INTEGRATION OF CLOUD COMPUTING AND SERVICE DELIVERY IN ACADEMIC LIBRARIES WITH REFERENCE TO SOUTH EASTERN KENYA UNIVERSITY

GUCHACHA JOSEPH THUBI

A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF LIBRARY AND INFORMATION SCIENCE, DEPARTMENT OF LIBRARY AND INFORMATION SCIENCE, UNIVERSITY OF NAIROBI

2019

DECLARATION

This is my original work and has not been presented to any other university or college for an award of a degree certificate.

Signature: _____ Date: _____

Joseph Thubi Guchacha

Registration Number: C54/85858/2016

This research report has been submitted for examination with our approval as the university supervisors.

Signature: _____ Date: _____

Dr. Elisha Ondieki Makori

Department of Library and Information Science

Signature: _____ Date: _____

Dr. George Kingori

Department of Library and Information Science

DEDICATION

To my lovely parents, brothers, sisters and my fiancée for the inspiration and support.

ACKNOWLEDGEMENT

My special gratitude first all goes to the Almighty God for granting me the wisdom and power that saw me through my studies. I am very thankful to my supervisors, Dr. Makori and Dr. Kingori for their knowledgeable comments and continued guidance in this research work. My appreciation goes to all the other lecturers and staff in the Department of Library and Information Science University of Nairobi for their unfailing support. I am grateful also to my parents, Jane Wambui and Peter Guchacha, brothers and sisters for their unfailing support and inspiration. My appreciation to my fiancée, Lilian Nzioki, for her unwavering support and for frequently checking on my progress in every facet of my life. Finally, I want to thank my guardians and spiritual parents, Rev. Waigwa and Mrs. Waigwa, for always being there for me offering guidance and immense support in my life.

TABLE OF CONTENTS

DECLARATION i
DEDICATION ii
ACKNOWLEDGEMENT iii
TABLE OF CONTENTS iv
ABSTRACT vii
LIST OF TABLES viii
LIST OF FIGURES ix
LIST OF ABBREVIATIONS AND ACRONYMS x
CHAPTER ONE 1
INTRODUCTION 1
1.1 Introduction 1
1.2 Background to the Study 1
1.2.1 Cloud Computing and Academic Libraries 2
1.2.2 Effects of Cloud Computing in Libraries 3
1.2.3 Cloud Computing Acceptability in Libraries 4
1.2.4 Context of the Study 5
1.3 Statement of the Problem 6
1.4 Aim of the Study 8
1.5 Objectives of the Study 8
1.6 Research Questions 8
1.7 Significance of the Study 9
1.8 Assumptions of the Study 9
1.9 Scope of the Study 9
1.10 Limitations of the Study 10
1.11 Definition of Terms and Concepts 10
1.12 Chapter Summary 11
CHAPTER TWO 12
LITERATURE REVIEW 12
2.1 Introduction 12
2.2 Cloud Computing Concept 12
2.3 Evolution of Cloud Computing 13
2.4 Cloud Computing Technologies 13
2.5 Cloud Computing Models 14
2.5.1 Service Models 14

2.5.2 Deployment Models....15
2.6 Fundamental Aspects of Cloud Computing....15
2.7 Impact of Cloud Computing in Academic Libraries....16
2.8 Application of Cloud Computing in Academic Libraries....17
2.9 Factors Influencing Usability of Cloud Computing in Academic Libraries....19
2.10 Theoretical Framework....20
2.11 UTAUT Theory....21
2.12 Conceptual Framework....21
2.13 Chapter Summary....22
CHAPTER THREE....23
RESEARCH METHODOLOGY....23
3.1 Research Design....23
3.2 Area of Study....23
3.3 Population....23
3.4 Sampling Strategies and Techniques....24
3.4.1 Sampling Strategies....25
3.4.2 Sampling Techniques....25
3.4.3 Sample Size....25
3.5 Data Collection Methods....26
3.5.1 Questionnaires....26
3.5.2 Document Review....27
3.6 Research Instruments....27
3.6.1 Pilot Study....27
3.6.2 Validity....28
3.6.3 Reliability....28
3.7 Ethical Considerations....28
3.8 Data Collection Procedures....29
3.9 Data Analysis and Presentation....29
3.10 Chapter Summary....30
CHAPTER FOUR....31
DATA PRESENTATION, ANALYSIS, INTERPRETATION AND DISCUSSION....31
4.1 Introduction....31
4.2 Response Rate of Respondents....31
4.3 Background Information of Respondents....31
4.4 Impact of Cloud Computing Information Services in the Library....33

4.5 Application of Cloud Computing Information Services in the Library 36
4.6 Factors Influencing Use of Cloud Computing Information Services 38
4.7 Regression Analysis of Independent Variables Effect on Dependent Variable 41
4.8 Chapter Summary 42
CHAPTER FIVE 43
SUMMARY OF THE FINDINGS, CONCLUSION AND RECOMMENDATIONS 43
5.1 Introduction 43
5.2 Summary of the Findings 43
5.2.1 Impact of Cloud Computing in Academic Libraries 43
5.2.2 Cloud Computing Services in Academic Libraries 43
5.2.3 Factors Influencing Use of Cloud Computing Information Services 44
5.2.4 Strategies to Increase Usage of Cloud Computing Information Services 45
5.3 Conclusion 46
5.4 Recommendations 46
5.4.1 Digital Literacy Training 47
5.4.2 Investment on ICT Facilities 47
5.4.3 Online Tutorials 47
5.4.4 Information Champions 47
5.5 Suggestions for Further Research 47
5.5.1 Study on Undergraduate Students 48
5.5.2 Incorporate More Variables to UTAUT Theory 48
5.6 Chapter Summary 48
References 49
Appendix I 53
Cover Letter for Questionnaire 53
Appendix II 54
Questionnaire for Lecturers and Postgraduate Students 54
Appendix III 59
Letter of Introduction 59
Appendix IV 60
Authorization to Collect Data 60

ABSTRACT

Cloud computing is one of the recent Internet related computing paradigms being implemented by academic libraries across the globe in bringing information services closer to their diverse and remote users. This leads to user satisfaction, enhanced image of librarians and university at large. The aim of undertaking this research was to explore the integration of cloud computing and service delivery in academic libraries with reference to South Eastern Kenya University. The objectives were to assess the impact of cloud computing information services, examine the application of cloud computing technologies, find out the factors influencing optimal utilization of cloud computing information services and develop appropriate strategies to increase utilization of cloud computing information services at South Eastern Kenya University library. The research adopted quantitative and qualitative research approaches. In total, 152 respondents were included in this study where 63 and 89 were lecturers and postgraduate students respectively. Purposive and census sampling techniques were adopted in selecting respondents for data collection. Data and information were collected through questionnaires and document analysis. Collected data and information were analyzed using multiple regression analysis and thematic content analysis methods. Results of the study revealed that cloud technologies have greatly transformed service delivery in academic libraries and in addition has led to introduction of new services. Use of cloud computing in libraries has tremendous benefits to users as it enables access of services anywhere and anytime, although there are challenges related to inadequate computing facilities. Utilization of cloud computing services are influenced by performance expectation, effort expectation, social influence, and facilitating conditions as presented in UTAUT theory. There is need to enhancement of digital literacy training, investment on Information and Communication Technology facilities and creation of online tutorials with the aim of increasing utilization of cloud services among library users. This study is beneficial to library management in helping boost usage of cloud computing information services.

LIST OF TABLES

Table 3. 1: Sample Frame 24
Table 3. 2: Sample Size 26
Table 4. 1: Response Rate of Respondents 31
Table 4. 2: Benefits of Using Cloud-based Information Services 34
Table 4. 3: Benefits Analysed Thematically 34
Table 4. 4: Challenges Encountered in Accessing Cloud-based Services 36
Table 4. 5: Challenges Analyzed Thematically 36
Table 4. 6: Cloud Computing Services in the Library 37
Table 4. 7: Devices and Gadgets Used in Accessing Services 38
Table 4. 8: Performance Expectancy 38
Table 4. 9: Effort Expectancy 39
Table 4. 10: Social Influence 40
Table 4. 11: Facilitating Conditions 40
Table 4. 12: Use Behavior 41
Table 4. 13: Summary of Multiple Regression Analysis 42

LIST OF FIGURES

Figure 2. 1: Conceptual Framework of the Study.....22
Figure 4. 1: Gender of Respondents 32
Figure 4. 2: Highest Level of Study/Qualification.....32
Figure 4. 3: Age of Respondents.....33

LIST OF ABBREVIATIONS AND ACRONYMS

CC	:	Cloud Computing
CD	:	Compact Disc
E-library	:	Electronic library
IaaS	:	Infrastructure as a Service
ICT	:	Information and Communication Technologies
IP	:	Internet Protocol
IT	:	Information Technology
LIS	:	Library and Information Science
OPAC	:	Online Public Access Catalogue
PaaS	:	Platform as a Service
PC	:	Personal Computer
SaaS	:	Software as a Service
SEKU	:	South Eastern Kenya University
SEUCO	:	South Eastern University College
SEWNR	:	School of Environment, Water and Natural Resources
SNS	:	Social Networking Sites
SPAS	:	School of Pure and Applied Sciences
SPSS	:	Statistical Package for Social Science
UKAI	:	Ukambani Agricultural Institute
UTAUT	:	Unified Theory of Acceptance and Use of Technology

CHAPTER ONE

INTRODUCTION

1.1 Introduction

Cloud computing technologies have provided libraries with great opportunities which enhance the management, access, and dissemination of information resources to users. This has greatly transformed the educational procedure and enhanced the worthiness of services offered in libraries (Khatib & Opulencia, 2015:2). From the technological perspective, cloud computing use has been attributed to it being user-friendly, cost-effective and interactive with the users. Usability of cloud computing technologies is gaining acceptance among library users as it enables accessibility and utilization of library services anytime and from anywhere regardless of their location (Ogbu, 2013:1). Following this recent popularity of cloud computing adoption among libraries, this study was undertaken to assess the fundamental aspects characterizing the application and integration of cloud computing in provision of library services.

1.2 Background to the Study

Modern libraries are adopting innovative digital systems with the aim of ensuring that the institutions and users access timely and relevant information and knowledge resources irrespective of their location (Makori & Mauti, 2016:3). This has been due to a sudden transformation in the way accessibility of information has dynamically drifted to the virtual platforms. Nowadays, phones, laptops, and tablets are found everywhere owing to their ease in portability and improved computing power. This prompts academic libraries to provide services and information resources in the virtual environment which are in line with the preference of users or risk isolating them (Yuvaraj, 2015:8). To achieve this goal, academic libraries have no option but to

switch over to cloud computing as a strategic tool in offering seamless and quality library services in a cost-effective manner (Bhattacharjee & Purkayastha, 2013:1).

1.2.1 Cloud Computing and Academic Libraries

Cloud computing technologies permit sharing and use of services and resources using the web instead of having them on native servers or individual devices (Aher et al., 2016:1). For instance, implementation of cloud technologies among university libraries in China is manifested through development and growth of library digital portal which consists of three features; the integration of services, resources and the management platform (Chunhong, 2014:2). The integration of these infrastructures results into introduction of innovative library resources and user services particularly in college and university libraries which offer multi-disciplinary information resources (Hai-yan, 2013:3). Libraries in USA have also adopted several cloud applications like Dropbox, Libguides, Makerspaces, VMware, OffieLive, and Bluelock in service delivery (Yuvaraj, 2016a:3).

The growth of technology usage has made academic libraries in Africa to be keen on the new developments in ICT arena especially in developed countries and eager to integrate the systems in service delivery. For instance, National Open University of Nigeria operates a digitalized library well-known as "Information Gateway" which offers multimedia tutorials to library users. National Open University of Nigeria library has further implemented cloud computing technologies in cataloguing, metadata storage, retrieval, acquisitions and cloud-based electronic resources (Okwoli, 2015:48). This makes cloud computing one of the most popular trends basically due to its potential to assist the process of information access, improve collaboration and reinvent traditional IT structures. Cloud service providers offer several software, and hardware services that academic libraries can determine how

they can become part of the cloud environment. The selected cloud computing services by academic libraries can help in saving resources where software and servers are located outside the library premise (Yuvaraj, 2016b:3). In Kenya, libraries have also adopted some of these cloud solutions. The commonly used cloud based services include emails, social media, electronic databases, institutional repositories, remote access software, and library management systems like Koha (Makori, 2016; Otieno, 2016).

1.2.2 Effects of Cloud Computing in Libraries

Globally, libraries are shifting towards implementation of cloud services with the sole purpose of improving service delivery, managing resources and finding new avenues for growth. Subsequently, the application of cloud computing technologies eliminates the need for libraries to host multiple servers and other infrastructures within the vicinity and regularly dealing with the hardware breakdown, installation and upgrading of software as well as compatibility problems (Aher et al., 2016:1). Moreover, cloud computing services are offered globally through global service providers in addition to being always available on demand irrespective of the size and location of the library (Srivastava & Verma, 2015:1). This popularity of cloud computing technologies in libraries has been attributed to its capability of providing quicker on-demand computing infrastructures, self-service, and independent capability to access information resources (Changchit & Chuchuen, 2018:1).

Cloud computing technologies enables library users to access and use library services from their homes and offices. This means that library users can read books, conduct research regardless of their location (Ogbu, 2013:1). This offers libraries the prospect to lengthen their effect to users everywhere and all the time (Aharony, 2015). However, use of cloud computing technologies is hindered by various drawbacks

especially in developing countries. A study conducted by Khatib & Opulencia (2015:3) on libraries in United Arab Emirates (UAE) found out that constant electricity disruptions and local power blackouts affected the access of online services. Oh & Yoon (2014:13) indicate that user interface, the manner in which content is displayed, knowledge of the system and lack of feedback mechanisms affect utilization of cloud services.

1.2.3 Cloud Computing Acceptability in Libraries

Cloud computing has been among the present-day popular technologies offering IT resources as utility services. Cloud computing technologies are valuable for private use as well as to the library users as they can access resources dynamically depending on their information requirements. However, the utilization of these technologies is quite low at the individual level (Alkhater et al., 2017:4). This is because the growth of the cloud computing usage presents several adoption and learning challenges to the ultimate users. The influence of users' perceptions towards these cloud computing technologies is a matter that requires further assessment and analysis (Ashtari & Eydgahi, 2015:1).

Research conducted by Hashim and Hassan (2015:9) in Kufa university in Iraq found out that behavioral intention was a significant factor in influencing the utilization behavior of cloud services, meaning that any rise in behavioral intention among users would lead to an upsurge of cloud computing utilization. Effort expectation was seen also to influence the behavioral intent. Users at University of Kufa consider learning how to access and use cloud services easy as well as working on the cloud. Social influence was also proven to be influencing the behavioral intent of users to utilize cloud services at Kufa University. This means that peers, library staff and lecturers' influence have a strong outcome on users. Although cloud computing implementation

has been a hype in academic libraries, only a few studies have discussed the way experiences of users are formed in the cloud based services, and the fundamental factors influencing use of the technology among users (Gambo, 2017; Hashim & Hassan, 2015).

In Kenya, institutions of higher learning have experienced tremendous growth in terms of student enrollment and course programmes. This growth has been occasioned by several factors such as the believe that university education guarantees a lifetime safe career, the fluctuating environment in the job market requiring additional training, and the need to progress in the present employment (Gudo et al., 2011:205). New modes of study are being initiated in universities to address the rising demand of training such as e-learning which have increased the need for digital information (Kihara & Gichoya, 2014:2). This has consequently compelled academic libraries to apply cloud technologies in offering information services to the same users. Literature review conducted revealed inadequate empirical studies on the notion of users regarding the cloud computing integration in delivery of services in academic libraries in Kenyan context. This formed the basis of this study which was geared towards assessing the influences of cloud computing use in service delivery and develop strategies that academic libraries in Kenya can employ in increasing the access and usage. The study is of value to academic libraries in acknowledging the factors that facilitate or inhibit use of cloud computing services among patrons.

1.2.4 Context of the Study

South Eastern Kenya University initially existed as UKAI which was founded in 1976 and in 2008 it became an integral college of University of Nairobi as SEUCO. In March 2013, SEKU was conferred a charter making it a full-fledged University. The main campus is situated in Kwa Vonza, Kitui County while its four satellite campuses

are located in Kitui, Machakos, Wote and Mtito-Andei towns. The vision of SEKU is to become a globally competitive centre of excellence in teaching, research, innovation and service.

SEKU has tremendously grown in terms of student population which stands at approximately 8,000 and has academic programmes in Diploma, Undergraduate and Postgraduate levels. This growth has led to computerization of facilities including the library to facilitate provision of valuable services to its diverse consumers. Online services include; OPAC, remote access to electronic resources using EZproxy, institutional repository and reference services which are provided using emails, LiveChat tool and social media networks. The library has stocked physical resources approximately 18,000 volumes in an effort of achieving its mission of becoming a centre of excellence in provision of information resources and services which support university's core mandate of teaching, learning and research.

1.3 Statement of the Problem

Globally, academic libraries are adopting different technologies which provide new ways of accessing information resources in both electronic and print format. In academic libraries, cloud computing technologies provide information retrieval systems, a diversified opportunities for expansion of information services, decrease in maintenance requirements of IT infrastructures and encourages efficient use of available resources (Ogbu, 2013:1). The literature review conducted shows that most of researches are centered on discussing the charges and benefits of utilizing cloud services in academic libraries and very few studies have examined cloud acceptance from users' perspective (Park & Ryoo, 2013). This therefore means that there is inadequate information regarding the factors affecting reception and utilization of cloud information services which should guide in decision making regarding the

adoption process in institutions of higher education (Gambo, 2017:2). Scholars also hold the same view that even with the rapid rise in acceptance of cloud information systems, there are inadequate researches from the users' perspective. Scholars argue that the biggest hindrances affecting cloud based system acceptance are related not to technology, but perception of users (Alotaibi, 2014; Hashim & Hassan, 2015). The utilization of cloud computing technologies boosts the competitive advantage of an organization. However, low reception and use of new technology systems by users can result into financial losses and tainted organizational culture (Wu et al., 2013:10).

Most academic libraries in Kenya have in one way or another adopted cloud computing in various services. SEKU library for instance has adopted several cloud based services such as the on-campus and off-campus access to e-resources, file storage and mailing services and utilization of social media for reference services. This has greatly improved the quality of service delivery and development of new services. Equally, it has posed new challenges related to technology such as bandwidth size, inadequate computers and frequent power outages which affect the effective access and utilization of cloud services. SEKU library for some time has witnessed low utilization of cloud information services in library such as emails, social media in references services, on-campus and off-campus access to electronic books and journals, OPAC and institutional repository. This observation therefore prompted the researcher to undertake a study to assess the fundamental factors controlling usability of cloud computing services among library users in SEKU library.

1.4 Aim of the Study

The aim of the study was to scrutinize the influence of integration of cloud computing in delivery of service in academic libraries with reference to South Eastern Kenya University, and suggest strategies to enhance the technology.

1.5 Objectives of the Study

The objectives that steered the study were to:

1) Assess the impact of cloud computing information services in service delivery in academic libraries.
2) Examine the application of cloud computing technologies in service delivery in academic libraries.
3) Find out the factors influencing optimal use of cloud computing information services in academic libraries.
4) Develop appropriate strategies to increase usage of cloud computing information services in academic libraries.

1.6 Research Questions

Following were the research questions that steered the research:

1) What is the impact of cloud computing information services in academic libraries?
2) How are cloud computing technologies applied in service delivery in academic libraries?
3) Which factors influence use of cloud computing information services in academic libraries?
4) Which strategies can be adopted to increase use of cloud computing information services in academic libraries?

1.7 Significance of the Study

The following are the values of this research:

1.7.1 Practical value

The study helps the library management to recognize the factors that control utilization of cloud services by users. The study also provides practical solutions in form of strategies and recommendations to improve use of cloud computing services.

1.7.2 Theoretical value

The results of the study supplements the rising experimental literature on integration of cloud computing and service delivery in academic libraries. Researchers and scholars can utilize this study for reference purposes and as a source of secondary data forming a foundation for further research in cloud computing in libraries.

1.8 Assumptions of the Study

The study presumed that SEKU library users were suitable and convenient representative of all the users in Kenyan academic libraries. The second assumption was that the responses given by respondents in the questionnaires were honest and objective. The third assumptions was that the respondents regularly use cloud computing services offered in the library.

1.9 Scope of the Study

Examined in this research was the integration of cloud computing and service delivery among Kenyan academic libraries with an inclination to public universities. By 2018, Kenya had 31 public universities and each has a main library which is mandated to procure and issue information resources both physical and electronic. To accomplish the aim of this study, the focal point was SEKU library which is a Kenyan public university. The key targeted groups were the SEKU postgraduate students and

lecturers in the School of Pure and Applied Sciences (SPAS) and School of Environment, Water and Natural Resources (SEWNR).

1.10 Limitations of the Study

There were a number of restrictions in the research which formed a foundation for future research. One of the restrictions is associated to the scope of the research since the participants were limited to only postgraduate students and lecturers in SPAS and SEWNR who were valuable in confirming the results of the study in other academic libraries in public universities in Kenya. Finally, there was scarcity of literature relating to assessment of usage of cloud computing services by library users among academic libraries in Kenya.

1.11 Definition of Terms and Concepts

Cloud Computing

This is a technique that facilitates the access and utilization of technological infrastructures remotely through the internet without having to purchase and maintain them.

Academic Libraries

These are libraries which are set up majorly in colleges and universities to provide information resources to users in an effort of supporting the institution's core activities of teaching, learning and research.

Cloud Library

This refers to a library whose services are provided and accessed through the internet.

Infrastructure as a Service

This service gives storage, database management and computing competencies on demand basis.

Software as a Service

These are applications embedded on the cloud and are accessed as services by users.

Platform as a Service

This service delivers the platform used to design, develop, and test computer applications.

1.12 Chapter Summary

Highlighted in this chapter are the fundamental aspects of integration of cloud computing and service delivery in libraries from the various perspectives across the globe. It has provided comprehensive information on the context of the study and discovered presence of a knowledge gap in the aspect of cloud computing adoption from the users' viewpoint. Presented also are the objectives that steered the study as well as the theoretical and practical value to scholars and library practitioners. South Eastern Kenya University was the focal point of the research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Review of literature denotes the methods of locating and summarizing the studies associated to a topic with the aim of comparing their findings (Creswell, 2009:29). This chapter has been organized thematically so as to present a broad evaluative report of the past studies on application and influences of cloud computing utilization in libraries. The literature review is anchored on the following issues: the main characteristics, models and operationalization of cloud computing among academic libraries, determinants and conceptual framework that can be applied to guide academic libraries in increasing utilization of cloud computing technologies.

2.2 Cloud Computing Concept

Even though cloud computing has not been completely a fresh idea, it has no universally accepted or standard definition (Oliveira et al., 2014) creating room for development of a range of descriptions by various scholars and researchers. Cloud computing entails accessibility and usage of outsourced electronic resources and services over the Internet. It comprises of distant servers where subscribers' data, information and applications are saved. With the aid of Internet connection, saved data and applications are accessible by subscribers from any computer system (Thamaraiselvi, 2016:2). The metaphor "cloud" in this context signifies the huge networks of applications and hardware for availing services to clients by internet (Srivastava & Verma, 2015). Cloud computing denotes the applications and functions that operate on distributed networks which use virtual resources and are accessed through networking standards and internet protocols. Related technologies, services and applications on the internet are pooled together and converted into a self-service

utility (Bhattacharjee & Purkayastha, 2013:2). Several definitions of cloud computing have been postulated by various scholars, but they all revolve around facilitating users in accessing the computing services by overcoming the challenges of computing resources and infrastructures (Mokhtar et al., 2013).

2.3 Evolution of Cloud Computing

As a concept, cloud computing emerged and gained foundation in the 1960s when a computer scientist, John McCarthy, noted that, "Computation may someday be organized as a public utility". It was until 2007 when large companies like Google, IBM among others embarked on researches related to cloud computing and its possible benefits on the IT industry gave rise to its popularity. Since then, a lot has been debated and developed in regard to cloud computing (Abidi et al., 2012). After invention of personal computers and Internet, cloud computing has been regarded as the third evolution (Laxmanrao & Milind, 2014:1) making it the most incredible discovery after the invention of Internet (Srivastava & Verma, 2015). The integration of different innovations such as service oriented architecture, grid computing, and virtualization of computing resources resulted into the birth of cloud computing (Oredo, 2016:8). In particular, utility computing paradigms are considered as the precursors of cloud computing (Laxmanrao & Milind, 2014:1). The integration and application of all these technologies has transformed the manner in which information systems are developed, managed and services offered in organizations (Okwoli et al., 2015:2).

2.4 Cloud Computing Technologies

Numerous technologies which constitute cloud computing have matured in the recent years facilitating real applications in institutions. The technologies include service-oriented architecture which enables users to perform various functions without

incurring the costs and risks associated to the service. Service orientation design enables cloud computing providers to integrate resources and services while providing universal access to applications. Open architectures are applicable when allowing access to contextualized knowledge and searching worldwide using portals that authorize individualized sign-on verification for all authorized users (Mavodza, 2013). Virtualization as a technology emulates the computing infrastructures such as operating system, storage and network servers. Virtualization machines allow operating systems to provide similar functionality that is offered by physical computers (Shi et al., 2016).

Another technology is cloud enterprise resource planning system which is an application that integrates wholly the functional entities of an organization in a consolidated manner. If an ERP system possesses the characteristics of cloud computing, then it is labelled as cloud-based. Cloud ERP systems are accessed over the internet using the end users' browser without changing the system on the side of consumers (Elmonem et al., 2016:2). Edge computing as a technology permits computation to be executed on the margins of a network. Edge computing allows computing to occur at the proximity of data sources resulting into improved response time and bandwidth cost saving where large amount of data is involved.

2.5 Cloud Computing Models

Scholars have noted numerous models of cloud computing.

2.5.1 Service Models

There are three core models of service that have been identified in various studies (Han, 2013; Wasike & Njoroge, 2015). i) Software as a Service which refers to an application embedded on the cloud and is accessed by the help of a web-browser. They comprise of Google Apps, EZproxy, Facebook, Zotero, youtube, and Mendely.

ii) Platform as a Service presents tools and an atmosphere for a library to develop, try, install and use personalized cloud applications. In PaaS model, the software already exists, like when a library is using a Library Integrated System like Koha and SirsiDynix (Mavodza, 2013) and software for hosting repositories such as Greenstone, and D-Space (Ifijeh, 2014:3). iii) Infrastructure as a Service comprises of numerous servers which store the computing infrastructures with an "on-demand and pay for every use" formulation. Cloud storage services consist of Microsoft Azure and Amazon S3 (Simple Storage Service) (Han, 2013). Other examples of IaaS include Google Drive and Dropbox.

2.5.2 Deployment Models

Deployment models of cloud computing are four and are categorized according to the location of the hosting cloud. They include public, private, community and hybrid clouds (Alotaibi, 2013; Bhattacharjee & Purkayastha, 2013; Changchit & Chuchuen, 2018). Public cloud is hosted at the vendor's site and the locality of cloud infrastructures is not visible by the clients. In this model, several organizations share the computing infrastructures. In private cloud, the computing environment is devoted to one institution only. It is expensive but more secure than public cloud. In community cloud, the computing infrastructures are appropriated amongst establishments with similar goals such as academic libraries in a given geographical area. In hybrid cloud, a library can host the most vital and sensitive applications such as patron details in a private cloud whereas the less important are stored in the public or community clouds.

2.6 Fundamental Aspects of Cloud Computing

Prominent scholars have noted five essential aspects of cloud computing (Alotaibi, 2013; Han, 2013). The first one is on-demand self-service. This means that users can provision computer resources without the prerequisite of collaboration with the

provider of cloud services. The second is broad network accessibility. This facilitates cloud services to be presented through network and accessed using the standards that support utilization by diverse gadgets, for instance laptops and smartphones. Resource pooling is the third one and involves bringing together computing resources of a supplier to attend to multiple clients through multiple-tenant model. Computing resources consist of storage, virtual machines, network bandwidth and email services. The fourth one is rapid elasticity. This means that cloud services are quickly provisioned to rapidly scale out or in at any time and quantity. The last one is measured service. Consumption of cloud resources is measurable and can be reported thus ensuring openness between the provider of the service and user.

2.7 Impact of Cloud Computing in Academic Libraries

Several researches reveal that libraries worldwide experience similar challenges related to rigidity, ineffectiveness of digital information and costly management of ICT equipment. The remedy to this threat is incorporation of cloud computing in delivery of services in libraries (Wasike & Njoroge, 2015). In integration of cloud computing, library users are capable of browsing physical books, CDs or opt to check out a resource or scan the barcode using mobile devices which facilitates faster retrieval of information (Ogbu, 2013:4). The merits of using cloud computing in academic libraries include easier collaboration, knowledge sharing (Mohamed & Pillutla, 2014), superior efficiency because of the online availability, improved security and data protection, seamless flow of information, no purchase of servers and vendors have to deal with software upgrades (Mavodza, 2013). Again, cloud computing in libraries has been found to lower technological related costs, increased capability, consistency and performance while reducing computer maintenance (Wasike & Njoroge, 2015).

Use of cloud computing services eliminates hosting of multiple servers locally and frequently dealing with hardware failures, software installations, up-grading and compatibility problems. For numerous institutions, cloud computing streamlines processes which saves time and money (Abdu et al., 2017; Aher et al., 2016). Migration of academic libraries to cloud computing environment provides an opportunity to test new software and hardware without having to purchase them as well as configure the computing capabilities to meet the users' demands (Alotaibi, 2013). Implementation of cloud technologies within academic libraries has resulted into increased access to professional and research tools, enhanced capability of distance education by students (Mokhtar et al., 2013) and ease congestion in computer labs as patrons can access online resources using other gadgets such as smart-phones and tablets. Despite all these advantages, cloud computing services are not completely plug and play. Libraries which have adopted it need to be concerned about the local bandwidth, clients' hardware and software configuration (Prince, 2012). Other challenges encountered in utilizing cloud services according to Islam et al., (2017:9) are: unexpected failure of cloud infrastructures, some cloud environments provide support for only specific platforms, and network latency which affects the time it takes for a user to receive information from the cloud service providers.

2.8 Application of Cloud Computing in Academic Libraries

Incorporation of cloud technologies within academic libraries has proven valuable in providing services to the diverse clientele. Cloud services have reached maturity and are a preference in offering innovative technologies for libraries (Tritt & Kendrick, 2014:2). For instance, cloud computing facilitates integration of services in the library portal through development of service platform, provision of database retrieval, document delivery and remote reference services which are all in tandem with users'

needs (Hai-yan, 2013:3). Scholars have noted various cloud-based applications employed in service delivery among libraries which include:

2.8.1 Communication and Networking

This entails the social networking sites which offer free platforms for interaction and provision of services to library users. Social networking sites facilitate creation, sharing and dissemination of information related reference services, news and updates (Kumar, 2015:2). The common social networking sites include Facebook, Twitter, Blogs and Youtube.

2.8.2 Remote Access

EZproxy is a cloud service which is applied in academic libraries to facilitate remote access to electronic journals and books. EZproxy provides off-campus access to library databases such as those from ProQuest, Emerald and EBSCO among others (Erturk & Iles, 2015:2). Initially, electronic journals and books subscribed to by academic libraries were only accessible on-campus via IP authentication.

2.8.3 Electronic Databases for Supplementary Resources

A range of commercial databases have been integrated in library resources such as, Elsevier, Springer, Ebsco, Emerald, Jstor among others (Chunhong, 2014). These subscribed databases provide an assortment of electronic journals and books in diverse disciplines which are downloadable by users of the library.

2.8.4 Citation and Reference Management Tools

These tools assist researchers in creating and organizing the references and bibliographic information by maintaining a database of the information sources. Researchers are able generate citation and references to their scholarly work easily using the citation and reference management tools (Kaur & Dhindsa, 2016:1). Examples include Zotero, Mendeley and ReadCube.

2.8.5 File Storage and Management

Due to their cost effectiveness, open source software are applied in academic libraries in creating digital libraries and building repositories which support storage and accessibility of information resources through the internet. For instance, integrated library systems such as Koha supports library functions like acquisition, cataloguing, circulation and management of patrons (Payne & Singh, 2010:6). Similarly, DSpace and Greeenstone software are used in development of institutional repositories.

2.9 Factors Influencing Usability of Cloud Computing in Academic Libraries

Technologies hosted on cloud are valuable for individual consumption in diverse ways. Accessibility to services and resources by library users is from anyplace and all the time. This versatility increases user's productivity. It is presumed that the likelihood of persons to accept cloud services is high the moment they recognize substantial value after utilizing them (Alkhater et al., 2017:2). The findings of a research undertaken by Gambo (2017:1) affirmed that ease of use, security, trust, usefulness, performance expectation, social influence, effort expectation, and facilitating conditions had the highest influence on user reception of cloud-based learning. Other factors that facilitate cloud computing implementation in academic libraries include adequate Internet bandwidth and approval of decision makers to transition to cloud technologies (Mokhtar et al., 2013).

In a research undertaken by Oh & Yoon (2014:13) at Cyber Hankuk University of Foreign Studies and Open Cyber University in Korea to assess the use of e-learning services, it was found out that effort expectance had the highest force on intention to utilize internet services among individuals. This is an indication that users scrutinize the ease of access when deciding on the internet services to use. From this perspective, it is imperative for providers of internet services to involve target users in

the design and development stage of user interface. The same study found out that social effect had a substantial impact on the utilization of Internet services. Other factors which influence usage of cloud services according to Oh & Yoon (2014:13) include the usefulness of the content to the task at hand and the effort required to access and use.

2.10 Theoretical Framework

A theoretical framework highlights the various theories and issues that a study is embedded on (Kumar, 2011:40). Several technology adoption theories have been developed by scholars in an effort to describe the different factors that determine utilization of new innovations. This research was anchored on Unified Theory of Acceptance and Use of Technology (UTAUT) which guided in identifying key influences of the user acceptance and utilization of cloud services in SEKU library. UTAUT theory was advanced through evaluation and incorporation of eight core theories and models which include the Motivational Model, the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB), the Technology Acceptance Model (TAM), the Model of PC Utilization, Innovation Diffusion Theory (IDT), a combined TBP/TAM, and Social Cognitive Theory (Williams et al., 2015).

UTAUT pinpoints four significant factors which are performance expectance, effort expectance, social influence and facilitating conditions (Venkatesh et al., 2012:2). Performance expectance is the extent individuals consider a system useful to their work performance as well as the perceived benefits while effort expectance is the intensity of how utilization of technology is simple. Social influence is the degree that individuals recognize that influential people such as colleagues and peers, believe that they need to utilize the new system. It is usually manifested in form of recommendations by the people considered important. Social influence postulates that

these individuals create an affirmative impact on approval of new technologies. Facilitating conditions is the degree of confidence that available technical and administrative resources support the utilization of innovation (Mutlu & Der, 2017:6).

2.11 UTAUT Theory

The main variables as postulated in UTAUT theory were applied in studying the factors influencing use of cloud computing information services. They include performance expectance, effort expectance, facilitating conditions and social influence.

2.12 Conceptual Framework

Conceptual framework describes the aspects that have been extracted from the theoretical framework to form the basis of a study (Kumar, 2011:40). In UTAUT theory, performance expectance, effort expectance, and social influence have been theorized as influencers of behavioral intention to utilize a technology, whereas behavioral intention and facilitating conditions are influencers of technology usability (Venkatesh et al., 2016:2). The cloud computing and service delivery was used as the independent variable while cloud applications, impact of cloud computing, factors influencing use of cloud services, and strategies to enhance usage were used as the dependent variables.

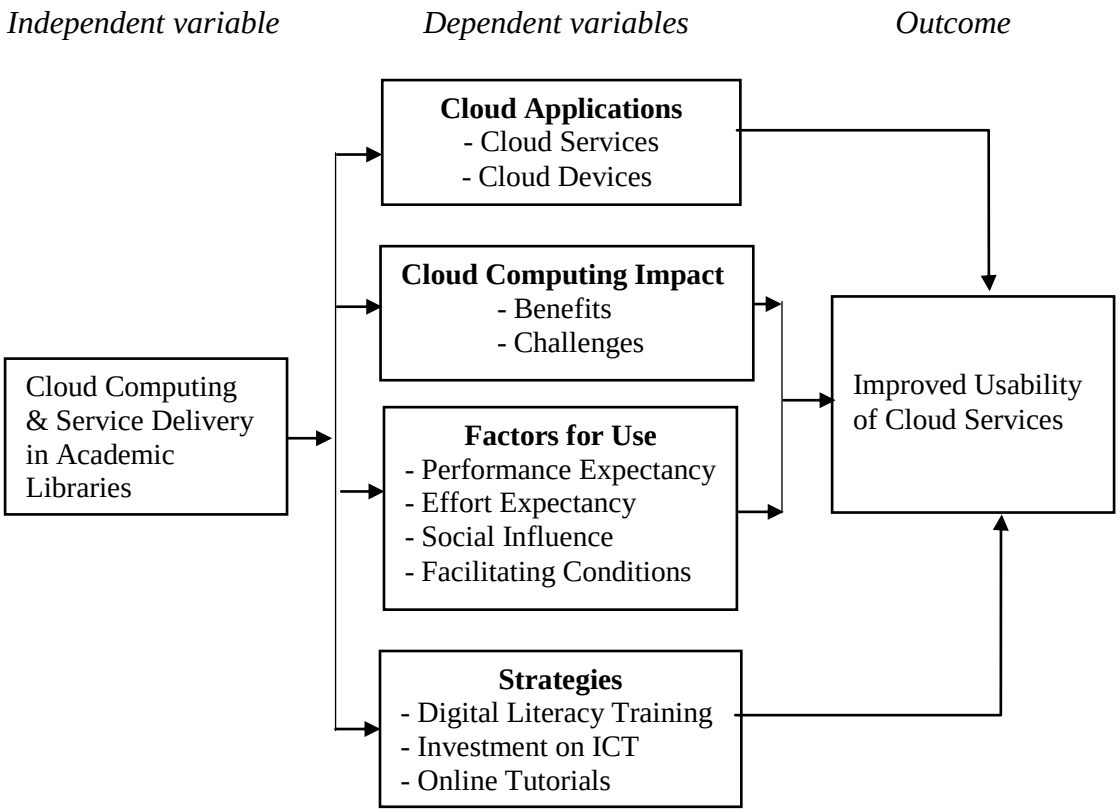

Figure 2. 1: Conceptual Framework of the Study

2.13 Chapter Summary

This chapter has revealed that previous studies have dealt with different aspects of integration of cloud computing and service delivery in libraries. There are wide range of service and deployment models available for libraries to pick from according to the form of the services given. Libraries have adopted several cloud applications like social media, ebooks, and institutional repositories in delivery of services. Accessibility of library services and resources by users is from anywhere and all the time. Performance expectance, effort expectance, social influence and facilitating conditions in UTAUT theory were applied to survey the factors that control access and utilization of cloud-based services.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research Design

Research design denotes a strategy and research processes which narrows the choices from extensive presumptions to comprehensive approaches of collection and analysis of data. It entails the intersection of theoretical assumptions, strategies of investigation, and particular methods (Creswell, 2013:266). The study was largely quantitative with a small aspect of qualitative approach. Consolidation of both qualitative and quantitative approaches allowed flexibility and in-depth examination of variables involved in the study resulting to greater understanding and description. Quantitative approach was applied in closed-ended questions which required respondents to rank questionnaire items in a five-Likert scale. Qualitative approach was used on open-ended questions which required respondents to enter more benefits and challenges they encounter when using cloud computing services apart from the ones listed in the questionnaire.

3.2 Area of Study

This study was undertaken at SEKU main campus and all the four satellite campuses. Main campus allowed the researcher to access the lecturers while satellite campuses offered access to postgraduate students as they are the ones that largely provide postgraduate programmes.

3.3 Population

SEKU postgraduate students and lecturers in SPAS and SEWNR were the selected population for the study. Lecturers and postgraduate students were key to the study as they are the ones who heavily depend on scholarly resources for their research, teaching and course work. Postgraduate students are on part-time mode of study and

the lecturers are not stationed in main campus only. This makes them the main beneficiaries of cloud based services provided by the library as they can access them anywhere and anytime. To obtain the sample frame of the targeted population, two formal letters were written and dispatched to Admissions and Human Resource Departments. These two departments availed the information regarding the population of postgraduate students in each campus and lecturers as per Schools. It is from these information that the sample size of the study was derived from. Table 3.1 represents the sample frame of this study.

Table 3. 1: **Sample Frame**

Strata	**Sampling Stratification**	**Target Population**	**% of the Total Population**	**Sample Size**
Lecturers	School of Pure and Applied Sciences	33	52.4	33
	School of Environment, Water and Natural Resources	30	47.6	30
Sub-Total		**63**	**100**	**63**
Postgraduate Students	Kitui Campus	362	44.6	40
	Machakos Campus	158	19.5	17
	Mtito Andei Campus	121	14.9	13
	Wote Campus	171	21.1	19
Sub-Total		**812**	**100**	**89**
Grand Total		**875**		**152**

3.4 Sampling Strategies and Techniques

3.4.1 Sampling Strategies

The study employed both probability and non-probability sampling strategies. Probability sampling strategy was used in selecting lecturers and non-probability sampling strategy was used to select postgraduate students. Sampling as a process entails picking persons from the entire population in such a manner that every individual stands an equal opportunity of being incorporated into the sample of the

population (Singh, 2006:82). Sampling process entailed identification and selection of postgraduate students and lecturers who were appropriate for inclusion in this study.

3.4.2 Sampling Techniques

This research adopted purposive and census sampling techniques. Purposive sampling involves the researcher selecting the individuals who possess the requisite information for realization of the objectives of the study, and are more than willing to share it (Kumar, 2011:207).

Purposive sampling was adopted in selecting the postgraduate students due to their intensive nature of their studies which calls for extensive consumption of scholarly information resources that are provided in the library through cloud based platforms. A sample size of postgraduate students was selected in each of the four satellite campuses of SEKU as indicated in Table 3.1. Paper questionnaires were then distributed randomly among the postgraduate students. Census sampling involved administering email questionnaires to all the lecturers in SPAS and SEWNR as they are the largest in terms of numbers. Though the two schools have the largest number of lecturers, their sum total was small hence warranting census sampling. These methods resulted into collection of comprehensive information and knowledge relating to the area of study hence increased content validity.

3.4.3 Sample Size

Sample proportion for postgraduate students was calculated according to Slovin's sample formula where the confidence level was 90 and the margin of error was 0.1. After executing the calculation, the result was 89 which represented the sample size for postgraduate students. Census population was used for all the lecturers in SPAS and SEWNR which was totalling to 63. The total sample size was 152 participants as indicated in Table 3.2.

$$n = \frac{N}{1+Ne^2}$$ Where n= sample size N= population size e= error tolerance

Table 3. 2: Sample Size

Respondents	Population size	Sample size
Lecturers	63	63
Postgraduate students	812	89
Total	**875**	**152**

3.5 Data Collection Methods

Data collection techniques according to Cowles and Nelson (2017:2) is the blueprint on how a researcher gathers information required to address the research questions. The main methods include observations, interviews, questionnaires and focus groups. This study utilized questionnaires to gather raw data from respondents.

3.5.1 Questionnaires

A questionnaire presents written questions whose responses are recorded by the targeted respondents. In a questionnaire, the respondent is required to read and understand the questions and then record the response for each (Kumar, 2011:145). The study made use of raw data that was gathered through structured questionnaires as they facilitated data collection from the diverse and remote postgraduate students and lecturers thus saving time. The questionnaires contained open and close ended queries. A five-point Likert scale was applied on close ended questions on an interval scale spanning from “strongly agree” to “strongly disagree”. The close-ended questions were used to measure impact, applications and UTAUT theory constructs as contained in the proposed conceptual framework. The open-ended questions were to

gather more information on benefits and challenges experienced by respondents when accessing and using cloud computing services.

3.5.2 Document Review

Document review process involved use of textbooks, journal articles, and thesis appropriate to the area of study as sources of information. The goal of document review was to offer current information and knowledge regarding integration of cloud computing and delivery of services in academic libraries.

3.6 Research Instruments

3.6.1 Pilot Study

To pretest the appropriateness of the questionnaire and data analysis tools, a pilot study was conducted. Pilot study was undertaken at University of Nairobi main campus, Jomo Kenyatta Memorial Library. The questionnaires were administered using purposive sampling to 10 postgraduate students and 10 lecturers since they possessed the characteristics of the targeted research sample. 11 filled-up questionnaires out of 20 were returned translating into a 55% response rate. From the pilot study, it was observed that the low response rate from the lecturers was contributed by the fact that they have busy schedules and doing follow-ups was difficult since they are not always in the university premise unlike postgraduate students. To increase the response rate among lecturers, the researcher resorted into using mail-out questionnaires so that lecturers can fill them at their own convenient time. The research tools were found to be valid and reliable hence no changes were made to them. Quantitative and qualitative data were obtained and analyzed by use of multiple regression and thematic content analysis respectively. This established that the analysis methods selected were suitable in yielding valid and reliable results for the final study.

3.6.2 Validity

The validity of a tool refers to its capability of measuring that which it is intended to measure (Kumar, 2011:178). Items contained in the questionnaire were informed by the literature review conducted and used by other researchers in quantifying variables in their research. The design and development of the questionnaire process involved the recommendation and ideas from the supervisors. This guaranteed that the information gathered was accurate and relevant in achieving the objectives of the study.

3.6.3 Reliability

Reliability means that there is consistency and stability in the measurement of the targeted variables (Riemer et al., 2012:231). Kumar (2011:5) states that reliability is the quality of a measurement process that guarantees repeatability and accurateness. Analysis and presentation of data collected during pilot study confirmed that the items contained in the questionnaires would gather consistent information from all the respondents.

3.7 Ethical Considerations

Ethical procedures and practices were adhered to so as to ensure that the study was confined within approved research guidelines of University of Nairobi. This was achieved by getting consent of the participants to take part in the research, providing them with the aim of the study and guaranteeing confidentiality of information provided. References used in the study were well cited and acknowledged to avoid incidences of plagiarism. This research project was run through anti-plagiarism software and it complied with the University of Nairobi acceptable percentage.

3.8 Data Collection Procedures

Raw data was gathered from respondents after obtaining permission from the university upon successfully defending the research proposal. The deans of SPAS and SEWNR provided the researcher with all the emails of the lecturers in the two schools upon request. The paper questionnaires were self-administered to postgraduate students and mail-out questionnaires were emailed to the lecturers. Collection of the filled up questionnaires took place after two weeks since the day of admission and the same grace period was given to those emailed out. Two rounds of reminders were channeled to respondents to improve the degree of response.

3.9 Data Analysis and Presentation

The obtained data was analyzed through the use of Microsoft Excel and SPSS applications. Analysis of Quantitative data was accomplished using descriptive statistics and multiple regression analysis which was gathered by close-ended questions. Analysis through multiple regression was specifically applied to objective number three since there were more than one dependent variables which affected the independent variable in the study. Analysis through multiple regression was instrumental in explaining the connection between the dependent variables and the independent variable as identified in the conceptual framework. Qualitative data which was gathered using open-ended questions regarding the benefits and challenges encountered when using cloud computing services was analyzed using thematic content analysis. Thematic content analysis entailed grouping the responses into major themes and then coding them for analysis purposes. The themes generated under benefits of cloud computing use were: diversity of resources; requires limited space; and user friendly. The themes generated under challenges were: lack of login credentials to databases; inaccessible computers; other databases not subscribed to;

network problems; many operations required to access. Presentation of analyzed data was through pie charts, tables and graphs. Cross-tabulation was also employed to make comparisons between chosen variables.

3.10 Chapter Summary

Provided in this chapter is the plan and process that was pursued to realize the aim of this study. The area of research was South Eastern Kenya University library and the targeted population included lecturers and postgraduate students. The sampling techniques used were purposive and census. Questionnaire was the tool applied to gather data. Obtained data was subjected to multiple regression and thematic content analysis methods.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS, INTERPRETATION AND DISCUSSION

4.1 Introduction

Outlined in this chapter is the presentation, analysis, interpretation and discussion of data gathered from postgraduate students and lecturers. Raw data was acquired through administration of questionnaires with the purpose of assessing the incorporation of cloud computing in delivery of service in academic libraries. Analysis of raw data was carried out in conformity with the formulated research questions. Analysed data was displayed through tables, pie chart and graphs.

4.2 Response Rate of Respondents

Data collection involved administering 63 email questionnaires to lecturers and 89 paper questionnaires to postgraduate students. 37.6% (n=41) of respondents were lecturers and 62.4% (n=68) comprised postgraduate students as shown in Table 4.1. The total respondents were 109 out of 152, reflecting a response rate of 71.7%. This shows that the study concentrated on the key consumers of cloud-based information services which guaranteed validity of collected data.

Table 4. 1: Response Rate of Respondents

Respondents	Distributed	Returned	Percent (%)
Lecturers	63	41	37.6
Postgraduate students	89	68	62.4
Total	**152**	**109**	**100.0**

4.3 Background Information of Respondents

4.3.1 Gender of Respondents

In the aspect of gender, the study established the following information as illustrated in Figure 4.1. Male respondents accounted for 62.7% and female 37.3%. This

indicates that use of cloud-based information services is more preferred among males compared to females.

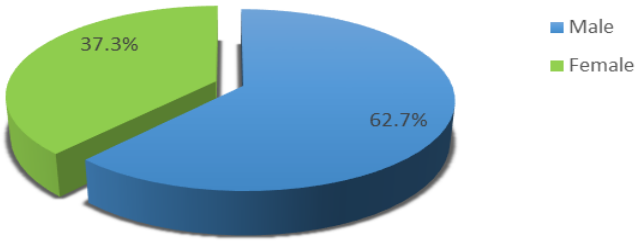

Figure 4. 1: Gender of Respondents

4.3.2 Highest Level of Study/Qualification

Lecturers were required to specify the highest level of qualification while postgraduate students' respondents entered the level of study. This was an open ended question which was coded into two bands of PhD and Masters. From Figure 4.2 below, majority of lecturers had PhD (79.5%) as the highest level of qualification while the greater number of postgraduate students had Masters (89.9%) as the level of study.

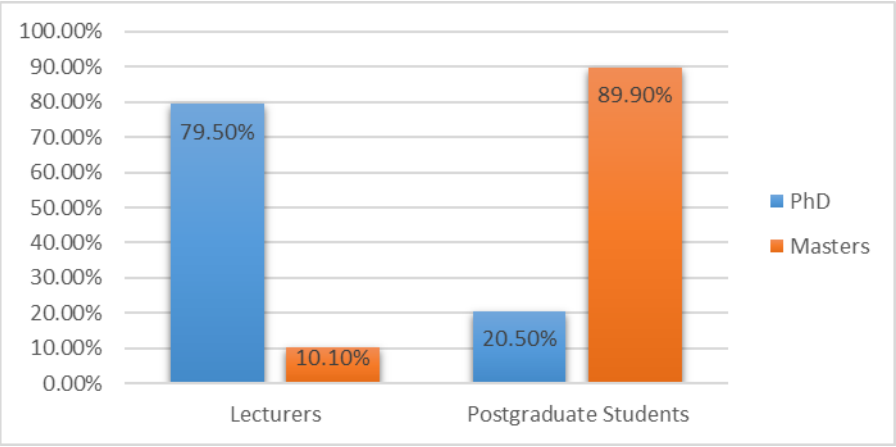

Figure 4. 2: Highest Level of Study/Qualification

4.3.3 Age

The results in Figure 4.3 demonstrates that greater part of the respondents (46.4%) were aged 40 years and beyond with minority being 20-24 years (2.7%). This is an indication that respondents aged 40 years and above have greatly embraced the use of cloud computing information services compared to those aged 24 years and below.

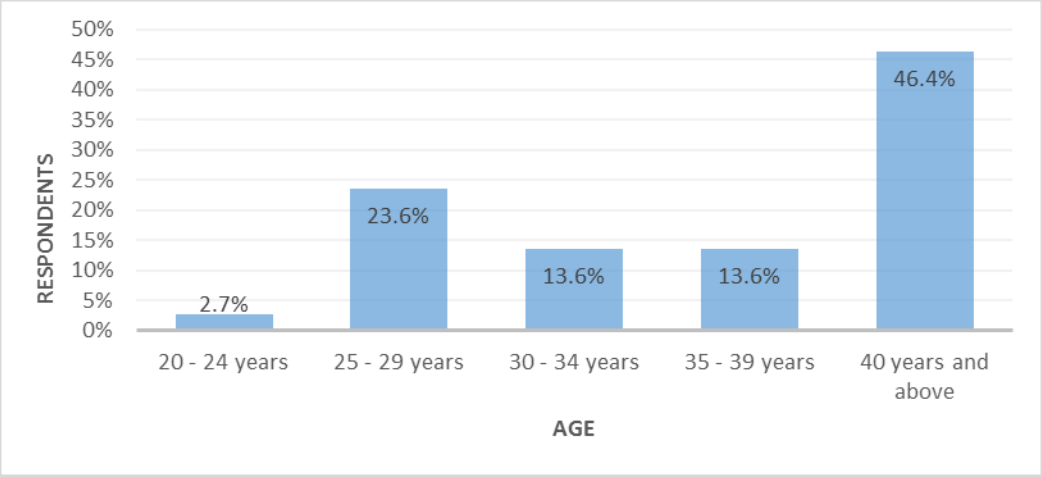

Figure 4. 3: Age of Respondents

4.4 Impact of Cloud Computing Information Services in the Library

The first objective of the study was to assess the benefits and challenges that library users encounter while accessing and utilizing cloud services.

4.4.1 Benefits of Cloud-based Information Services

The study aimed at gathering information as regards to the perceived benefits of consuming cloud services as presented in Table 4.2. Access to resources anywhere and anytime was ranked as the highest benefit (Strongly Agree = 68%). This means that library users appreciate the fact that they can access library resources regardless of their location. This is in concurrence with a research carried out by Ogbu (2013:1) which informed that cloud computing technologies facilitates access of library services by users from their homesteads and workplaces. Better security to archived resources was ranked as the lowest benefit (Strongly Agree = 52%), an indication that

there are security concerns on the safety of data kept and accessed through cloud services.

Other benefits of using cloud information services as captured in the space provided in the questionnaire were analysed thematically as shown in Table 4.3 below. The responses were grouped into three main themes. The theme on diversity of resources had the highest score (n=25). This finding is in agreement with Hai-yan (2013:3) study which indicated that integration of services in the library portal allows users to access diverse services effortlessly from a centralized place. This indicates that users value the fact that they can access and use a variety of resources offered through cloud computing in the library hence easily meeting their information needs. The second highest was requires limited space (n=13) and the third was user friendly (n=16).

Table 4. 2: Benefits of Using Cloud-based Information Services

Benefits of using cloud computing	Respondents Number and Percent					
	Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**	**Total**
Saves money and time	57 (52.3%)	33 (30.3%)	7 (6.4%)	3 (2.8%)	9 (8.3%)	109 (100%)
Better storage of accessed resources	63 (57.8%)	18 (16.5%)	13 (11.9%)	8 (7.3%)	7 (6.4%)	109 (100%)
Better security to archived resources	52 (47.7%)	34 (31.2%)	14 (12.8%)	3 (2.8%)	6 (5.5%)	109 (100%)
Access to resources anywhere, anytime	68 (62.4%)	27 (24.8%)	6 (5.5%)	5 (4.6%)	3 (2.8%)	109 (100%)

Table 4. 3: Benefits Analysed Thematically

Benefits of using cloud computing	Respondents Number and Percent	
	Agreed	**Total**
Diversity of resources	25 (22.9%)	109 (100%)
Requires limited space	13 (11.9%)	109 (100%)
User friendly	16 (14.7%)	109 (100%)

4.4.2 Challenges Encountered in Accessing Cloud-based Services

An aspect of the study was to examine the challenges encountered when using cloud services as presented in Table 4.4. Inadequate information and knowledge was ranked as the biggest impediment (Strongly Agree = 26.6%). Library should engage users frequently to know the information and knowledge they require to access resources. Wade (2013:2) opines that this external relations strategy is effective in creating awareness of library services among users.

Insufficient internet bandwidth was ranked as the second challenge (Strongly Agree = 25.7%) hindering accessibility to cloud services. This is caused by the large population in public universities depending on internet use for research and learning. This finding resonates with a research conducted by Mokhtar et al. (2013) which presented inadequate internet bandwidth as impediment to access of cloud computing technologies. Although inadequate support by library staff was ranked as the least challenge (Strongly Agree=7.3%), library staff should be proactive in delivering information regarding availability and accessibility of cloud services.

The other challenges of using cloud information services as captured in the space provided in the questionnaire were analysed thematically as illustrated in Table 4.5 below. The responses were grouped into five main themes. The theme on network problems scored the highest (n=28). This is in agreement with a study contacted by Wei and Blake (2010:2) which found out that network problems and outages affect adoption of cloud computing. This indicated that network related issues such as weak Wi-Fi signal, inadequate Ethernet ports, and network interruption due to power outages hinder accessibility and utilization of cloud services in the library. The score for the other themes was: Other databases not subscribed to (n=19); lack of login

credentials to some databases (n=17); inaccessible computers (n=14); and many operations required to access (n=12).

Table 4. 4: Challenges Encountered in Accessing Cloud-based Services

Challenges of using cloud computing	Respondents Number and Percent					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total
Insufficient internet bandwidth	28 (25.7%)	29 (26.6%)	25 (22.9%)	14 (12.8%)	13 (11.9%)	109 (100%)
Inadequate information	29 (26.6%)	33 (30.3%)	14 (12.8%)	13 (11.9%)	20 (18.3%)	109 (100%)
Inadequate support by library staff	8 (7.3%)	7 (6.4%)	35 (32.1%)	18 (16.5%)	41 (37.6%)	109 (100%)
Constant power outages	10 (9.2%)	21 (19.3%)	23 (21.1%)	17 (15.6%)	38 (34.9%)	109 (100%)
Insufficient number of computers	27 (24.8%)	7 (6.4%)	15 (13.8%)	25 (22.9%)	35 (32.1%)	109 (100%)

Table 4. 5: Challenges Analyzed Thematically

Challenges of using cloud computing	Respondents Number and Percent	
	Agreed	Total
Network problems	28 (25.7%)	109 (100%)
Other databases not subscribed to	19 (17.4%)	109 (100%)
Lack of login credentials to some databases	17 (15.6%)	109 (100%)
Inaccessible computers	14 (12.8%)	109 (100%)
Many operations required to access	12 (11%)	109 (100%)

4.5 Application of Cloud Computing Information Services in the Library

The second objective of the study was to examine cloud services provided in the library and the gadgets and devices commonly used to access the resources.

4.5.1 Cloud Computing Information Technologies Used in Accessing Services

Respondents were required to select all the cloud-based services that they use in the library. As presented in Table 4.6 below, electronic books and journals were the highly used services by both lecturers (n=31) and postgraduate students (n=45). The fact that the electronic books and journals can be accessed from anywhere and

anytime makes them popular among the respondents for their suitability in teaching, learning and research. The services with less than half (n=54) of the total respondents were social networking (n=25), information retrieval system (n=36), reference services (n=36), and emailing services (n=47). This shows that half of the services are being underutilize. Library should use events like workshops and establish an information help desk to create awareness of cloud computing services as revealed in a study conducted by Yi (2016:7).

Table 4. 6: Cloud Computing Services in the Library

Cloud Services	**Response Rate**		
	Postgraduate Students	**Lecturers**	**Total**
Information Retrieval System	33 (91.7%)	3 (8.3%)	109 (100%)
E-books and E-journals	45 (59.2%)	31 (40.8%)	109 (100%)
Digital Repository	36 (65.5%)	19 (34.5%)	109 (100%)
Reference services	29 (80.6%)	7 (19.4%)	109 (100%)
Citation management tools	38 (66.7%)	19 (33.3%)	109 (100%)
Professional forums	39 (59.1%)	27 (40.9%)	109 (100%)
Social Networking	19 (76.0%)	6 (24.0%)	109 (100%)
Emailing services	26 (55.3.0%)	21 (44.7%)	109 (100%)

4.5.2 Gadgets/Devices Used in Accessing Cloud-based Services in the Library

Regarding the various gadgets and devices used, the study found out that majority (66.1%) of respondents utilize personal laptops. Smartphone was ranked second (43.1%), an indication that more library users are embracing use of smartphones in accessing information resources. Table 4.7 below provides an overview of devices and gadgets used in accessing services.

Table 4. 7: Devices and Gadgets Used in Accessing Services

Gadgets/devices	Respondents Number and Percent					
	Very Great Extent	Great Extent	Moderate Extent	Little Extent	No Extent	Total
Library computers	18 (16.5%)	18 (16.5%)	3 (2.8%)	20 (18.3%)	50 (45.9%)	109 (100%)
Personal laptop	72 (66.1%)	16 (14.7%)	5 (4.6%)	2 (1.8%)	14 (12.8%)	109 (100%)
Tablet	4 (3.7%)	3 (2.8%)	18 (16.5%)	7 (6.4%)	77 (70.6%)	109 (100%)
Smart phone	47 (43.1%)	6 (5.5%)	25 (22.9%)	12 (11.0%)	19 (17.4%)	109 (100%)

4.6 Factors Influencing Use of Cloud Computing Information Services

The study applied the variables in UTAUT theory to discover the determinants that influence utilization of cloud information services. Each of the five variables in UTAUT theory were measured using three questionnaire items on a five-Likert scale of 1 (Strongly Disagree) to 5 (Strongly Agree). The independent variable was cloud based services whereas the performance expectance, social influence, effort expectance and facilitating conditions were used as the dependent variables.

4.6.1 Performance Expectancy

This signifies the perceived advantages of using cloud-based information services. The highly rated statement was ‘enhances effectiveness in coursework and research’ (Strongly Agree=63%) as shown in Table 4.8. This is an indication that most respondents are able access required information resources with ease hence boosting the quality of learning and research.

Table 4. 8: Performance Expectancy

Performance Expectancy	Respondents Number and Percent					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean
Accomplish tasks quickly	61 (56.0%)	38 (34.9%)	3 (2.8%)	7 (6.4%)	3 (2.8%)	4.43
Effectiveness in coursework & research	63 (57.8%)	25 (22.9%)	2 (1.8%)	7 (6.4%)	5 (4.6)	4.56
Increases work output in studies	58 (53.2%)	34 (31.2%)	8 (7.3%)	14 (12.8)	2 (1.8%)	4.40

4.6.2 Effort Expectancy

This signifies the ease of utilizing cloud-based information services. Table 4.9 illustrates that 'learning how to use the services is easy' was ranked the highest. This implies that the process of accessing the various cloud services in the library is simple when taken through it. The statement that scored the lowest was 'training is provided whenever a new cloud-based service is introduced'. This means that library staff should sensitize and train users when new cloud-based services have been introduced.

Table 4. 9: Effort Expectancy

Effort Expectancy	Respondents Number and Percent					
	Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**	**Mean**
Services are simple to access	22 (20.2%)	44 (40.4%)	26 (23.9%)	14 (12.8%)	12 (11.0%)	3.71
Learning how to use services is easy	24 (22.0%)	59 (54.1%)	12 (11.0%)	13 (11.9%)	1 (0.9%)	3.84
Training is provided for new services	25 (22.9%)	28 (25.7%)	17 (15.6%)	29 (26.6%)	10 (9.2%)	3.27

4.6.3 Social Influence

This is the perception that persons hold that persuasive individuals like lecturers and peers believe that they must utilize cloud information services. The statement that ranked highest was 'library staff have been helpful in use of cloud computing services' (Strongly Agree=40%) as indicated in Table 4.10. This means that when library staff come into contact with users, they encourage them to make use cloud-based services. 'Lecturers encourage use of cloud computing services' was the statement that scored lowest (Strongly Agree=27%). This indicates that lecturers need to emphasize more on the use of cloud information services among their students.

Table 4. 10: Social Influence

Social Influence	Respondents Number and Percent					
	Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**	**Mean**
Library staff have been helpful	40 (36.7%)	28 (25.7%)	18 (16.5%)	9 (8.3%)	5 (4.6%)	4.06
Lecturers encourage use of services	27 (24.8%)	33 (30.3%)	27 (24.8%)	17 (15.6%)	5 (4.6%)	3.55
My peers are using cloud based services	33 (30.3%)	25 (22.9%)	32 (29.4%)	12 (11.0%)	7 (6.4%)	3.60

4.6.4 Facilitating Conditions

This question was based on the technical and organizational infrastructures necessary for utilization of cloud-based services. The statement ranked the highest according to Table 4.11 was 'cloud services are accessible and compatible with the devices I use' (Strongly Agree=37%). This means that respondents are able to access and use cloud-based services regardless of the devices they use. 'Knowledge to use cloud computing services is available' was rated the lowest (Strongly Agree=11%). This means that library staff have a duty to communicate information on how to access and use cloud-based services.

Table 4. 11: Facilitating Conditions

Facilitating Conditions	Respondents Number and Percent					
	Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**	**Mean**
Resources are available	16 (14.7%)	55 (50.5%)	25 (22.9%)	10 (9.2%)	3 (2.8%)	3.65
Knowledge to use services is available	11 (10.1%)	45 (41.3%)	38 (34.9%)	10 (9.2%)	5 (4.6%)	3.43
Services are accessible & compatible with devices I use	37 (33.9%)	41 (37.6%)	14 (12.8%)	13 (11.9%)	8 (7.3%)	3.97

4.6.5 Use Behaviour

This question required respondents to quantify the intention of use in regard to cloud services. Table 4.12 illustrates that a great portion of respondents indicated that they would recommend others to utilize cloud computing services (Strongly Agree=53%). This shows that the cloud services are beneficial and most respondents would like others to experience the same benefits. With the lowest score was 'regular use of cloud computing services for learning and teaching will continue to be part of me' statement (Strongly Agree=46%).

Table 4. 12: Use Behavior

Use Behavior	Respondents Number and Percent					
	Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**	**Mean**
Regular use of services will be part of me	46 (42.2%)	42 (38.5%)	4 (3.7%)	11 (10.1%)	15 (13.8%)	4.24
In future I will commence using services	50 (45.9%)	33 (30.3%)	21 (19.3%)	1 (0.9%)	10 (9.2%)	4.28
I will recommend others to use the services	53 (48.6%)	42 (38.5%)	10 (9.2%)	1 (0.9%)	6 (5.5%)	4.38

4.7 Regression Analysis of Independent Variables Effect on Dependent Variable

Application of multiple regression analysis assisted in examination of the connection between use behavior and the independent variables. Standardized coefficients (beta) allows comparison of the effect of each dependent variable to the independent variable and the higher the value, the stronger the effect (Sarstedt & Mooi, 2014:22). Multiple regression analysis showed that performance expectance had the highest positive substantial influence on use behavior of cloud information services, followed by social influence. This outcome is in concurrence with a research undertaken by Hashim and Hassan (2015:9) which found out that the powerful predictor of use behavior was performance expectance. Facilitating conditions and effort expectance

equally had a positive and substantial outcome on use behavior of cloud information services as demonstrated in Table 4.13.

Table 4. 13: Summary of Multiple Regression Analysis

Variables	Unstandardized Coefficients	Standardized Coefficients (Beta)	Sig.
Performance Expectancy	0.355	0.541	0.000
Effort Expectancy	0.123	0.225	0.013
Social Influence	0.194	0.302	0.002
Facilitating Conditions	0.154	0.282	0.008

4.8 Chapter Summary

The methods used to present data were tables, pie chart and graphs which were generated from SPSS software and Microsoft Excel. The total respondents for the study were 109 who comprised of 37.3% females and 62.7% male. A great portion of respondents in the study were within the age bracket of ’40 years and above’. The cloud computing information service that was highly used was electronic books and journals while the least used was social networking. Cloud based services provided in academic libraries were found to be beneficial. Insufficient internet bandwidth was cited as the huge hindrance to use of cloud computing information services while inadequate support by library staff was the least challenge. Regarding the connection between the independent and dependent variables, it was found out that ‘performance expectancy’ had the highest effect on the use behavior of cloud information services in the library and ‘effort expectancy’ had the lowest effect.

CHAPTER FIVE

SUMMARY OF THE FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter provides an overview of the key findings and discussions in line with the objectives of the study. The discussion of the findings was grounded on the data analysis undertaken in chapter four. Covered in this chapter also are conclusions and recommendations. Finally, the chapter provides possible areas for further studies that were outside the scope of this study.

5.2 Summary of the Findings

This study was guided by four objectives and this segment highlights the summarized findings for each.

5.2.1 Impact of Cloud Computing in Academic Libraries

The first objective of the study strived to assess the impact of cloud information services in academic libraries. This objective aimed at assessing the benefits and challenges experienced by library users in accessing and utilizing cloud computing information services in the library. All the four benefits listed got a score of 50% and above, an indication of user satisfaction with the available cloud based information services. A number of challenges were found to be hampering access and utilization of cloud services in the library. To address some of these challenges, library staff have a duty to teach library users on the process of accessing and utilizing available cloud information services.

5.2.2 Cloud Computing Services in Academic Libraries

The second objective of this study endeavoured to examine the application of cloud computing technologies in delivery of service in academic libraries. The outcomes of

this study indicated that various cloud services are provided in academic libraries which include electronic books and journals, professional forums, citation management tools, and emailing services. From the data collected, it appears that professional forums are more preferred by both lecturers (65.9%) and postgraduate students (57.4%) compared to social networking. This shows that at this level of study and qualification, individuals concentrate more in building professional networks where they can share the research and projects they have undertaken as well as access those of other scholars. Regarding the gadget and devices commonly used, personal laptop was found to be vastly used in accessing cloud services in the library. This is owing to the portability, improved computing power and convenience compared with the library computers. The study revealed that use of smartphones has gained popularity an indication that mobile cloud computing is a reality in accessing library resources.

5.2.3 Factors Influencing Use of Cloud Computing Information Services

The third objective of this study was to find out the determinants that influence utilization of cloud information services in academic libraries. The study used the variables in UTAUT theory to analyze the factors that influence usability of cloud information services in academic libraries. Performance expectance, effort expectance, social influence and facilitating conditions were the dependent variables whereas use behavior was the independent variable. To examine the connection between the dependent and independent variables, multiple regression analysis was undertaken. The analysis of the data illustrated that all the four dependent variables had a positive significant effect on use behavior of cloud information services.

Performance expectancy was ranked as the highest predictor of use behavior indicating that more library users use cloud services in the library because of the

benefits they gain. Social influence was ranked second an indication that lecturers, library staff and peers play a pivotal part in inspiring users to get involved in cloud computing information services in the library. Facilitating conditions ranked third, an indication that availability of resources, knowledge and compatibility of devices influence the use of cloud computing information services. Effort expectancy was ranked the least in terms of the effect on the use behavior. This means that if library users perceive learning how to use and access cloud-based information services as easy, then they will tend to use them more often.

5.2.4 Strategies to Increase Usage of Cloud Computing Information Services

The fourth objective of this study strived to develop appropriate strategies so as to increase usability of cloud information services in academic libraries. The aim of this objective was to offer practical solutions that would boost the usage of cloud information services in the library which are founded on the findings of this research.

5.2.4.1 Conduct User Needs Survey

This should form the first activity that the library needs to undertake with the intention of pinpointing and documenting the information requirements of its users. For effective user needs survey, user segmentation is suggested so as to capture the needs of each group of library users since they vary.

5.2.4.2 Develop a Marketing Plan

For the existing cloud computing information services, library needs to design and develop marketing techniques which promote usage of their services. This can be done through the digital platforms such as emails, social networks and library website. Some of the print media that can be used include library guides and brochures.

5.3 Conclusion

From the findings and results of the study, the following conclusions are presented:

- Library users have greatly benefited from cloud-based services. However, there are several challenges experienced by users which hinder accessibility and usability of cloud computing information services in the library. The library management needs to urgently address these challenges by implementing applicable solutions so as to amplify the utilization of cloud services.

- Although SEKU library has extensively embraced the usability of cloud computing technologies in provision of services, most of them are unknown to users hence they are under-utilized. This means that the main goal of introducing some of these cloud-based information services in the library remains unattained.

- Several factors exist which either promote or hinder optimal use of cloud-based information services. Some of these factors go beyond the scope of the library and touches on the ICT directorate which is the custodian of the all information systems. These two stakeholders should constantly share information on technological hitches related to cloud-based information services in the library. Concerted effort is required in mitigating the negative effects of the identified factors.

5.4 Recommendations

From this study, various shortcomings were identified which hinder optimal usage of cloud services in the library. To correct and mitigate their effects, this study recommends the following:

5.4.1 Digital Literacy Training

For one to utilize a service optimally, information is required on how to access it. SEKU library need to conduct digital literacy training regularly so as to increase the usage of cloud-based services. Library staff have a duty to sensitize all users on the need and benefits of the training through use of emails, social networking sites and notice boards. Information literacy training should be conducted at least weekly with a provision where users can make request for the training.

5.4.2 Investment on ICT Facilities

The library management should liaise with the ICT directorate in an effort to improve the internet bandwidth and internet access points to cater for large population of users. More computers should also added in the library as well as the computer labs to satisfy the increasing number of users.

5.4.3 Online Tutorials

Library staff should create and disseminate online tutorials and instructional manuals on cloud services they offer and how to access and utilize them. The tutorials and manuals should be embedded in the library website where library users can download and replay them severally until they grasp the process of accessing and using the cloud-based services.

5.4.4 Information Champions

Library management should reach out to more library users through information champions. This could be lecturers who interact more often with students and fellow students who are already using cloud computing services provided in the library.

5.5 Suggestions for Further Research

The study assessed the integration of cloud computing and delivery of services in academic libraries with an inclination to factors that influence its use among lecturers

and postgraduate students. The variables in UTAUT theory were used as the anchor of this study. Due to this limitation of the scope, future studies can focus on the following areas:

5.5.1 Study on Undergraduate Students

More study need to be undertaken to assess the usage of cloud information services in academic libraries among undergraduate students. Undergraduate students form the largest population in public institutions of higher learning, and hence more information will be gathered regarding determinants that highly influence utilization of cloud services.

5.5.2 Incorporate More Variables to UTAUT Theory

This study suggests further assessment of the factors that influence utilization of cloud computing information services in academic libraries by incorporating more variables to UTAUT theory including but not restricted to trust, security and reliability. Through such studies, libraries can develop appropriate strategies to boost use of cloud based services among users.

5.6 Chapter Summary

The study has shown that SEKU library has integrated cloud computing information services with the highly used being electronic books and journals. Various challenges are experienced by users when accessing services and this study has suggested strategies and recommendations such as establishment of a marketing plan to promote services, trainings users and creating tutorials on how to access library services. Further researches which were outside the sphere of the study need to be carried out targeting undergraduate students and incorporating more variables to the UTAUT theory.

REFERENCES

Abdu, H., Aliyu, A., Paulinus, U., & Umar, M. (Eds.). (2017). The Integration of Cloud Computing Technology in Academic Library Operations towards Effective Library Services. *International Journal of Research In Science & Engineering*, *3*(1).

Abidi, F., Abidi, H. J., & Armani, S. (2012). *Cloud libraies: A novel application of cloud computing*. Presented at the International conference on education and e-learning innovations. Retrieved from http://ieeexplore.ieee.org/ielx5/6353667/6360561/06360664.pdf?tp=&arnumber=6360664&isnumber=6360561

Aharony, N. (2015). An exploratory study on factors affecting the adoption of cloud computing by information professionals. *The Electronic Library*, *33*(2), 308–323. https://doi.org/10.1108/EL-09-2013-0163

Aher, V. N., Pandit, P. J., & Borse, T. R. (2016). Cloud computing and library automation: An overview. *International Journal of Innovative Research in Science and Engineering*, *2*(3), 502–506.

Alkhater, N., Wills, G., & Walters, R. (2017). *An Integrated Model to Investigate an Individual's Behavioural Towards using Cloud Computing:* 478–481. https://doi.org/10.5220/0006404204780481

Alotaibi, M. B. (2014). Exploring users' attitudes and intentions toward the adoption of cloud computing in Saudi Arabia: An empirical investigation. *Journal of Computer Science*, *10*(11), 2315–2329. https://doi.org/10.3844/jcssp.2014.2315.2329

Alotaibi, M. S. (2013). Utilizations of cloud computing in library and information centers: A theoretical study. *International Journal of Digital Library Services*, *3*(4), 83–93.

Ashtari, S., & Eydgahi, A. (2015, October). *Student Perceptions of Cloud Computing Effectiveness in Higher Education*. 184–191. https://doi.org/10.1109/CSE.2015.36

Bhattacharjee, N., & Purkayastha, S. D. (2013). Cloud computing and its applications in libraries. *E-Library Science Research Journal*, *1*(7). Retrieved from http://eprints.rclis.org/22929/

Changchit, C., & Chuchuen, C. (2018). Cloud Computing: An Examination of Factors Impacting Users' Adoption. *Journal of Computer Information Systems*, *58*(1), 1–9. https://doi.org/10.1080/08874417.2016.1180651

Chunhong, Z. (2014). The Applicating of Cloud Computing in Academic Libraries. *2014 Sixth International Conference on Measuring Technology and Mechatronics Automation*, 659–662. https://doi.org/10.1109/ICMTMA.2014.163

Cowles, E. L., & Nelson, E. (2017). *An introduction to survey research*. Retrieved from http://www.credoreference.com/book/bepsurvey

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). California: SAGE Publications. Inc.

Creswell, J. W. (2013). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (Fourth edition). Thousand Oaks: SAGE Publications, Inc.

Elmonem, M. A. A., Nasr, E. S., & Geith, M. H. (2016). Benefits and challenges of cloud ERP systems – A systematic literature review. *Future Computing and Informatics Journal*, *1*(1–2), 1–9. https://doi.org/10.1016/j.fcij.2017.03.003

Erturk, E., & Iles, H. R. E. (2015). Case study on cloud based library software as a service: Evaluating EZproxy. *ArXiv Preprint ArXiv:1511.07578*. Retrieved from https://arxiv.org/abs/1511.07578

Gambo, Y. (2017). Review on Factors Influencing User Acceptance of Cloud- Based Learning System in Higher Education. *International Journal of Computer Application*, *7*, 14.

Gudo, C. O., Olel, M. A., & Oanda, I. O. (2011). University expansion in Kenya and issues of quality education: Challenges and opportunities. *International Journal of Business and Social Science*, *2*(20). Retrieved from http://www.ijbssnet.com/journals/Vol_2_No_20_November_2011/22.pdf

Hai-yan, C. (2013). The evolution of user service based on cloud computing in the university digital library. *Instrumentation and Measurement, Sensor Network and Automation (IMSNA), 2013 2nd International Symposium On*, 1050–1053. Retrieved from http://ieeexplore.ieee.org/abstract/document/6743461/

Han, Y. (2013). IaaS cloud computing services for libraries: Cloud storage and virtual machines. *OCLC Systems & Services: International Digital Library Perspectives*, *29*(2), 87–100. https://doi.org/10.1108/10650751311319296

Hashim, H. S., & Hassan, Z. B. (2015). Factors That Influence The Users' Adoption Of Cloud Computing Services At Iraqi Universities: An Empirical Study. *Australian Journal of Basic and Applied Sciences*, 12.

Ifijeh, G. (2014). Adoption of Digital Preservation Methods for Theses in Nigerian Academic Libraries: Applications and Implications. *The Journal of Academic Librarianship*, *40*(3–4), 399–404. https://doi.org/10.1016/j.acalib.2014.06.008

Islam, M. A., Abul Kasem, F. B., & Zaman Khan, S.-U. (2017). Cloud Computing in Education: Potentials and Challenges for Bangladesh. *International Journal of Computer Science, Engineering and Applications*, *7*(5), 11–21. https://doi.org/10.5121/ijcsea.2017.7502

Kaur, S., & Dhindsa, K. S. (2016). Comparative study of citation and reference management tools: Mendeley, Zotero and ReadCube. *2016 International Conference on ICT in Business Industry Government (ICTBIG)*, 1–5. https://doi.org/10.1109/ICTBIG.2016.7892715

Khatib, M. M. E., & Opulencia, M. J. C. (2015). The Effects of Cloud Computing (IaaS) on E- Libraries in United Arab Emirates. *Procedia Economics and Finance*, *23*, 1354–1357. https://doi.org/10.1016/S2212-5671(15)00521-3

Kihara, T., & Gichoya, D. (2014). Use of cloud computing platform for e-learning in institutions of higher learning in Kenya. *2014 IST-Africa Conference Proceedings*, 1–6. https://doi.org/10.1109/ISTAFRICA.2014.6880638

Kumar, C. R. (2015). *Social networks impact on academic libraries in technology era*. *5*, 8.

Kumar, R. (2011). *Research methodology: A step-by-step guide for beginners* (3rd ed). Los Angeles: SAGE.

Laxmanrao, K. A., & Milind, S. S. (2014). Cloud Computing and Academic Libraries: An Overview. *International Journal of Innovative Research and Development*, *3*(12). Retrieved from http://www.ijird.com/index.php/ijird/article/view/57730

Makori, Elisha O, & Mauti, N. O. (2016). Digital technology acceptance in transformation of university libraries and higher education institutions in Kenya. *Library Philosophy and Practice*, 21.

Makori, Elisha Ondieki. (2016). Exploration of cloud computing practices in university libraries in Kenya. *Library Hi Tech News*, *33*(9), 16–22. https://doi.org/10.1108/LHTN-11-2015-0077

Mavodza, J. (2013). The impact of cloud computing on the future of academic library practices and services. *New Library World*, *114*(3/4), 132–141. https://doi.org/10.1108/03074801311304041

Mohamed, M. A., & Pillutla, S. (2014). Cloud computing: A collaborative green platform for the knowledge society. *VINE*, *44*(3), 357–374. https://doi.org/10.1108/VINE-07-2013-0038

Mokhtar, S. A., Ali, S. H. S., Al-Sharafi, A., & Aborujilah, A. (2013). Cloud computing in academic institutions. *Proceedings of the 7th International Conference on Ubiquitous Information Management and Communication*, 2. ACM.

Mutlu, M., & Der, A. (2017). Unified theory of acceptance and use of technology: The adoption of mobile messaging application. *Megatrend Revija*, *14*(1), 169–186. https://doi.org/10.5937/MegRev1701169M

Ogbu, R. C. (2013). Cloud Computing and Its Applications in e-Library Services: Nigeria in Focus. *International Journal of Innovation, Management and Technology*. https://doi.org/10.7763/IJIMT.2013.V4.445

Oh, J.-C., & Yoon, S.-J. (2014). Predicting the use of online information services based on a modified UTAUT model. *Behaviour & Information Technology*, *33*(7), 716–729. https://doi.org/10.1080/0144929X.2013.872187

Okwoli, M. E. (2015). *Adoption of cloud computing technology for library services in the national open university of Nigeria library* (Master of Information Science). Ahmadu Bello University, Zaria.

Okwoli, M. E., Gbaje, E. S., & Aduku, B. S. (2015). The Adoption of Cloud Computing Technology for Library Services in the National Open University of Nigeria Library. *Information Manager (The)*, *15*(1–2), 22–32.

Oredo, J. O. (2016). *Cloud computing vision, institutional forces, organizational mindfulness, cloud adoption and performance of selected firms in Kenya* (Doctor of Philosophy in Business Administration). School of Business, University of Nairobi.

Otieno, J. O. (2016). *Open source software features and performance of Kenyan university libraries in Nairobi metropolitan, Kenya*. Kenyatta University.

Park, S. C., & Ryoo, S. Y. (2013). An empirical investigation of end-users' switching toward cloud computing: A two factor theory perspective. *Computers in Human Behavior*, *29*(1), 160–170. https://doi.org/10.1016/j.chb.2012.07.032

Payne, A., & Singh, V. (2010). Open source software use in libraries. *Library Review*, *59*(9), 708–717. https://doi.org/10.1108/00242531011087033

Prince, J. D. (2012). Climate Change in Libraries: Library Functions Move to the Cloud. *Journal of Electronic Resources in Medical Libraries*, *9*(1), 87–93. https://doi.org/10.1080/15424065.2012.651575

Riemer, F. J., Quartaroli, M. T., & Lapan, S. D. (n.d.). *Qualitative Research*. 558.

Sarstedt, M., & Mooi, E. (2014). Regression Analysis. In M. Sarstedt & E. Mooi, *A Concise Guide to Market Research* (pp. 193–233). https://doi.org/10.1007/978-3-642-53965-7_7

Shi, W., Cao, J., Zhang, Q., Li, Y., & Xu, L. (2016). Edge Computing: Vision and Challenges. *IEEE Internet of Things Journal*, *3*(5), 637–646. https://doi.org/10.1109/JIOT.2016.2579198

Singh, Y. K. (2006). *Fundamental of research methodology and statistics.* New Delhi: New Age International Pvt. Ltd., Publishers.

Srivastava, J. P., & Verma, V. K. (2015). Cloud computing in libraries: Its needs, applications, issues and best practices. *Emerging Trends and Technologies in Libraries and Information Services (ETTLIS), 2015 4th International*

Symposium On, 33–38. Retrieved from http://ieeexplore.ieee.org/abstract/document/7048168/

Thamaraiselvi, G. (2016, September 26). *E-Learning through Cloud Computing Services Provided by Academic Libraries for Promoting Research and Development*. https://doi.org/10.5176/2251-1814_EeL16.3

Tritt, D., & Kendrick, K. D. (2014). Impact of cloud computing on librarians at small and rural academic libraries. *The Southeastern Librarian*, *62*(3), 2.

Venkatesh, V., Thong, J., & Xu, X. (2016). Unified Theory of Acceptance and Use of Technology: A Synthesis and the Road Ahead. *Journal of the Association for Information Systems*, *17*(5), 328–376. https://doi.org/10.17705/1jais.00428

Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012). *Consumer acceptance and use of information technology: Extending the Unified Theory of Acceptance and Use of Technology*. 23.

Wade, M. (2013). Re-inventing the library: The role of strategic planning, marketing and external relations, and shared services at the National Library of Scotland. *Library Review*, *62*(1/2), 59–66. https://doi.org/10.1108/00242531311328177

Wasike, J. M., & Njoroge, L. (2015). Opening libraries to cloud computing: A Kenyan perspective. *Library Hi Tech News*, *32*(3), 21–24. https://doi.org/10.1108/LHTN-09-2014-0072

Wei, Y., & Blake, M. B. (2010). Service-Oriented Computing and Cloud Computing: Challenges and Opportunities. *IEEE Internet Computing*, *14*(6), 72–75. https://doi.org/10.1109/MIC.2010.147

Williams, M. D., Rana, N. P., & Dwivedi, Y. K. (2015). The unified theory of acceptance and use of technology (UTAUT): A literature review. *Journal of Enterprise Information Management*, *28*(3), 443–488. https://doi.org/10.1108/JEIM-09-2014-0088

Wu, W., Lan, L. W., & Lee, Y. (2013). Factors hindering acceptance of using cloud services in university: A case study. *The Electronic Library*, *31*(1), 84–98. https://doi.org/10.1108/02640471311299155

Yi, Z. (2016). *Effective techniques for the promotion of library services and resources*. 22.

Yuvaraj, M. (2015). Problems and prospects of implementing cloud computing in university libraries: A case study of Banaras Hindu University library system. *Library Review*, *64*(8/9), 567–582. https://doi.org/10.1108/LR-01-2015-0007

Yuvaraj, M. (2016a). Determining factors for the adoption of cloud computing in developing countries: A case study of Indian academic libraries. *The Bottom Line*, *29*(4), 259–272. https://doi.org/10.1108/BL-02-2016-0009

Yuvaraj, M. (2016b). Perception of cloud computing in developing countries: A case study of Indian academic libraries. *Library Review*, *65*(1/2), 33–51. https://doi.org/10.1108/LR-02-2015-0015

APPENDIX I

COVER LETTER FOR QUESTIONNAIRE

Joseph Thubi Guchacha,
P. O. Box 53344-00200,

Nairobi.

2nd August 2019.

Dear respondent,

RE: INTRODUCTORY LETTER

I am a student at the University of Nairobi undertaking a course in Master of Library and Information Science. For successful completion of my course, I am conducting a research project with the aim of assessing the integration of cloud computing and service delivery in the library. The objectives of the study are to:

1) Assess the impact of cloud computing information services in the library
2) Establish the application of cloud computing technologies in the library
3) Find out the factors influencing optimal use of cloud computing information services in the library
4) Develop appropriate strategies to increase usage of cloud computing information services in the library

It is in this respect that I am kindly requesting for your valuable time in responding to the attached questionnaire. It will take approximately 10-15 minutes. Your sincere and accurate answers will be fundamental in achieving the main purpose of this research and the information will be handled with extreme confidentiality.

The results of the study will be utilized for academic purposes only and the final report will be presented to your institution for information and archival purposes.

Thank you for your support.

Yours faithfully,

Joseph Thubi.

APPENDIX II
QUESTIONNAIRE FOR LECTURERS AND POSTGRADUATE STUDENTS

INSTRUCTIONS

Please respond by ticking (√) against your preferred response(s) for questions with options. For questions requiring suggestions or commentaries, please use the space provided.

BACKGROUND INFORMATION

1. Gender: _____

2. School _____

3. Area of specialization _____

4. Level of study/Highest level of Qualification _____

5. Age:

Age Bracket	**Tick the Right Option**
20 - 24 years	
25 - 29 years	
30 – 34 years	
35 – 39 years	
40 years and above	

IMPACT OF CLOUD COMPUTING INFORMATION SERVICES IN ACADEMIC LIBRARY

6. Select the benefits realized in utilizing cloud based information services in the library using the scale of Strongly Agree= 5, Agree= 4, Neutral= 3, Disagree = 2, Strongly Disagree= 1.

Benefits of Cloud Information Services	**1**	**2**	**3**	**4**	**5**
Cloud computing services saves money and time					
Cloud computing services offer better archiving and storage of accessed resources					
Cloud computing guarantees better security to my archived information resources					
Cloud computing services provide ease of access to resources anywhere, and anytime					

7. What other reasons motivate you to utilize cloud information services in the library?

_____

_____

8. Indicate the challenges encountered when accessing and utilizing the cloud services in the library. Use the scale of Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, Strongly Disagree = 1.

Challenges of Using Cloud Services	**1**	**2**	**3**	**4**	**5**
Insufficient internet bandwidth hinders access to cloud computing services					
Inadequate information and knowledge on how to access cloud computing services affects use					
Inadequate support by library staff hinders use of cloud computing services					
Constant power outages hampers usability of cloud computing services					
Insufficient number of computers in the library					

9. What other challenges do you encounter while utilizing cloud services in the library?

_____

_____

APPLICATION OF CLOUD COMPUTING TECHNOLOGY IN ACADEMIC LIBRARIES

10. Select the range of cloud technologies applied in delivery of services in the library.

Cloud Based tools	**Pick All Applicable Options**
Information Retrieval System e.g. OPAC	
Electronic books and journals	
Digital Repository	
Reference services e.g. LiveChat, Ask a Librarian	
Citation management tools e.g. Zotero, Mendeley	
Professional forums e.g. Google scholar, Researchgate	
Social Networking e.g. Library Facebook and Twitter	
Emailing services e.g. library gmail	

Any others (please specify)_____

11. Select the gadgets/devices you commonly use to access cloud information services in the library. To show the extent of usability, apply the scale of Very Great Extent=5, Great Extent=4, Moderate Extent=3, Little Extent=2, No Extent=1.

Gadgets and Devices Used	**1**	**2**	**3**	**4**	**5**
Library computers					
Personal laptop					
Tablet					
Smart phone					

Any others (please specify)_____

FACTORS INFLUENCING OPTIMAL USE OF CLOUD COMPUTING INFORMATION SERVICES IN ACADEMIC LIBRARIES

12. To what level do you concur with the provided statements relating to the performance expectancy while utilizing cloud based information services in the library? Use the scale of Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, Strongly Disagree = 1.

Performance Expectancy	**1**	**2**	**3**	**4**	**5**
Enables to accomplish tasks quickly					
Enhances effectiveness in course work and research					
Increases work output in studies					

13. To what level do you concur with the provided statements relating to the effort expectancy when using cloud based information services in the library? Use the scale of Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, Strongly Disagree = 1.

Effort Expectancy	**1**	**2**	**3**	**4**	**5**
Services are simple to access					
Learning to use the services is easy for me					
Training is provided whenever a new cloud based service is created					

14. To what level do you concur with the provided statements in relation to social influence of using cloud based information services in the library? Use the scale of Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, Strongly Disagree = 1.

Social Influence	**1**	**2**	**3**	**4**	**5**
Library staff have been supportive in the use of cloud computing services					
My lecturers encourage me to use the cloud computing services					
My peers are using cloud based services in their study and teaching					

15. To what level do you concur with the provided statements relating to the facilitating conditions when utilizing cloud information services in the library? Use the scale of Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, Strongly Disagree = 1.

Facilitating Conditions	**1**	**2**	**3**	**4**	**5**
Resources necessary to utilize cloud computing services are available					
Knowledge necessary to utilize cloud computing services is available					
Cloud based services are accessible and compatible with devices I use					

16. To what level do you concur with the provided statements in relation to use behavior of cloud based information services in the library? Use the scale of Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, Strongly Disagree = 1.

Use Behavior	**1**	**2**	**3**	**4**	**5**
Regular use of cloud computing services for learning and teaching will continue to be part of me					
In future I will commence using cloud computing services for learning and teaching purposes					
My duty will be to recommend others to use the cloud computing services					

Thanking you for your participation

APPENDIX III

LETTER OF INTRODUCTION

UNIVERSITY OF NAIROBI

FACULTY OF ARTS

DEPARTMENT OF LIBRARY AND INFORMATION SCIENCE

Telephone: +254 20 318262, Ext. 28095
Telegram: Varsity
Fax: +254 20 2245566
dnjiraine@uonbi.ac.ke

P.O. Box 30197- 00100 GPO
Nairobi, Kenya.

Our Ref: UON/CHSS/FOA/DLIS/303 **14th June 2018**

To whom it may concern

Dear Sir/Madam,

RE: Joseph Guchacha: C54/85858/2016

The above named is a bonafide student at the University of Nairobi undertaking a Master of Library and Information Science (MLIS), at the Department of Library and Information Science.

He has successfully completed his course work and has been cleared by the Department to collect data for his research project *"Integration and Application of Cloud computing Technology at South Eastern Kenya- University Library"*, which is a requirement for the award of the degree.

Your support towards accomplishing the research study will highly be appreciated.

Yours faithfully,

DEPARTMENT OF LIBRARY AND INFORMATION SCIENCE
UNIVERSITY OF NAIROBI
14 JUN 2018
P. O. Box 30197, NAIROBI

Dr. Dorothy Njiraine
Ag. Chairperson
Department of Library & Information Science (DLIS)

APPENDIX IV

AUTHORIZATION TO COLLECT DATA

SOUTH EASTERN KENYA UNIVERSITY
OFFICE OF THE DEPUTY VICE-CHANCELLOR
(ACADEMIC, RESEARCH AND STUDENT AFFAIRS)

P.O. BOX 170-90200
KITUI
Website: www.seku.ac.ke
0716-962796 (Kitui)
email: dvc-arsa@seku.ac.ke

REF: SEKU/CA/RES/1 DATE: 1st August 2019

Joseph T. Guchacha
P.O. Box 53344-00200
NAIROBI

Dear Guchacha

RE: DATA COLLECTION

Your letter dated 29th July 2019 on the above subject matter refers.

Permission has been granted to enable you collect data among lecturers and postgraduate students at SEKU for your research project titled "Integration and Application of Cloud Computing Technology at South Eastern Kenya University Library."

You will be expected to treat the information given purely for academic purposes and with strict confidentiality.

OFFICE OF THE DEPUTY VICE CHANCELLOR
ACADEMIC, RESEARCH & STUDENT AFFAIRS
SOUTH EASTERN KENYA UNIVERSITY
P. O. Box 170-90200,

5/8/2019

PROF. ZIPPORAH NG'ANG'A
DEPUTY VICE-CHANCELLOR (ACADEMIC, RESEARCH AND STUDENT AFFAIRS)

ZW/jww