



**The preparedness of University of KwaZulu-Natal (UKZN)
libraries to implement and use mobile phone technology in
the provision of library and information services**

by

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DECLARATION

I, Irene Shubi Isibika, declare that

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ATHOL LEACH
Name of Supervisor

Signature

DEDICATION

I dedicate my work to my lovely and supporting parents, Robert and Lucy Isibika and the entire family. Thank you so much for your encouragement and the extra push, support, love and most of all prayers during this whole time.

ABSTRACT

The study investigated the preparedness of University of KwaZulu-Natal (UKZN) libraries to implement and use mobile phone technology in the provision of library and information services. This investigation included the factors which could influence and impact technology adoption. It is imperative that libraries respond to changes in technology in terms of the provision of their services. A recent development has been the emergence and proliferation of mobile phone technology and it is the adoption and implementation of this technology by academic libraries in the provision of services that concerned this study. The significance of this study lies in its adding value to the little knowledge out there by improving our understanding of the challenges and opportunities associated with mobile technology in an academic library context.

In terms of the methodology, the study used a quantitative approach and survey design. Data was collected from a total of 30 staff members working in libraries on the UKZN Pietermaritzburg and Howard College campuses. A self-administered questionnaire that consisted of both open and closed questions was used to collect the data. The research questions which underpinned the study can be summarised as follows: what mobile phone technology is and what it comprised of in this research context, what skills the staff required to be able to provide library and information through mobile phone technology, and finally, what technological, organizational and environmental factors could influence the implementation of this technology in the libraries concerned. The Technology Organisation and Environment Framework (TOE) was used as the framework to guide the study. The data collected was analysed using SPSS and the findings were presented in the form of tables, bar graphs, pie charts and text.

Interpretation of the findings revealed that the staff of the libraries were in the main positively predisposed to mobile technology, with many of them having Internet enabled mobile phones and the skills to do some of the tasks associated with the provision of library and information services via the technology. The technological, organizational and environmental factors identified and investigated were such that the libraries could be regarded as sufficiently

prepared for the introduction of mobile phone technology in the provision of services. Funding or budgetary constraints, however, were identified as the main constraint.

Recommendations were made based on the finding of the survey and the literature review and these relate to funding concerns and the implementation and usage of mobile phone technology to the advantage of the libraries.

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LIST OF ACRONYMS AND ABBREVIATIONS

3G	Third Generation
CAMFED	Campaign for Female Education
CDMA	Code Division Multiple Access
CSIR	Council for Scientific and Industrial Research
GSM	Global System for Mobile
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
ICT	Information and Communication Technology
ID	Identity Document
IDT	Innovation Diffusion Theory
IRV	Interactive Voice Response
ISBN	International Standard Book Number
IT	Information Technology
IYF	International Youth Foundation
LAN	Local Area Network
LIS	Library and Information Science
MILS	Millennium Integrated Library System
MIT	Massachusetts Institute of Technology
mLEARNING	Mobile Learning
MOPAC	Mobile Online Public Access Catalogue
NTHU	National Tsing-Hua University
NTU	National Taiwan University
ODL	Open Distance Learning
OPAC	Online Public Access Catalogue
OS	Operating System
PC	Personal Computer
PDA	Personal Digital Assistant
PDF	Portable Document Format
QR	Quick Response

SMS	Short Message Service
TAM	Technology Acceptance Model
TOE	Technology, Organization and Environment
TV	Television
UJ	University of Johannesburg
UK	United Kingdom
UKZN	University of KwaZulu-Natal
UNISA	University of South Africa
USA	United States of America
WAP	Wireless Application Protocol
WEBPAC	Web Public Access Catalogue
WML	Wireless Markup Language

CHAPTER ONE

INTRODUCTION TO THE STUDY

1.1 Introduction

This Chapter provides the background to the study and an outline of the research problem. The research objectives and questions, significance of the study as well as scope and delimitations of the study follow. The theoretical framework and the research methodology used in the study are then briefly delineated and the structure of the thesis outlined.

1. 2 Background to the research problem

UKZN is situated in the KwaZulu-Natal province in South Africa. It has a total of five campuses namely, Edgewood, Howard College, Medical School, Pietermaritzburg (PMB) and Westville campuses.

The UKZN Library network comprises 19 libraries. All library collections are accessible via an online catalogue even though some of the services such as borrowing of library material are done in person, that is, physical presence in the library by the borrower. This study focused on the PMB and Howard College campus libraries. They are: the Cecil Renaud Library, Life Sciences Library, Law Library, EG Malherbe Library, GMJ Sweeney Law Library, Eleanor Bonna Music Library and the Architecture Library.

Information provision and access is progressively shifting away from a Web-based online setting into the mobile environment. Ally and Needham (2010) affirm that different sectors of society are using mobile technologies to reach customers and members of society. For example, mobile banking is allowing people to conduct their banking transactions anywhere and anytime using mobile technology which in turn allows for real time business to take place that benefits both the customers and banks. This technology is also seen in mobile shopping where people are able to shop from anywhere and at anytime. They are able to compare prices and quality of different

commodities using mobile technology before deciding where to purchase their goods. There is also mobile government which gives citizens access to government information on their mobile phones (Ally and Needham 2010). What has also emerged are libraries whose services can now be accessed using mobile phone technology where teachers and learners have a “library” in their pockets to access information anytime and anywhere. This speedy diffusion of mobile technology particularly among students and teenagers has clearly brought several opportunities for business, social and educational services with the latter including libraries.

While most libraries, museums, and cultural institutions are providing the now traditional web-based Online Public Access Catalogues (OPACs), some have begun to move a step further and set up dedicated mobile access applications as well (Li 2013). This can be as simple as sending text message alerts about reservations becoming available, overdue books and the charges incurred on overdue books, or as complex as library mobile applications which allow readers to access full e-books and e-journal articles through their library subscriptions on any mobile device (Mills 2009). Even though the use of mobile technologies to support and enhance access to learning presents challenges to individuals and educational institutions in design and development, academic libraries are well positioned to meet these challenges (Saravani and Haddow 2011).

In most countries outside of Africa, citing the examples of the United States of America (USA) and the United Kingdom (UK), hardware and Internet infrastructure are well-established and mobile devices are everywhere, thereby making library services using mobile devices appear an easy mission. In a recent study undertaken in South Korea, more than 70 universities are using “Mobile Campus”. Mobile Campus provides users with easy access to academic administration, library services, email, and news and much more at a glance with easy to read visuals and one click access from their mobile phones (Choi 2009). Users can get alerts on many kinds of mobile devices and only need a user ID.

Whereas we see much has been done in developed countries outside Africa regarding implementation of mobile technology in academic libraries, many African countries are still struggling to implement information and communication technologies (ICTs) at large. In Africa, South Africa is at the forefront in the implementation of both ICTs in libraries and mobile technology in academic libraries with the University of Johannesburg and University of South

Africa at the forefront. These universities are using the AirPac software to cater to their library users' needs through their mobile phones. Library information services such as searching the library website, managing patron records, requesting learning materials and searching certain databases are some of the services offered by the University of South Africa Library (Mbambo-Thata 2010).

Nicholson's (2011) observation is that instant messaging seems to be more attractive to teenagers than communicating via short message service (SMS) or email, as they enjoy real time communication instead of waiting for a later response. With this said, it is then crucial to have this real-time or immediate communication from the mobile phone technology library applications to ensure that the users receive the requested information without any delays. These applications provide for convenient and timely access of information to users from the comfort of their own homes, offices and wherever they are with their mobile phones provided there is an Internet connection (Mtshali 2011).

The central role of librarians is to provide access to information and effective delivery of information services. Mobile technologies have added another characteristic to this role – one that involves new abilities, skills and knowledge to make certain that the needs and expectations of users are met (Saravani and Haddow 2011). However, it is important to recognize that it is not just about providing library and information services to users on their mobile phones, but making sure that those services being provided are meeting the users' information needs. If libraries are to be successful in developing services for mobile technologies, their managers will have to consider the following factors/issues that make it possible to have these technologies running. These are environmental, organizational and technological factors. These factors are contained in the research questions and will be elaborated on in Chapter two.

It is then a question of whether the UKZN PMB and Howard College libraries have those factors/conditions in place to enable them to make use of these mobile phone technologies.

1.3 Problem statement

The researcher has observed no usage of mobile phone technologies in the provision of library services in the UKZN PMB libraries. Even though the use of mobile technology in libraries has been implemented in a number of academic institutions particularly overseas, the libraries of UKZN still use a computer automated system with the SIRSI application to deliver its services to its users. Today's challenge is bringing mobile specific services to smartphones, e-Book readers and tablets to users on the go who now view more information on mobile devices than desktop and laptop computers (Nyofane and Kovatcheva 2012).

Given the above, the purpose of this study was to investigate the implementation and usage of mobile technologies in the provision of library services in UKZN libraries with the aim of improving delivery of library services and ultimately maximizing the usage of these libraries. As pointed out by Nicholson (2011), mobile technology provides huge potential for research, learning and teaching purposes and the question which this study attempted to answer was whether UKZN libraries are prepared, and are in a position, to take advantage of this potential to implement and use this technology to provide library and information services.

1.4 Research questions

The main research question for this study is:

To what extent are the University of KwaZulu-Natal PMB and Howard College libraries prepared to implement and use mobile phone technologies in provision of library and information services?

The sub-questions are as follows:

- What is mobile technology and what does it comprise of in this research context?
- What skills do the staff require to be able to use this technology to provide library and information services to the users?

- What technological factors can influence the implementation of mobile technology in the UKZN Pietermaritzburg and Howard College libraries?
- What organizational factors can influence the implementation of mobile technology in the UKZN Pietermaritzburg and Howard College libraries?
- What environmental factors can influence the implementation of mobile technology in the UKZN Pietermaritzburg and Howard College libraries?

1.5 Scope and delimitations

In doing research it is important to show what it covers and how much it covers as boundaries are essential in a study to provide direction. The study focused on the library staff of UKZN PMB and Howard College campus libraries only. These consisted of staff that had professional library qualifications and those that did not. This population was chosen on the basis that these staff were in the best position, by virtue of their expertise, to provide relevant information on the issues being investigated. Arguably, they would also be the staff most involved in the provision of library and information services via mobile technology. The library and information services considered in the study were: searching the library website, managing patron records, requesting learning materials, issuing and returning library materials, searching databases for material, asking a librarian, interlibrary loan services, academic reserves and information retrieval and reference services. The mobile phone technology that this study examined was the AirPac software that enables the integration of websites into small screens such as those on mobile phones. This study was also only focused on mobile phone technology, that is, cell phones and not any other mobile devices for example personal digital assistants (PDAs), iPads and palmtops. Finally, the study was limited to PMB and Howard College campus libraries only. This was due to both time and financial constraints as well as to the nature of a short dissertation. Including all the library staff from libraries on the other three campuses would have been too costly in terms of both time (one semester) and finance (limited). Travel costs (the research instrument was personally distributed to respondents on the PMB Campus to assist in ensuring an adequate response rate) involved in visiting all the libraries of the five campuses were beyond the means of the researcher.

1.6 Significance of the study

According to Vyas (2011), mobile technology usage in the provision of library and information services in an academic context is increasingly popular with its users and provides a research topic as it is a fairly new area to the learning environment particularly in the South African context. Research in this field has given rise to major learning developments and further research is required to shed more light on the applications of mobile technology in academic institutions. The researcher has noted the lack of existing research about this new development, that is, mobile technology in academic libraries especially in Africa and thus among the many purposes of this study one was to add to the knowledge already out there by understanding the challenges and opportunities associated with mobile technology in an academic library context.

The practical benefits of the study were both professional and academic. Academically, this study, should it prepare the way for the adoption and implementation of services via mobile technology, will have an impact on the ways in which students and academics use the services of the library as these services will be at their disposal anytime and anywhere through their mobile phones and therefore assist in maximizing library usage. Professionally, the study will help library staff and management gain a better understanding of the dynamics associated with the implementation and use of mobile technologies in the provision of the various academic library services.

Although mobile technology in libraries is still a new concept, it can fully be applied to the advantage of teachers and learners of today and specifically to UKZN. This is because, as will be outlined, UKZN has the advantage of an adequate ICT infrastructure at its disposal. It is a well-established University in terms of buildings, network connectivity and resources.

1.7 Theoretical framework

The purpose of the study was to investigate how mobile technology can be implemented and used in the PMB and Howard College campus libraries to enhance the services they provide. This study was supported by the Technology, Organization and Environment (TOE) framework. To study the adoption of technological innovations, Tornatzky and Fleischer (In Lippert and

Govindarajulu 2006) developed the TOE framework to describe the factors that determine an organization's adoption decision. This TOE framework emphasizes that three principle contexts – technological, organizational, and environmental – influence the process by which an organization implements and accepts a new technology. This framework was chosen because it fully explains and gives some understanding of factors that could influence the implementation and usage of mobile technologies in the PMB and Howard College campus libraries. Since this study was looking at the implementation of this technology from the library perspective, this model was then seen as suitable to provide a basis for the set research questions. The model is discussed in more detail in the following Chapter (Chapter two).

1.8 Research methodology

Mamabolo (2009) defines methodology as ways of “obtaining, organizing and analyzing data”. The research paradigm used in this study was the positivist paradigm that supported the quantitative research approach that was used. The research design used in the study was the survey and this is because as articulated by Neuman (2003:89), survey research involves collecting data through asking questions either using self-administered questionnaires or interviews. Surveys are useful because they help in collecting data in a relatively cheap way (Maree 2007:157). The target population for the study was the staff at the PMB and Howard College campus libraries. The total number of the staff stood at 60. Twenty one of them were on the PMB Campus and 39 on the Howard College Campus. Since the total number of the population was relatively small, the study made use of the entire population and hence the census sampling technique was adopted. Research Observatory (2013) states that where the potential population is small, it is often feasible to undertake a census to ensure that all their views are represented.

A two-pronged method of data collection was adopted. These methods were the search for and review of the relevant literature and the use of a self-administered questionnaire. This questionnaire contained both open-ended and closed questions. The search for relevant literature enabled the researcher to find out what else had been done in relation to the problem being studied and makes repetition of existing studies less likely. A total of 30 questionnaires were

completed and returned by the library staff. Since the questionnaire had both open-ended and closed questions, a mixture of data analysis techniques was used. For open-ended questions in the questionnaire, thematic content analysis was used to analyze the collected data. For the closed questions, the study adopted SPSS to analyze and interpret the collected data. The full research methodology is discussed in Chapter three below.

1.9 Structure of dissertation:

Chapter One - Introduction to the study

The Chapter comprised of the background to the study, research problem, significance of the study, research questions, scope and delimitations, theoretical framework and research methodology.

Chapter Two - Literature review and theoretical framework

This Chapter consists of the review of relevant literature pertaining to the study and the theoretical framework underpinning the study.

Chapter Three - Research methodology

This Chapter discusses the issue of the research methodology. The research paradigm, approach and design that were adopted are discussed. The population of the study, sampling, data collection and analysis and the ethical clearance are also brought forward in this Chapter.

Chapter Four - Presentation of the results

This Chapter presented the research findings from the library staff of the PMB and Howard College campus libraries. The findings, obtained from the questionnaire, are presented in form of graphs, pie charts and tables.

Chapter Five - Discussion of results

This Chapter discusses and analyzes the findings of the study.

Chapter Six - Conclusions and recommendations

In this, the concluding Chapter, the major findings and conclusions relating to the findings will be presented and made. This will be followed by recommendations emerging from the conclusions, and suggestions for further research.

1.10 Summary

The study aimed to investigate the preparedness of University of KwaZulu-Natal libraries to implement and use mobile phone technology in the provision of library and information services. The research process was described as was the problem statement, significance of the study, scope and delimitations and methodology. The existing literature which helped to inform the study was introduced as well as the theoretical framework underpinning the study. Finally, the structure of the study was provided. In the following Chapter the literature pertaining to the study is reviewed and the theoretical framework underpinning the study is described.

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

This Chapter comprises both the related literature concerning mobile phone technology and its use in the provision of library and information services as well as the theoretical foundation on which the study is based. The Chapter is organized according to the research questions the study aims to answer and is divided into six sections. Section one discusses mobile technology and what it comprises in this research context. The second section addresses mobile technology adoption in a learning environment. Usage of mobile phone technology specifically in academic/university libraries together with the specific software used is discussed in the third section. The fourth section will look into the academic library services and UKZN. The fifth section will discuss the theoretical framework used to underpin this study, that is, the TOE Framework introduced in the preceding Chapter. Finally, this Chapter is summarized in section six. Where appropriate, the literature is reviewed from the global perspective, to the African context and finally down to South Africa. Sources consulted include published and unpublished articles, online conference papers and published books in both hardcopy and electronic format.

2.2 Mobile technology

Liang et al. (2007) define mobile technology as “referring to any communications, either direct or indirect, via mobile devices, such as phones or personal digital assistants” (PDAs). For the purpose of this study, the definition of mobile technology was narrowed and referred to mobile phone technology only. Liang et al. (2007) state that the most important features of mobile technology are “mobility and portability”. The researcher agrees with this statement in that the flexibility of communicating with another person irrespective of geographic locations and being able to do so at your own convenience are the main features of mobile technologies. Mobile technology is the ability to access services ubiquitously, on the move, and through wireless networks and various devices. Mobile technology is being used by people to conduct everyday

business and to accomplish everyday tasks. The technology is changing the way people work, learn, conduct business and access information (Ally and Needham 2012:2).

There are various types of mobile technologies. They are categorized according to generations in which they came about. Sharon (2009) described these technologies as:

1G is the first generation mobile technology that had analog devices. 2G was the second generation technology that had digital devices. These devices could transmit both voice and limited data over the internet. 3G was the third generation that had its devices allowing voice and unlimited broadband data with high speed. It also allowed streaming video.

Mobile technologies are characterized by their small size and portability (Aharony 2012). These technologies change the way people communicate since they provide many options on a single device. Examples of such options are information searching and retrieval, information sharing and dissemination, instant messaging, phone calls and so on. However one cannot ignore some of the limitations to using this technology like low storage memory for some mobile phones, the mere fact that a mobile phone screen maybe too small to use for reading purposes and battery life may not be long enough to support long usage of the phone. Aharony (2012) noted that an ever-increasing number of people worldwide access the Internet through their mobile devices daily in order to read and send emails, check the news and weather, do their banking and access social networks such as Facebook and/or Twitter. The social networking capability is one great feature that is leading to the increased use of these technologies.

For Internet use through a mobile phone, one needs to have access to mobile broadband. According to Windows (2013):

Mobile broadband technology, also called wireless wide area network technology, provides wireless high-speed Internet access through portable devices. With mobile broadband, you can connect to the Internet from any location where there is Global System for Mobile (GSM) or Code Division Multiple Access (DMA) based cellular service available for mobile Internet connectivity. With mobile connectivity, you can maintain your Internet connection even as you move from place to place.

A report by the Broadband Commission (2012) said that worldwide mobile phone subscriptions exceeded six billion by early 2012 with three-quarters of those in developing countries. This Commission also noticed that as the price of mobile phones falls and their functionality increases, soon a huge number of people will hold devices with higher processing power than the most powerful computers from 1980s.

Walsh (2012:XIII) says that the world of mobile technology has changed enormously during the last few years but mobile phones and mobile computing are not new. However, if we look at how these technologies have been approved and used within libraries, for example with regard to Internet usage, it is worrying how little these technologies are being put to use. Walsh (2012:XIII) goes on to state that “mobile phones now seem to be a near-ubiquitous technology”. For example as of the year 2011, there were more mobile phone contracts in UK than there were people, and, in the whole world there were 5.9 billion mobile phone subscriptions and 79% of the population in the developing world owned mobile phones (International Telecommunication Union 2012). In South Africa alone, as of the year 2011, there were 64 million mobile-cellular telephone subscriptions and 126.83 mobile-cellular telephone subscriptions per 100 inhabitants (International Telecommunication Union, 2012). Walsh (2012:2) also noted that an incredible 4.1 billion SMS messages were sent daily during the first half of 2009. This surely shows how important this device is in people’s lives, the amount of opportunities available for organizations, and the extent to which when properly used, mobile phone technology can be used to improve the service delivery in organizations.

Technologies which are connected to the mobile revolution and societal wants are influencing the next frontline of the knowledge age and economy (Mtshali 2011). Ally and Needham (2010:3) observed that “for every personal computer in a developing country, there are approximately four mobile phones and that although many of these are likely to be older or low-end models, today’s high-end devices have the equivalent processing power of a personal computer (PC)” (Ally and Needham 2010:3). The margin between mobile phones, hand-held game consoles, entertainment devices and personal computers is increasingly becoming blurred with devices such as Blackberry, Symbian-driven and Android operating smartphones and GPS-enabled mobile phones breaking new ground. This is not the limit as technology continues to

advance at a remarkable pace opening new opportunities that many people would only have dreamt of.

Mtshali (2011) indicated that there are many mobile technologies, that is, applications and devices that can be used for teaching and learning in the academic environment. These application and devices are intended to improve both teaching and learning, transmit administrative data and learning modules wirelessly as well as enable faster and better communication between educators and learners (Mtshali 2011). Considering these mobile devices and their influence on our daily life, the question we should then ask is whether those in the Library and Information Science (LIS) community (for example, librarians and students) are ready to adopt, implement and use mobile phones to deliver library services.

2.2.1 Mobile devices

A mobile device which is also referred to as a handheld device or small computer is a pocket-sized computing device typically having a display screen with touch input and/or tiny keyboard (What is a mobile device 2013). It is seen as an addition to the human body that is used for communication between people (Mtshali 2011). The latest mobile devices come with either a full touch display screen, a half touch with a miniature keyboard or a non-touch display screen with a miniature keyboard.

There are many types of mobile devices, the commonest among them being mobile phones, smartphones, PDAs, pagers and personal navigation devices. For this study, only the mobile phones and smartphones (which fall under mobile phones) were considered. Examples of these mobile phones and smartphones are, HTC, Samsung, LG, Blackberry, Sony Ericsson and iPhone. Today's mobile devices are as "connected" and powerful as any laptop or PC and this attracts people to own and use a mobile phone because one can perform so many functions on it instead of having to own both a mobile phone and a PC or a laptop.

Computer technologies are not limited to desktop and office settings as they were before. Cell phone towers ensure easy mobility of users and devices which in turn have changed the way things are done nowadays (Walsh 2012: 33). One can now no longer ignore the fact that it is no longer a luxury to own a mobile phone but a prerequisite as these devices have been used to alert people of important functions such as interviews and emergencies (Walsh 2012:33). Use of

mobile phones range from the mobile phone's simple inbuilt applications such as the calculator to more complex uses like broadcasting slide shows and streamlining other media (Hellstrom 2010). Apart from the basic function of communicating with people for which these devices were made in the first place, the researchers experience with using different mobile phones, specifically smartphones, shows that these devices have a selection of other functions that they perform. For example, they are used to access information resources anywhere and anytime, they can also record data and live stream different events which ensure up-to-date information recording, and they are personal assistants to the owner of the phones in such a way that people are able to synchronize data from the phone together with their PCs. This functionality is very useful because it can act as a reminder to different meetings and functions that otherwise would have been done by either a dairy or a personal secretary.

Crucially, in terms of the current study, mobile phones are now used as learning devices where different learning materials can be accessed and read. With smartphones for example, there is an application that allows the mobile phone to read Portable Document Format (PDF) documents. Students can then download these documents from their emails and read them anywhere and anytime. The researcher thinks this is advantageous as compared to the traditional way of accessing these documents through desktops or laptops which can be cumbersome to busy students who do not have the time to sit in front of a desktop or laptop to access the document (assuming, of course, that they do have access to such technology). With mobile phones however, students can read the document/s anywhere and at anytime (Mtshali 2011). It is evident that these mobile devices can be useful tools for supporting learning and workplace activities and it is to the issue of mobile learning that this review now turns.

2.3 Mobile learning (mLearning)

mLearning is a term used to describe the many possibilities of learning opened up by the convergence of many functions that a single portable mobile device can do, whether it be getting exam results using the mobile phone, downloading learning materials to the mobile device, lecture podcasting via iPods and iPads or structured language games on a Nintendo (a game PlayStation) (Ally and Needham 2010:4).

We are in a mobile generation. Ally and Needham (2012:2) say that mobile technologies can be used to access education especially by people living in developing countries where computers are less available. Mobile devices facilitate learning in many and often unstructured ways all over the world. It is no longer a requirement to be in a certain specific environment to teach and learn concepts (Ally and Needham 2012:2). The use of mLearning has been increasing over the last few years due to the acquisition and development of mobile technology. For example, in Africa people are moving directly to wireless mobile technology thereby bypassing the traditional cable or landline based way of telephone communication. The direct drive to wireless mobile technology provides an excellent opportunity for libraries to reach learners around the world regardless of location (Ally and Needham 2012:2). Mobile chat, mobile wikis, mobile blogs, tweets and social sites like Facebook and YouTube are resourceful tools for mLearning (Hellstrom 2010).

Ally and Needham (2010:4) observed that the learning experience on mobile phones changes vividly if interactivity is included and this is enabled with high Internet bandwidths available. For example, use of video clips to explain procedures, such as how to go about searching an online public access catalogue (OPAC) to find relevant information. However, one cannot ignore the fact that cost of connectivity could be a limiting factor in terms of participation in mLearning, especially for teachers and learners who are not in an institution that already has a strong local area network (LAN) in place.

India has made extensive use of this technology to its full advantage. The country has implemented mLearning services such as language training, mobile reading, adult literacy and vocational training on specific subjects (Ally and Needham 2012: 146). Some of the technologies being used in this are EnableM, Deltics, GCube Solutions and Tata DoCoMo software. Tata DoCoMo is software that:

“Provides an English Seekho service through its mobile portal, Tata Zone. It allows users to take conversational English-language lessons on their mobile phones through an interactive voice response (IRV) application that guides the user through audio clips. It also provides short lessons followed by interactive sessions which allow the users to practice what they have learnt either using a keyboard or speech recognition” (Ally and Needham 2012: 147).

Three other countries, namely the UK, Italy and Sweden, involved themselves in an mLearning project for the hard-to-reach learners in diverse situations. Attewell (2005) reported on this project which was funded by the European Commission's Information Society Directorate General, the project partners and in the UK, the Learning and Skills Council. In his article, "From research and development to mobile learning: tools for education and training providers and their learners", he identified the hard-to-reach learners as those that were economically and educationally marginal. The project involved four years of planning, research and development. It developed learning materials and systems that could be reached via handheld mobile devices and these materials were intended to arouse an interest in learning (Attewell 2005). The materials were also supposed to assist with development of literacy, numeracy and life skills (Attewell 2005). Key findings of the project showed that mLearning has the following advantages:

- It allows for anywhere, anytime personalized learning;
- It can be used to remove some of the formalities involved in the traditional way of learning which may be unattractive and can make learning not fun;
- It can be used to help slow-learning learners to remain more focused for longer periods (Attewell 2005).

In Africa, there are several initiatives that have been started aimed at using mLearning as a means through which education is provided. In Nigeria, for example, there is the eXact Learning Solutions, a company that is "a leading learning content management and digital repository solutions provider and which offers a wide range of tools and services for content development, content management and content delivery" (UK Training Industry Press Releases 2010). Also in Nigeria, the University of Ibadan and the Educational Advancement Center partnered and started the African Mobile Learning Initiative in 2010 (African Mobile Learning Initiative 2010). This initiative was started so as to extend the traditional idea of delivering learning via computers to delivering the required learning materials via mobile phones seamlessly. According to the University of Ibadan, making these learning materials available via mobile phones would benefit administrators, teachers and learners (African Mobile Learning Initiative 2010). These benefits included: the simplicity with which tests, quizzes and surveys could be disseminated and the results gathered and examined, the provision for continuous interactions with the student and teacher and among students themselves, the easy reach of notifications of events, deadlines, class

and exam timetables to the students and, finally, the possibility of accessing books on mobile phones at ten to fifteen percent of the cost of supplying hard copies (African Mobile learning initiative 2010). Such an initiative extends the learning environment provided for the student from that of a classroom to an anytime and anywhere learning situation.

An initiative in Tanzania is that of BridgeIT, locally known as Elimu kwa Teknolojia. This initiative was started by the Tanzanian Ministry of Education and Vocational Training and the International Youth Foundation (IYF). The main aim of this project was to “significantly increase the quality of teacher instruction and student achievement among primary school boys and girls in math, science and life skills by taking full advantage of the power of mobile phone technology” (International Youth Foundation 2013). In this project, teachers downloaded video content using mobile phones, which were connected to televisions (TVs) in their classrooms. This allowed and helped remote schools and communities to access a wide range of locally developed or modified educational content (International Youth Foundation 2013). It is reported by Mlana Penina, an executive Director for the Campaign for Female Education (CAMFED) and a member of the IYF board that BridgeIT had seen significant benefits since its launch in 2007. Since then the project, run by experienced and technical people, had achieved most of its objectives (Educational Technology Debate 2010). This project led to 1000 plus teachers being trained to use the technology including the uploading and downloading of more than 300 videos to use while teaching and improving on student education to a great extent. Cost is always a major challenge to such projects but for this particular project, the cost of operation was low because only a television and a mobile phone were required to have it running under the mobile phone network. Electricity disruptions cannot be ignored as this is a major challenge in Tanzania. But these were overcome by using solar energy to power up the televisions and charge the mobile phones.

The mobile industry in Africa is growing and thriving. It was the second largest mobile market in the world after Latin America with over 620 million mobile connections as of September 2011 and “in the past 10 years, the number of mobile connections in Africa has grown an average of 30% per year and was forecasted to reach over 735 million by the end of 2013” (Africa Mobile Observatory 2011). South Africans have utilized this opportunity and have initiated a mobile learning platform called Dr Maths. This initiative of the Council for Scientific and Industrial

Research (CSIR) Meraka Institute is a mobile tutoring service which allows mathematics learners to “chat” their way to better math results (CSIR 2011). It provides real time support and assistance with mathematics homework and revision. The service, compared to a text-based call center, was initiated in 2007 and has had over 25 000 registered users since then (CSIR 2011). It is quite simple to use as learners are requested to register on Mxit, a social networking site and adding Dr. Math to their contacts. There are online volunteer tutors present from Sundays to Thursdays, between 14:00 and 20:00, who offer real-time support to different mathematical queries. Apart from online real time support, there are additional features available via Dr. Math which can be used by learners when tutors are not online. This includes definitions of mathematical terms such as parabola and definitions of mathematical formulae such as trigonometric identities. There are also games and competitions that are aimed at improving mathematic skills but also provide a fun way for learners to do some mathematics. These, according to the CSIR (2011), have proved to be very successful and popular with learners.

In 2005, the University of Cape Town made use of mobile phones to help administer a number of its courses. This was a trial project to determine the extent to which mobile technology can be used to deliver services at the University. Text messages were sent out to students whenever there were computer network problems, rescheduling and cancelling of classes or when test results became available (Ally and Needham 2010: 10). Even though the initiative was not a success because of the rapid changes in technology and developments of sophisticated mLearning tools in the developed world, it showed that this concept had been brought to the attention of academic libraries (Ally and Needham 2010: 10).

There are many advantages that have been noted in the use of mLearning. Attewell (2005) said that mLearning is helping students to recognize their current abilities and to better their numeracy and literacy skills. He went on to say that it encourages both independent and collaborative learning involvement and helps learners identify areas where they may need help and assistance.

Mtshali (2011) emphasized that the most noticeable benefit of mLearning is that it offers convenient learning from anywhere and at any given time. He states that mLearning provides students with the opportunity for easy access to learning materials and that convenience, mobility and ease of access to learning materials makes mLearning applicable to a wide range of learners

in different settings. This is attributed to the increased interest in, and encouragement of, teaching and learning using mobile technologies in many educational quarters (Keegan 2002).

As much as mLearning has opened up a bigger platform for learning opportunities to different learners, nothing is without its disadvantages. Some of the drawbacks to mLearning include the lack of a common hardware platform for these mobile phones that makes it difficult to develop content for all types of mobile phones, mobile devices becoming outdated very quickly, accessing wireless connectivity can be costly or may be slow if so many users are using it at the same time and, finally, one needs to be connected to a network in order to be able to print content (Hajim 2012).

However, Mtshali (2010) noted that mLearning is possible today due to the increased acceptance of ICT artifacts. These artifacts include information technology (IT) software, hardware, infrastructure, data communications, processes and methods that are associated with IT (ICIS 2013). The possibility of mLearning is a result of the continuation of the educational technology investment strategy implemented by higher learning institutions. mLearning is going through the experiments and trials that outline its roles and applications in institutions of higher learning. Early trials of mobile learning indicate that it can offer increased access, mobility and convenience (Little 2011; Keegan 2002).

mLearning is ideal for those who are always on the move, tech-savvy, know what they want and when they want it and do not want to stop to get it. These are, arguably, typical characteristics of students nowadays.

2.4 Mobile academic libraries (mLibraries)

Understanding library clients and their current use of information technologies is essential to providing information and services to them effectively. Mtshali (2011) says it is important for university institutions not to implement a particular technology for the sake of implementation but rather for its effectiveness and usefulness as this would guarantee a return on investment.

The concept of mobile technologies in the provision of library services is not a new one. According to Walsh (2012: XIII), text messaging which is a feature of a mobile phone was

introduced in libraries in the early 1990s and was used for sending messages to library patrons alerting them of due dates, arrival of new materials and changes in library working hours.

mLibraries involve the delivery of library services through mobile devices. The growing use of mobile devices in various aspects of life is necessitating that libraries consider making use of these new technologies. Ally and Needham (2012:15) say that libraries have responded to this mobile technology “buzz” and use it to support the provision of information services. They argue that the huge investment done by these academic libraries in electronic resources pre-date the more recent convenient mobile technologies. The authors argue that even though libraries already use other Internet applications like social networking and email to promote their information services, they should now look to expand the provision of these information services to more mobile devices (Ally and Needham 2012: 15).

Academic libraries in developed countries have been embracing this technology and using it to better their delivery of library and information services. The University of the South Pacific in the Oceania region, University of Catalonia in Spain, University of Houston in USA, University of Bath, the Open University in UK and the Athabasca University in Canada are such examples (Ally and Needham 2012). According to Little (2011), this has been possible due to the availability of resources such as a good backbone of ICT infrastructure, the readily available technical personnel to implement the technology, the penetration of smartphones usage among young residents who are primarily the targeted audience of the libraries and the readiness of these academic libraries to implement and use the technology. Libraries which have done so include those at Duke, Boston College, Brigham Young, Cornell, Rochester, McGill, British Columbia, Massachusetts Institute of Technology (MIT), Alberta and Virginia (Little 2011).

Cornell University Library in Ithaca, New York, developed a mobile website based on data collected during a survey that was carried out in the University. This development brought a 75% increase in the number of mobile devices accessing the library servers in a semester while the library staff noted an increase in the number of students using smartphones on campus (Little 2011). When compared to Cornell University Library, Ryerson University Library in Toronto made use of this technology as early as 2009. They gave users a mobile version of their website and the ability to send a catalogue record to their mobile phones or email (Little 2011). During the survey conducted by Ryerson University Library, student users were asked what they wanted

on the mobile library site. A majority of the responses were: the ability to book a room, display hours, check an individual student timetable, check a borrower record and search the catalogue for information and articles. Based on those responses and the fact that the library website did not have all these, the library then reconfigured the site and it surprisingly recorded an increase in usage with 3 276 new unique users in a semester (Little 2011).

Seeler (2011) observed that in the USA and Canada, 39% of academic libraries were already providing a mobile version of their websites while 36% were offering a mobile friendly catalogue by the year 2011. Other mobile priorities for the academic library in those countries included reference services, notifications and the ability to access the databases (Seeler 2011). Georgetown University Library in Washington DC is an example of an academic library that uses a mobile version of its OPAC which allows for item renewal, hold and searches. Li (2013), in his research on mobile library service, calculated that as of November 30 2010, among the 20 top-ranking USA university libraries, 19 were already providing mobile phone technology library services.

In South Korea alone, 70 universities are now providing mobile library services using “Mobile Campus” a service which started in 2004 and is proving to be popular in all the institutions. Mobile Campus is a software program that provides users with easy access to academic administration, library services, email, news and much more at a glance with easy to read visuals and one click access from their mobile phones (Choi 2009). However, there are differences in the range of services being offered in each of the 70 universities. Users can get alerts like overdue books, arrival of requested books from interlibrary loan and so forth on different kinds of mobile devices and only need to set up a user ID. Students who use this service can make use of it by presenting a mobile student’s ID card which is a two dimension bar code. This ID card is in the students’ mobile phones and when a student needs to access services from the library, she/he has to present that bar code number while logging into the library website. An example of a university in South Korea that uses this service is the Konkuk University (Choi 2009).

Mobile technology has surely spread across different parts of the world. In Taiwan, the National Taiwan University (NTU) offers a MOPAC (Mobile OPACs) that can be accessed on this link (<http://tulips.ntu.edu.tw/screens/iphone.html>), the National Taitung University provides a mobile library website accessed on this link (<http://media.lib.nttu.edu.tw/m/>) which has opening hours,

MOPAC, newly acquired materials and QR (Quick Response) codes for electronic books which provide a user with access to reading that book online (Wang 2011). In addition, WebPACs (Web Public Access Catalogue) of NTU and National Tsing-Hua University (NTHU) shows the full bibliographic details of an item with a QR code that attaches the item's title, International Standard Book Number (ISBN), call number, and location (Wang, Renke and Lu 2011). Many challenges like the lack of staff technical skills, initial costs, library website down time during implementation may have been encountered while implementing mobile phone usage to provide library and information services. The perseverance and determination to better the service delivery drove the developed world to confront these challenges and move towards this new technology era.

In Africa, although much as the penetration rate of mobile phone usage is growing each year and the mobile market is the second largest in the world (Africa Mobile Observatory 2011), academic libraries in the majority of African countries are yet to consider using this technology. Factors such as cost and funding for the libraries, ICT infrastructure and poverty, lack of necessary resources like electricity, lack of governmental and institutional technological policies, lack of trained staff and staff development initiatives and many more factors all hinder academic libraries to adopt and use these technologies (Mtshali 2011).

It is not to say that there is no evidence of such technologies in Africa. Ally and Needham (2012:24) stated that South Africa had the 17th highest number of mobile phone users in the world and that the mobile phone has turned out to be the personal computer of Africa. South African universities are taking advantage of this opportunity and are at the forefront in adopting, implementing and using these technologies to deliver library and information services. The University of South Africa (UNISA) is one such example. It is one of the world's top ten mega universities, the fifth largest open distance learning (ODL) institution and the largest ODL institution in Africa (UNISA 2013) with a population of more than 200,000 students of whom more than 25, 000 are distance learning students. Its vision is "Towards the African University in the service of humanity" (UNISA 2013). In line with their ODL policy which defines ODL as "a multidimensional concept that in practice seeks to bridge the time, geographical, economic, social, educational and communication distances between students and the institution, students and peers, students and academics and students and courseware", the library endeavors to bridge

the distance between the library and students to use information technology and mobile technology in particular to promote open learning for remote learners and in light of its diverse student profile, to ensure equal access to information for all its clients (Ally and Needham 2012:24).

Due to the high number of distance learning students, the UNISA Library saw fit to incorporate and make use of mobile technologies to deliver their services so as to cater to all students, near and far by providing equal access to information. The Library then investigated mobile phone usage to deliver services and these investigations discovered significant possible benefits in terms of access to library and information services for the majority of their users. These would be of most benefit to those users “on the go” as many of them spend so much time in transit (Ally and Needham 2012:26). Some of the services being rendered via the mobile phones are: access to lending services, access to global information material through WorldCat Mobile that can be delivered via interlibrary loan, access to reference services, access to UNISA’s Library e-collection, access to UNISA’s Library training and access to communication with UNISA’s Library clients (Ally and Needham 2012:26).

The University of Johannesburg (UJ) is the other institution in South Africa whose library has implemented this technology and is using it to deliver library services. Unlike UNISA, UJ has approximately 48,000 students in total and is one of the largest residential universities in the country. UJ offers a broad range of learning programmes from career orientated and traditional academic to professional and postgraduate qualifications (University of Johannesburg 2013). In line with the Library’s vision and mission, UJ implemented mobile phone technology to provide library and information services. In 2009, it started providing these services through SMSs to their users’ mobile phones (Nyofane and Kovatcheva 2012). These SMSs were sent to a user to let them know that they can come and collect their requested books, let them know that their library books are overdue and so they should renew or return them, tell the users about different library training services that are in place and so forth (Nyofane and Kovatcheva 2012). The library then moved from sending SMSs to using a more advanced application to deliver their services. Use of the AirPac software was implemented in 2010 to improve on the delivery of these services to their users. This software is being used to date to help users retrieve information by searching the UJ Library catalogue using both basic search and advanced searching features,

reserve items (place a hold on them), renew overdue books, download e-books and e-journal articles and so much more (Nyofane and Kovatcheva 2012). The University Library went further and initiated and implemented UJoogle. This is an integrated library search engine that brings easier use of the system to library users by offering social features such as Facebook and Twitter, faceted search, advanced relevancy ranking, peer-reviewed articles, digital collections, books and many more. It is a feature that provides a platform that allows for content flexibility and streams information from article sources in real-time (Nyofane and Kovatcheva 2012).

A survey was carried out on the mobile use of the UJ catalogue, AirPAC, with the aim of getting feedback from the library users of the usefulness of the AirPAC mobile services. This survey was trying to discover whether the AirPAC software was fulfilling the mission of taking the library to its patrons or not, and whether or not the mobile technology was improving the learner support in terms of library services. This survey was carried out in 2011 for two weeks and on four campuses. Focus groups were used to collect the data and a sample of 41 participants participated in the survey (Nyofane and Kovatcheva 2012). With the use of the Technology Acceptance Model, findings revealed that 35% of the users used the Internet for more than six hours per week and with the majority of those using it for social networking and emailing. On the ease of use of the AirPAC software, 44% reported it as a very easy to use application, 46% said it was easy, 10% did not know while none reported it being difficult (Nyofane and Kovatcheva 2012). When asked about the limitations to using the technology to access information, 26% reported cost as the most limiting factor and 22% percent of respondents said they would rather use a PC. Usefulness of the technology was divided into three categories. In the searching category, 46% of respondents reported it being very easy to search while 48% reported easy to search. In the renewals category, 51% reported very easy to renew materials using the technology while 46% said it was easy to renew. And finally in the records category, 51% said it was very easy to check records and 49% said it was easy (Nyofane and Kovatcheva 2012).

It is therefore motivating to see that even though much has not been done in Africa with regard to usage of this technology in libraries, some universities have taken the necessary steps towards using it and this provides a motivation for UKZN to try and do the same.

2.4.1 A library mobile phone technology application (AIRPAC)

The UNISA and UJ libraries provide access to their library catalogues through the Innovative Interface AirPAC product. AirPAC is OPAC software that is specifically designed for small screens like mobile phone screens. It is a user friendly application with a main aim of bringing the library catalogue to the users whether they are catching a bus, waiting for class to start, or simply relaxing (Innovative 2013a). It is a smartphone developed application with features like searching the library catalogue with basic and advanced searching, limiting and sorting of results and displaying of holdings, retrieving book information including location, call number and real time data about status and availability, viewing one's circulation records, placing a hold, checking due dates of one's loans and renewing items (Hong Kong Polytechnic University 2013). It is designed to serve a wide range of devices having browsers operating HTML (Hypertext Markup Language) or WML (Wireless Markup Language) used on WAP (Wireless Application Protocol) devices. Any 3G (Third Generation) or WAP enabled mobile phone can use this application to access the library OPAC (University of Sydney 2013). Smartphones such as Blackberries, iPhones, Google's Android, OS (such as DROID by Motorola and HTC) are some of the phones that can use this product to access library and information services.

“The Innovative Interface Incorporation developed the Millennium Integrated Library System (MILS) that is intended for both librarians and the library at large. The system is not only designed to perform the simple, everyday library transactions but also satisfy the demands of catalogers, circulation managers or web librarians” (Innovative 2013b). The AirPAC smartphone application was designed to “bring significance to libraries worldwide by providing patrons with quick access to the MILS catalogue and self-service features”. By the year 2010, more than five universities were using this product including the UJ (Innovative press release 2010b).

The Higher College of Technology in the United Arab Emirates adopted this application for their library in 2010. Robert O'Connell, the librarian at the Higher Colleges of Technology said that “most students carry mobile phones and so this provides them with easy access to the library catalogue” (Innovative press release 2010a). He goes on to say that understanding how students want to access library materials is a crucial first step toward producing contented patrons.

Wireless access with AirPAC is then a step forward in bringing the library catalogues to mobile library users. AirPAC controls the large, bright screens and updated browser support of smartphones while bringing modern features like cover images and direct connections to online resources and electronic journals to patrons. With AirPAC, accessing self-service features while on the go is easy, fast and a convenient time saver for both library staff and patrons (Innovative press release 2010a). When users want to find their library, AirPAC helps by linking to Google Maps.

The institution wanting to make use of this product to provide library and information services does not need to purchase specific wireless devices in order to make use of it. According to Waage (2011) the AirPAC program runs on a server machine and does not need to be installed on client devices. As long as the device is capable of displaying HTML or WML functionality and can identify itself as such through HTTP, then the device can use the program. It is designed to be client-independent because it is standards-based and should work on any device that runs a Web browser that is compatible with the current HTML or WML standards (Waage 2011).

2.5 Academic library services and UKZN

According to Mtshali (2011):

Libraries are at the heart of learning, teaching and research, which all focus on information and this can collectively be regarded as an activity leading to the transformation of information from one level to another. Libraries thus remain the great essential way to learning, knowledge acquisition, transformation and ultimately discovery.

Academic libraries are important investments as these ensure the increase and improvement of the quality of tertiary education for the learners. They hold a vast range of learning materials from print to electronic. Many of the academic libraries today are no longer only holding the print format of materials but also the electronic format. This has many advantages the biggest being, serving many users at the same time given that many learners can access and use the electronic information simultaneously and from anywhere.

Mtshali (2011) defines an academic library as a central service of operation that is set up to provide a location, materials and services to the users for teaching, learning and research in an institution. He further went on to acknowledge that they are the most funded types of libraries because they are the core of any university and hence more developed. University or academic libraries play an important role in a student's life both in learning and research. If a student cannot access materials from the library, his/her educational life becomes a challenge. It is therefore the library's main goal to provide efficient and effective, timely, correct and up-to-date information to the student. The main activities of university libraries include, but are not limited to, document delivery, reference services, collection development, user education, access to resources held by the library, access to other library holdings and access to electronic information (Mtshali 2011).

With the advancement of technology from the desktops to laptops and now to mobile technologies, libraries are expected to provide cost effective and reliable access to information using state of the art technology which is easy to use for both users and librarians. The penetration of usage of mobile phones provides such a huge potential for this to become a true achievement. As is evident from the discussion above, using mobile technology to provide services to library users overcomes distance, time wasted having to go to the library to pick the material or renew a book, and cost involved if coming from far. It also provides for easier communication, increase of library usage and creates new opportunities for libraries to play a role in the delivery of information.

UKZN is well equipped with technological tools and runs enough LAN laboratories that provide access to information to the students and staff using up-to-date computers. The University is connected with one main network through which all information is exchanged. Unlike many other university libraries in Africa, the libraries on the five UKZN campuses are lucky enough to have a robust technology backbone. They run on the University's main network, they are connected to each other and share one central server in which the main catalogue can be accessed. The presence of the strong and reliable technology infrastructure, the well trained staff of the libraries, the huge collection of material in the libraries, the subscription to so many different databases, the wide number of users the libraries serve every year, are some of the reasons as to why these libraries need to look into mobile technologies to improve their service

delivery. And it is for these same reasons that the libraries should ensure delivery of services to the users is efficient, effective, timely and can be done at anytime and anywhere through their mobile phones.

Notably, most library-related mobile phone technology research has concentrated on developing services for patrons. But to meet the needs of library users more efficiently and effectively, the library as an organization and the librarians must work with the mobile devices themselves to be familiar with them and their features and become aware of what is expected of them when delivering services to their users. The portability and convenience of mobile devices offers distinct advantages to the librarians in their work as they go beyond their office to provide expert assistance around campus or the community or wherever their responsibilities take them (Ally and Needham 2010:54).

In this case, however, librarians, perhaps more than users, need the skills to understand and utilize mobile phone technologies, identify and evaluate the trends associated with them, and come up with tactical responses. Ally and Needham (2010:54) emphasized that, “time and expertise are not infinite and a decision to build and manage mobile services needs to be situated within the context of users, needs, resources, and other pressures”. In order to do this, factors that could influence the adoption and implementation of this mobile technology need to be determined and looked at. It is for this reason that the theory that considers factors that could influence an organization to adopt a technological innovation is turned to.

2.6 Underpinning theory

The study investigated the preparedness of the UKZN libraries on the PMB and Howard College campuses to implement and use mobile phone technology in the provision of library and information services with the aim of improving service delivery. The study was underpinned by technology, organization and environment (TOE) Framework. This section discusses the framework along with details about the contribution and significance to the study. This includes understanding of the different factors that can be used to influence adoption of this technology from the library perspective. The TOE framework is considered most appropriate to underpin

this study because it explains and gives an understanding of major factors that can influence the adoption and implementation of information technology innovations at the firm level.

“An organizational innovation is defined as a process, system, or service that is either internally developed or purchased from an external source, and this innovation is new to the firm” (Lippert and Govindarajulu 2006). Innovation is a concept that has been comprehensively studied at both the individual and organizational level. Gallivan (2011) observed that organizations provide support for the introduction of new technology inventions when they are seen or anticipated to “be an improvement over the current system. Additionally, firms may seek innovations due to pressures associated with maintaining a competitive advantage or gaining recognition within an industry” (Gallivan 2011).

In order to examine the level of acceptance of an innovation at firm level or individual level, one needs to consider several factors that can determine the acceptance or rejection of the innovation. To be able to do this, different models and frameworks that are used to assess and examine individual/firm level acceptance of technologies are considered. One of the most frequently used models is the Technology Acceptance Model (TAM) developed by Davis (1989)(In Lippert and Govindarajulu 2006). It explains and predicts an individual’s reception behaviour towards a new technology and this does not depend on the user population or on the new technology (Lippert and Govindarajulu 2006). While this model is useful for understanding individual’s acceptance or rejection of a particular technology, the model is not appropriate for the investigation of organizational level acceptance of technologies since the adoption decision for innovations is usually made as a strategic firm level initiative (Lippert and Govindarajulu 2006). And so as a result, it is necessary to adopt an organizational level theory, model or framework to explain, predict and understand an academic institution’s acceptance behaviour of a new technology, in this case, mobile phone technology.

Different studies have investigated firm level adoption of technological innovations. Some studies employed Innovation Diffusion Theory (IDT) which advocates that diffusion of an innovation is primarily based on “the characteristics of the technology and users’ perceptions of the system”. Teo, Wei and Benbasat (2003) in their article on predicting the intention to adopt inter-organizational linkages from an institutional perspective assumed that an organization makes an adoption decision in order to improve operational efficiency. However, the decision of

an organization to adopt mobile phone technology may also be influenced by the environmental factors of the organization such as, in terms of the present study, the users of the library, the suppliers of the technological tools to be used and the institutional policy and regulations. These factors provide barriers or motivations to technology adoption. Since widespread adoption of mobile phone technology in libraries has not yet developed extensively across academic institutions especially in Africa, it is believed that the institutional environment will play a large role in the adoption decision along with the characteristics of the technology. The TOE framework takes into consideration the factors likely to influence the mobile phone technology usage in the UKZN PMB and Howard College libraries for provision of library and information services.

2.6.1 The Technology Organization Environment (TOE) framework

To study the adoption of technological innovations, Tornatzky and Fleischer developed the TOE framework to describe the factors that determine an organization's adoption decision (Lippert and Govindarajulu 2006). This TOE framework emphasizes that three principle contexts – technological, organizational, and environmental – influence the process by which an organization implements and accepts a new technology. According to Lippert and Govindarajulu 2006), “The technological context looks at the available internal and external technologies important to the organization that might be useful in increasing organizational output.” The authors go on to state that

The organizational context is defined in terms of resources available to support the acceptance of the innovation. These resources include the firm size and scope; the centralization, formalization, interconnectedness, and complexity of the managerial structure; and the quality and availability of the organization's human resources. The environmental context represents the organization's structure, its competitors, technology support infrastructure, organization policy and regulations, the organization's ability to access resources supplied by others and interactions with the government (Lippert and Govindarajulu 2006).

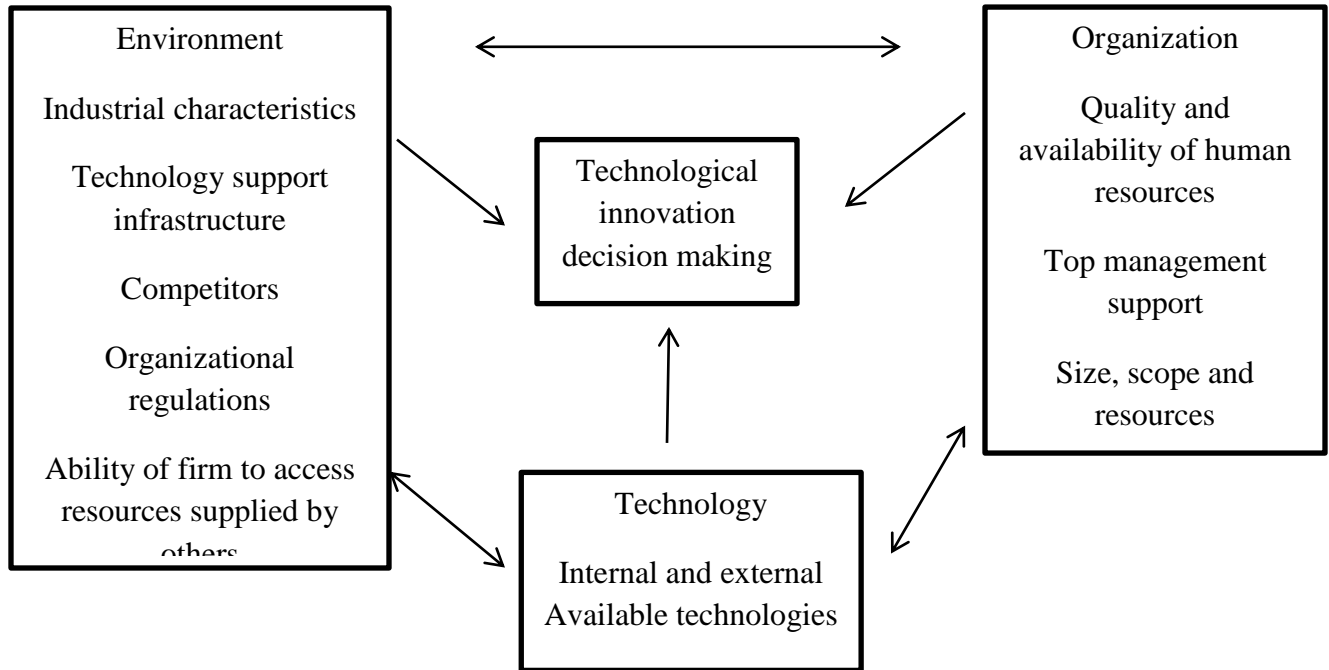


Figure 1: Technology, Organization, and Environment Framework (Oliveira and Martins 2011).

Oliveira and Martins (2011) observed that an excess of empirical studies have used the TOE framework as a theory underpinning for examining firm/organizational acceptance of new technologies. They noted the following studies that used this framework:

Zhu and Kraemer (2005) used the TOE framework to study antecedent influences on e-business use and business value in a multinational study of 624 organizations. Zhu et al. (2004) developed a research model based on the TOE framework to assess and test the effect of technological, organizational, and environmental factors on e-business value. Additionally, Zhu et al. (2003) studied data from 3,100 firms to understand influences of technology competence, organizational factors of firm scope and size, and environmental context influences of consumer readiness, trading partner readiness, and competitive pressure on e-business adoption.

All the three studies were interested in understanding backgrounds to e-business adoption.

2.6.2 Technological context

According to Van Bell and Reed (2012), the technological context refers to the internal and external technologies available to the organization which have an influence on its efficiency, effectiveness and productivity and can include both existing technologies in use within the organization and/or the relevant technologies the organization can acquire externally. The authors consider five technological factors relevant to this context and these are: compatibility, complexity, relative advantage, trialability (the extent to which a product can be tried and tested by the consumer freely) and observability. Of the five, three have been considered to be the most common variables linked to technology adoption. These are compatibility with existing technologies in the organization, relative advantage over current technologies and complexity which may negatively influence adoption. Rui (2007) defines these variables as follows: Relative advantage is the measure of how much of an improvement the new technology is relative to the existing one and is primarily measured in terms of cost and reliability. This is crucial because if the proposed innovation is not going to bring any advantages over the existing technology, there is no need to invest in it. Complexity is “the degree to which an innovation is alleged to be relatively difficult to understand and use” (Rui 2007). For one university library, implementation of mobile phone technology may be less difficult because of staff having the necessary skills required to implement it whereas it could be more complex for another university library that does not have skilled staff. Compatibility is the extent to which an innovation is consistent with firm’s current conditions. Rui (2007) further breaks it down into two meanings. Compatibility with the values or norms of the potential adopters and users which implies what people feel or think about the technology or a compatibility with the existing practices of the organization which implies a compatibility which is more practical or operational (Rui 2007). One thing these three variables have in common is that they all comprise characteristics whose values are dependent on circumstances of the organization.

Cost is also a major factor that influences or discourages adoption of technological innovations (Hall and Khan 2002). Adoption of a new technology is usually costly for many reasons including new machines need to be purchased if the existing ones are incapable of doing the job. The new technology for this study being AirPAC software, needs to be purchased and this could

be a once off payment or a recurring payment based on agreed terms and employees need to be trained to work with the new technology (Hall and Khan 2002).

Security is a feature that everyone becomes concerned about when IT is involved. Lippert and Govindarajulu (2006) identify the issue of security as an aspect that affects the intention to adopt and actual adoption behaviour. However organizations and especially academic institutions depend upon their information systems for day-to-day operations. It is through these information systems that there is quick and reliable communication among staff and students in UKZN. Compromising these systems may cost the institution in terms of work output from both the staff and students. Since mobile phone technology use to provide library and information service is a relatively new field of practice, their uses may pose security concerns especially from the user's perspectives (Little 2011).

2.6.3 Organizational context

The organizational context is characterized by the resources available in the organization to support the adoption and implementation of the technology innovation. These resources include quality and availability of human resources, top management support, and size and scope of the organization. Studies have shown that organizational characteristics are important in technology adoption and implementation. Lippert and Govindarajulu (2006) state that firm size and scope seem to be seen as the most important aspects for an organization to adopt and implement a technological innovation. They realized that the higher the scope of the organization, the higher the demand for IT investment and likewise found out that the firm size is strongly associated with investments in IT (Lippert and Govindarajulu 2006).

The researcher thinks firm size is a big predictor of technological adoption. According to Lippert and Govindarajulu (2006) "large firms/organizations have more resources, greater economies of scale, and can take bigger risks related to innovation adoptions". Small firms, on the other hand, because of their resource limitations, do not eagerly implement newer technologies even though they are more responsive and flexible than large firms. While this may be true for a known technology, small firms cannot risk resources to adopt unknown innovations. Since mobile phone technology usage in libraries is still evolving, it is thought that large firms can easily overcome the risks of mobile phone technology implementation.

Apart from those two factors, size and scope, the firm's internal resources such as financial resources, technological resources and human resources have also been factors identified and used by researchers (Rui 2007). In addition, IT competence, technical competence, IT infrastructure, employee's IT knowledge and expertise, the presence of technically skilled human resources, are other organizational factors that researchers use (Zhu, Kraemer and Xu 2003; Kuan and Chau 2001; Crook and Kumar 1998; Mehrtens, Cragg and Mills 2001). The general argument by these researchers is that the availability of resources is a necessary condition for innovation adoption since innovation adoption works in conjunction with using the firm's resource (Rui 2007). Thus the firm's ability to adopt and implement the technology will greatly depend on the resources available to support the innovation.

One major factor in the organizational context listed above that should be emphasized is the top management support. Without this nothing in any organization can take place. This is because it is the top management that makes the final decision of whether to implement the technology or not. In support of this regard, Rui (2007) observed that top management support is needed for any adoption of technological innovation. He further went on to say that leaders can influence the innovation climate indirectly through setting of goals and policies, through encouraging innovation initiatives from subordinates and through their decision with respect to innovation adoption or rejection. For example, in Iacovou, Benbasat and Dexter (1995) research on the concept of IT sophistication in technological readiness, the authors captured not only the level of technological expertise within the organization but also assessed the level of management understanding of, and support for, using IT to achieve organizational objectives.

“Organizational readiness” in terms of finances and technology resources is also a factor seen by Iacovou, Benbasat and Dexter (1995). In their study, organizational readiness refers to the level of financial resources readiness and technological resources readiness. The financial readiness in this study refers to financial resources available to pay for installation costs of the software, customizing the library website to be suitable for small screens, hiring of expert staff to do the job, implementation of any subsequent enhancements, and on-going expenses during usage. According to Iacovou, Benbasat and Dexter (1995) the technological readiness is concerned with the level of complexity of IT usage and IT management in the organization. In terms of the present study, the university libraries already own a well-developed website through which its

users can access the required information and it has access to the required technological resources such as hardware.

2.6.4 Environmental context

The environmental context refers to the area in which the organization operates and conducts its business (Wang, Wang and Yang 2010). The organization is influenced by industry characteristics, its competitor's, technology support infrastructure, organization regulations and the ability of the firm to access resources supplied by others (Oliveira and Martins 2011). Researchers like Rui (2007) observed that organizations do not exist in a vacuum but rather operate in an environment that provides opportunities and enforces constraints. He goes on to say that the most frequently proposed environmental factors are those reflecting market uncertainty such as competition intensity, competitive pressure, industry pressure and market uncertainty. This, according to Oliveira and Martins (2011), is incorporated in competitors in Figure 1 above. With UKZN being an academic institution, the competition that they have to keep up with is the quality of education being offered to the students, the research output from the institution and number of graduates produced in a year when compared to other institutions. And so this environmental factor is very strong because if those aspects are not met, then the University will drop in its ranking. In adopting and implementing mobile phone technology in its libraries, access to information will be made easier and hence research output might increase as might the quality of education due to easier access to information.

The organizational regulations and policies are also a major factor. Within the environmental context, regulatory support has been recognized as an essential factor affecting innovation diffusion (Bose and Luo 2011). Bose and Luo (2011) consider that regulatory support in terms of supportive government or state policies and/or legislation, and institutional support in terms of designing technological policies that support innovations can help organizations (in this case academic institutions) achieve their technological aims and hence improve on their service delivery. In terms of the present study regulatory support by means of policies and regulations as well as incentives for technological innovation adoption and implementation can aid UKZN libraries in more effectively managing their library operations and provide opportunities for information searching, retrieval, dissemination and usage.

2.7 Summary

The concept of mobile phone technology was explained, the usage of the technology in libraries was shown, and the need for it was elucidated as were the factors that can influence implementation and usage of this technology in these libraries. It became clear that when such a technology is used, the delivery of library and information services is improved in terms of the increase in library usage. The literature focused mainly on describing what has been done in terms of mobile phone technology adoption and to a lesser extent on students' perceptions and use of mobile phone technology. However, very little, if anything, has been done on the library perceptions of adopting and implementing this technology. Although most research has been carried out in developed countries with very little in developing countries especially Africa, the impact of mobile technology to enhance education, teaching and learning is global and should be clearly looked at as it offers so many opportunities. The theory underpinning this study has also been discussed and where appropriate significant points identified in the literature review will be used in the discussion of the results in Chapter five. The research methodology employed in the study is described in the following Chapter.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This Chapter comprises a discussion of the research methodology employed in the study.

Mamabolo (2009) defines research methodology as “ways of obtaining, organizing and analysing data”. Rajasekar, Philominathan and Chinnathambi (2006) on the other hand define research methodology as an organized way of solving a problem. The processes by which “researchers go about the work of describing, explaining and predicting phenomena with the main aim of giving the work plan of the study” are called research methodology (Rajasekar, Philominathan and Chinnathambi 2006).

This Chapter is divided into nine sections. Section one addresses the research paradigm in which this study is placed. The chosen research approach which is in line with the research paradigm is then discussed in section two. Section three looks at the research design and this is followed by the population of the study. Sampling of this population is then discussed in section five. The way in which data was collected is addressed in section six and this is followed by how the collected data was analysed. The issues of validity and reliability and ethical considerations will be in the final sections, sections eight and nine respectively.

3.2 Research paradigm

Hunt (1991) defines paradigms as “patterns of beliefs and practices that regulate inquiry within a discipline by providing lenses, frames and processes through which investigation is accomplished”. According to Ponterotto (2005), a paradigm can be defined as a “set of interrelated assumptions about the social world which provides a philosophical and conceptual framework for the organized study of that world”. He noticed that the paradigm selected, directs the researcher in philosophical assumptions about the research and it also helps the researcher in selecting tools, instruments, participants, and methods used in the study. In simple terms a

“research paradigm sets the background for an investigator’s study” (Ponterotto 2005). Maree (2007: 47) defines a paradigm as “a set of assumptions about fundamental aspects of reality which gives rise to a particular world-view”. He says paradigms report on important assumptions taken on faith such as beliefs about the nature of reality, the epistemology and the assumptions about methodologies. He further goes on to say that:

Paradigms represent what we think about the world but cannot prove. Our actions in the world include the actions we take as inquirers and cannot occur without reference to those paradigms: As we think, so do we act.

Neuman (2003: 70) says a paradigm includes the basic important questions to be answered, the research techniques to be used and it is an example of what good research should be. There are various types of paradigms. The two which will be discussed below are positivism and interpretivism.

3.2.1 Positivist paradigm

Positivism is the most widely used paradigm in the social science and it is sometimes called positivist social science. Positivism is associated with many specific social theories (Neuman 2003: 71). It is broadly defined as “the approach of the natural sciences” (Neuman 2003: 70). Positivism was originally called ‘positive philosophy’ by French philosopher August Comte (Mittwede 2012). According to Mittwede, this term is used in two ways 1) the doctrine and movement founded by Comte and 2) a general philosophical approach of which Comte’s positivism is but a single instance. Pure positivists believe that there is an external reality that consists of facts and that with the appropriate method one can obtain those facts (Hunt 1991). Hjørland (2004) states that the key positivist ideas were that “philosophy should be scientific and that metaphysical speculations are meaningless”.

In the social sciences and the philosophy of the social sciences, positivism has supported the emphasis on quantitative data as a research approach (Hjørland (2004). Positivist researchers have a preference for exact quantitative data and regularly use surveys, experiments and statistics (Neuman 2003: 71). They seek difficult, exact measures and they test hypotheses by carefully examining and analysing numbers from the measures. With this type of paradigm, the key concepts are only objective and observable facts that can be the basis for science (Maree 2007:

21). Terre Blanche and Durrheim (1999:6) expressed the view that the ontology in the positivist paradigm “sees reality as stable, external and governed by laws”, the epistemology is objective and the researcher is detached from the study and the methodology is experimental or survey, quantitative and hypothesis testing (Terre Blanche and Durrheim 1999:6).

3.2.2 Interpretivist paradigm

Maree (2007:21) states the key concepts of interpretivism as:

- A paradigm that foregrounds the meaning that individuals or communities assign to their experiences;
- Its intersubjective meanings are vital to achieving understanding and meaning;
- Since behaviour is constituted by social agreements, interpretation is required because facts simply do not speak for themselves;
- There is no distinction between the subject (the researcher) and the object (the event being studied);
- The social context, agreements, customs and morals of the particular person or community are key elements in evaluating and understanding human behaviour.

Neuman (2011:101) states that this approach to social science research that stresses significant social action, socially constructed meaning and value beliefs. There are several varieties of interpretive social science according to Neuman (2003:76). These are “hermeneutics, constructionism, ethnomethodology, cognitive, idealist, phenomenological, subjectivist and qualitative sociology”. This paradigm is often called qualitative method of research. Researchers who adopt this paradigm for their studies usually use respondent observation and field research. These methods demand researchers to spend many hours in the field in direct personal contact with their objects, that is, those being studied or observed (Neuman 2003:76). A positivist researcher, on the other hand, will specifically measure selected quantitative data from a huge number of people using statistics while an interpretive researcher may live a full year with a couple of people to gather large amounts of qualitative data in order to obtain an exhaustive understanding of what they mean in everyday life (Neuman 2003:76).

For this study, the positivist paradigm was adapted and used to inform the ways in which the methodological processes were carried out. This is because of the above mentioned key concepts that fall under positivism, namely, objective and observable facts that can be the basis for science.

3.3 Research approach

Research methodology comprises of two approaches according to Neuman (2003:139). These are quantitative and qualitative approaches.

3.3.1 Qualitative approach

Hancock (1998) stated that qualitative research is concerned with developing clarifications of social phenomena. According to her, “it aims at understanding the world we live in and why things are the way they are”. This research approach is concerned with answering questions that begin with why, how and in what way (Hancock 1998). Qualitative and quantitative researches differ in many ways but also complement each other (Neuman 2003:139). Terre Blanche and Durrheim (1999:42) say that qualitative research usually attempts to collect data in the form of written or spoken language, or in the form of observations, and analyses the collected data by identifying and categorizing themes. They go on to say that qualitative research is “naturalistic (studies the real world situations as they unfold naturally, it is non-manipulative and non-controlling and is open to whatever emerges), it is holistic (it focuses on more complex interdependences, not meaning-fully forced to few discreet variables and it causes effective relationships) and also inductive (begins by exploring genuinely open questions rather than testing theoretically derived hypotheses)” (Terre Blanche and Durrheim 1999:43).

Neuman (2003:139) supports the above mentioned factors of qualitative research by saying that qualitative researchers every so often depend on interpretive social science. They apply and use logic and follow a nonlinear research pathway. “Qualitative researchers speak a language of cases and contexts and emphasize conducting detailed examinations of cases that arise in the natural flow of social life” (Neuman 2003:139). Qualitative research usually uses

phenomenology, ethnography, grounded theory and case studies as research designs and uses interviews, focus groups, documents and observations to collect data (Maree 2007:257).

3.3.2 Quantitative approach

The quantitative approach on the other hand guides the researcher to rely on a positivist approach to social science. This approach uses a language of variables and assumptions and stresses measuring variables and examining hypotheses that are connected to overall fundamental descriptions (Neuman 2003: 139).

“Quantitative researchers collect data in the form of numbers and use statistical types of data analysis” (Terre Blanche and Durrheim 1999:43). Unlike the qualitative approach that allows the researcher to study the selected issues in depth and openness, quantitative methods begin with a series of predetermined categories, usually personified in uniform quantitative measures and use this data to make wide and generalized assessments.

Positivist researchers prefer to use a quantitative approach that predefines the objects to be studied (Terre Blanche and Durrheim 1999:46). In the quantitative approach data can be collected using surveys, questionnaires and experiments. This data is represented in numbers and it is then analysed using statistical means (Terre Blanche and Durrheim 1999:46).

While this study did have a qualitative dimension in terms of the open questions that were asked, the quantitative approach dominated and this is compatible with the positivist paradigm.

3.4 Research design

A research design should show an obvious plan for action (Terre Blanche and Durrheim 1999:44). This should include the techniques that will be used in carrying out or implementing the research. Terre Blanche and Durrheim (1999:30) say that “research designs ensure that 1) the study fulfils a particular purpose and 2) the research can be completed in the specified time and with the available resources”. According to the authors “The aim of a research design is to plan and structure a given research project in such a manner that the eventual validity of the research finding is maximized” (Terre Blanche and Durrheim 1999:33). In developing a research design,

the researcher must make a sequence of decisions along four scopes 1) the purpose of the study; 2) the theoretical framework informing the study; 3) the situation within which the study is being carried out and 4) the research techniques to be used to carry out the research (Terre Blanche and Durrheim 1999:33).

Taking the above into consideration, the research design used in this study was the survey. Research designs should provide detailed and extensive information about the research procedure, that is, how the research is to be conducted.

3.4.1 Surveys

Maree (2007:155) defines a survey as a technique in which researchers choose a sample of respondents before conducting interviews or handing out questionnaires, either through mailing them or personally handing them out to collect information about different features. These features could include their attitudes, values, habits, ideas, feelings, demographics, opinions, perceptions and plans. Neuman (2003:35) articulates that the survey technique is often used in descriptive or exploratory studies. This technique is the most widely used data gathering technique in social sciences and many other fields as well (Neuman 2003:264). Maree (2007:155) describes survey data as data that is used to define and clarify phenomena, to trace change and to make conclusions. According to Hoskins (2002) survey research is appropriate for studying and analysing relationships among a large number of respondents or a geographically dispersed targeted population. The latter point was particularly applicable to this study given that the libraries under study were in different areas of the KwaZulu-Natal province.

Johnson (2011) says that precisely, surveys are for:

- Determining the characteristics of a population or a community
- Defining existing conditions in a community or region
- Documenting community opinion
- Comparing groups of communities
- Collecting large samples in a short period of time.

He goes on to say that surveys are:

- Relatively easy to administer, and
- Very economical.

There are several types of surveys. These are: mail and self-administered questionnaires, telephone interviews and face-to-face interviews (Neuman 2003:289). For this study, the self-administered questionnaire was adopted and used.

3.5 Population

Bless, Higson-Smith and Kagee (2006:99) define population (sometimes called the target population) as the set of elements that the study concentrates upon. Mbokane (2009), on the other hand, defines the population study as “an aggregate or totality of all the objects, subjects or members that conform to a set of specification”.

The target population for this study was the staff of the PMB and Howard College campus libraries. The total number of the staff stood at 60. Twenty one of them were in the PMB Campus and 39 on the Howard College Campus. These consisted of the director, two campus librarians, the circulation staff, the subject librarians, the interlibrary loan staff, the administration staff, the information services staff, the IT support/web support staff, academic reserves staff and the e-resources staff. The researcher physically handed out the self-administered questionnaire to the library staff of the PMB Campus and also physically collected the completed questionnaires from them. With the Howard College libraries staff, the questionnaire was emailed to them and they returned the completed questionnaire through email.

3.6 Sampling

Neuman (2011:240) defines a sample as a “small set of cases a researcher selects from a large pool and generalizes to the population”. It is difficult to include the entire population in any study because of time and cost and especially if the targeted population is very large. Hence one has to make use of sampling (Maree 2007:172). The goal of a sample is to study the population

and it is very important to draw a sample that can represent the entire population (Maree 2007:172).

Terre Blanche and Durrheim (1999:44) state that “sampling involves decisions upon which observations are made on people, settings, social processes, events and behaviour and the main worry of sampling is representativeness”. There are two main types of sampling namely, probability and nonprobability sampling. For this study, the approach used was to use the entire population which is also known as census sampling.

3.6.1 Census sampling

A census can have two definitions according to Harding (2006). One meaning is that it is an effort to gather data from every participant of the population being studied instead of choosing a sample. And the other meaning is a specific form of social survey that is organized by governments and it aims at collecting information from every family in the country. Since the total number of the targeted population in this study was small, that is 60, this study made use of all of them thereby adopting a census sampling technique. Research Observatory (2013) states that where the potential population is small, it is often feasible to undertake a census to ensure that all their views are represented.

3.7 Data collection

A two-pronged method of data collection was adopted. These methods were the search for and review of the relevant literature and the use of a self-administered questionnaire.

In a self-administered questionnaire, the researcher asks questions to respondents in a written questionnaire which is either mailed to them or handed out (Neuman 2003:35). It consists of instructions which the respondents have to follow and questions that they have to record the answers to. Some of the advantages to this type of survey are that it is a very cheap means through which data can be collected; it is easy to be carried out by a single researcher since the researcher can send the questionnaires to a wide range of people in a wide geographic area; they are very effective and the response rates can be high if the target population is educated and interested in the topic being studied; many respondents can complete the questionnaire in a

relatively short period of time, and finally, it allows for administrators to check for accuracy (Neuman 2003:289).

The self-administered questionnaire for this study contained both open and closed questions. An open question is an unstructured and free response question that asks a respondent a question to which they can provide any answer whereas a closed question is a structured and fixed response question that asks both a question and gives the respondent fixed answers to choose from (Neuman 2011:323). The choice of open or closed questions should be based on the purpose and the practical limits of the study. There are both advantages and disadvantages to using each type of question but having a mixture of both in the questionnaire allows for the study to make use of the advantages of both (Neuman 2022:324).

Hoskins (2002) noted that a literature investigation is an essential element of any research conducted in the social sciences for many reasons. Among them being that the search for relevant literature allows the researcher to find out what else has been done in relation to the problem being studied and makes repetition of existing studies less likely. This allows the researcher to understand the methodologies used in other studies, analyse them to see whether they fit in the study being carried out and to make decisions on whether to adopt the same or use other methodologies. This method also makes interpretation of the outcomes of the study more meaningful because they can be deliberated based on what has been done before (Hoskins 2002).

3.8 Data analysis

According to Bless, Higson-Smith and Kagee (2006:163), once data has been collected and checked, the researcher then has to analyse it. This analysis is conducted so that the researcher can identify constant patterns within the data (Bless, Higson-Smith and Kagee 2006:164). They also state that the data analysis process allows the researcher to generalize the findings from the sample used in the research. Since the questionnaire in the present study had both open and closed questions, a mixture of data analysis techniques was used. For the open questions in the questionnaire, content analysis was used to analyse the collected data. For the closed questions, the study adopted SPSS to analyse and interpret data collected.

3.8.1 Content analysis

Neuman (2003:36) defines content analysis as a method for examining information or content in written or symbolic material, examples being song lyrics, pictures and so forth. Maree (2007:01) states that it is “a process of looking at data from different angles with a view to identifying keys in the text that will help understand and interpret the raw data”. It is used to analyse answers to open questions on surveys, interviews or focus groups (Maree 2007:101). As mentioned above, content analysis was used to analyse data collected from the open questions in the questionnaire used in this study. In terms of this analysis categories were created and subsequently coded to allow for input into SPSS.

3.8.2 SPSS

SPSS is a Windows based program that can be used to do data entry and analysis by creating tables and graphs (Harvard-MIT Data Centres 2013). SPSS is commonly used in the Social Sciences and in the business world. It is a good first statistical package for people wanting to perform quantitative research in social sciences because it is easy to use (Harvard-MIT Data Centres 2013). SPSS has now turned out to be the standard analytical tool for most quantitative research being carried out (Pickard 2007:278). Quantitative analysis using SPSS was adopted in this study to analyse and interpret the answers, as mentioned above, from both the closed and open questions.

3.9 Validity and reliability

Neuman (2011:207) emphasizes that all researchers want validity and reliability and that it is not possible to have perfect validity and reliability but these are ideals to which we strive. These are ideals that help to create truthfulness, credibility or believability of the results in a study (Neuman 2011:207). Terre Blanche and Durrheim (1999:61) define validity as “the degree to which the research conclusions are sound” while Maree (2007:147) says validity is “a measure or instrument is said to be valid if it measures what it is supposed to measure”. Reliability on the other hand refers to the level at which the results are repeatable (Terre Blanche and Durrheim 1999:63). Reliability has to do with the uniformity of an instrument. High reliability is obtained

when the same instrument will give the same result if the research is redone on the same sample (Maree 2007:147). For this study, the researcher strived to produce findings that are believable and convincing and also presented negative or inconsistent findings in order to add to credibility to the study. The researcher also had the questionnaire checked by the supervisor to ensure that it was adequate for measuring what it was supposed to measure therefore ensuring content validity. However, the main method for testing the validity of an instrument is the pre-test.

3.9.1 Pre-test

A field pre-test is like a dress rehearsal for a survey in a study. It is useful tool that allows researchers to identify potential problems with the data collection tool prior to carrying out the survey (Gallagher 2004). It involves collecting data from a relatively small number of people, preferably a sample from the selected study's sample frame using the collection tool specified for the study (Gallagher 2004). Gallagher (2004) goes on to say that if this is not feasible, respondents in the pre-test can be chosen based on convenience and availability but the closer to the study sample the better.

For this study, a pre-test was done by administering the questionnaire to six staff members at the other campus libraries, that is, the Westville and Edgewood campus libraries to check for possible errors in the questionnaire. A total of four staff members filled in and returned the questionnaire. All of them reported that they fully understood the questions in the questionnaire and that they did not see any clarifications/alterations that should be made in the questionnaire.

3.10 Ethical considerations

According to Maree (2007:298) it is imperative to seek permission to conduct any research from the relevant authorities as long as human or animal subjects are involved. Whenever students are involved in any study with a view to develop and implement a questionnaire, ethical clearance must be sought. The researcher conducted the research under the UKZN research ethics code and ensured that permission from the Research Office was given before going out to the field to conduct the research. Permission from the Research Office was contingent, amongst other

factors, on obtaining approval from the Director of Libraries at UKZN. This approval was obtained via email correspondence.

3.10.1 Informed consent and autonomy

Participants or respondents have a right to know about the study being undertaken. They need to know what the study is about, how it will affect and benefit them, the risks involved in participating and the fact that they have the right to withdraw from the study at anytime they feel like doing so. The principle of autonomy involves the freedom of respondent's action and choice to decide whether to participate in the study or not. And so no person should be forced to participate.

In this study, a letter of informed consent was attached to the questionnaire that clearly stated the research process. The respondents were requested to read the letter and sign the consent letter if they were willing to participate in the study. In case of any inquiries, a contact address was provided.

3.10.2 Confidentiality

Maree (2007:299) clearly states that there should be a clear understanding between the researcher and the respondent regarding confidentiality of the results and findings of the study. For this study, confidentiality was achieved by not asking respondents for their names nor for their job designations. Finally, the data collected from the respondents was kept under secure conditions.

3.11 Summary

This Chapter discussed the research methodology and methods that were used in the study to address the research problem. This included a detailed discussion on the research design adopted for the research and the data collection methods that included a survey using a self-administered questionnaire. Other issues such as the study population, pre-test, validity and reliability and ethical considerations were also discussed. To begin with, the study was located in the

appropriate paradigm and the broad approach adopted was discussed. The findings of the survey are presented in the following Chapter.

CHAPTER FOUR

PRESENTATION OF THE RESULTS

4.1 Introduction

This Chapter presents the results of the study. The study set out to investigate the preparedness of University of KwaZulu-Natal libraries to implement and use mobile phone technology in the provision of library and information services. To be able to do so, the questions in the self-administered questionnaire that was used to collect data from library staff on the two UKZN campuses, namely, PMB and Howard College, were designed to answer the key questions as posed in Chapter one. The questionnaire data was analyzed using SPSS and the results for each question in the questionnaire are presented in various formats including tables, bar graphs, pie charts and text.

4.2 Response rate

As previously mentioned in Chapter three, the self-administered questionnaire was distributed to the staff of UKZN PMB and Howard College campus libraries. Out of a total of 60 questionnaires distributed, 30 questionnaires were returned yielding a response rate of 50%.

4.3 Questionnaire results

The distributed questionnaire consisted of six sections. Section one looked at general information of the respondents. Section two looked at skills required by staff to use mobile phone technology to provide library and information services. Section three examined organizational factors that could influence implementation of mobile phone technology in these libraries. While Section four investigated technological factors that could influence implementation and usage of this technology in these libraries, Section five examined the environmental factors that could do so.

The questionnaire ended with Section six which examined librarian's perceptions about mobile phone services.

It must be noted that Questions 1a, 1c, 1d, 2, 4a and 6 are not multiple response questions. The rest of the questions in the questionnaire were multiple response questions thus permitting the respondents to provide more than one response. Total percentages in these questions are more than 100%. The symbol N below indicates the number of respondents that were asked a particular question.

4.3.1 Section one: General information

The section provides information about who the respondents were in terms of where they worked and their library qualifications, their gender and age and their main duties and/or tasks in the library.

4.3.1.1 Library at which respondents worked

Question 1a asked to determine at which library the respondents worked.

Figure 2: Library at which respondents worked

N= 30

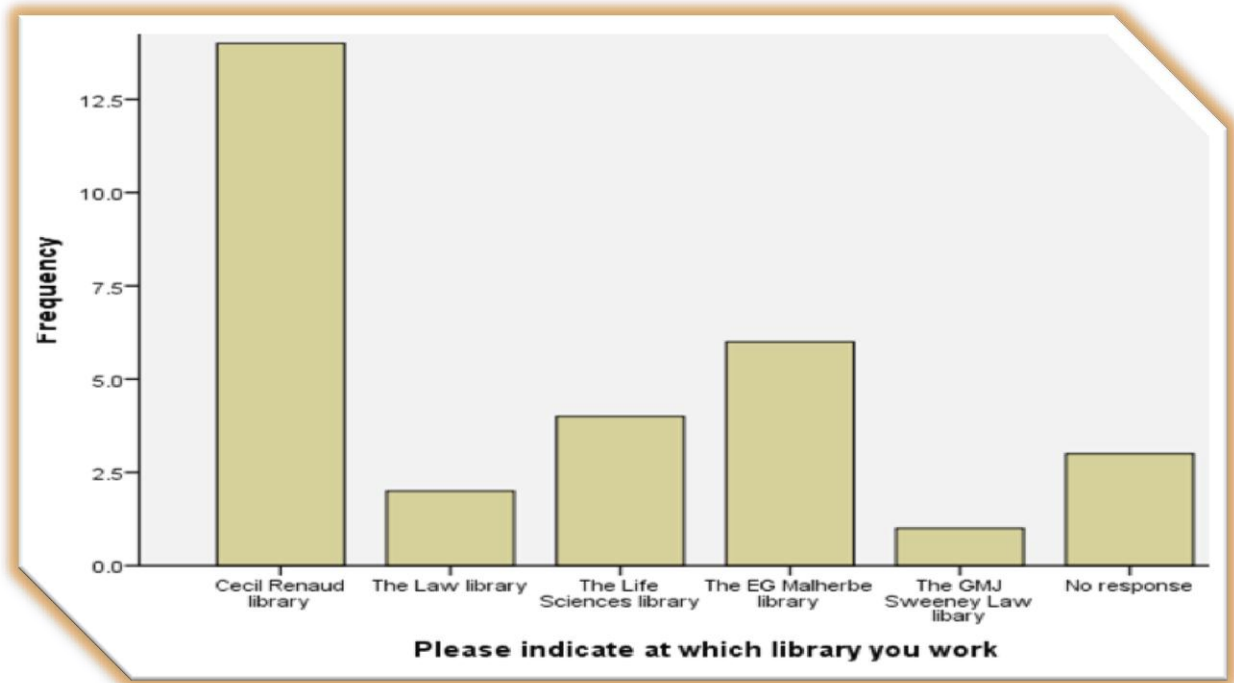


Figure 2 shows that majority 20 (66.7%) of the responses came from PMB Campus, that is, 14 (46.7%) respondents indicated that they worked in the Cecil Renaud Library, four (13.3%) worked in the Life Sciences Library and two (6.7%) worked in the Law Library. Only seven (23.3%) responses were received from Howard College Campus. Two (10.0%) respondents did not respond to this question.

4.3.1.2 Professional library qualification

Question 1b was asked to determine the professional library qualification of the respondents.

Table 1: Professional library qualification
N= 30

Please list your professional library qualification(s)	Responses	
	N	Percentage
Bachelor of Library Science Honours	10	33.3%
Postgraduate Diploma in Information Studies	7	23.3%
Master of Library Science	6	20.0%
National Diploma in Library Science	4	13.3%
Bachelor of Library Science	4	13.3%
PhD in Library and Information Studies	3	10.0%
Higher Diploma in Library Science	2	6.7%
Bachelor of Technology in Library Science	1	3.3%
Advanced University Diploma in Library and Information Studies	1	3.3%
No response	6	20.0%
Total	*44	146.5%

*Multiple responses received

Table 1 shows that the highest number of respondents, namely 10 (33.3%) had a Bachelor of Library Science Honours. Seven (23.3%) had a Postgraduate Diploma in Information Studies. Six (20%) had a Master of Library Science. It was also interesting to see that there were three (10.0%) staff that went as far as attaining a PhD in Library and Information Studies.

4.3.1.3 Gender of the respondents

Question 1c determined the gender of the respondent.

Table 2: Gender

N=30

Gender	Frequency	Percentage
Female	16	53.3%
Male	12	40.0%
No response	2	6.7%
Total	30	100.0%

Table 2 shows that out of the 28 respondents who answered the question, 16 (53.3%) were female while 12 (40.0%) were male.

4.3.1.4 Age of the respondents

Question 1d was asked to find out the age groups of the respondents. The age groups were categorized into four groups and these were 20-29, 30-39, 40-49 and 50+.

Table 3: Age
N= 30

Age	Frequency	Percentage
20-29 years	2	6.7%
30-39 years	7	23.3%
40-49 years	12	40.0%
50+ years	9	30.0%
Total	30	100.0%

Out of 30 respondents as seen in Table 3, the largest number of 12 (40.0%) fell in the age group of 40-49. The Table also shows that nine (30.0%) were in the 50+ group while seven (23.3%) were between 30-39 years of age.

4.3.1.5 Main duties or tasks

Question 1e asked about the main duties/tasks of the library staff.

Table 4: Main duties

N= 30

Please list the main duties or tasks of your work	Responses	
	N	Percentage
Information retrieval and reference services	19	63.3%
Collection organization, development and maintenances	16	53.3%
Issue desk	8	26.7%
User education	6	20.0%
Outreach and communication	5	16.7%
Circulation supervisor	5	16.7%
Information services	3	10.0%
Human resources management	3	10.0%
College and school liaison	3	10.0%
Marketing	2	6.7%
Selection and purchase of information	2	6.7%
Professional development and training	2	6.7%
Interlibrary loans	2	6.7%
Academic reserves	1	3.3%
Running of reports on workflow	1	3.3%
Allocating duties to student assistants	1	3.3%
Maintain the library database	1	3.3%
Occupational health	1	3.3%
Campus librarian	1	3.3%
No responses	4	13.3%
Total	*86	286.9%

***Multiple responses received**

Table 4 shows the main duties of the library staff of the two campus libraries. The three most listed duties were information retrieval and reference services, collection organization, development and maintenances and issue desk duties which were being done by more than a quarter of the respondents with the first mentioned being done by a majority of 19 (63.3%). The remaining 16 duties listed were mentioned six or less times and 10 of those duties were mentioned two or less times.

4.3.1.6 Ownership of a mobile phone

Question 1f was asked to determine whether the respondents owned a mobile phone and if so what type of mobile phone it was.

Table 5: Ownership of a mobile phone
N: 30

Do you own a mobile phone?	Frequency	Percentage
Yes	19	63.3%
No	9	30.0%
No response	2	6.7%
Total	30	100.0%

As seen in table 5 above, a majority of the respondents owned a mobile phone and nine (30.0%) did not.

Table 6: Type of mobile phone
N=19

Which type of phone do you own?	Frequency	Percentage
Blackberry	7	36.8%
Sony Ericson	4	21.1%
Nokia	4	21.1%
Samsung	1	5.3%
No response	3	15.8%
Total	19	100.0%

As seen in the table above, a majority of the respondents owned Internet enabled mobile phones. Of the 19 respondents who said they owned mobile phones, seven (36.8%) owned a Blackberry while Sony Ericson and Nokia phones were owned by a total of eight (42.1%) staff. Three (15.8%) did not respond to the question.

4.3.2 Section two: Skills required for the use of mobile technology

The one question which comprised Section two asked about the skills required by the staff to be able to use mobile technology to provide library and information services to the users.

Table 7: Mobile technology skills required by staff

N=30

Mobile skills	Responses	
	N	Percentage
Instant messaging with friends and family on mobile phone	23	76.6%
Access Internet on your mobile phone	22	73.3%
Open your email on your mobile phone	21	70.0%
Access the library website on your mobile phone	19	63.3%
Open a file e.g. PDF, word document and read it on your mobile phone	15	50.0%
Attach and email a document using your mobile phone	11	36.7%
Offer reference services to a library user using your mobile phone	7	23.3%
No response	2	6.7%
Total	*120	399.9%

***Multiple responses received**

Table 7 shows the different skills required by the library staff of PMB and Howard College campus libraries to be able to provide library and information services. Of the 30 respondents, 23 (76.7%) said they were able to do instant messaging with friends and family on their mobile phones. When asked whether they could access Internet on their mobile phones, 22 (73.3%) said ‘yes’ they can and 21 (17.8.5) indicated being able to open their emails on their phones. Remarkably, seven (23.3%) respondents were already offering references services to their users through their mobile phones.

4.3.3 Section three: Organizational factors

Section three provides information about the organizational factors that could influence adoption and implementation of mobile phone technology in these libraries.

4.3.3.1 Investing funds

Question 3a asked respondents whether top management was likely to invest funds in mobile phone technology for the provision of library and information services. Respondents were then asked why they gave the answer they did.

Figure 3: Investing funds

N= 30

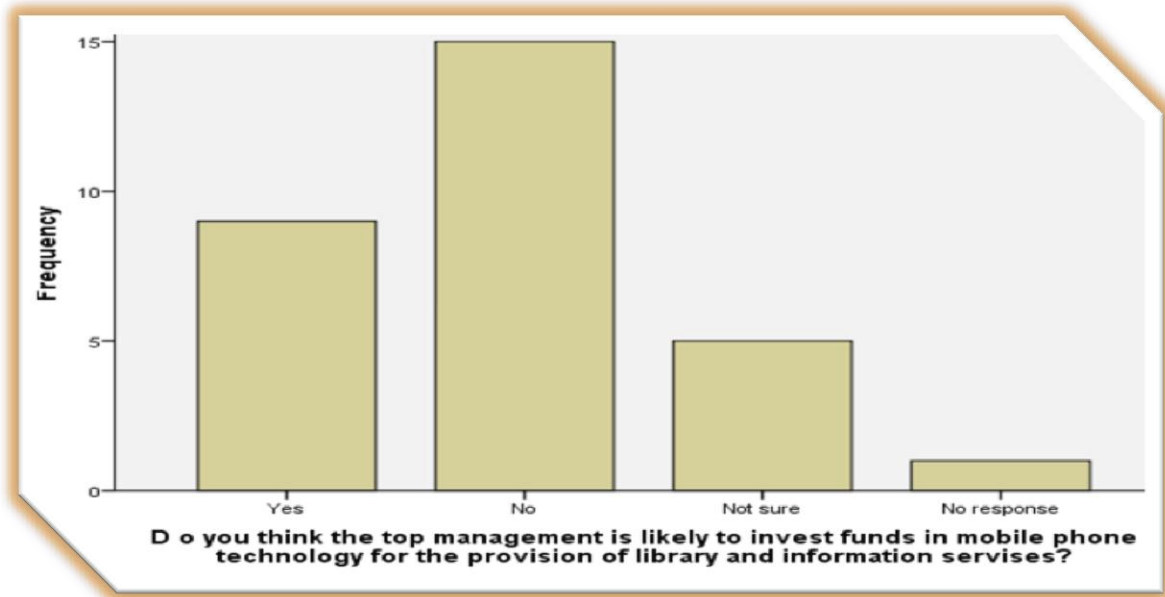


Figure 3 shows that nine (30.0%) of the 30 respondents said ‘yes’ to top management investing funds in mobile phone technology for provision of library and information services. Half of the respondents said “no” to top management doing so, and five (16.7%) were not sure.

4.3.3.1.1 Reasons for positive or negative response

Table 8: Reasons for negative response to top management investing funds

N=15

Reason	Responses	
	N	Percentage
There are no funds	15	100.0%
They don't see the need	4	26.7%
Total	*19	*126.7%

***Multiple responses received**

Fifteen respondents gave different reasons to their answers. All the 15 respondents said that top management would not invest funds in mobile phone technology because there were not enough

funds in the library while four (26.7%) said top management would not invest funds because they do not see the need to.

Table 9: Reasons for positive response to top management investing funds

N=8

Reason	Responses	
	N	Percentage
To improve access to information	5	62.5%
To be in line with new technology	1	12.5%
To meet the objectives of the library	1	12.5%
Simpler to implement due to cloud computing	1	12.5%
It is cheap	1	12.5%
Total	*9	*112.5%

***Multiple responses received**

Among those respondents who said ‘yes’ to top management investing funds, five (62.5%) indicated that top management would be willing to do so because it would improve access to information while others gave reasons as seen in Table 9 above. Those respondents who were not sure in Figure 3 did not indicate any reasons.

4.3.3.2 Willing to take risks

Question 3b asked the respondents whether top management would be willing to take risks involved in the adoption of mobile phone technology in the library. Respondents were then asked why they gave the answer they did.

Figure 4: Risks

N= 30

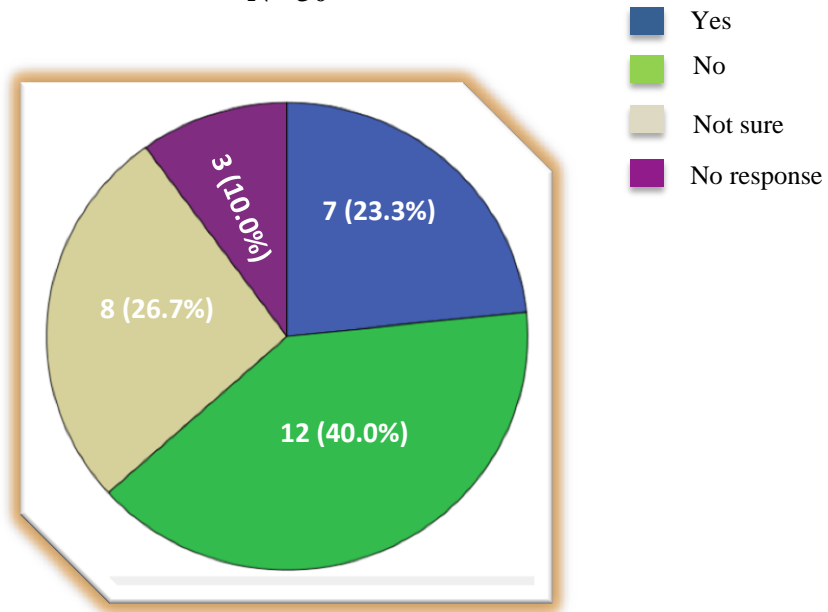


Figure 4 above shows that out of 30 respondents, 12 (40.0%) said 'no' to top management taking risks involved in adopting and implementing mobile phone technology. Seven (23.3%) said 'yes', top management would be willing, while eight (26.7%) were not sure about it. While those respondents who were not sure did not specify why, the other respondents gave the following reasons.

4.3.3.2.1 Reasons for positive or negative response

Table 10: Reasons for negative response to top management taking risks

N=10

Reasons	Responses	
	N	Percentage
There are no funds to risk	6	60.0%
They are not exposed to such a technology	4	40.0%
Not in top management position to comment	2	20.0%
Not all students have mobile phones and phones are not suitable for reading documents, the print is too small	1	10.0%
It is not a priority of the library	1	10.0%
It will lead to loss of jobs	1	10.0%
Total	*15	*150.0%

***Multiple responses received**

Sixty percent of the respondents who provided reasons as to why top management would not be willing to take the risks involved in implementing this technology stated the library did not have funds to risk. Four (40.0%) respondents noted that top management would not be willing to take a risk because they are not exposed to such a technology yet. Other reasons are as seen in Table 10 above.

Table 11: Reasons for positive response to top management taking risks

N=6

Reasons	Responses	
	N	Percentage
For easy accessibility of resources and to be competent	2	33.3%
All students have mobile phones	2	33.3%
If the technology is proven to be beneficial	1	16.7%
Recently the library subscribed to “libguides” which is mobile compatible	1	16.7%
To be in line with new technology	1	16.7%
All risks can be overcome at a limited cost	1	16.7%
Total	*8	*133.4%

***Multiple responses received**

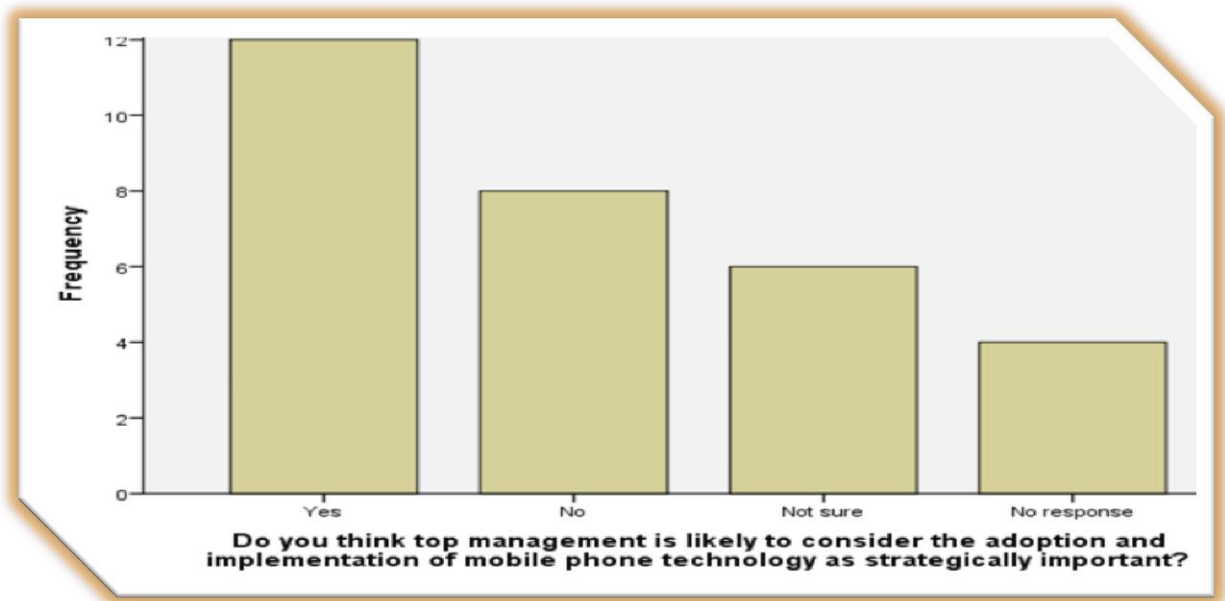
Among those who provided reasons to top management taking risks, easy accessibility of resources and for the university to be competent were among the reasons listed. It was interesting to find out that the library had subscribed to “libguides” (These are guides that hold listings of suggested resources for finding information, such as databases and journals that are most relevant to one’s area of study) that are mobile compatible and this would also motivate top management to take risks involved as explained by one (16.7%) respondent.

4.3.3.3 Strategic importance

Question 3c asked the respondents whether top management was likely to consider the adoption and implementation of mobile phone technology as strategically important. They were then asked why they gave the answer they did.

Figure 5: Strategic importance

N= 30



Twelve (40.0%) respondents said ‘yes’ to top management considering adopting mobile phone technology as strategically important. While eight (26.7%) said ‘no’ they wouldn’t, six (20.0%) of the respondents were not sure whether top management would or would not consider that it is strategically important and did not state why they were not sure.

4.3.3.3.1 Reasons for positive or negative response

Table 12: Reasons for negative response to top management considering adoption and implementation of mobile technology as strategically important

N=5

Reasons	Responses	
	N	Percentage
It is not an important issue at the moment	4	80.0%
No funds	2	40.0%
It is already implemented, one can access the databases using mobile phones	1	20.0%
Total	*7	140.0%

***Multiple responses received**

Four (80.0%) respondents who provided reasons to top management seeing the implementation of this technology as strategically important said that it was not an important issue of the library at that moment while two (25.0%) said it was because there were no funds.

Table 13: Reasons for positive response to top management considering adoption and implementation of mobile technology as strategically important

N=9

Reasons	Responses	
	N	Percentage
To promote access to information	4	44.4%
Improve communication with the users	2	22.2%
If the technology is exposed and demonstrated to them	2	11.1%
It is aligned with the library long-term strategy	1	11.1%
Increase delivery of resources	1	11.1%
Easy to track down students with overdue materials	1	11.1%
Total	*11	111.0%

***Multiple responses received**

Promoting access to information was seen as the main reason as to why top management would consider adoption of mobile technology as strategically important for the library being mentioned by four (33.3%) of the respondents. Improving communication with users and

exposure of this technology to top management were considered as reasons that would make top management see this technology as strategically important.

4.3.3.4 Competitive advantage

Question 3d required the library staff to state whether they thought top management was likely to be interested in adopting mobile phone technology in order to gain competitive advantage. They were also asked why that particular answer.

Figure 6: Competitive advantage

N= 30

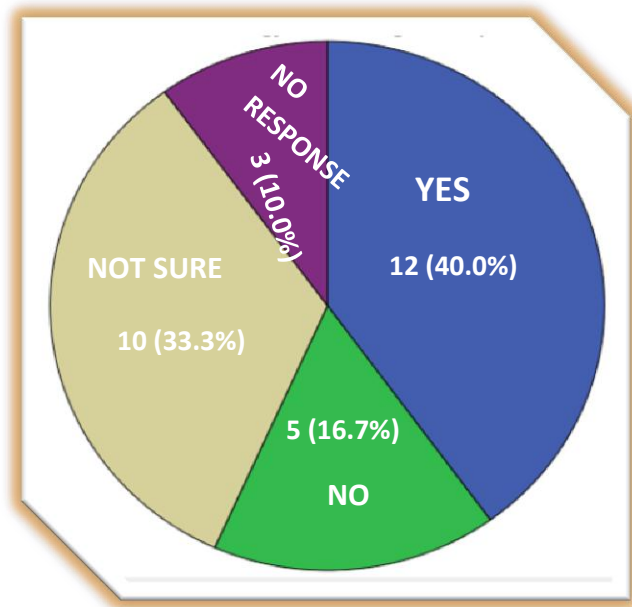


Figure 6 above shows that 12 (40.0%) respondents were positive that top management would be interested in adopting this technology to gain competitive advantage. Ten (33.3%) of respondents were not sure about it while five (16.7%) said 'no', top management would not adopt it for competitive advantage.

4.3.3.4.1 Reasons for positive or negative responses

Table 14: Reasons for negative response to top management being interested in adopting the technology to gain competitive advantage

N=4

Reason	Responses	
	N	Percentage
There are no funds	4	100.0%
Not all users have phones to access the internet	1	25.0%
They have no motivation to compete	1	25.0%
Total	*6	150.0%

***Multiple responses received**

Among those who said ‘no’ to top management adopting the technology for competitive advantage, lack of funds seemed to be the main reason. Other reasons are as seen in Table 14 above.

Table 15: Reasons for positive response to top management being interested in adopting the technology to gain competitive advantage

N=8

Reason	Responses	
	N	Percentage
Improve access to information	4	50.0%
Library needs to be visible to all the users anywhere	2	25.0%
It is a new technological trend	1	12.5%
They should be the fore runner and hence take the initial challenge	1	12.5%
If they realize that other universities are using the technology	1	12.5%
Most of the information is on the website	1	12.5%
It will help the university to go up in ranking	1	12.5%
Total	*11	137.5%

***Multiple responses received**

The strong ‘yes’ responses above as to whether top management would adopt mobile technology for competitive advantage were supported by reasons such as adopting this technology would lead to improving access to information which was specified by four (50.0%) respondents and the library needs to be visible by all users anywhere which was raised by two (11.8%) respondents.

4.3.3.5 Knowledge

Question 3e was aimed at identifying whether the libraries in general had enough knowledge to provide library and information services through mobile phones. The respondents were again asked why they gave the answer they did.

Table 16: Libraries having enough knowledge

N=30

Does your library in general have enough knowledge to provide library and information services through mobile phones?	Responses	
	N	Percentage
No	13	43.3%
Yes	6	20.0%
Not sure	6	20.0%
No response	5	16.7%
Total	30	100.0%

Table 16 above shows that out of 30 respondents, 13 (43.3%) said ‘no’, the library does not have enough knowledge to provide library and information services through mobile phones while six (20.0%) said ‘yes’ and not sure respectively.

Of those who said ‘no’ as to whether the libraries had enough knowledge, four (30.8%) did not give reasons while the remaining nine (69.2%) gave the following reasons:

- There is no formal training provided for staff (six (66.7%));
- Information sharing and knowledge co-ordination in the library is not shared (two (22.2%));
- There is no interest in top management and among the staff so no one is talking about it (two (22.2%));
- The needs of the users are unknown (one (11.1%));
- There is no technical or IT department to do research on new technology trends (one (11.1%)).

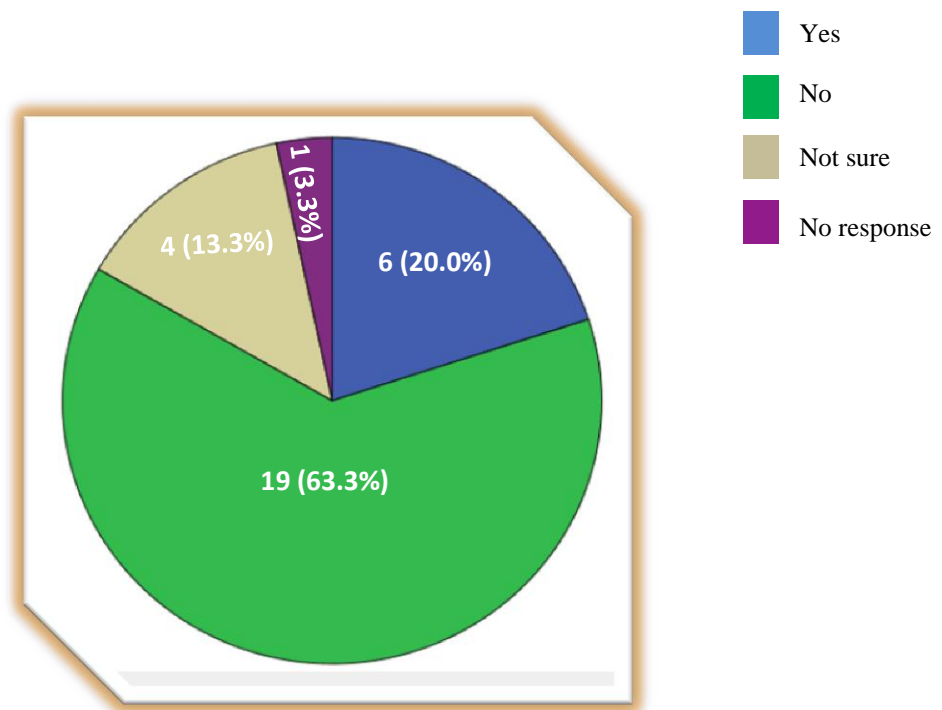
Of those who said ‘yes’ as to whether the libraries had enough knowledge, one (16.7%) did not give reasons while the remaining five (83.3%) gave the following reason:

- There is enough skills and qualified people to implement the technology (three (60.0%));
- The library is already providing information via the web and hence mobile (one (20.0%));
- Technology is the next logical step (one (20.0%)).

4.3.3.6 Resources

Question 3f asked the respondents whether the library had enough resources (e.g. human, hardware and financial resources) for adoption and implementation of mobile phone technology. They were also asked to specify why they gave their particular answer.

Figure 7: Enough resources
N= 30



The pie chart above shows that a majority of 19 (63.3%) respondents said that the library does not have enough resources to adopt and implement the technology while six (20.0%) said the library does have enough resources to do so and four (13.3%) were not sure.

The respondents, who said ‘no’ to the library having enough resources, two (10.5%) did not give reason while the rest gave the following reasons:

- There is lack of funds in the library (17 (100.0%));
- Shortage of staff and currently there is restructuring in the library (eight (47.1%));
- There is a lack of expertise to run the technology (two (11.8%)).

Other reasons that had only one (5.9%) respondent stating it included: there is not enough hardware to implement the technology, the library does not have the time to implement this technology, the library is dependent on computers, there is no planning in the library and there are enough resources but there are other important issues at the moment.

Of those who said ‘yes’ about having enough resources in the library, two (33.3%) did not give reasons while the rest gave the following reason:

- The resources in the library are enough four (100.0%).

4.3.3.7 Difficulties anticipated in the adoption and implementation of mobile phone technology

Question 3g asked the respondents to mention the difficulty/ies they would anticipate in the adoption and implementation of mobile phone technology.

The twenty respondents who answered this question anticipated the following difficulties:

- Financial constraints/budget cuts/funding for the library (seven (35.0%));
- Training of the library staff to be able to use the technology (four (20.0%));
- Internet/network connecting problems (three (15.0%));
- Cost of using the Internet (three (15.0%));
- Not enough staff/manpower in the library to use the technology (three (15.0%));
- Not all mobile phones are compatible with the technology (two (10.0%));
- Maintenance problems (two (10.0%));
- The technology may not accommodate all students (two (10.0%));

- User education has to be provided to students to be able to use the technology (two (10.0%));
- Lack of IT support in the library and reluctance of staff to use the technology were all respectively mentioned by (two (10.0%));
- Disagreements between library departments to use the technology (one (5.0%));
- Some superiors in the library did not own mobile phones (one (5.0%));
- Exposure to the technology by the library staff and management (one (5.0%));
- Lack of planning in the library (one (5.0%)).

4.3.4 Section four: Technological factors

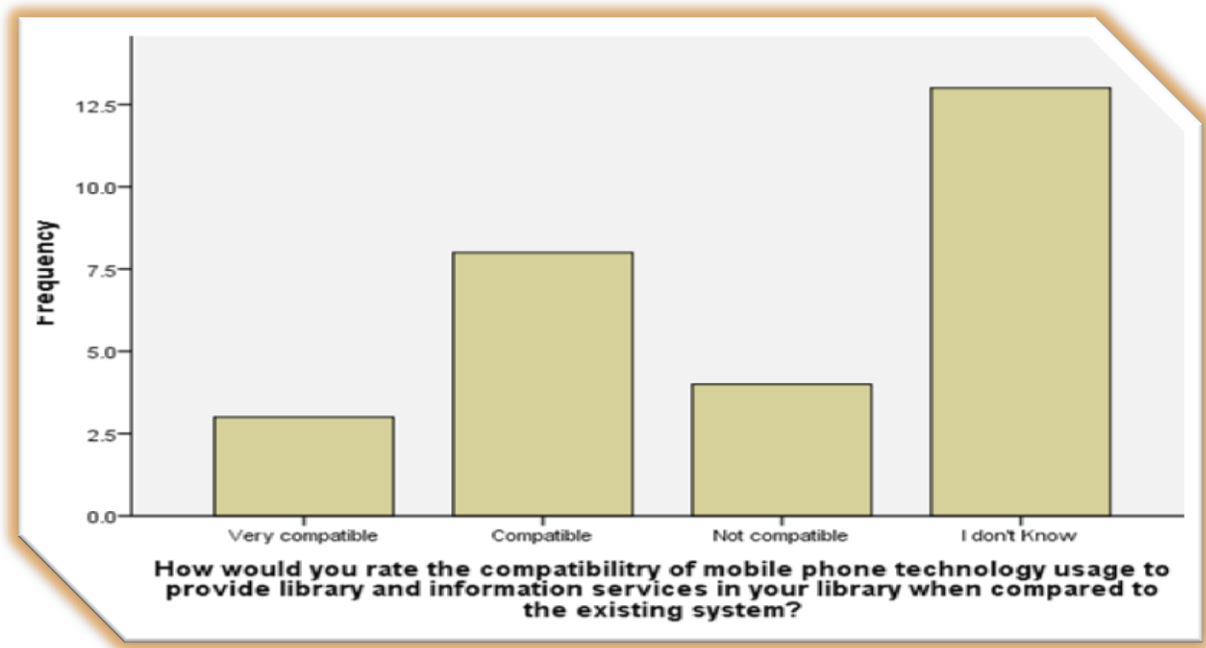
Question 4 was concerned with the technological factors which could influence implementation of mobile technology in the libraries.

4.3.4.1 Compatibility of mobile phone technology with the existing library system

Question 4a asked respondents to rate the compatibility of mobile phone technology usage to provide library and information services when compared to the existing system.

Figure 8: Compatibility

N= 30



Thirteen (43.3%) of the respondents did not know whether the existing system in the library was compatible with mobile phone technology. Of the 11 respondents who viewed the compatibility in a positive light, eight (26.7%) rated the mobile phone technology as compatible and three (10%) as very compatible with the existing library system. One could argue that it would only be the systems librarians who would know this information.

4.3.4.2 Information technology infrastructure

Question 4b asked the respondents whether the information technology infrastructure, that is, hardware and software in the library could satisfy the need to adopt and implement mobile phone technology usage in the library. They were also asked to provide reasons for their choice of answer.

Table 17: Information technology infrastructure

N= 30

Do you think the information technology infrastructure in your library can satisfy the need to adopt and implement mobile phone technology usage in your library?	Responses	
	N	Percentage
Yes	12	40.0%
Not sure	8	26.7%
No	5	16.7%
No response	5	16.7%
Total	30	100.0%

A total 12 (40.0%) respondents said ‘yes’ the infrastructure was enough while eight (26.7%) were not sure.

Of those 12 respondents who said ‘yes’ the information technology infrastructure in the library could satisfy the needs to adopt and implement mobile phone technology, only six gave a reason for their answer.

- The library is up-to-date with technology and there is high-end software and hardware supported by IT staff (four (66.7%));
- Availability of free Wi-Fi to enable students to access information (one (16.7%));
- Quick response to emails by students (one (16.7%)).

Five respondents said ‘no’ the information technology infrastructure could not satisfy. Four gave the following reasons:

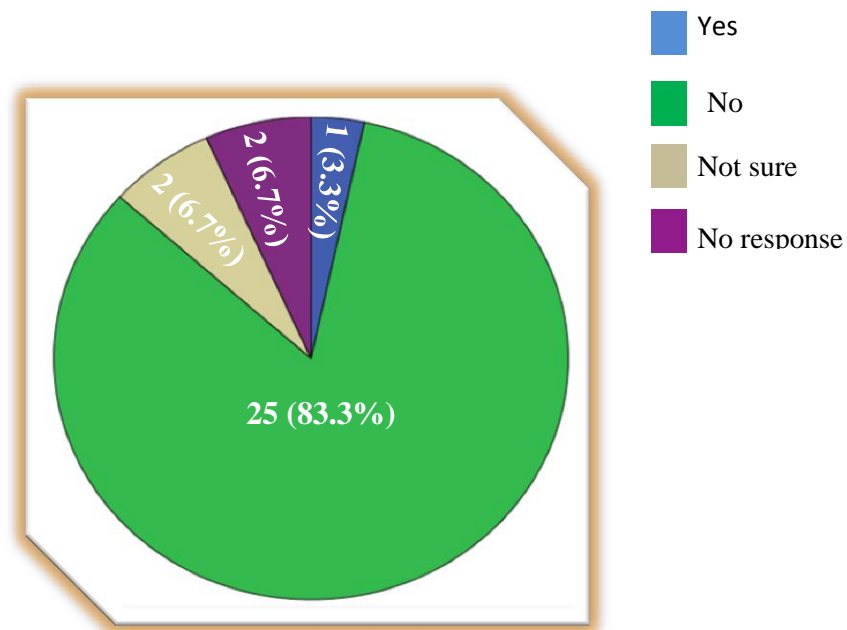
- The infrastructure in the library is outdated (3 (75.0%));
- Not everyone in the library is technological “savvy” (one (25.0%));
- The infrastructure needs to be tried and tested before being implemented (one (25.0%));
- Lack of training (one (25.0%)).

4.3.4.3 Complex task

Question 4c asked the respondents whether using mobile phones to provide library and information service was a complex task.

Figure 9: Complex task

N= 30



A significant majority 25 (83.3%) of the respondents did not think using mobile phone technology to provide library and information services was a complex task while only one (3.3%) said 'yes' it was a complex task.

Of the 25 respondents who said 'no' using mobile phone technology to provide a library and information service was not a complex task, 16 gave the following reasons:

- Mobile phones are just like mini computers, they are the same as iPads and laptops (four (25.0%))
- Most users of the library have and use smartphones (three (18.75%));
- The staff have to be trained to use the technology (three (18.75%));

- Everything is online which makes it easy to download and use (two (12.5%));
- It will promote easy communication and improve services (one (6.25%));
- We need to upgrade to where the rest of the world is (one (6.25%));
- There should be a dedicated unit to ensure updates and sustainability (one (6.25%));
- The library should have enough funds to purchase the technology (one (6.25%)).

For the one respondent who said ‘yes’, the reason given was that not everyone has a smartphone to provide these services to.

4.3.4.4 Improve delivery of services and maximize library usage

Question 4d asked the respondents whether using mobile phones would improve delivery of library and information services in the library and maximize library usage. The respondents were also asked to provide reasons for their answers.

Figure 10: Improve delivery of services and library usage

N= 30

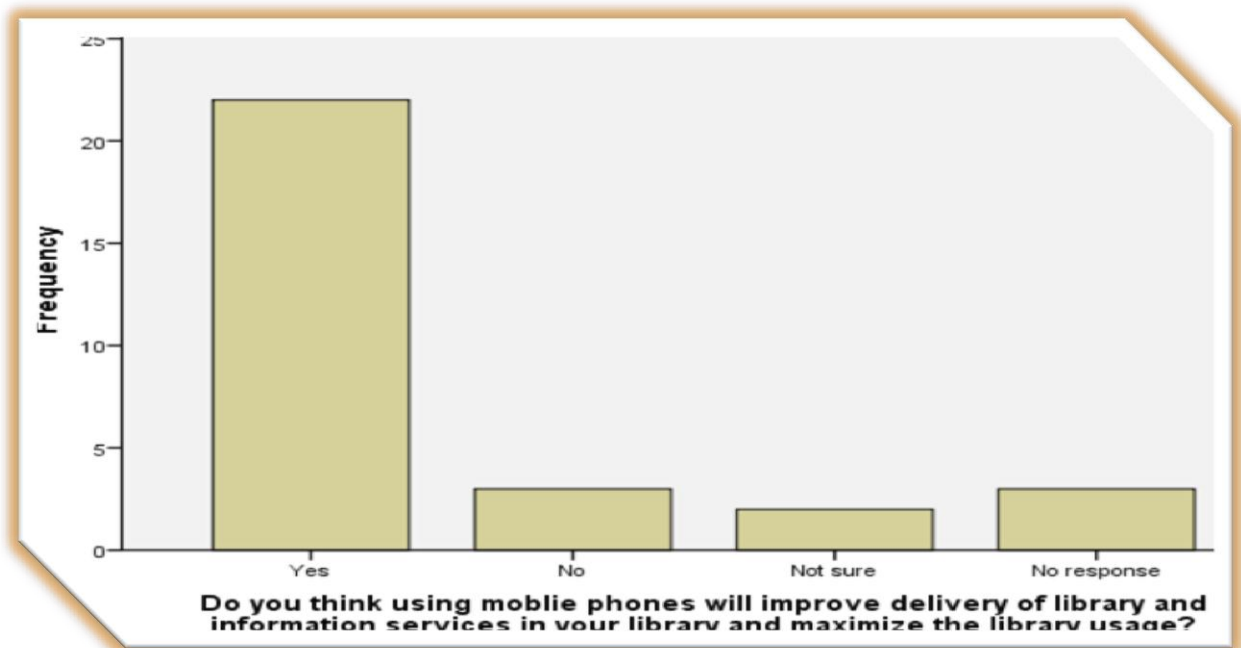


Figure 10 shows that a total of 22 (73.3%) respondents said that using mobile phone technology would improve delivery of services and maximize usage of the library. While three (10.0%) said it would not, two (6.7%) were not sure.

4.3.4.4.1 Reasons for positive or negative response

Of the 22 respondents who agreed that using mobile phone technology would improve delivery of services and maximize usage of the library, 18 gave the following reasons.

Table 18: Reasons for positive response to using mobile phone technology to improve delivery of library and information services

N= 18

Reasons for thinking using mobile phones will improve delivery of library and information services	Responses	
	N	Percentage
Increase access to information	10	55.5%
Many students use smartphones	6	33.3%
There will have to be user education	2	11.1%
It will help in promoting awareness of the library services	1	5.6%
It will be an added communication device	1	5.6%
It will help in reaching more users in their own space and environment	1	5.6%
Total	*21	116.7%

***Multiple responses received**

Of the 18 respondents who gave reasons, the reason given most by 10 (55.5%) librarians was increasing access to information as seen in Table 18 above. While the fact that many students already use smartphones appeared to have been another good reason mentioned by six (33.3%). Two (11.1%) of the library staff stated that there would have to be user education first.

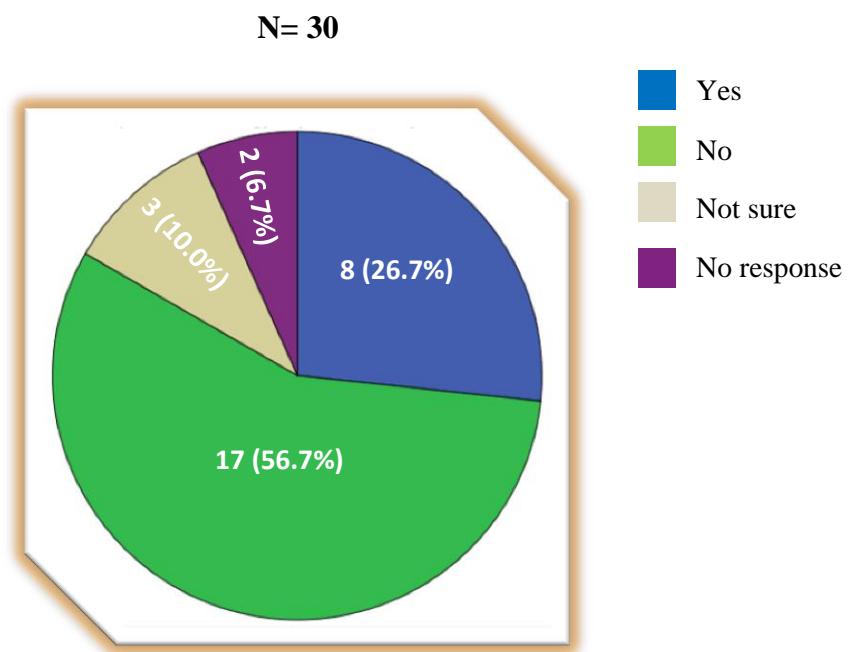
For the three respondents who said ‘no’ using mobile phone technology would not improve delivery of services, each one gave one reason. These reasons were:

- It will require librarians to work longer hours;
- Depends on the application that suits students because some applications are better on computers;
- There is low usage of the library now and it is not because of technology.

4.3.4.5 Affordability of the technology

Question 4e asked the respondents whether the library could afford to implement, use and maintain mobile phone technology to provide library and information services. They were also required to provide reasons for their choice of answer.

Figure 11: Affordability of mobile phone technology



A slight majority of the respondents, 17 (56.7%) were of the opinion that their library could not afford to implement, use and maintain mobile phone technology while eight (26.7%) thought that their library could.

4.3.4.5.1 Reason for positive or negative response

Table 19: Reasons for negative response to the library being able to afford implementing this technology

N= 14

Reasons for thinking the library can afford to implement, use and maintain mobile phone technology	Responses	
	N	Percentage
There are no funds to implement the technology	14	100.0%
There is shortage manpower	1	7.1%
Total	*15	*107.1%

***Multiple responses received**

All 14 respondents who gave a reason listed the lack of funds as being the main reason why the library could not afford to implement the technology as seen in the Table above.

Table 20: Reasons for positive response to the library being able to afford implementing this technology

N= 5

Reasons for thinking the library can afford to implement, use and maintain mobile phone technology	Responses	
	N	Percentage
If we start on a small scale to a larger scale	3	60.0%
There is available infrastructure to implement	2	40.0%
Library system is already connected with mobile phones	1	20.0%
Total	*6	120.0%

***Multiple responses received**

Three of the five respondents who gave a reasons said if the library starts on a small scale towards a bigger one then it will be able to maintain and use mobile phone technology and two (40.0%) indicated that the library has available infrastructure to implement and use this technology.

4.3.5 Section five: Environmental factors

In question 5 a series of questions were asked concerning environmental factors that could influence implementation of mobile phone technology in the libraries under study.

4.3.5.1 Mission of UKZN libraries

Question 5a aimed to investigate the possibility of achieving the mission of UKZN libraries through the application and development of mobile phone technology in the libraries without considering internal resource constraints.

Table 21: Achievement of the mission of UKZN libraries

N= 30

Without considering internal resource constraints, will the application and development of mobile phone technology in your library help you to achieve the mission of UKZN libraries?	Responses	
	N	Percentage
Yes	21	70.0%
Not sure	3	3.3%
No	1	10.0%
No response	5	16.7%
Total	30	100.0%

Table 21 shows that minus the internal resource constraints, 21 (70.0%) respondents believed that the application and development of mobile phone technology would help in achieving the mission of UKZN libraries.

Of the 21 library staff who thought that the application and development of mobile phone technology would help in achieving the mission of UKZN Library, 13 gave reasons and these reasons are listed below:

- It will increase access to information all the time (six (46.2%));
- It will increase reliability and quick delivery of information (two (15.4%));
- It will increase usage of the library (two (15.4%));
- It will increase and promote efficient and effective rendering of services (two (15.4%));
- It will help support researches being conducted in the University through the library (one (7.8%));
- It will enhance in attaining the goal number one of UKZN (one (7.8%));

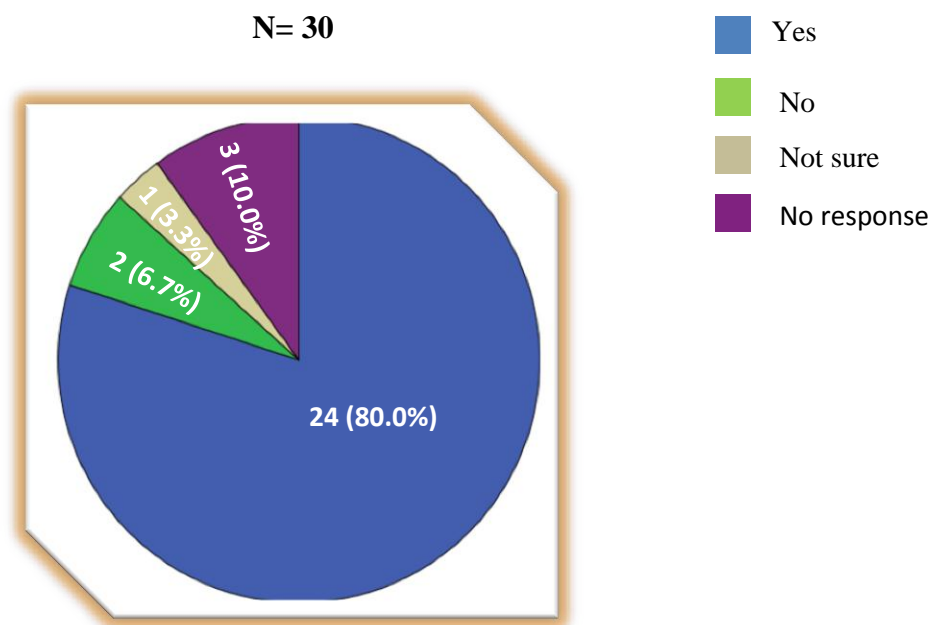
- It will promote remote access to information and reach a wider number of library users (one (7.8%)).

Loss of jobs and the fact that the library did not have internal support was stated by the one respondent who said ‘no’ the application and development of mobile phone technology in the library would not help to achieve the mission of UKZN libraries.

4.3.5.2 Improve image and reputation

Question 5b asked the respondents whether usage of mobile phones to provide library and information services could improve the image and enhance the reputation of the library. The respondents were also asked to give reason as to why they thought so.

Figure 12: Improve image and reputation



Twenty four (80.0%) of respondents indicated that ‘yes’ using mobile phone technology to provide library and information services could improve the image and enhance the reputation of their libraries. Two (6.7%) did not think so and one (3.3%) was not sure about it.

When asked why they thought it would improve the image and enhance the reputation of their libraries, of the 24 respondents 15 gave the following reasons:

- To be in line with new technology and hence be able to compete with other institutions in the technological changing world (four (26.7%));
- It will help in serving more users wherever they are (three (20.0%));
- It will enable the library and University at large to be leaders and not followers (three (20.0%));
- Most students are technologically “savvy” and hence prefer using mobile phones instead of computers (three (20.0%));
- It will increase closeness and communication between librarians and students (two (13.3%));
- If the technology is well done and maintained (one (6.7%));
- It will improve services being offered by the library (one (6.7%)).

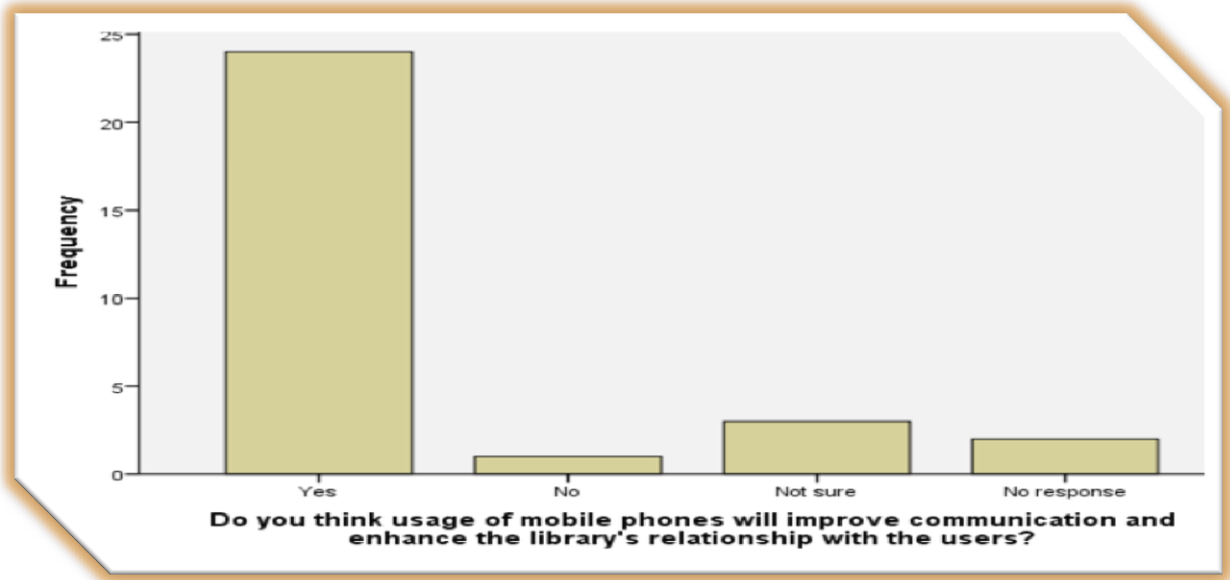
Between the two (6.7%) respondents who said ‘no’, one did not give a reason why and the other said the library needs funds to implement this technology.

4.3.5.3 Improve communication

Question 5c asked the respondents whether usage of mobile phones would improve communication with library users and enhance the relationships with them without forgetting to state why they thought so.

Figure 13: Improve communication

N=30



It is motivating to see that majority of the library staff, 24 (80.0%), thought that mobile phone technology would improve communication and enhances relationships with users.

Of the 24 respondents, 15 gave the following reasons:

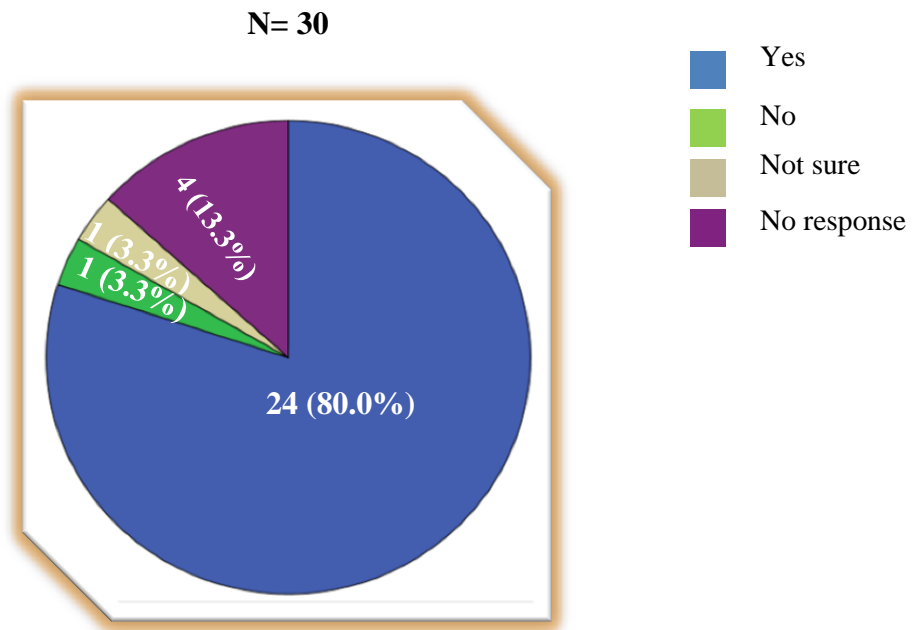
- Increase access to information at anytime (four (26.7%));
- It will promote closeness of users and librarians because there will be real time communication (four (26.7%));
- It is more reliable and quicker than the current methods (two (13.3%));
- It will lead to more work for librarians (one (6.7%));
- Users of the library use mobile phones more often (one (6.7%));
- Most users use mobile phones (one (6.7%));
- Most users of the library communicate through SMSs and social networks (one (6.7%));
- It will be easier to keep users up-to-date with library news and keep them informed of new books (one (6.7%));
- There are problems with logging on to the computers (one (6.7%)).

The one respondent who said ‘no’ said so because usage of this technology will add more work to the librarians. However this was also mentioned by one who said “Yes”.

4.3.5.4 Improve customer services

Question 5d asked the respondents whether using mobile phones to provide library and information services would improve customer services and enhance operational efficiency. Respondents were then asked why they gave the answer they did.

Figure 14: Improve customer services



As seen in Figure 14 above, a significant majority of 24 (80.0%) respondents answered in the affirmative to mobile phones improving customer services and enhancing operations efficiency.

When asked why, the following reasons were given by 14 of the 24 respondents:

- It is reliable and quicker than the current methods (four (28.6%))
- It will increase access to information (three (21.4%))
- It will improve communication (two (14.3%))
- It will create more independent users (two (14.3%))
- It depends on the purpose of use, notifications, user education or searching materials (one (7.1 %))

- It is one of the normal networks used (one (7.1%)).

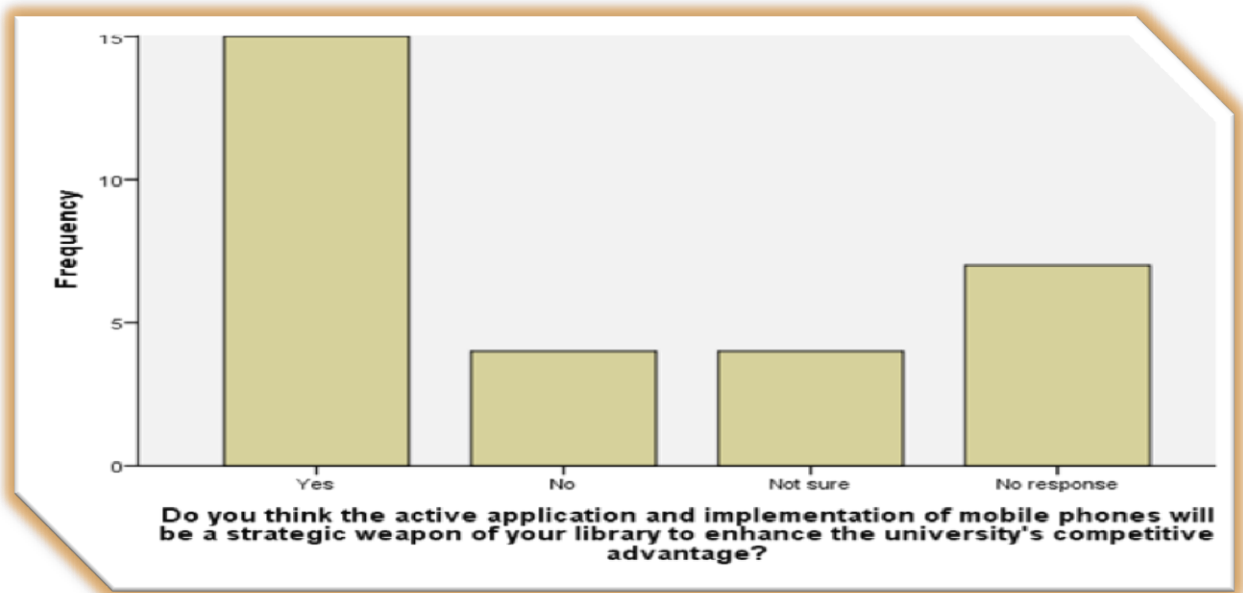
The reason for the one ‘no’ response was that usage of this technology will be a disadvantage because users will not visit the library anymore.

4.3.5.5 University’s competitive advantage

Question 5e asked the respondents whether active application and implementation of mobile phones would be a strategic weapon for the library to enhance the University’s competitive advantage. Respondents were then asked why they gave the answer they did.

Figure 15: University’s competitive advantage

N=30



Half of the respondents 15 (50.0%) believed that the application and implementation of mobile phones would be a strategic weapon for their libraries to enhance the University’s competitive advantage as seen in Figure 15 above. Four (13.3%) of respondents said ‘no’ it would not be strategic while another four (13.3%) were not sure.

4.3.5.5.1 Reasons for positive or negative response

When asked why they thought so, 10 of the 15 gave a reason/s:

Table 22: Reasons for positive response to why the active application and implementation of mobile phones will be a strategic weapon for the library to enhance University's competitive advantage

N= 10

Reasons for thinking the active application and implementation of mobile phones will be a strategic weapon of the library	Responses	
	N	Percentage
There are some South African universities that have implemented the technology and so UKZN will be among the leaders	4	40.0%
There will be availability of information and this will grant competition with other institutions	3	30.0%
It will improve communication	2	20.0%
Students will appreciate using the mobile phone technology	1	10.0%
The implementation of the technology must be directed by the library users' needs	1	10.0%
Parents send their children to reputable universities with world class resources	1	10.0%
It will help in reaching towards the university's mission and vision	1	10.0%
Total	*13	130.0%

***Multiple responses received**

It was interesting to see that the most mentioned reason which was raised by four (40.0%) respondents was that some South African universities have already implemented this technology and so UKZN would be among the leaders. Availability of information which will grant competition with other institutions was also said by three (30.0%) respondents. Other reasons as seen in Table 22 above were also quite relevant and interesting to see them being raised.

Among the four respondents who said 'no' to mobile phones being a strategic weapon, one did not specify why and the rest gave one reason each. The reasons given were:

- Mobile phone technology is not the only tool as there are other web2.0 tools like "libguides" that have put the University libraries in a strategic advantage;
- UKZN is already using SMS system to communicate and hence this will just be an extra tool for students and library;

- There are already some South African universities that have implemented the technology and so UKZN will just be among the leaders. (This was also mentioned by four of the respondents who said “Yes” above.)

4.3.6 Librarian’s perceptions about mobile phone services

Question 6 was asked to determine the perceptions of respondents concerning mobile phone technology in libraries.

Table 23: Librarian’s perceptions about mobile phone services

N= 30

Librarian’s perception about mobile phone	Responses						Total
	Strongly disagree	Disagree	Not sure	Agree	Strongly agree	No response	
I believe using mobile phone technology in the library will improve my work at the library	3	3	9	11	3	1	30
I like to experiment with new technology	3	1	3	12	10	1	30
I believe using mobile phones will improve the library efficiency	3	1	7	11	7	1	30
Using mobile phones will help in building user-librarian relationship	2	2	6	10	9	1	30
I believe using mobile phones will help improve usage of the library	3	1	5	12	7	2	30
I believe using mobile phones will ensure maximum use of library information resources e.g. databases	3	1	6	10	8	2	30

It was fascinating to see that majority of the library staff, 22 (73.3%) either agreed or strongly agreed that they like to experiment with new technology. It was also interesting to find out that just under half 14 (46.7%) of the respondents either agreed or strongly agreed that using mobile

phone technology will improve their work in the library and just above half 18 (60.0%) also either agreed or strongly agreed that using mobile phones will improve the library efficiency. The respondents' perceptions on using mobile phone technology to improve usage of both firstly the library and secondly library information resources was positive as 19 (63.3%) and 18 (60.0%) respondents respectively agreed and strongly agreed to the statements.

4.3.7 Additional comments

The respondents were asked if they had any further comments and to kindly mention them. However no additional comments were made.

4.4 Summary

Chapter four presented the results of the study which set out to investigate the preparedness of University of KwaZulu-Natal libraries to implement and use mobile phone technology in provision of library and information services. Data was collected using self-administered questionnaires from 30 library staff of both the PMB and Howard College libraries of UKZN. Findings were presented in the form of tables, pie charts, bar graphs and text. The following Chapter, Chapter five, discusses the presented findings.

CHAPTER FIVE

DISCUSSION OF THE RESULTS

5.1 Introduction

This Chapter discusses the findings of the study which were presented in the previous Chapter. The study sought to investigate the preparedness of University of KwaZulu-Natal libraries to implement and use mobile phone technology in the provision of library and information services.

The Technology, Organization and Environment (TOE) framework referred to in Chapter two is used as the framework for the discussion of the preparedness of these libraries to adopt and implement mobile phone technology. The findings are discussed in the light of the relevant literature and the theoretical framework. The Chapter is divided into five sections. Section one discusses the general information of the respondents while Section two discusses the necessary skills required by the staff to provide library and information services through mobile phones. Sections three, four and five discuss the organizational, technological and environmental factors that could influence implementation of this technology. Before moving on to the first section, a brief discussion of the response rate follows.

5.1.1 Response rate

The population for this study was 60 UKZN PMB and Howard College library staff that consisted of the director, two campus librarians, the circulation staff, the subject librarians, the interlibrary loan staff, the administration staff, the information services staff, the IT support/web support staff, academic reserves staff and the e-resources staff. Questionnaires were distributed to the whole population of the study either through emails to those who were at Howard College (Durban) or physically handing them to those staff on the PMB Campus. Nulty (2008) states that a response rate is only adequate depending on the use that is being made of the data. He goes on to say that 50% is regarded as an acceptable rate in social research postal surveys. In the light of this, the response rate obtained in this study could be considered acceptable as out of the 60 questionnaires distributed, 30 (50.0%) were returned. The majority of the returned questionnaires were from the PMB Campus. The low response rate from Howard College may have been

brought about by the fact that the researcher made use of email to distribute the questionnaires to Howard College respondents. These respondents could have ignored the emails requesting them to fill in the questionnaire. There is the possibility that others may not have been able to complete the questionnaire online or print it out. The response rate of 50% was achieved after much follow up with the respondents via emails, phone calls and sometimes physical visits to their offices asking them to complete the questionnaire. A reason given by potential respondents for not answering the questionnaire was not having enough time to deal with a questionnaire consisting of a number of open questions. Other potential respondents were on leave during the data collection time.

5.2 Background information on respondents

This section outlines who the respondents were and discusses the following variables: area of work, professional library qualification, gender, age, main duties/tasks and ownership of mobile phones.

5.2.1 Area of work

As can be seen in Figure 2 in Chapter four above, just under half the respondents 14 (46.7%) indicated working in the Cecil Renaud Library on the PMB Campus. This was probably due to the researcher being based on this Campus making it easy to follow up on the completion of questionnaires. Six (20.0%) respondents specified working in the EG Malherbe Library (Howard College) and four (13.3%) worked in the Life Sciences Library (also on the PMB campus).

5.2.2 Gender and Age

The results showed that out of the 30 respondents, 16 (53.3%) were female while 12 (40.0%) were male. Many studies have shown that women are less likely to adopt and use new technology and if they do then it is to a lesser extent compared to men. For this study, the high number of responses from women could mean that this technology will be highly accepted if implemented. The largest number of respondents, 12 (40.0%) for both campuses were between the age group of 40-49. There were nine (30.0%) above 50+, seven (23.3%) between the age of 30-39 and only two (6.7%) were between the ages of 20-29. The results then show that out of the

30 respondents, only nine (30.0%) were between the ages of 20-39 with the majority above that. With advancements of technology usually being well received by younger people generally, it could be argued that the age of the staff at the libraries may negatively influence the adoption and implementation of mobile phone technology within the libraries since the majority of them are above 40 years. However, when asked whether they like to experiment with new technologies, 12 (40.0%) agreed that they like experimenting with new technologies and 10 (33.3%) strongly agreed. This then opens doors wider and promises a good response in terms of usage of the technology if implemented in these libraries.

5.2.3 Professional library qualifications

While some respondents indicated qualifications that are not specific for the library science field, most of them did indicate having library science qualifications. The majority 29 (96.7%) of the respondents had the basic library qualifications that included: the Bachelor of Library Science, Postgraduate Diploma (or Higher Diploma or Advanced University Diploma) and Bachelor of Library Science Honours. The staff at these libraries have gone as far as obtaining Masters and PhDs in Library Science as was indicated by a total of nine (30.0%) of the respondents. It is inspiring to see that majority of the staff of these libraries are qualified with appropriate qualifications.

5.2.4 Main duties/tasks of the library staff

In order to understand the ways in which mobile phone technology can be used to provide library and information services, one must examine the main duties/tasks performed by these library staff. Based on the results presented in Chapter four sections 4.3.1.5, the main duties/tasks performed by the library staff were: 19 (63.3%) for information retrieval and reference services, 16 (53.3%) for collection development, organization and maintenance, eight (26.7%) issue desk duties, six (20.0%) user education, five (16.7%) outreach and communication and another five (16.7%) circulation supervisors. Services that can be offered to users of the library through mobile phone technology include, but are not limited to, reference services and information retrieval, issue desk/circulation services, interlibrary loan services, academic reserve services and user education to a certain extent as stated by Mtshali (2011) in Chapter two. This shows that most of these services listed by Mtshali corresponded with the main duties of the respondents

and this bodes well for the usage of mobile phone technology should it be implemented in the UKZN libraries.

5.3 Skills required by the library staff to use mobile phone technology

The researcher is of the view that when adopting and implementing a new technology, it is rather important to identify whether there is some level of usage of the technology under study with the study population. Adopting and implementing mobile phone technology in UKZN PMB and Howard College libraries would be facilitated by the kind of mobile phones the staff themselves owned. Having mobile phones which are not Internet enabled could delay the adoption and implementation process. Similarly, it could be argued that the more staff who owned (and used) Internet enabled phones, the more likelihood of their “buy in” of the new technology. As presented on section 4.3.1.6 above, results showed that 19 (63.3%) of respondents owned Internet enabled mobile phones. When asked which type of mobile phones they owned, a total of 16 (53.3%) indicated owning smartphones, namely, Blackberry, seven (36.8%), Sony Ericson and Nokia each owned by four (21.1%) and a Samsung owned by one (5.3%) respondent. It was interesting to see that three (15.8%) respondents did not know the type of mobile phone they owned.

With the advancement of technology from the desktops to laptops and now to mobile technologies, libraries are expected to provide cost effective and reliable access to information using state of the art technology which is easy to use for both users and librarians. With that said, the librarians were asked to state whether they could perform some of the functions that come with these smartphones. These functions included: instant messaging with friends and family, accessing the Internet, opening emails, accessing the library website, opening a file, for example, a PDF or word document, attaching and emailing a document and, finally, offering reference services using their mobile phones. Most of the skills listed were being done by a majority of the respondents as 23 (76.6%) said they were able to do instant messaging with friends and family on their mobile phones, 22 (73.3%) could access the Internet, 21 (70.0%) indicated being able to open their emails, 19 (63.3%) could access the library website and 15 (50.0%) pointed to being able to open a PDF or word document using their phones.

It is therefore evident that the skills level of the library staff is high enough to be used to provide library and information services through mobile phones given that firstly, the majority of the staff own Internet enabled mobile phones, secondly they are able to use these phones to perform various functions which would suggest that, with the necessary training, it would be easy for them to deliver the library services that can be offered by using mobile phones and, thirdly and importantly, staff perceptions of mobile phone technology usage in the library was positive. These positive perceptions concerning the use of mobile phone technology for the provision of library and information services are reflected in Table 23 – with one slight exception the majority of respondents were positively predisposed (either agreeing or strongly agreeing with various statements) toward various aspects of mobile phone technology and its use in the library context.

5.4 Organizational factors that could influence implementation of mobile phone technology

This section discusses the organizational factors that could influence adoption and implementation of mobile phone technology in UKZN PMB and Howard College libraries.

5.4.1 Top management support

As emphasized in Chapter two, without top management support, nothing in any organization can take place. This is because it is the top management that makes the final decision regarding the implementation of a new technology or not. Rui (2007) observed that top management support is needed for any adoption of technological innovation. He further went on to say that leaders can influence the innovation climate indirectly through setting of goals and policies, through encouraging innovation initiatives from subordinates and through their decision with respect to innovation adoption or rejection.

When the respondents were asked whether they thought top management would be willing to take the risks involved in adopting mobile phone technology in their library and whether top management was likely to invest funds in mobile phone technology for the provision of library and information services, half (15) said ‘no’. This finding corresponds to an extent with the finding that 12 (40.0%) respondents were of the opinion that top management would not take

the risks involved in adopting and implementing mobile phone technology (see Figure 4). This is perhaps understandable as if there are insufficient funds in the library, then it would be difficult for management to risk putting funds into a technology they are not exposed to as explained by four (13.3%) of respondents when asked why they thought top management would not take the risks involved. For any innovation to be implemented and used, the organization has to be ready. According to Iacovou, Benbasat and Dexter (1995) “organizational readiness” in terms of finances and technology resources are also organizational factors that need to be considered when adopting a new technology. The financial readiness in this study refers to financial resources available to pay for installation costs of the software, customizing the library website to be suitable for small screens, hiring of expert staff to do the job, implementation of any subsequent enhancements, and on-going expenses during usage. The general argument by researchers is that the availability of resources is a necessary condition for innovation adoption since this can only occur in conjunction with using the firm’s resources (Rui 2007). Thus the firm’s ability to adopt and implement the technology will greatly depend on the resources available to support the innovation. As much as respondents indicated that top management would not take risks involved in implementing this technology and there were not enough funds in the library to adopt this technology, their perceptions may not have been correct.

The minority of respondents nine (30.0%) who said ‘yes’ to top management investing funds in mobile phone technology and seven (23.3%) who also said ‘yes’ to top management willing to take the risks involved, gave some reasons that could be seen as advantages of providing library and information services through mobile phones. These reasons included the five (16.7%) respondents who said top management would be willing to take the risk because it would promote easy accessibility of information, one (3.3%) who pointed out that the library had recently subscribed to “libguides” which are mobile compatible and two (6.7%) respondents who said that risks would be taken to be in line with new technology and to meet the objective of the library.

When an organization’s top management thinks of adopting and implementing a technology, it is expected of them to determine if the process will be of strategic importance and of competitive advantage to them. In the questionnaire, the respondents were asked whether they thought top management would consider adoption and implementation of mobile phone technology as

strategically important and whether they thought they would be interested in adopting it to gain competitive advantage. It is quite motivating to see that on both strategic importance and competitive advantage, 12 (40.0%) of the total respondents said 'yes'. Also of interest is that in both instances the number of respondents who did not answer or were not sure was more than the number of respondents who said 'no'. Reasons given for the affirmative response in terms of adoption and implementation of the technology were: four (13.3%) said it would promote access to information, one (3.3%) said it would increase delivery of resources, one (3.3%) said it would help the university to go up in ranking and one (3.3%) said it is aligned with the library's long-term strategy. It was also mentioned that the library needs to be visible to all the users anywhere and that it would improve communication with the users. In terms of the latter, it is very important for librarians to have good communication with their users. Mobile phone technology will not only improve delivery of services but also improve user-librarian relationships as strongly agreed by nine (30.0%) and agreed by 10 (33.3%) respondents. It is therefore evident that once top management is able to provide funds for this technology to be implemented in the libraries there is the perception that there will be an improvement in the delivery of services and communication between the library and its users.

5.4.2 Resources, knowledge and difficulties in implementation

The last part of the organizational factors section in the questionnaire asked about knowledge, resources and difficulties in implementation of the technology. The respondents were asked what difficulties they would anticipate in adoption and implementation of mobile phone technology in their libraries. Seven (23.3%) respondents said the major drawback would be financial constraints/budget cuts/funding for the library. This same problem was raised when they were asked whether they thought the libraries had enough resources for adoption and implementation of the technology as 18 (60.0%) of the respondents said there was a lack of funds in the library. This seems to be the major issue in these libraries. This is in line with the literature as (Mtshali 2011) also noted factors such as cost and funding for the libraries, ICT infrastructure and poverty, lack of necessary resources like electricity, lack of governmental and institutional technological policies, lack of trained staff and staff development initiatives could hinder academic libraries to adopt and use these technologies. Another difficulty anticipated was training. Four (13.3%) of the respondents said there was usually no training of the library staff

and two (6.7%) said there was a lack of expertise to run the technology. This could clearly be due to the fact that funds are limited. Associated with the lack of funds is the shortage of staff/manpower as raised by three (10.0%) of the respondents. Given the above, Rui's point does need to be emphasized. Rui (2007) states that the availability of resources is a necessary condition for innovation adoption since this can only occur in conjunction with using the firm's resources and that the firm's ability to adopt and implement the technology will greatly depend on the resources available to support the innovation.

One cannot ignore the fact that the cost of connectivity and network problems could be limiting factors. This was also foreseen as a difficulty by three (10.0%) respondents. Many African countries are still struggling not only in applying mobile technology in their academic libraries but also implementing ICT technology at large. Internet connectivity is a huge problem. This was anticipated by some of the library staff but as earlier stated, unlike many other university libraries in Africa, the libraries on the five UKZN campuses are fortunate to have a robust technology backbone. They run on the University's main network, they are connected to each other and share one central server in which the main catalogue can be accessed. The presence of this strong and reliable technology infrastructure when compared to other African universities, the well trained staff of the libraries, the huge collection of material in the libraries, the subscription to so many different databases, the wide number of users the libraries serve every year, are some of the reasons as to why these libraries need to look into mobile technologies to improve their service delivery. And it is for these same reasons that the libraries should ensure that delivery of services to the users is efficient, effective, and timely and can be done at anytime and anywhere through their mobile phones.

However, as discussed in the preceding paragraphs, one could conclude that these libraries have to first address the major issues like lack of funds, shortage of manpower and lack of expertise if they are to engage in the adoption and implementation of mobile phone technology to provide library and information services as these issues could seriously hinder the adoption and implementation process. Technological factors are other considerations and these are now turned to.

5.5 Technological factors that could influence implementation of mobile phone technology

This section discusses the technological factors that could influence adoption and implementation of mobile phone technology in UKZN PMB and Howard College libraries.

5.5.1 Compatibility of library systems with mobile phone technology

It is essential and critical to first of all determine whether the existing system in one's organization is compatible with the system to be implemented. It was for this reason that the respondents were asked to rate the compatibility of the existing system in their library with mobile phone technology usage to provide library and information services. Much as many of the respondents, that is, 13 (43.3%) did not know whether they were compatible or not, a good number of eight (26.7%) said the two systems were compatible and three (10.0%) said they were very compatible. Rui (2007) defines compatibility as the extent to which an innovation is consistent with the firm's current conditions. He further breaks it down into two meanings. Compatibility with the values or norms of the potential adopters and users which implies what people feel or think about the technology or a compatibility with the existing practices of the organization which implies a compatibility which is more practical or operational (Rui 2007). As earlier discussed, the "feel" towards this technology by the library staff is very positive and this technology is meant to enhance the provision of library and information services which are already being provided by the library. While technical compatibility would need to be investigated and verified by IT staff, on the basis of the above findings, one could conclude that mobile phone technology usage is compatible with the existing system of the library. Such "expert" intervention would ultimately also be needed in terms of what is discussed below.

5.5.2 Availability of ICT infrastructure

Respondents were asked whether they thought the information technology infrastructure, namely, hardware and software in their library could satisfy the needs to adopt and implement mobile phone technology usage in their library. A total of 25 respondents answered this question to which 12 (40.0%) said 'yes' the infrastructure available could satisfy the needs while eight

(26.7%) were not sure. Of the 30 respondents, four (13.3%) said that the library is up-to-date with technology and there is high-end software and hardware supported by IT staff. As earlier stated unlike many other university libraries in Africa, the libraries on the five UKZN campuses are lucky enough to have a robust technology backbone. They run on the University's main network, they are connected to each other and share one central server in which the main catalogue can be accessed. This is advantageous to the libraries because if they decide to implement this technology, they may not incur much expense because of the already robust ICT infrastructure and also the fact that the library already runs on the University's main network which could provide full support for the implementation processes.

5.5.3 Complexity of using mobile phone technology in the library

Rui (2007) defines complexity as “the degree to which an innovation is alleged to be relatively difficult to understand and use”. The use of this technology can be somewhat complex but due to the staff having the required skills to use it, implementation may be less difficult. In terms of the study it was important to know whether the library staff of the UKZN PMB and Howard College libraries thought the usage of mobile phone technology to provide library and information services was a complex task. It was fascinating to see that the vast majority 25 (83.3%) of the respondents did not think using mobile phone technology to provide library and information services was a complex task and only one (3.3%) thought so. This should be encouraging to the top management of these libraries to consider using this technology. It is evident that the library staff who participated in the study were eager to use new technology in this fast moving technological world.

5.5.4 Affordability of the technology by the library

When the respondents were asked whether the library could afford to implement, use and maintain mobile phone technology to provide library and information services, the majority 17 (56.7%) said ‘no’. The main reasons given were lack of funds and shortage of manpower. According to Rui (2007), cost and reliability are a measure to which a technology is seen to be of relative advantage when compared to the existing system. The lack of funds in the UKZN PMB and Howard College campus libraries could be a big hindrance to the adoption of this technology in these libraries even if it is seen to be of an improvement when compared to the existing

system. It was interesting to see that one respondent stated that the library system is connected with mobile phones. However, there were no further explanations on how they are connected or what services they offer.

5.6 Environmental factors that could influence implementation of mobile phone technology

This section discusses the environmental factors that could influence adoption and implementation of mobile phone technology in UKZN PMB and Howard College libraries.

5.6.1 Achieving the mission of UKZN libraries

Any organization works towards achieving its mission and vision. The mission of the University of KwaZulu-Natal Library is “to support teaching, learning, research and community engagement by providing a high quality, relevant, expanding and innovative library and information service”. The vision is “to be a strategic partner in positioning the University of KwaZulu-Natal as the premier university of African scholarship” (University of KwaZulu-Natal Library 2007). It needs to be noted that the mission supports the provision of expanding and innovative library and information services which is very much in line with this research. Furthermore, when the respondents were asked, without considering internal resource constraints, if the application and development of mobile phone technology in their library would help to achieve the mission of UKZN libraries, a significant majority 21 (70.0%) said ‘yes’. Reasons given by the 21 respondents for their positive answer included increased access to information all the time, six (20.0%), the promotion of remote access to information, one (3.0%), increase reliability and quick delivery of information, two (6.7%), increasing the usage of the library, and the increase and promotion of efficient and effective rendering of services, two (6.7%). One respondent commented that the use of mobile technology will enhance attaining the number one goal of UKZN Library namely, an efficient and effective infrastructure that supports library operations, systems and processes. It is thus evident that in the view of the majority of the respondents, the mobile technology will not only assist in the daily running of the library but will also help in achieving the mission of the library which, as pointed out, is the number one goal of any organization.

5.6.2 Competitive advantage, image and reputation of the library and the university at large

UKZN is an academic institution that produces thousands of graduates yearly. Its vision is to be the Premier University of African Scholarship and its reputation and image are essential to its survival. When the library staff were asked to indicate whether they thought using mobile phone technology to provide library and information services would improve their library's image and enhance its reputation, 24 (80.0%) said 'yes'. Reasons provided included, three (10.0%) it would enable the library and University at large to be leaders and not followers, three (10.0%) it would help in serving more users wherever they are and four (13.3%) to be in line with new technology and hence be able to compete with other institutions in the technological changing world. This will definitely be of competitive advantage to the University because access to information and delivery of services will, arguably, improve significantly. Some respondents, three (10.0%) pointed out that there are some South African universities that have implemented the technology and so UKZN will be among the leaders, two (6.7%) said there will be availability of information and this will enable competition with other institutions and one (3.3%) said parents send their children to reputable universities with world class resources.

With UKZN being an academic institution, the competition that they have to keep up with is the quality of education being offered to the students, the research output from the institution and number of graduates produced in a year when compared to other institutions. This environmental factor is thus strong because if those aspects are not met, then the university will drop in its ranking. The importance of university ranking has been taken seriously by management at UKZN as evidenced by the number of messages to this effect appearing on the University email system recently. In adopting and implementing mobile phone technology in its libraries, access to information will be made easier at UKZN and there is the possibility that this may benefit both research output and the quality of education provided.

5.6.3 Improve customer services and communication

The library as an organization is a service rendering organization. The staff communicate with and help users every day. It is very important to have good customer service and respectable communication between the library and the users of the library. If this is not taken into serious consideration, the library may be the last place one thinks of when trying to find information.

The library staff of UKZN PMB and Howard College libraries were asked two questions with regard to customer service and communication. They were asked whether usage of mobile phone technology will improve customer service and enhance operational efficiency and also improve communication between the library and the users. On both accounts, a substantial majority 24 (80.0%) said 'yes' – mobile phone technology would improve these services. Reasons given included: a total of seven (23.3%) respondents for both said it would increase access to information at anytime, four (13.3%) said using mobile phone technology would promote closeness of users and librarian because there would be real time communication, one (3.3%) said it would be easier to keep users up-to-date with library news and keep them informed of new books, four (13.3%) said it is more reliable and quicker than current methods of service provision and two (6.7%) said it would create more independent users. It is rather surprising that these staff know and are aware of the advantages of this technology given that it is a relatively new technology and it has not yet been used much in African libraries. Further re-enforcing the view that adoption and implementation of mobile phone technology was the finding that 19 (63.3%) of the respondents either agreed or strongly agreed that mobile technology would help in building user-librarian relationships. It is evident that as much as the staff are already doing their best to communicate and help the users of the libraries, the implementation of mobile phone technology should contribute to improved customer service and communication which should impact positively on usage of the libraries.

5.7 Summary

This Chapter discussed the findings as presented in Chapter four above. The discussion was based on answering the key research questions as stated in Chapter one. The skills required by the library staff to provide library and information services were discussed. The technological, organizational and environmental factors that could influence adoption and implementation of this technology were also discussed. In the concluding Chapter, which is to follow, major results and conclusions are provided and suggestions for further research are made.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This study investigated the preparedness of the University of KwaZulu-Natal libraries to implement and use mobile phone technology in the provision of library and information services. In this, the final Chapter, conclusions and recommendations are made based on the key research questions of the study and on the findings. The research questions were:

- What is mobile technology and what does it comprise of in this research context?
- What skills do the staff require to be able to use this technology to provide library and information services to the users?
- What technological factors can influence the implementation of mobile technology in the UKZN Pietermaritzburg and Howard College libraries?
- What organizational factors can influence the implementation of mobile technology in the UKZN Pietermaritzburg and Howard College libraries?
- What environmental factors can influence the implementation of mobile technology in the UKZN Pietermaritzburg and Howard College libraries?

The conclusions and recommendations that follow below will be made based on the findings as presented and discussed in Chapters four and five respectively. It should be noted that the research questions for this study were generated from the theoretical framework and are the basis for the conclusions. However, to begin with, a summary of the study so far is given and this follows next.

6.2 Summary of the study

Chapter one provided the introduction to the study. Presented in this Chapter were the problem statement and the associated research questions concerning the preparedness of the University of

KwaZulu-Natal libraries to implement and use mobile phone technology in the provision of library and information services. The significance of the study, a brief literature review and the theoretical framework adopted, and the scope and limitations of the study were also presented.

Chapter two consisted of the literature review and the theoretical framework. The literature relating to mobile phone technology usage in academic libraries was discussed and an overview of mobile phone technology together with its different applications presented. The AirPAC product for the provision of library and information services through mobile phones was focused on. Finally, the Technology, Organization and Environment framework, as the framework underpinning the study, was presented.

Chapter three presented the research methodology and methods used in the study. The researcher used the positivist paradigm with its accompanying quantitative approach for the study. A self-administered questionnaire was used to collect data and this data was analyzed using the SPSS tool. Reasons for choosing the quantitative approach and a self-administered questionnaire were provided. The researcher made use of census sampling technique and a response rate of 50% was achieved. A pre-test of the questionnaire was done to ensure validity and reliability.

Chapter four presented the data collected from the 30 respondents. In doing so, the researcher made use of bar graphs, pie charts, tables and text.

Chapter five analyzed and discussed the findings as presented in the previous Chapter. This discussion was based on the research questions presented in Chapter one and outlined, once again, above.

6.3 Major findings and conclusions

The major findings and conclusions are guided by the research questions and they are the basis on which the conclusions and recommendations are made. The study of the 30 respondents resulted in several findings and conclusions and in each instance, the major findings will be provided followed by a conclusion relating to these findings.

6.4 What is mobile technology and what does it comprise of in this research context?

Sections 2.2 and 2.2.1 in Chapter two discussed the meaning of mobile technology and their devices. Mobile technology refers to any communications, either direct or indirect, via mobile devices, such as phones or personal digital assistants (PDAs). These technologies change the way people communicate since they provide many options on a single device. Examples of such options are information searching and retrieval, information sharing and dissemination, instant messaging, phone calls and so on.

Today's mobile devices are as powerful and "connected" as any PC or laptop and are now being used as learning devices where different materials can be accessed and read. Applications such as PDF are making this possible. Mobile phones are minimizing the "sit-down in front of a computer" approach in order to read a document. With them one can read on the move. It is therefore very evident that these mobile devices can be useful tools for supporting learning and workplace activities.

Research shows that while the world of mobile technology has changed enormously during the last few years, mobile phones and mobile computing are not new. However, if we look at how these technologies have been approved and used within libraries, for example with regard to Internet usage, it is worrying how little these technologies are being put to use in the library context in South Africa.

Considering these mobile devices and their influence on our daily life, it can be concluded that it is perhaps not questions of whether academic library and information services should implement or whether they are ready to implement the technology, but rather ones of when and why have they not already done so given the evident advantages associated with such technology.

6.5 What skills do the staff require to be able to use this technology to provide library and information services to the users?

The findings revealed that majority of the staff at the UKZN PMB and Howard College libraries are professionally qualified to do their work. This is because 20 (83.3%) out of the 24

respondents who answered the question on qualifications indicated having obtained library qualifications such as the Postgraduate Diploma in Information Studies (PGDIS), Bachelor of Information Science, Masters in Library Science, Honours in Library Science, and a PhD in Library and Information Studies. However, being able to provide library and information services through mobile phone technology, requires one to have some awareness and some level of usage of this technology. After the respondents were asked to indicate whether they owned a mobile phone, they were asked to specify whether they could perform some tasks on them. The majority of the staff could do functions such as accessing the Internet and the library website and opening emails and PDF or word documents using their phones. These are among the skills one needs to provide library and information services through mobile phones.

When the respondents were asked on their perception of mobile phone technology usage, the majority of the respondents were positively predisposed (either agreeing or strongly agreeing with various statements) towards various aspects of mobile phone technology and its use in the library context as seen in Table 23, Chapter four.

Given the above, it can be concluded that with the professional qualifications attained by these staff, the skills level (albeit self-reported) that the library staff have with regard to using Internet enabled mobile phones and their positive perception regarding the use of this technology bodes well for the successful implementation, should this be done, of this technology in the PMB and Howard College campus libraries.

6.6 What organizational factors can influence the implementation of mobile technology in the UKZN Pietermaritzburg and Howard College libraries?

Several organizational factors were considered that could influence the implementation of mobile phone technology in these libraries. These included: funds, strategic importance, competitive advantage and knowledge and resources. The major findings of these factors were: 50.0% of respondents said the library did not have the funds to invest and take risks involved with mobile phone technology; 40.0% of the respondents indicated that top management would consider adopting mobile phone technology as strategically important; 40.0% of the respondents also said top management would be interested in adopting this technology to gain competitive

advantage over other academic libraries; 43.3% of the respondents said the library did not have enough knowledge to provide library and information services through mobile phones and a majority, 63.3%, reported that the library does not have enough resources to adopt and implement this technology.

The study revealed that lack of funds in the libraries hindered technological innovations. Fifty percent of respondents said that top management was not likely to invest funds in mobile phone technology for the provision of library and information services and similarly, 40.0% said top management would not take the risks involved in implementing this technology. The main reason provided was a financial one, namely, that the libraries do not have enough funds to risk. The study however, also revealed that 40.0% of the respondents specified that top management was likely to consider the adoption and implementation of mobile phone technology as strategically important and of competitive advantage.

The respondents were asked to state whether the library had enough knowledge to provide library and information services and also to state whether the library had enough resources (for example, human, hardware and financial resources) for adoption and implementation of mobile phone technology. Thirteen (43.3%) respondents said the library did not have enough knowledge to provide library and information services and the main reason identified was that there was no formal training provided to staff in the library. On the other hand 19 (63.3%) of the respondents said the library does not have enough resources to adopt and implement the technology. They gave the following major reasons: lack of funds, shortage of staff and lack of expertise to run the technology. This again shows that a lack of funds in the PMB and Howard College libraries is a major concern and a major drawback to technological adoption and implementation.

Any innovation adoption and implementation, comes with some difficulties. The library staff were asked to state some of the problems they could anticipate with the implementation of this technology in their libraries. As expected the study revealed that financial constraints, lack of training, shortage of manpower, lack of expertise to run the technology and cost of using the technology were the major difficulties envisaged. The lack of expertise in the library could be challenging as this will need the library to use more money (that they do not already have) to either train existing staff to use the technology or hire expert staff. This falls hand in hand with

shortage of manpower. All these problems, in one way or another, come about due to a shortage of funds in the libraries.

It can be concluded that a lack of funds in these libraries is a major concern and possible stumbling block with regard to the adoption and implementation of a technological innovation such as the use of mobile phone technology in the provision of library and information services. The staff knowledge about this technology was also of concern. This is because while the majority of the respondents reported being able to use their Internet enabled mobile phones to perform functions related to information provision, on the other hand when they were asked to state whether their libraries had enough knowledge to provide library and information services through mobile phones, only 20.0% said 'yes' the library had enough knowledge. It is thus difficult to conclude whether the staff were skilled enough or needed more training. These findings revealed that these libraries may not be sufficiently prepared in terms of skills and knowledge to adopt and use this technology.

6.7 What technological factors can influence the implementation of mobile technology in the UKZN Pietermaritzburg and Howard College libraries?

Three main factors are considered as important in the technological context. These are relative advantage, compatibility and complexity. Relative advantage is the measure of how much of an improvement the new technology is relative to the existing one and is primarily measured in terms of cost and reliability. When the respondents were asked whether the library could afford to implement, use and maintain mobile phone technology to provide library and information services, the majority 17 (56.7%) said 'no'. The respondents re-emphasized the lack of funds in the library as the main reason.

Compatibility on the other hand is the extent to which an innovation is consistent with a firm's current conditions. The study revealed that mobile phone technology could be compatible with the existing system in these libraries as stated by 11 (36.7%) respondents and this was further explained by one respondent who said the library had recently subscribed to 'libguides' which were mobile compatible. The libraries ICT infrastructure was up-to-date with current operating

systems and computers and so the adoption and implementation of mobile phone technology should, if done, be a smooth process in this regard.

Complexity is the degree to which an innovation is alleged to be relatively difficult to understand and use. As expected, this study discovered that 83.3% of the respondents did not think it was a complex task to provide library and information services through mobile phones.

With the above findings, one can conclude that the current system in the libraries supported implementation and usage of mobile phone technology to provide library services especially given the fact that the existing system is perceived as been compatible with mobile technology and the ICT infrastructure in these libraries was up-to-date with the current operation systems and computers. It can also be concluded that the majority of respondents did not consider mobile phone technology as complex and liked to experiment with new technology which again bodes well for possible future implementation.

6.8 What environmental factors can influence the implementation of mobile technology in the UKZN Pietermaritzburg and Howard College libraries?

Under the environmental context, the following factors are usually considered: organizational competitors, organization image and reputation, customer service and the overall competitive advantage. The study revealed that the adoption and implementation of mobile phone technology may help in achieving the mission of the library. Twenty one respondents (70.0%) said 'yes' to technology doing so. It should be noted that the mission of the library includes "the provision and expansion of innovative library and information services" – something which mobile phone technology would do. This technology was also seen as a way by which the image and reputation UKZN libraries and the University at large could improve. By providing quick, reliable, and easy access to information through mobile phones, students and staff of the University will be able to do their work in the convenience of their own time and space and this may have a positive impact on the research output of the University and its subsequent ranking in terms of universities world-wide.

Communication between users and librarians and customer service rendered to the university community at large by the libraries was also seen as improving with the usage of mobile phone technology by the vast majority of respondents, namely 80%.

As indicated and in conclusion, mobile phone technology together with all its advantages, is a means through which UKZN as a university could improve its image and reputation. Proper customer care and communication in libraries is vital for the information to be used by the library users and this technology provides a means to achieve this.

Even though UKZN PMB and Howard College campus libraries are facing financial constraints, these libraries still are to an extent sufficiently prepared to implement and use mobile phone technology to provide library and information services to their users. This is because: the staff at these libraries have the necessary library qualifications and are skilled enough to use Internet enabled phones which is a prerequisite to provide library and information services through mobile phones; their perception of using this technology is positive; the existing system in the libraries is compatible with mobile phone technology to the extent that the Library has subscribed to “libguides” which are compatible with mobile phones; the ICT infrastructure in the libraries is up-to-date; and, finally, the mission and vision of the library supports expansion and provision of innovative library and information services.

6.9 Recommendations

Based on the findings and conclusions of the study as noted above the following recommendations are made that could help UKZN PMB and Howard College libraries prepare themselves adequately to adopt, implement and use mobile phone technology for the provision of library and information services.

- **Implementation and usage of the technology**

This study examined the extent to which the UKZN PMB and Howard College libraries were prepared to implement and use mobile phone technologies in provision of library and information services. Several factors were considered and this brought about many different responses from the respondents as seen above. It is recommended by the researcher that the

UKZN PMB and Howard College campus libraries implement and use this mobile phone technology to their advantage. This is a technology that is increasingly pervasive and is being used in many university libraries overseas and has already been adopted by university libraries in South Africa. It is recommended to be used because, as outlined above, mobile phone technology will not only improve communication between users and librarians, but may also increase the usage of the library. There is also the possibility of such technology playing a role in increasing the research output of the University by providing quick, reliable and easy access to information.

- **Staff training with regard to the provision of library services via mobile technology**

Given the uncertainty of the findings regarding expertise and knowledge, the researcher recommends that staff be trained more often to meet technological changes and be up-to-date with technology especially as technology helps with effective and efficient dissemination of information. Once the staff are trained specifically for using mobile phone technology to provide library and information services, it will facilitate this technology being implemented and used in these libraries. However, while this recommendation is made, the researcher acknowledges the budgetary concerns as expressed by the respondents. It is the budget which forms the basis of the next recommendation.

- **Budget**

It is evident from the findings of the study that budgetary constraints would be an inhibiting factor in the adoption and implementation of mobile phone technology. However, given the clear advantages associated with mobile phone technology, it is recommended that both the library and the University management give urgent attention to ensuring that funding is available to adopt and implement the technology. Consideration would be given to UKZN libraries having a separate budget dedicated to technological advancements. This would arguably assist in facilitating such advancements.

6.10 Recommendations for further research

- Much as the respondents reported to having the skills to use Internet enabled phones that provided the basis for skills required to provide library and information services through

mobile phones, they also reported that the libraries did not have enough knowledge to use this technology. It is thus recommended that thorough research be done on the skills the library staff have and need to have to use this technology.

- It is suggested that further studies should be done on this topic. Studies could be done with the other UKZN campus libraries or other academic institutions in South Africa. The findings would be compared to see whether the same scenarios are being experienced on the other campuses.
- Studies could also be done on what mobile phone applications would be the most suitable, including AirPAC. This may show which application works best, is cheaper to use and which is more suitable for UKZN libraries.
- A study could be done that incorporates students, staff and the library to get views from all parties concerning usage of this technology. It is important to know whether the users of these libraries would be willing to use this technology (although the literature indicated that they would).

6.11 Summary

This Chapter has presented the major findings, conclusions and recommendations based on the findings. Recommendations for further research were also made. Research shows the penetration of mobile phones provides a huge potential for usage of this technology in the library context to become a true achievement. As has been noted, using mobile technology to provide services to library users overcomes distance, time wasted having to go to the library to collect the material, find the information, or renew a book, and if coming from afar, the cost involved. Mobile technology exceeds time constraints and boundaries that come about from the opening and closing hours of the library. Patrons and users of the library would be able to fully utilize and enjoy the library services being offered without having to physically visit the library.

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Appendix 1: Cover letter to the respondents

15 July 2013

Dear Respondent,

I am Irene Shubi Isibika, a Master of Information Studies (MIS) candidate at the University of KwaZulu-Natal, Pietermaritzburg Campus, South Africa. I am conducting this study as part of the requirements for the Masters degree. This survey aims at soliciting information regarding the preparedness of University of KwaZulu-Natal libraries to implement and use mobile phone technology in the provision of library and information services.

The results of the study will be disseminated to the University of KwaZulu-Natal libraries. Better understanding the preparedness of University of KwaZulu-Natal libraries to implement and use mobile phone technology in provision of library and information services and empirical evidences that will be gleaned from the study could contribute to both policy, practice and service delivery of these libraries and ultimately maximize the library usage.

The survey is intended for the staff at the University of KwaZulu-Natal Pietermaritzburg and Howard College campus libraries. All the professional practising staff of these libraries will be surveyed. Anonymity and confidentiality will be strictly observed when presenting the data. Please note that you are not required to provide your name.

You are kindly asked to answer all questions to the best of your ability.

Please complete the questionnaire by not later than 30th September 2013. I will physically come and collect the answered questionnaires from you.

Thank you.

Sincerely

IRENE SHUBI ISIBIKA

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Appendix 2: Informed Consent form for the sample population

INFORMED CONSENT FORM

Title of study:

The preparedness of University of KwaZulu-Natal libraries to implement and use mobile phone technology in provision of library and information services.

I,, hereby consent to participate in the study as outlined in the document about the study/ as explained to me by the researcher.

I acknowledge that I have been informed about why the questionnaire is being administered to me. I am aware that participation in the study is voluntary and I may refuse to participate or withdraw from the study at any stage and for any reason without any form of disadvantage.

I,, acknowledge that I understand the contents of this form and freely consent to participating in the study.

Participant

Signed:

Date:.....

Researcher

Signed:

Date:

Appendix 3: Library staff of UKZN PMB and Howard College campus Questionnaire

I Irene Shubi Isibika am kindly asking you to take part in the survey for my Masters dissertation by filling in the attached questionnaire below.

The purpose of this questionnaire is to assess your knowledge and understanding of mobile phone usage in providing library and information services in UKZN PMB and Howard College campus libraries and to determine the extent in which this technology is being used in these libraries or the possibility of implementing them with the aim of improving delivery of these services and ultimately maximizing usage of the libraries. Please note, however, that this is not a formal test. Please try to answer the questions as best as you can. If you do not know or are unsure of an answer, it is not a problem – please simply indicate this on the questionnaire. Kindly indicate with a cross the answer which applies.

Any information gathered in this study that can be identified with you will remain confidential and will be disclosed only with your permission. Please note that your name will not be included in the report and your confidentiality will be maintained throughout the study.

Your participation in answering the questions is completely voluntary. You have the right to withdraw at anytime during the study. I appreciate the time and effort it would take for you to answer the questionnaire.

Please kindly fill in the questionnaire not later than the 30th of August. I will physically come and collect the questionnaire after this set date.

IRENE SHUBI ISIBIKA

Masters in Information Studies UKZN

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Mobile phone technology refers to the use of mobile phones to deliver services to the library users.

1. General information

a) Please indicate at which library you work.

- The Cecil Renaud Library []
- The Law Library []
- The Life Science Library []
- The EG Malherbe Library []
- The Eleanor Bonna Music Library []
- The Architecture Library []
- The GMJ Sweeney Law Library []

b) Please list your professional library qualification(s)

.....
.....
.....
.....

c) Gender Female [] Male []

d) Age

- 20 - 29 years []
- 30 - 39 years []
- 40 - 49 years []
- 50+ years []

e) Please list the main duties or tasks of your work.

.....
.....
.....
.....

f) Do you own a mobile phone on which you can access the Internet (e.g. email, browsing the Web)? If so which phone do you own?

.....

2. Skills required by staff to be able to use mobile technology to provide library and information services to the users.

Can you:	Yes	No	I don't know
Access Internet on your mobile phone	[]	[]	[]
Open your email on your mobile phone	[]	[]	[]
Access the library website on your mobile phone	[]	[]	[]
Open a file e.g. PDF, word document and read it on your phone	[]	[]	[]
Attach and email a document using your mobile phone	[]	[]	[]
Offer reference services to a library user using your phone	[]	[]	[]
Do instant messaging with friends and family on your phone	[]	[]	[]

3. Organizational factors that could influence implementation of mobile phone technology in the UKZN Pietermaritzburg and Howard College libraries.

a) Do you think the top management is likely to invest funds in mobile phone technology for the provision of library and information services? Why?

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b) Do you think top management is willing to take risks involved in the adoption of mobile phone technology in the library? Why?

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c) Do you think top management is likely to consider the adoption and implementation of mobile phone technology as strategically important? Why?

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d) Do you think top management is likely to be interested in adopting mobile phone technology in order to gain competitive advantage? Why?

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e) Does your library in general have enough knowledge to provide library and information services through mobile phones? Why?

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f) Do you think your library has enough resources (e.g. human, hardware and financial resources) for adoption and implementation of mobile phone technology? Why?

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g) What difficulty/ies in the adoption and implementation of mobile phone technology would you anticipate?

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4. Technological factors that could influence implementation of mobile technology in the UKZN Pietermaritzburg and Howard College libraries.

a) How would you rate the compatibility of mobile phone technology usage to provide library and information services in your library when compared to the existing system?

- i. Very compatible []
- ii. Compatible []
- iii. Not compatible []
- iv. I don't know []

b) Do you think the information technology infrastructure, that is, hardware and software in your library can satisfy the need to adopt and implement mobile phone technology usage in you library? Why?

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c) Do you think using mobile phones to provide library and information service is a complex task to do? Why?

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d) Do you think using mobile phones will improve delivery of library and information services in your library and maximize library usage? Why?

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e) Do you think your library can afford to implement, use and maintain mobile phone technology to provide library and information services? Why?

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5. Environmental factors that could influence implementation of mobile phone technology in the UKZN Pietermaritzburg and Howard college libraries.

a) Without considering internal resource constraints, will the application and development of mobile phone technology in you library help your library to achieve the mission of UKZN libraries? Why?

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b) Do you think use of mobile phones to provide library and information services can improve the library image and enhance its reputation? Why?

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c) Do you think usage of mobile phones will improve communication and enhance the Library's relationship with the users? Why?

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d) Do you think mobile phone usage to provide library and information services will improve customer services and enhance your operational efficiency? Why?

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e) Do you think the active application and implementation of mobile phones will be a strategic weapon of your library to enhance the university's competitive advantage? Why?

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6. Librarian’s perceptions about mobile phone services

Below are statements concerning your attitudes towards the adoption of mobile phone services in your organization. Please mark with X the column which describes your level of agreement with the following statements:

	Statement	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
1	I believe using mobile phone technology in the library will improve my work at the library					
2	I like to experiment with new ICTs. (This is to determine your acceptance of mobile phone technology usage in your library)					
3	I believe that using mobile phone technology will improve the library efficiency					
4	Using mobile phone technology will help in building user-librarian relationships					
5	I believe using mobile phone technology will improve the usage of the services offered by the library					
6	I believe using mobile phone technology will ensure maximum use of library information resources, e.g. databases and the OPAC					

Please kindly provide any additional comments that you may have.

.....

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Thank you so much for your time. I really appreciate it.



Oil

Microwave Sample Preparation Note: XprOP-1
Category: Oils

Rev. Date: 6/04

Sample Type: Oil
Application Type: Acid Digestion
Vessel Type: 55 mL
Number of Vessels: 12
Reagents: Nitric Acid (70%)
Method Sample Type: Organic
Sample Weight: 0.5 gram

Step 1:

<u>Acid Type</u>	<u>Volume</u>
Nitric	10 mL

Heating Program: Ramp to Temperature Control

Stage	Max. Power	% Power	Ramp (min.)	Pressure (psi)	Temperature (°C)	Hold (min.)
(1)	1200 W	75	15:00	-	200	15:00

NOTE A: This procedure is a reference point for sample digestion using the CEM Microwave Sample Preparation System and may need to be modified or changed to obtain the required results on your sample.

NOTE B: Manual venting of CEM closed vessels should only be performed when wearing hand, eye and body protection and only when the vessel contents are at or below room temperature to avoid the potential for chemical burns. Always point the vent hole away from the operator and toward the back of a fume hood.

NOTE C: Power should be adjusted up or down with respect to the number of vessels. General guidelines are as follows: 8-12 vessels (50% power), 13-20 vessels (75% power), >20 vessels (100% power).

NOTE D: "Organic Method Sample Type" should be used for most sample types. Choose "Inorganic" for samples with more than 1 gram of solid material remaining at the bottom of the vessel at the end of the digest (ex. leach methods). Choose "Water" for samples that are largely aqueous prior to digestion.