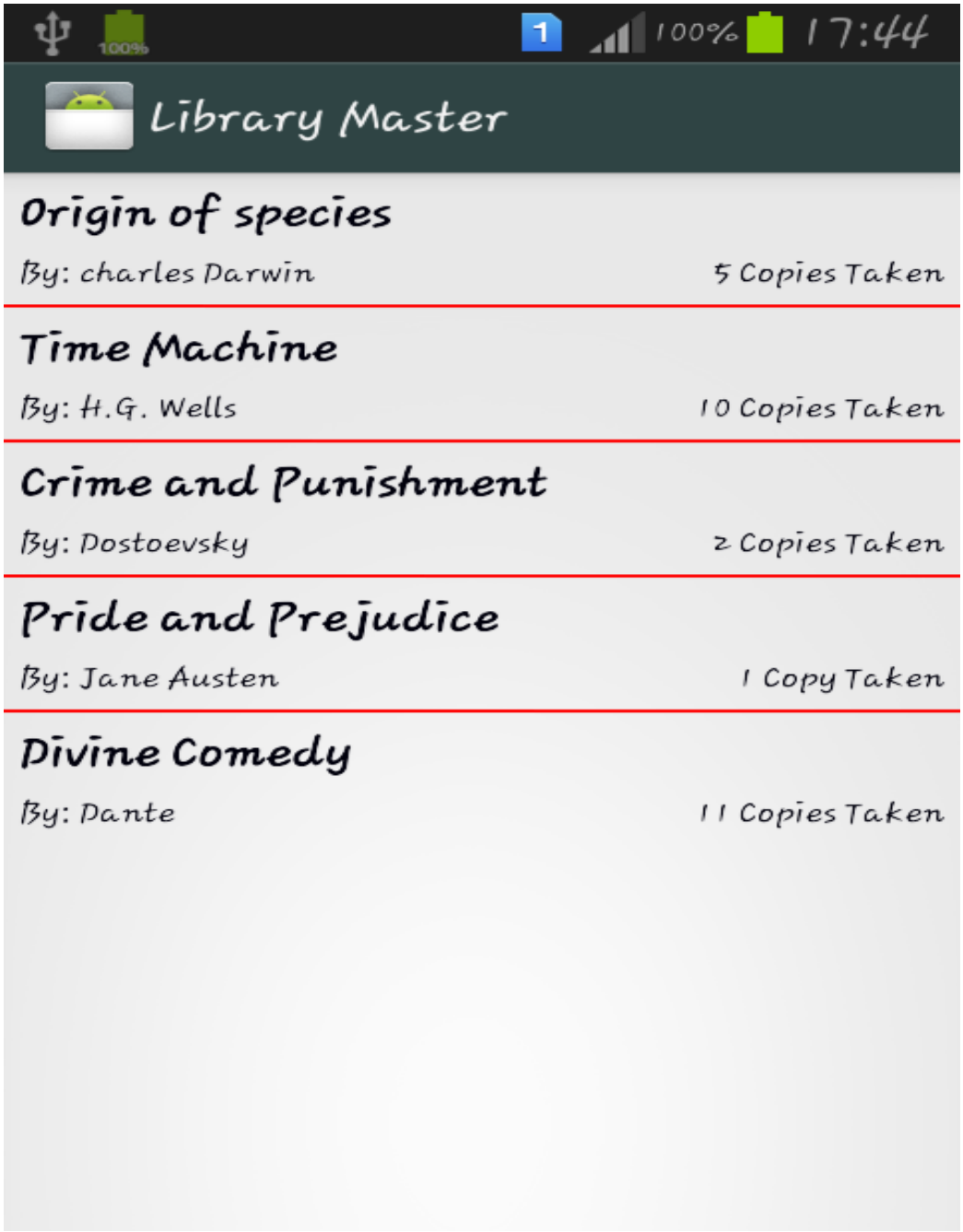


Fig. 5.9: The interface for the librarian to confirm receiving of a book from the user

Below is the interface for the librarian to confirm receiving of a book from the user. This is used at a time when the user returns the book. This also helps notify the other library users that a book that was out of the library is returned to enable them come and borrow it.

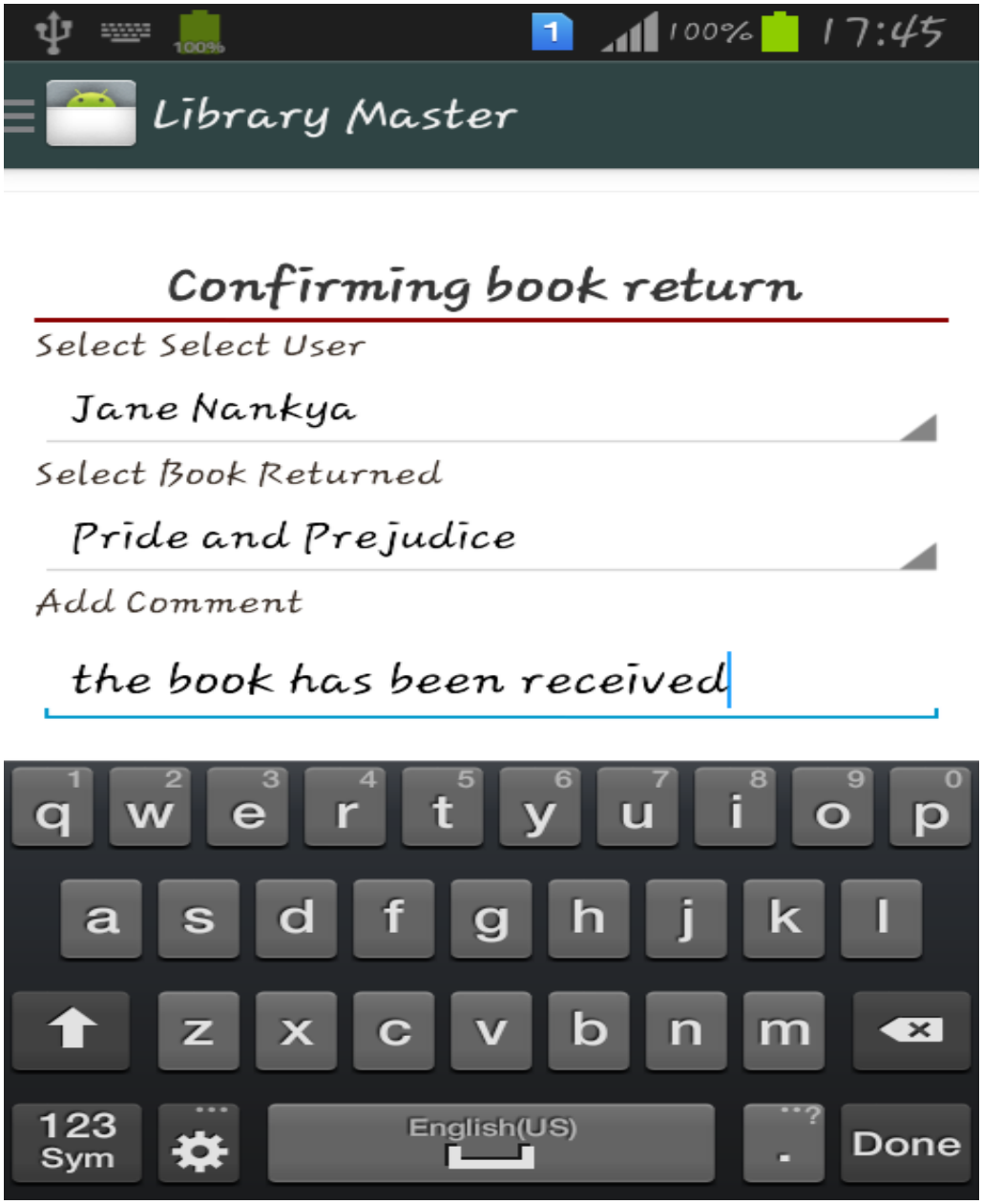


Fig. 5.10: The interface used by registered users to request for a book.

When registered users log on to the mobile based library system, then they will be able to get access to various information resources otherwise if they don't log on successfully then they will be required to re enter their pass word or seek help from the librarian.

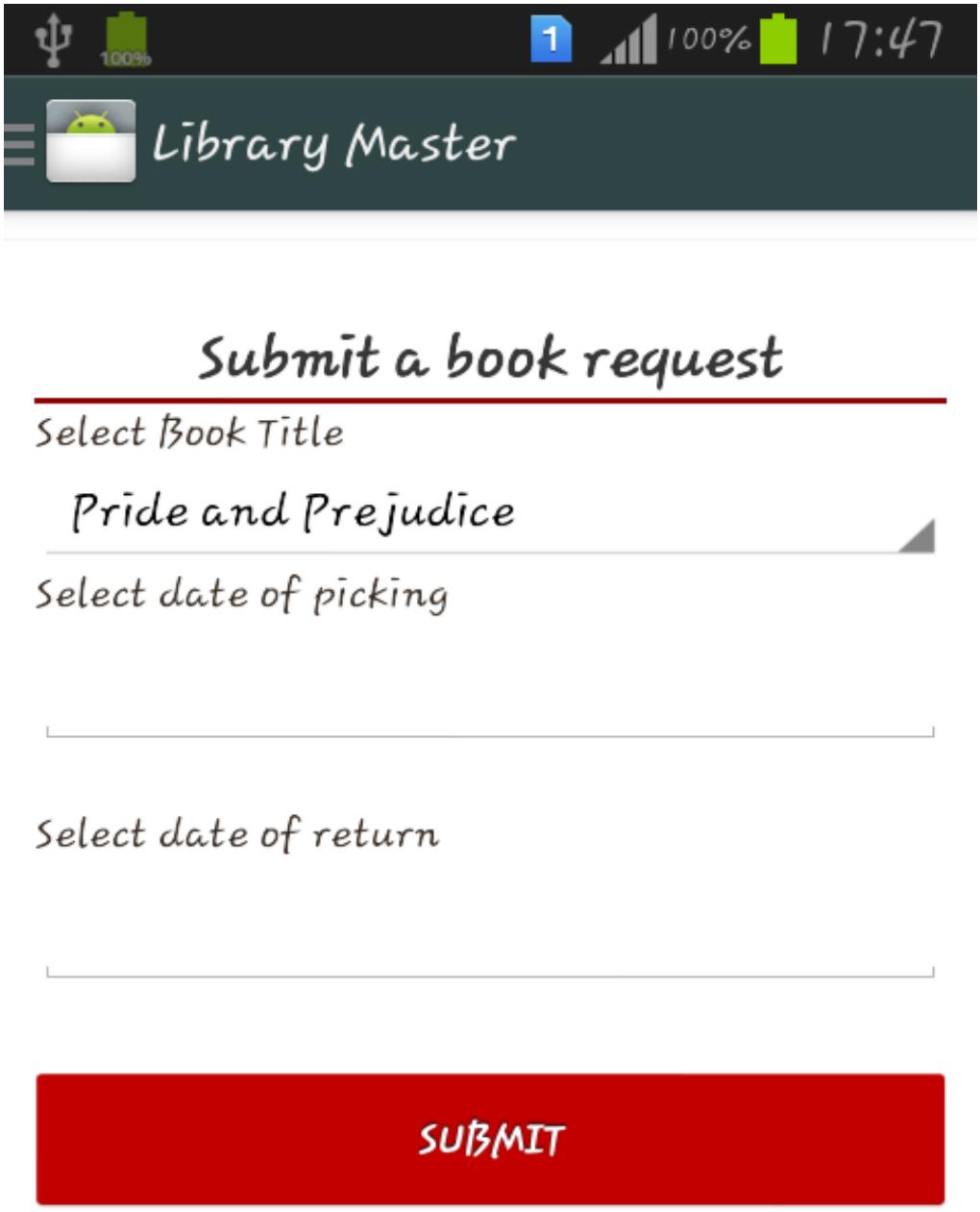
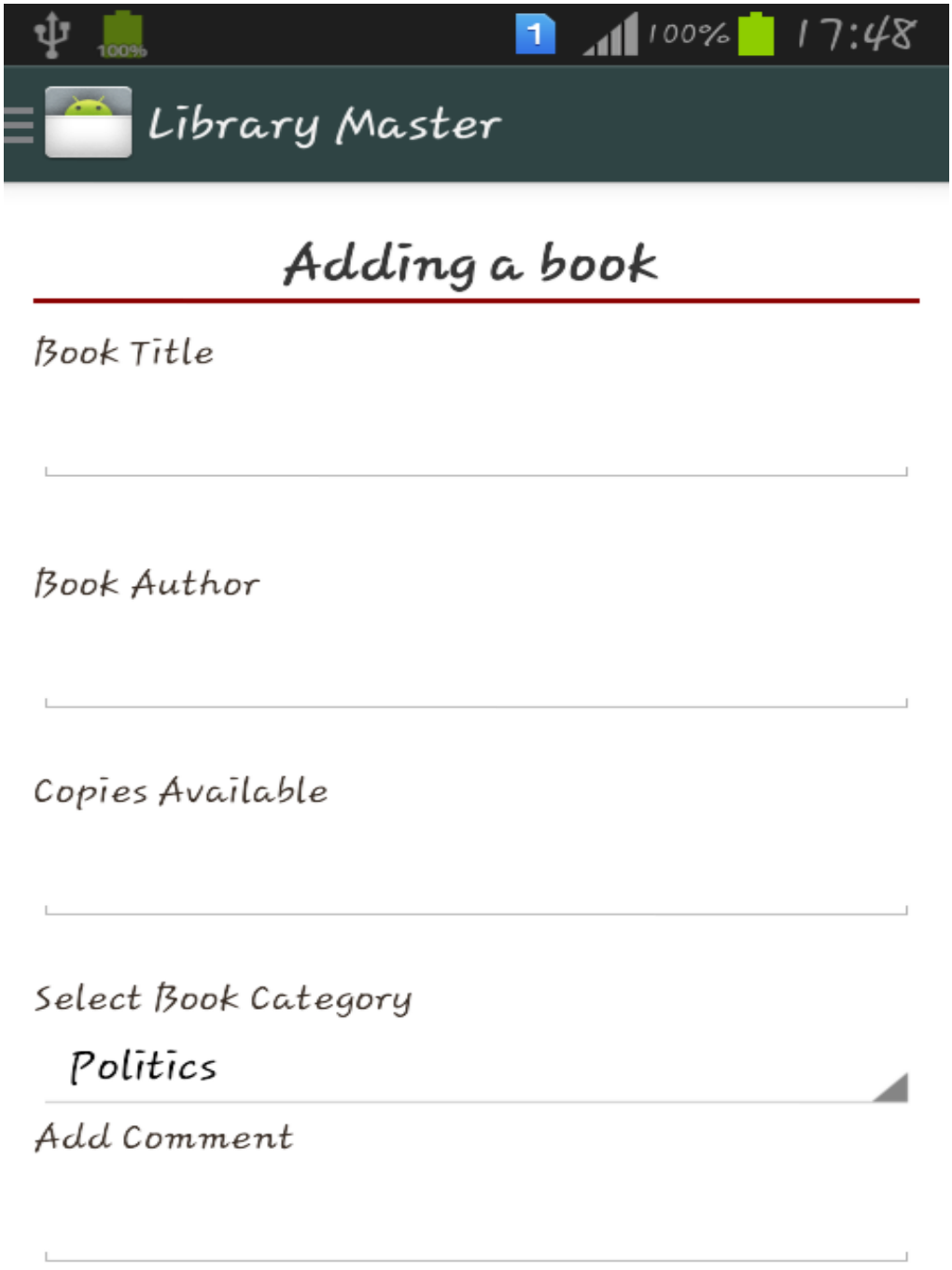


Fig. 5.11: The interface used by librarian to record new books to the library

The interface records the main attributes of the book to the database. When new information materials are received, they are quickly put to the notice of library users so that they can know that there are some new information resources as a way of promoting the information resources.



5.6 Security Design

This section involved an overview and discussion of the security features that were embedded into the system when implementing it. The following security features were considered while implementing the system:

User Authentication: Every user registered into the system was assigned a username and password to protect the system against non-authenticated users from accessing it.

User Authorization: Different system users were granted different privileges, and would perform differing functionalities with the system. They got different interfaces with differing features.

Network configuration: A firewall was installed to protect the server from unwanted spam, and websites that would attack the system from the internet.

Virus Protection: Antivirus software was installed on all computers to provide regulated scanning of the system.

5.7 Conclusion

This chapter described the detailed specifications of the system elements of the SAIMS, based on the functional, logical, physical, network and program designs. An Entity Relationship Diagram was drawn; data dictionary established from the physical design, as well as the User interface design and report templates. The designs provided inputs for the actual implementation, which was the last phase of the project.

CHAPTER SIX

SYSTEM EVALUATION AND IMPLEMENTATION

6.0 Introduction

This chapter describes how the IUIU-MBLS deployed, tested, installed, and ensured its transition into an operational system using the models described in the previous chapters. By converting the physical system specifications into a working and reliable system and documenting the work that has been implemented, help was provided to the current and future system users. The system designs were translated into code and the physical realization of the database and the application designs to interface the user with the database was completed. Other things included in this chapter are the overall implementation plan, the code used, the user guide, training plan, and the maintenance plan of the system. The deliverables or outputs included a user's manual, training plan, implementation plan, and the actual working system (IUIU-MBLS).

6.1 Formative Evaluation

The primary goal of formative evaluation is to collect information about the library user perceptions, users' behavior and identify any usability issues early in design. In order to achieve this, the researcher used two hundred library users. The participants were given an introductory briefing about the mobile based library system, user goals and requirements. The evaluation was then driven by the task of stating the services they expect to get from the mobile based library system. During the interview stage, the researcher used an audio recorder to capture the library users' perceptions about the mobile based system. The participants were then given a questionnaire in order to capture their experiences with the mobile based system. A number of issues were highlighted as revealed in our subsections that follow. Our participants were eighty two females and one hundred eighteen males from the departments of Computer Science and Information Technology at IUIU. Each of them had been in the university for at least a year. In order to collect information about the perceptions and behavior intentions of library users towards library mobile based systems, early in design, the researcher utilized the Likert scale attitude statements as illustrated below;

6.1.1 Mobile system performance expectancy

The evaluation of Library user perceptions of the mobile based library system gives satisfactory results. The first four questions posed sought to measure how easy it is to learn, ease of navigation, enjoy- ability and ease of use after training. The results in table 19

below confirm that users found the mobile based library system easy to learn, navigate, enjoyable and easy to learn after training.

Table 6.1: Library User perception of mobile based systems

System Effectiveness	SD (%)	D (%)	A (%)	SA (%)
IUIU MBLS is not easy to learn	89.5	10.5		
It is not easy to navigate the IUIU-MBLS			7	93
IUIU-MBLS is easy to use			17	83
IUIU-MBLS is enjoyable to use		1	20.5	78.5
IUIU-MBLS is easy to learn after training			11	89

SD- Strongly Disagree **D-** Disagree **A-** Agree **SA-** Strongly Agree

6.1.2 Perceived Benefits

In order to evaluate the perceived benefit of the library mobile based system, the researcher asked the library users whether they thought the system may help make information access and retrieval easier, whether the system functions facilitate ease of use and whether the system features are easy to understand. The majority of our participants revealed positive results for the three questions except seven as shown in the table below.

Table 6.2: Library User perception of mobile based systems

Perceived Benefits	SD (%)	D(%)	A(%)	SA(%)
IUIU-MBLS may help make information access and retrieval easier			9.5	90.5
The IUIU-MBLS functions facilitate the ease with which information can be accessed			3.5	96.5
It is easy to understand the features provided by IUIU-MBLS		3.5	12.5	84

6.1.3 User Satisfaction

In order to evaluate the perceived library users' satisfaction of the library mobile based system, they were asked four questions. More precisely, the library users were asked to answer questions that focused on measuring aspects related to their reaction to the interaction with the system, the user's opinion about the system, how the functions are structured, and the sequence of screens. Results from table 20 reveal that all the 200 respondents thought the system was perceptive, only 4 said it was confusing to navigate, 5 said the functions were not structured suitably, 4 said the sequence of screens were confusing.

Table 6.3: Library User perception of mobile based systems

Library Users' satisfaction	**SD (%)**	**D(%)**	**A(%)**	**SA(%)**
IUIU-MBLS can be used without thinking			69.5	30.5
IUIU-MBLS is confusing to navigate.		2	81	17
IUIU-MBLS functions are not structured suitably	79.5	18	2.5	
The Sequence of screens is confusing	77	20.5	2.5	

The data analysis points out that the prototype has been fairly appreciated. The tables 19, 20 and 21 under chapter 6 show the representation of the different usability aspects measured. Lastly, there were various user comments on the user interface design and functionality as detailed in below:

Functionality

One user suggested a reduction in the number of steps required to access the information resources and automate as much as possible

The users insisted on the need for the system to offer support for fault tolerance i.e. if a user provided the system with many instructions.

The participants also expressed the need for further automation so that the system is as less disturbing as possible and more perceptive.

Navigation

Two of the users suggested that the navigation needed to be improved such that the tool provides meaningful alerts and prompts.

Terminology

Some terminology had to be re-thought for instance some users did not understand what

"publish" or "upload" meant. Just as in the first design session, the participants needed clarification on some of the terms for example "publish" – they preferred to use "Distribute"

6.2 Implementation Plan

This phase takes the user tested system and interaction designs and implements them into working systems ready to go live. The implementation plan involved a plan of the major activities required to install both the hardware and software of the system.

6.3 Coding

In this activity, the physical design specifications and models designed in the previous chapter are converted into working computer code.

6.3.1 User Interfaces

PHP was the main programming language used in developing the user interfaces and connecting to the interfaces to the database. The PHP was embedded in HTML to enhance desirable interfaces. Macromedia Dreamweaver version 8.0 was the web page program editor used for coding and de-bugging the PHP functions. The front end was built using PHP and also used to connect the interfaces to the backend. Java script was used for validating all data to be fed into the different forms.

6.4 Database Implementation

The database management system was designed using MySQL and a script was run to build the database, the necessary tables, the relationships between those tables, and their constraints as depicted in the systems' design phase. The primary keys were identified in all tables, the relationship between the primary keys and foreign keys of the different tables which were useful in linking the related tables. The database system was built basing on the Entity Relationship Diagram created in the system design phase. In order to test the database integrity, the database was populated with data by the developer to ensure that whenever certain queries were run, the results produced matched those expected. Attempts were also made to enter erroneous data into the database to ensure that the correct data types were recognized.

6.5 Installation of the developed system

The android mobile application can be installed directly on an android Smartphone by copying the APK to the phone and clicking on this APK file brings an option for the installation.

6.6 Testing

Since this project is a software based project, I used the following techniques to test the developed system:

6.6.1 Unit testing

This involved testing individual units of source code or development process to determine whether they were fit for use. Testing was conducted on a complete, integrated system to evaluate the system's compliance with its specified requirements. That's to say, to determine the system's fulfillment of its specific requirements. It was performed on the entire system in the context of both the Functional Requirement Specifications and System Requirement Specification. The final system was tested through a simulation where a user carried out a specified set of tasks using the system.

6.6.2 Integration testing

Here, I tested the individual software modules then combined and tested them as a group. It helped me in simulating inter-process communication, knowing how the combined units work and working on errors that would come as a result of integrating the different software that make up my system.

6.7 Training Plan

After the system installation and having the user documentation in place, the university management together with the system developers developed training plans that were specifically to identify training requirements and then schedule the training procedures to make sure staffs are able to use and maintain the IUIU-MBLS system after its implementation. The following approaches were suggested to achieve the training goals; Prepare training materials basing on the delivered user documentation and this would involve system setup, configuration, maintenance, and other usual routine operations; The training was directed towards specifically library users, staff, the administration, and the IT/ IS support staff; The training was conducted on two levels; IUIU-MBLS maintenance and operation which were designed specifically for library and IT staff; and user training which was designed specifically for library staff, library users, lecturers, and administrative staff who will be using the system on a day-to-day basis. Below is a summary of the deliverables and tools that were used during the training.

Table 6.4: showing the Training schedule for IUIU-MBLS

Activity	Deliverable	Tool

Training	-General computer concepts	Ms Power Point, Projector, CD's, Hand-outs
	- Use of the SAIMS	Ms Power Point, Projector, Hand-outs
	- Information system concepts	CD's, Hand-outs
	- System managements	CD's, Hand-outs
	- System installation and trouble shooting	CD's, DVD's, Hard drives
	Training methods	
	- Training manuals, Tutorials	CD's, Hand-outs

6.9 IUIU-MBLS Functionalities

Title Registration; - Register tittles for information materials and details into the system, to create groupings of the information materials based on types, editions, ISBN, etc of the same information materials.

User Registration; - The Administrator/librarian has the responsibility of adding new users that is students, administrative staff, and lecturers into the system and assign them usernames and passwords.

Reports; - Reports such as library user reports, library stock reports, student to book ratio reports, loyal library users, etc are generated for statistics, analysis, and decision-making.

6.10 Considerations for change from Old to New System

The following aspects were followed for the process of changing from the old to the new system;

Both systems will have to be used concurrently for some time (three months) until the new system is proven beyond reasonable doubt that it can serve the purposes for which it was designed; All data (papers and files) for the previous system will have to be kept safely and could be referred to any time by the university staff; That system users have been trained (system use, maintenance, and operation) prior to the installation of the new system.

6.11 Ethical Considerations for the IUIU-MBLS

The system was designed with two interfaces that is Administrator and User interfaces where only the Administrator has access to vital university library information such as reports; The Administrator/ librarian alone has the right to enter other library users and assign them passwords. This helps control who is authorized to access and use the system

and the Administrator can easily track who did what with the system; The system was designed in such a way that it is accessible to only registered staff of the university. This helps avoid unauthorized access to its vital data and also the univ
ersity is able to reserve its information from the public which keeps it unique and compete favorably in the market.

6.12 Conclusion

A user centered design approach has been brought to the design of a mobile based library system. Such an approach recognizes the articulation work done by the library users in adapting and appropriating mobile based library technologies into their information seeking practices and environments and seeks to engage them in design. Therefore, this paper describes design activities with library users, sufficient to lead to the design of a useful mobile based library system. The design effort focused on creating and maintaining a library mobile based system. Therefore IUIU-MBLS is an example of what can be achieved using this process. The researcher highlights issues of accountability and the extent to which this user-centered design as a great deal of inventiveness. These were derived from discussions during the design sessions. The researcher then presented formative evaluation of IUIU-MBLS. Results indicated that the system has been successful in revealing usability issues. In terms of library users' perceptions towards library mobile based technologies, the majority reported that the tool is easy to learn and in terms of users' satisfaction, the users were enthusiastic to use the IUIU-MBLS. The positive results of the formative evaluation confirm that the user centered design process allows for designing and implementing usable technologies. In this work, particularly important has been the involvement in the designing phase of the library users, the university academic and administrative who are keen on quick in information retrieval.

CHAPTER SEVEN

CONCLUSION AND RECOMMENDATIONS

7.1 Introduction

This chapter concludes what was achieved by the project, what wasn't achieved, an evaluation of the project, a summary of the project and recommendations. It discusses the issues experienced and addressed while investigating library user perceptions and behavioral intentions towards library mobile technologies, planning, designing and developing the MBLS project at IUIU, and sums up with future improvements on the MBLS.

7.2 Summary

This master's thesis is composed of seven chapters.

In the first chapter, the focus was the problem and the problem statement was formulated for the project. The project aimed at investigating the factors that are expected to influence the intention of University library users and their behavioral intentions towards the use of mobile phone-based library information system based on the Unified Theory of Acceptance and Use of Technology model. This was aimed at enhancing the business processes at IUIUL, through the development and implementation of a Mobile Based Library Management System. Here we also came up with objectives, activities and scope.

In the second chapter, literature on important themes were reviewed and discussions were focused on library user perceptions and behavior towards mobile technologies and its significance the various methodologies, techniques and tools used in Mobile based system design and implementation, IS modeling with UML and the methodologies for collecting and analyzing data to come up with systems requirements specifications.

The third chapter described the various research and development methodologies used in the project. User Centered design research methodology was used. This research explored and evaluated the potential for user perceptions and behavior to affect the efficiency and effectiveness of mobile based library systems. The focus was on how library user perceptions and behavior alignment with business strategy could be designed in conformity to a successful mobile based library system. The methodology included the data collection tools used while the development

methodologies included the system development techniques used in requirements gathering. A detailed schedule was also developed.

The fourth chapter dealt with the actual gathering and analysis of requirements specifications, business architectural modeling IS modeling using UML, functional and non functional requirements and all these provided templates and models for the design phase.

The fifth chapter basically providing the solutions to the problems identified during the previous phase and provides detailed system specifications and the acquisition plan for the proposed technology to be used. The models designed in the analysis phase are used to build the different designs that are the functional design, logical design, physical design, software specification, network model, user interface, and report templates that were used in the implementation of the IUIU-MBLS.

The sixth chapter was the actual deployment of the system with an implementation plan drawn for all the activities in this phase. Implementation of each activity was described in detail; however, for the activities not completed a detailed plan was drawn on how to carry out the implementation. The actual coding and testing was implemented and a testing report written, while plans were made for installation, training, support and maintenance.

This seventh chapter gave a chapter-by-chapter summary of the entire project, recommendations made based on the outcomes of the project, additional future capabilities to be considered for the IUIU-MBLS and personal experiences of working on the project.

7.3 Recommendations

To ensure the smooth implementation of the MBLS project in IUIU Libraries, and because of the complexities in the business processes in these settings, the library user needs should be thoroughly understood during the planning phase before embarking on designing, development and implementation. Libraries may have the expertise to describe manual processes and library automation requirements into a detailed specification document for the system requirements, features and functions of a MBLS. However, this can be labor intensive and time consuming the library users may not be familiar with some of the new tools and technologies available. Therefore

a thorough Library users' needs assessment in the early stages of planning and analysis of the systems specifications to prioritize automation enhancements, provide automation recommendations and allow all involved to have a common blueprint, can uncover any potential project implementation risks and provide a strong foundation for the successful implementation of the MBLS.

The importance of IS and IT infrastructure is becoming imperative in most library settings. Whether it is an efficiency increase, a reduction of lead-time, an improvement of library users' reading culture, provision of an IT infrastructure, the development and implementation of business applications or the monitoring and control of IT services and support, a MBLS enables libraries to gain massive improvements in all its functions. Business processes without IT support are becoming more and more inconceivable and the product quality is increasingly being influenced by the IT infrastructure. As a result, many library systems have been designed, but not properly utilized due to lack of user input in the design of these systems. Therefore, it is becoming a necessity that library users input is greatly considered when designing library management systems.

The MBLS project generally improved overall library operations, provide timely and convenient services through the ability to get information about the library 24 hours seven days, provide overdue reminders, enhance validated results data, rapid access to results, better communication, generation of worksheets, expediting report generation hence reducing reporting times, eliminate duplication of work, enhance quality, reduce costs, and reducing the overall turnaround time. To remain competitive in the ever-changing lab landscape organizations must embrace the principles of continual improvement to reduce waste and function more effectively. Employees are constantly required to do more with fewer and fewer resources; continual process improvement is key. This process must involve each member of the organization for the process to be successful. Laboratories that effectively manage change and continual process improvement can realize substantial cost savings through enhances data quality, laboratory safety, improved customer satisfaction, reduction in turnaround times and elimination of waste and duplication of efforts.

7.4 Future Plans

Launch MBLS

The plan is to fully-launch the MBLS at the Islamic University in Uganda main campus, Mbale. After the MBLS has fully stabilized then have it installed at the Libraries facility at Mbale Kibuli and Kabojja and hosted on legible users' mobile phones so that the MBLS can be accessed remotely and data uploaded in real-time by authorized users.

7.5 Personal Experience

The project was empowering and provided opportunities for quick information retrieval and quick and convenient learning, hence enabling quick and timely research. Most of the interaction was with the end users of the system, which provided a close link between decisions made and the impact of those decisions.

The project provided a great opportunity to fully apply the various activities in project planning and management. Proper planning and scheduling is key to completing a project successfully. Playing all the roles in information system project planning, design and implementation including the role of systems analyst, systems architect, systems developer, system programmer, database administrator, IT administrator, project manager, and the role of advocacy with the organization all at the same time was greatly enriching and empowering.

Based on literature and this project it has been proven that for any successful change in an organization especially with the dynamics today in competition and continuous change in information technology and communication that user centered design, information systems and information technology always work best when they complement each other.

7.6 Recommendation.

To gain access to library resources and information the following steps must be put in place for positive impact on library users. The library should not derail from its set goals, objectives and policies that have helped to move academics in the university forward.

The lowest possible cost should be adopted by the IUIUL for implementing the system; Adequate budget should be sanctioned for implementing mobile based library services in IUIUL; Library administration should be more dynamic to embrace mobile technology at IUIUL; Awareness among the library professionals and users is needed to implement such type of project; Innovative ideas and plans should be rewarded and encouraged in IUIUL; Changing mentality with changing needs and recent trends should be adopted in IUIUL for being up to date with the global environment; Librarians should have a collective vision to build world class library users with the provision of adequate and relevant information to support teaching and learning which is globally competitive and reputed for academic excellence; In addition, all the library units should maintain cordial relationship with other organs of information provider in order to promote academic excellence, repositioning the university library for the attainment of its vision, quality assurance, providing more ICT equipment, so that library users can make meaningful impact and positive influence in the society; Library users at Islamic University are recommended to have mobile communication devices in order to enjoy the services that are offered by the application; I recommend also uploading this application to Google play store, so that it might be accessed to all Ugandans.

Library patrons' needs are diverse, and satisfying them is an overwhelming task. But the dream of every librarian is to satisfy the information needs of the library users. The researchers observed that the patrons' awareness keeps increasing and their needs have become more pressing, while their supplies are declining. Satisfying them is the only reason why the libraries exist, therefore, no sacrifice can be too much for librarians to achieve this. The provision of mobile technology alone cannot help the increase of library patronage. Librarians also need to gather adequate ICT knowledge to handle technical procedures and to assist patrons to find information they want quickly and easily. They should provide information to support all key operations such as acquisition, circulation control reference, serials and e-resources management in the library. Moreover, the bandwidth allocated to the library by the ICT unit of the university should be increased considerably. This would encourage students' use of the library. Library services should be planned to cater for the present, future needs, demands and expectations of the library users through designing systems after consulting the users.

In conclusion, students who have benefited and those who are still benefitting from the university library resources and services should make use of the knowledge gained and not end up to be champions of class agenda in education. IUIU should build a solid foundation of knowledge about mobile services within the organization.

7.7 Conclusion

This chapter concludes the entire project report through chapter summaries, recommendations, future plans and personal experiences during the project. The project went through all the phases of information system planning, analysis, designing, development and implementation, and was an eye opener that successful and standardized MBLS projects can greatly improve the business processes of libraries and hence improve information retrieval in Islamic University in Uganda. The IUIU Library would be able to provide uncompromising information and intellectual requirements to its users with a user-friendly approach through this Mobile based library system. It will offer a fully integrated and dynamic environment for conducting academic research. Multiple copies will ensure that resources are easily available in Reference Section. Besides this, it will also provide the facility of reservation of books.

REFERENCES

1. AHARONY, N. (2013). Librarians & apps; attitudes towards mobile services. Aslib Proceedings, [online] 65(4), pp. 358-375. Available at: http://dx.doi.org/10.1108/ap-07-2012-0059 [Accessed 15 Jun. 2015].

2. AHARONY, N. (2014). *Mobile libraries: Librarians' and students' perspectives*. *College & Research Libraries*, 75(2), pp.202—217

3. AHARONY, N. (2011). *Librarians' Attitudes toward Knowledge Management*. College & Research Libraries, Pp. 111-126.

4. ALLAN, James Aslam Jay, .Et.al (2012). *Frontiers, Challenges, and Opportunities for Information Retrieval;* Report from SWIRL 2012.The Second Strategic Workshop on Information Retrieval in Lorne.

5. APPANNAIAH, H, Reddy, P, & Kavitha, BR 2009, *Organisational Behaviour*, Himalaya Publishing House, Mumbai

6. BARILE, LORI. (2011), "*Mobile Technologies for Libraries: A list of mobile applications and resources for development",* Association of college and Research Libraries, Vol.72 No. 4 pp.222-228. Retrieved at http://crln.acrl.org/content/72/4/222.full [Accessed 27th May. 2015].

7. BROWN, T. A. (2015) *Confirmatory Factor Analysis for Applied Research*, The Guilford Press, 2015

8. CASE, MARY M. (2011). *Partners in Knowledge Creation: An Expanded Role for Research Libraries in the Digital Future*. Journal of Library Administration, 48 (2): 141-156.

9. CHRISTER Carlsson, Joanna Carlsson, Kaarina Hyvönen, Jussi Puhakainen, Pirkko Walden. (2006). Adoption of Mobile Devices/Services – Searching for Answers with the UTAUT. Proceedings of the 39th Hawaii International Conference on System Sciences, 1-10.

10. COLLISON, C. (2010). *So, what is Knowledge Management?* Available at: http://chriscollison.wordpress.com/2010/05/24/so-what-is-knowledge management (Retrieved on 2 July, 2015).

11. CUMMINGS, J., MERRILL, A. AND BORRELLI, S. (2010), "*The use of handheld mobile devices: Their impact and implications for library services"*, Library Hi Tech, Vol. 28 No. 1, pp. 22-40. Retrieved at 2015/05/10 from:www.emeraldinsight.com/0737-8831.htm

12. DEUFF, D, & Cosquer, M 2013, FOCUS : User-Centered Agile Method (1), Wiley-ISTE, Somerset, US. Available from: ProQuest ebrary. [30 November 2016].

13. DRESSELHAUS, A. AND SHRODE, F. (2012). *Mobile Technologies & Academics: Do Students Use Mobile Technologies in Their Academic Lives and are Librarians Ready to meet this Challenge? Information Technology and Libraries*, [online] 31(2). Available at: http://dx.doi.org/10.6017/ital.v31i2.2166 [Accessed 22 June. 2015].

14. FOX, R. (2010). *Library to go. OCLC Systems & Services*, [online] 26(1), pp.8-13. Available at: http://dx.doi.org/10.1108/10650751011018455 [Accessed 15 Jun. 2015].

15. *Futures Thinking for Academic Librarians*: Higher Education in 2025 (2010) http://www.acrl.org/futures

16. GERRITY, BOB AND DIANE BRUXVOORT (2010). *Mobile Technologies in ARL Libraries: Status and Prospects*", Presentation at the 157th ARL Membership Meeting, October 13-14, 2010. http://www.arl.org/resources/pubs/mmproceedings/157mm-proceedings.shtml

17. HELFT, M., & VANCE, A. (2010). *Apple Passes Microsoft as No. 1 in Tech*. The New York Times.Retrieved from http://www.nytimes.com/2015/06/11/technology/27apple.html?hpw

18. HU, RACHAEL AND MEIER, ALISON (2010). *Mobile Device User Research*, The California Digital Library.

19. II Im, Seongtae hong, Myung Soo Kang. (2011). An international comparison of technology adoption Testing the UTAUT model. Information & Management, 48, 1-8.

20. Islamic University in Uganda. , (2015) Policy Statement Document. Mbale

21. ISRAEL, I.G. (2010). *Information explosion and university libraries: Current trends and strategies for intervention. Chinese Librarianship:* an International Electronic Journal. Available at: http://www.white-clouds.com/iclc/cliej/cl30ifijeh.pdf (Retrieved on 2 July, 2015).

22. IWHIWHU, B. E., RUTEYAN, J. O. AND EGHWUBARE, A. (2010), "*Mobile Phones for Library Services: Prospects for Delta State University Library, Abraka",* Library Philosophy and Practice (e-journal). Retrieved at 2015/05/27 from: http://unllib.unl.edu/LPP/iwhiwhu-ruteyan eghwubare.htm

23. KIM, YONG-MI & ABBAS, (2010). *Adoption of Library 2.0 Functionalities by Academic Libraries and Users: A Knowledge Management Perspective*. The Journal of Academic Librarianship, (36) 3: 211–218.

24. KOTHARI, C.R.2010. *Research Methodology: Methods and Techniques*. New Delhi: New Age International Publishers.

25. KROSKI, ELLYSSA. (2015) *On the Move with the Mobile Web: Libraries and Mobile Technologies.* Library technology reports vol.44. no5. http://www.alatechsource.org/ltr/on-the-move-with-the-mobile-web-libraries-and-mobile technologies

26. Library report (2014/2015). Islamic University in Uganda. Mbale.

27. LIPPINOCOTT. J.K (2010). *A Mobile Future for Academic Libraries:* Reference Service Review. Volume 38 Number 2. ISSN: 205-213.

28. MALATHY, S & KANTHA, P. (2013). *Application of mobile technologies to libraries*. DESIDOC Journal of Library &Information Technology 33(5): 361-366. Retrieved on 22 June 2015 at http://publications.drdo.gov.in/ojs/index.php/djlit/article/view/5098/2935

29. MARANTO, T. AND PHANG, S. (2010), "*Mobile Phone Access in Sub-Saharan Africa: Research and A Library Proposal",* LBSC 706, Seminar in International and Comparative Librarianship. Retrieved at 2015/05/27 from: http://www.phangpages.com/PhangMaranto_mobilephones.pdf

30. MEI-YING WU AND I-CHUN LIN. **(**2011**),** A Study of Taiwan Universities' Intention and Behavior to Use Library 2.0. Journal of Library and Information Science Research 6:1 (December 2011).

31. Mike Wade, Scott Schneberger. (2005, September 30). Retrieved from The Theories Used in IS Research: http://www.istheory.yorku.ca/UTAUT.htm.

32. Mirjana Kocaleva, Igor Stojanovik, Zoran Zdravev (2014). Research on UTAUT Application in Higher Education Institutions. ITRO 2014, 27 June 2014, Zrenjanin, Serbia. pp. 34-39.

33. MURRAY, L. (2010). *Libraries "like to move it, move it". Reference Services Review*, [online] 38(2), pp.233-249. Available at: http://dx.doi.org/10.1108/00907321011045007 [Accessed 14 June 2015].

34. MURRAY, L. (2011). *The Best Things in Life Are Free (Or Pretty Cheap): Three Mobile Initiatives That Can Be done now.* Librarianship in times of crisis. [online] pp.139-157. Available at http://dx.doi.org/10.1108/s0065-2830 (2011)0000034010 [Accessed 10th May 2015].

35. NISHANT, M. ET AL., (2014). *Context- aware Library Management using Augmented Reality*: ISSN Journal 0974-2174 volume 7 Number 9 (2014). P.p 923- 929.

36. NOWLAN, G. (2013). *Going mobile: creating a mobile presence for your library*. *New Library World*, [online] 114(3), pp.142-150. Available at: http://dx.doi.org/10.1108/03074801311304050 [Accessed 10th May. 2015].

37. OGUNMODEDE, T. A. and Emeahara, E. N. 2010. The effect of library use education as a course on library patronage: A case study of Lautech library, Ogbomoso, Nigeria. *Library Philosophy and Practice*. Retrieved march 11, 2016 from http://www.Unidaho.edu/~mbolin/ogunmodede-emeahara.htm

38. ONGWEN PATRICK ALFRED WALUCHIO (2012). *Knowledge Management and the Role of Libraries.* http://www.slideshare.net/patrickalfredwaluchio/knowledge-management-and-the-role-of-libraries.

39. OSO, YUKO WILLIS. (2008). *A General guide to Writing Research Proposal and Report: A Handbook for Beginning Researchers* .Kampala: Makerere University Press.

40. PARKSAH VED and Kanwaljit Kaur, (2015). *Enhancement of Library Services Via Mobile Technology*. e-Library Science Research Journal ISSN : 2319-8435 Vol.3 Issue.3 Jan. 2015 Accessed on 16 June 2015 at www.lsrj.in.

41. PARVEZ, AHMAD. (2011). *Development in Library Services with the Advent of ICT based products and services: A continuous process*. ISSN journal: 2250-1142 volume 1 Number 2 pp. 5-7.

42. PATERSON, L., & Low, B. 2011. Student attitudes toward mobile library services for smartphones. *Library Hi Tech, 29*(3), 412 – 423. doi: 10.1108/07378831111174387

43. PRITI JAIN (2012). *An Empirical Study of Knowledge Management in University Libraries in SADC Countries.*_ New Research on Knowledge Management Applications and Lesson Learned, Huei-Tse Hou (Ed.), ISBN: 978-953-51-0073-7, InTech, Available from: http://www.intechopen.com/articles/show/title/an-empirical-study-of-knowledge-management-in-university-libraries-in-sadc-countries.

44. ROBBINS, Stephen P. (2008). Organisational Behavior. (12th ed.).Prentice Hall, New Saddle River.

45. ROGERS, E.M. (2003). *Diffusion of innovations* (5th ed.). New York: Free Press.

46. SARRAFZADEH, M., MARTIN, B. & HAZERI, A. (2010). *Knowledge Management and Its Potential Applicability for Libraries.* Library Management, 31(3): 198-212.

47. SHARMA AJAY KUMAR, (2010). *Knowledge management and new generation of libraries information services: A concepts.* International Journal of Library and Information Science Vol. 1(2) pp. 024-030, Available online http://www.academicjournals.org/ijlis

48. SHARMA, DHARA AND DIPTI RANJAN SAHOO. (2014). *Application of Mobile Technology in Library Services: An Overview.* International Journal of Information Technology and Library Science. ISSN 2349-235X Volume 3, Number 1 (2014), pp. 17-24. http://www.ripublication.com

49. SCHMIDT, ERIC AND ANTHONY HA (2010) *Google's 'mobile first' attitude, weaknesses", Mobile Beat.* Retrieved at 15 June 2015 http://venturebeat.com/2010/04/12/eric-schmidt-mobile-first

50. TIKO IYAMU, (2013). *Understanding Mobile Technology for Service Delivery in Academic Library: Issues in Information Systems* Volume 14, Issue 2, pp.71-78.

51. TRAINOR, C. (2010). *Planning for a Mobile Site: Six Steps for Going Mobile at Your Library*. *American Libraries*, *41*(4), 26.

52. VISWANATH Venkatesh, James Y. L. Thong, Xin Xu. (2012). Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. MIS Quarterly, 157-178.

53. VOLLMER, TIMOTHY. (2010). *There is an app. for that: Libraries and mobile technology. An introduction to public policy considerations.*

54. WANKEL, L. AND BLESSINGER, P. (2012). *New Vistas in Higher Education: An Introduction to Using Social Technologies. Cutting-edge Technologies in Higher Education*, [online] pp.3-16. Available at: http://dx.doi.org/10.1108/s2044-9968(2012)000006b003 [Accessed 10th May. 2015].

55. WASHBURN, BRUCE. 2011. *Library Mobile Applications: What Counts as Success?* Information Outlook15,1(January/February). Pre-print available online at: http://www.oclc.org/research/publications/library/2011/washburn-io.pdf

56. *7 things you should know about QR codes.* http://www.educause.edu/ir/library/pdf/ELI7085.pdf/ (accessed on 22 June 2015).

57. Yana Hendriana. (2015). *Development of Mobile Library Application Based on Android in Universitas Ahmad Dahlan:* International Journal of Innovative Research in Science, Engineering and Technology, Vol. 4, Issue 3, March 2015.

DATA COLLECTION INSTRUMENTS TO BE USED DURING THE PROJECT

APPENDIX 1: QUESTIONNAIRE

DATA COLLECTION INSTRUMENTS TO BE USED DURING THE PROJECT

APPENDIX 2: QUESTIONNAIRE

AN INVESTIGATION OF LIBRARY USER PERCEPTIONS AND BEHAVIORAL INTENTIONS TOWARDS MOBILE PHONE-BASED LIBRARY SYSTEM.
QUESTIONNAIRE TO BE ADMINISTERED AT ISLAMIC UNIVERSITY IN UGANDA

Introduction

Thank you for agreeing to fill out the questionnaire. My name is Nakku Christine a student at Uganda Martyrs University (UMU) Nkozi, I would like to conduct an investigation of library user perceptions and behavioral intentions towards mobile phone-based library system. The questionnaire that you have agreed to fill out is an important part of a project which will be used partly as my dissertation but also to enhance the business functions of IUIU Library as a whole. Please do not hesitate to seek clarification where questions are not clear or need elaboration from me on 0701 580356. Your participation is voluntary and your academic records at IUIU will not be affected if you do not participate in the survey. The information you provide will remain **STRICTLY CONFIDENTIAL**. The survey responses will be aggregated and only a summary will be reported. The results will be used only for research purposes to determine how the current system works, and the state of library services at IUIU. Please provide as accurate and honest an answer as possible to each question. Thank you for your time and cooperation.

1) What is your occupation?

a. Student. Please specify year ……..
b. Lecturer
c. Administrative staff
d. Librarian or Library staff

Other (please specify)

If you selected other, please specify

……

2) What is your sex? Please tick the most appropriate.
   a) Male
   b) Female
3) How often do you visit the library?

1. Once a day
2. Sometimes
3. Once a week
4. Rarely
5. Less than once a week
6. Never used

7) To what degree do you use your Internet enabled mobile device for the following activities?

a) Always
b) Frequently
c) Occasionally
d) Rarely
e) Never
f) Social networking

Reading content (e.g., e books, articles, etc.)

Getting news alerts……..……..

Accessing email…….

Text messaging……..

Searching for information……..……..…..

Getting directions……..……...…..

Uploading content…….

Playing games……..…...

Listening to music or watching videos……..……..…..

Completing coursework or participating in lectures…….….

8) Please name the program(s) or application(s) you use to do the following.

Social networking

……

Reading content (e.g., e books, articles, etc.)

……

Accessing email

……

Searching for information

……

Text messaging

……

Getting directions

……

Getting news alerts

……

Uploading content

……

Playing games

……

Listening to music or watching videos

……..

Completing coursework or participating in lectures

……

9) When and where do you find yourself using your mobile device? (Please briefly describe the situations / environments in which you use it.)

……

……..

10) What library/academic information or resources would you like access using your mobile device? Please tick all that apply.

a. View library hours
b. Ask a librarian a question
c. View library contact information
d. Search library catalog

e. Request an item through interlibrary loan
f. Find out about library events
g. Search library databases
h. View locations of call numbers within the library
i. View library shelf locations
j. Renew library items
k. Other (please specify)

If you selected other, please specify

……

……

……..

Additional comments

……

……

11) Do you encounter any barriers (e.g., authentication/password requests) when trying to access library items (e.g., articles) using the ERP Library module? If so, how would you describe your experience?

a. I am able to get to the items easily.
b. I am able to get to the items, but it's a somewhat frustrating/annoying process.
c. I am able to get to the items, but I avoid having to do this because the process is so painful.
d. I have tried, but I have not been able to get to the items.
e. I have not tried to access library items from my mobile device.
f. I don't know./I don't remember.

Additional comments

……

……

12) What do you appreciate the most about using applications and/or the Internet on your mobile device?

……

……

……

……

13) What is the most frustrating thing about using applications and/or the Internet on your mobile device?

……

……

……

……

17) **For the following questions circle the most appropriate for you**

Mobile phone performance expectancy

a. I find mobile Internet useful in my daily life.
b. Using mobile Internet helps me accomplish things more quickly.
c. Using mobile Internet increases my productivity.

Library user Effort Expectancy

a. Learning how to use mobile Internet is easy for me.
b. My interaction with mobile Internet is clear and understandable.
c. I find mobile Internet easy to use.
d. It is easy for me to become skillful at using mobile Internet.

Social Influence of mobile devices on users

a. People who are important to me think that I should use mobile Internet.
b. People who influence my behavior think that I should use mobile Internet.
c. People whose opinions that I value prefer that I use mobile Internet.

Facilitating Conditions for library users to use mobile devices

a. I have the resources necessary to use mobile Internet.
b. I have the knowledge necessary to use mobile Internet.
c. Mobile Internet is compatible with other technologies I use.
d. I can get help from others when I have difficulties using mobile Internet.

Hedonic Motivation

Using mobile Internet is fun.

Using mobile Internet is enjoyable.

Using mobile Internet is very entertaining.

Price Value for mobile devices

a. Mobile Internet is reasonably priced.
b. Mobile Internet is a good value for the money.
c. At the current price, mobile Internet provides a good value.

Habit

a. The use of mobile Internet has become a habit for me.
b. I am addicted to using mobile Internet.
c. I must use mobile Internet.

Behavioral Intention

a. I intend to continue using mobile Internet in the future.
b. I will always try to use mobile Internet in my daily life.
c. I plan to continue to use mobile Internet frequently.

Use

Please choose your usage frequency for each of the following:

a) SMS

b) MMS

c) Ringtone and logo download

d) Java games

e) Browse websites

f) Mobile e-mail

Note: Frequency ranged from "never" to "many times per day."

THANK YOU FOR TAKING TO TIME TO COMPLETE OUR SURVEY!

APPENDIX 2: INTERVIEW QUESTIONS

LIBRARY MANAGEMENT SYSTEM ENHANCED WITH MOBILE TELEPHONE TECHNOLOGIES (LMS-EMTT) INTERVIEW GUIDE TO BE ADMINISTERED AT ISLAMIC UNIVERSITY IN UGANDA FEMALES' CAMPUS KABOJJA, WAKISO

1) Do you own a cell phone or other mobile device with email capabilities, Internet connection, and the ability to add applications?
2) How do you think you will be using your mobile device in the future? Are there university applications you'd like to see on your mobile device?
3) Tell me about an instance when you used you mobile phone/device to locate information that is of a personal interest
4) How do you feel about using your own cell phone or other mobile device to search for Information related to your research or communicate with the librarian?
5) Tell me about an instance when you tried to use your mobile phone or mobile device to help you in academic research?
6) What are the other situations where you might use your cell phone/mobile device to help support your academic research?
7) Tell me about a situation where you used texting or social networking service on your cell phone or mobile device to communicate with the librarian.
8) What are some situations where you might want to use your cell phone or other mobile device to access information from a library?
9) What device features would be important to your deciding to use your cell phone or mobile device for research?
10) Is there anything that makes you reluctant or unwilling to use your cell phone or mobile device for scholarly research?
11) How easy or difficult would you find learning to use a mobile device for information seeking?

For example, learning how to use mobile applications for learning, Internet searching, or other uses you might have?

12) In general, how helpful or supportive have your lecturers been in your use of mobile devices for library research?

Can you provide me with an example of how an instructor has encouraged/discouraged its use?

13) What IT services do you use on your phone? For example, Portal, email, blackboard, registration, course look up, counseling and any others you may be aware of.
14) Tell me about how you utilize your phone functions to manage your library research.
15) What advice would you give university administrators who are keen to encourage the effective use of mobile telephone applications in accessing library information?

APPENDIX THREE: SUPPORT PLAN

Being a newly introduced technology that is a library mobile based system, support would be inevitable to the users because it is assumed that they would need it to feel more comfortable in using the system and would also contribute to user satisfaction. On-going support would be the responsibility of both the developer and the library team where they will be responsible for providing continued system support, maintenance and upgrades, and also the day-to-day running of the system respectively. The support will be provided in the following ways;

1. Online support for example use of email, phones
2. Library reference desk
3. System user manuals
4. Recorded tutorials

APPENDIX FOUR: BUDGET PLAN

S/N.	Budget Item	Amount	Subtotal
1.	Personnel Expenses		
	Allowance for (2) Research assistants.	10,000/-@ for 20 days	400,000/-
	Meals per day	5,000/-@ for 20 days	200,000/-
	Total Personnel Expenses		**600,000/-**
2.	Stationary and Printing		
	Interview guides	50 * 200/-	10,000/=
	Writing CDs	3 * 5,000/-	15,000/=
	Printing draft report	150pages * 500/-	75,000/-
	Printing reports	150pages * 3 * 500/-	225,000/-
	Binding reports	3 reports * 5,000/-@	15,000/-
	Total costs		**340,000/-**
3.	Transport		
	Researcher & Research assistants	5,000/- * 3 * 20 days	300,000/-
	Total costs		**300,000/-**
	Grand Total		**1,240,000/-**

APPENDIX FIVE: SAMPLE CODES USED IN DESIGNING THE SYSTEM

Sample code for asynchronous task that checks if the server is online or not before sending library data to the database. Sample code for sending login credentials to the database and getting a response

```
class pingtask extends AsyncTask<String, Void, String> {

    /**
     * Before starting background thread Show Progress Dialog
     * */
    @Override
    protected void onPreExecute() {
        super.onPreExecute();
        pDialog1 = new ProgressDialog(resultsActivity.this);
        pDialog1.setMessage("Checking server connectivity");
        pDialog1.setIndeterminate(false);
        pDialog1.setCancelable(true);
        pDialog1.show();

    }
    protected String doInBackground(String... args) {


        InetAddress in;
        in = null;

        try {
            in = InetAddress.getByName("192.168.1.4");
        } catch (UnknownHostException e) {
            // TODO Auto-generated catch block
            e.printStackTrace();
        }

        try {
            if (in.isReachable(5000)) {

                mytoken=1;
            } else {
                mytoken=2;

            }
```

```
class mylogin extends AsyncTask<String, Void, String> {

    /**
     * Before starting background thread Show Progress Dialog
     * */
    @Override
    protected void onPreExecute() {
        super.onPreExecute();
        pDialog = new ProgressDialog(getActivity());
        pDialog.setMessage("user Loging in ..");
        pDialog.setIndeterminate(false);
        pDialog.setCancelable(true);
        pDialog.show();

    }

    /**
     * user login
     * */
    protected String doInBackground(String... args) {
        //String login_name=args[0];
        String login_email=useremail;
        String password=pword;


        // Building Parameters
        List<NameValuePair> params = new ArrayList<NameValuePair>();
        params.add(new BasicNameValuePair("login_name", login_email));
        params.add(new BasicNameValuePair("password", password));


        // getting JSON Object
JSONObject json = jsonParser.makeHttpRequest(url_login, "GET", params);
        Log.d("Create Response", json.toString());
```

Sample code for the class showing a list of library users as stored in the database to be displayed on the android app

```java
package com.libs.libmaster;

public class usersitem {
    private String name;
    private String location;
    private String contact;


    public void setlocation(String location) {
        this.location = location;
    }

    public String getlocation() {
        return location;
    }

    public String getname() {
        return name;
    }

    public void setname(String name) {
        this.name = name;
    }

    public String getcontact() {
        return contact;
    }

    public void setcontact(String contact) {
        this.contact = contact;
    }
}
```

Sample code that is executed when a menu item is selected

```
@Override
public boolean onOptionsItemSelected(MenuItem item) {

    if (item.getItemId() == android.R.id.home) {

        if (mDrawerLayout.isDrawerOpen(mDrawerList)) {
            mDrawerLayout.closeDrawer(mDrawerList);
        } else {
            mDrawerLayout.openDrawer(mDrawerList);
        }
    }

    return super.onOptionsItemSelected(item);
}

// The click listener for ListView in the navigation drawer
private class DrawerItemClickListener implements
        ListView.OnItemClickListener {
    @Override
    public void onItemClick(AdapterView<?> parent, View view, int position,
            long id) {
        selectItem(position);
    }
}
```