PhD BY RESEARCH ONLY

FINAL THESIS

A MODEL FOR MEASURING LEVELS OF END-USERS' ACCEPTANCE AND USE OF HYBRID LIBRARY SERVICES AND ITS APPLICABILITY TO UNIVERSITIES

By

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DEDICATION

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PUBLICATIONS

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LIST OF ABBREVIATIONS

Abbreviations

ADB	African Development Bank
ADL	Alexanderia Digital Library
AGORA	Access to Global Online Research in Agricultural
AVE	Average Shared Variance
Aw	Awareness
Bi	Behaviour Intention
CAPM	Comprehensive Access Print Material
CAS	Current Awareness Services
CD-ROM/s	Compact Disk-Read Only Memory
CDM	Clean Development Mechanism
CPA	Principal Component Analysis
DC/s	Developing Country/ies
DEL	Data Envelopment Analysis
DELOS	Workshops on the Evaluation of Digital Libraries
DTPB	Decomposed Theory of Planned Behaviour
Dw	Developed World
E-	Electronic
Eb	Expected Benefits
EBL	Evidence Based Librarianship
EDDS	Electronic Document Delivery Services
ELSAUM	Electronic Library Services Acceptance and Use Model
eVALUED	Electronic Services Valued
EXP	Experience
FAO	Food and Agriculture Organisation
Fc	Facilitating Conditions
GLM	Generalized Linear Model
GU	Gulu University
Ha	Alternative Hypothesis
HDI	Human Development Index
HINARI	Health Information Access to Research Initiative
IC	Internal Consistency
ICT/s	Information Communication Technology/ies
ICFA	Internal Consistency Factor Analysis
ICFL	Internal Consistency Factor Loading
IDT	Innovation Diffusion Theory
IMF	International Monitory Fund
INASP	International Network for the Availability of Scientific Publications
IS	Information Systems
IT	Information Technology
IUIU	Islamic University in Uganda

KIU	Kampala International University
KYU	Kyambogo University
LAN	Local Area Network
LCD	Liquid Crystal Display
LFA	Logical Framework
LibQUA	Library Quality
LIS	Library and Information Systems/Science
LS	Library Science
Mak	Makerere University
MakLIBIS	Makerere University Library System
MuLIB	Makerere University Library
MUST	Mbarara University of Science and Technology
NORAD	Norwegian Agency for Development Co-operation
OPAC	Online Public Access Catalogue
Pe	Performance Expectance
PEAK	Pricing Electronic Access to Knowledge
PERI	Programme for the Enhancement of Research Information
PLS	Partial Least Square
Re	Relevance
SAREC	Department for Research Cooperation /of Sida
SCT	Social Cognitive Theory
SDI	Selective Dissemination of Information
SERVQUAL	Service quality model
Si	Social Influence
Sida	Swedish International Development Agency
SPSS	A software package used for conducting statistical analyses, manipulating data and generating tables and graphs that summarize data
Stata	Data Analysis and Statistical Software (STAT ANALYSIS)
TAM	Theory of Acceptance Model
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
TV	Television
UCU	Uganda Christian University, Mukono
UMU	Uganda Martyrs University
Ub	Usage Behaviour
UTAUT	Unified Theory of Acceptance and Use of Technology
www	World Wide Web

ABSTRACT

This study concerns the acceptance and use of Information Communication Technology (ICT) services in libraries with particular reference to universities in developing countries. It is recognised that for information systems to be of value to an individual or groups of individuals the system should be accepted and used. The fairly recent shift in developing countries from mainly paper-based library services to electronic library services (e-library services) using ICT infrastructure has raised questions regarding their acceptance and utilisation. Whereas there is published evidence of the acceptance of use of technologies, there is a lack of similar evidence for e-library services. Most studies on acceptance and use of technology have been carried out in settings found in developed countries which have different contextual factors present in developing countries such as low technological development, low level of awareness and low resource capacity such as finance and human resource. This makes it inappropriate to extrapolate the findings from Developed countries to Developing countries (DCs). The opportunity to modify and adapt some of these models for groups in developing countries exists and this study builds on the work by Venkatesh *et al.* (2003) which capitalized on commonalities of the best aspects of each of some existing models to develop a model called "The Unified Theory of Acceptance and Use of Technology" (UTAUT). Using UTAUT as a foundation, this study set out to design a model for measuring levels of end-users' acceptance and use of e-library services in university settings in Uganda, as a representative of other developing countries.

A cross sectional survey design was used to collect data from eight universities in Uganda to design an Electronic Library Services Acceptance and Use Model (ELSAUM). The study data was examined for the mean, standard deviation, skewness, Kurtosis, and Shapiro-Wilk test statistic with the corresponding level of significance. The designed model has four independent constructs of performance expectance, relevance, social influence and facilitating conditions; four moderator variables of gender, age, experience and awareness and together influence the dependent constructs of behaviour intentions, usage behavior and expected benefits. The model was validated using data extracted from the main survey of 445 respondents. Results show that university communities have intentions to use e-library services. The findings show that major determinants of end-users behaviour intentions and usage behaviour of e-library services were relevance, social influence and facilitating conditions.

Some of the recommendations of the research are that: Governments should support Universities with the provision of ICT services; Librarians in the DCs should use validated instruments with the provision of ICT services; The need to merge the two professions of Information Systems and Library Science, because it appears that currently both professionals do almost similar functions with regard to ICT services.

This research contributes to technology adoption and library science literature, as well as to e-library practice; its emphasis was on Developing Countries. Many avenues for future research have been opened.

CHAPTER ONE - INTRODUCTION AND BACKGROUND

1. INTRODUCTION

This study is about the acceptance and use of Information Communication Technology (ICT) services in libraries with particular reference to universities in Developing Countries (DCs). The study designs, applies and tests a model of acceptance and use of such services based on an existing model of adoption and use of technology originally by Venkatesh *et al.* (2003).

The introduction of new technologies to education and libraries has brought major changes in the Developed World (Kwak 2002; Simpson 2004) and DCs (Andersson 2008; Bon 2007; Rosenburg 2005; Rajesh 2003; Bollag and Overland 2001; and others). Libraries have been transformed into hybrid libraries, consisting of digital objects as well as traditional objects, and providing electronic services. DCs including most African nations are consumers (rather than producers) of ICTs, and adopting technologies designed for other markets may have unforeseen consequences. An area of particular importance is the adoption of new technologies in university libraries, given the unprecedented growth and continuing need for university education in Africa and other developing regions. There was a need to identify factors that increase users' acceptance and use of library services supported by means of technologies.

Before proceeding to the background of this study, presented in 1.2, the researcher clarifies the usage of some terms.

1.1. DEFINITION OF TERMS AND CONCEPTS IN THE STUDY

This section shows how some terms and concepts were applied in the study context. Terms and concepts not defined in this section are defined the first time they are mentioned within the subsequent text.

Academic staff means a full-time member of an instructional staff of a university and may be used interchangeably with the word "lecturer", "teacher", "instructor" or "faculty member". Academic staff in any university are employed to teach and conduct research, which makes it more important for them to use library services more than the administrative staff.

Davis (1989) defines **acceptance** as the decision made by someone when to use a technology. However, Martinez-Torres *et al.* (2008) suggest the concept of the first time one makes that decision to use and continues using it.

Adapt is a verb used to mean being able to adjust to new conditions or make the conditions suitable for another purpose.

On the other hand**, adoption** means taking up or taking on, acceptance, assume, follow, embracement of something or formal appropriation. In this study, the word adoption is used interchangeably with acceptance.

Developing Countries (DC) comprise those countries which have not achieved a significant degree of industrialization relative to their populations, and which have in most cases a medium to low standard of living. According to the International Monetary Fund's World Economic Outlook Report of April 2009, countries which are neither "developed country" nor "failed state" are classified as developing countries. These include all the countries in the sub-Saharan Africa region e.g. Botswana, Burkina Faso, Burundi, Cameroon, Ethiopia, Kenya, Malawi, Rwanda, Sudan, Tanzania, Uganda, Zambia, and Zimbabwe (IMF 2009).

The phrase **Electronic Library Services (e-library services)** refers to all the library activities which use Information Communication Technology (ICT) in the provision of information services to the users. Thus Electronic Library Services rely on ICT infrastructure and facilities, computer interfaces, digital collections, the online library organization and online library staff support (Nicholson 2004).

E**valuation theories (models)** refer to practical management tools for understanding and improving the performance of programmes or projects and demonstrating the impact of programmes and projects (DELOS 2002), that is characterized by three main components: an evaluator, guidelines that include performance indicators and identified stakeholders.

Hybrid library services in this study means a library where print, audio, visual, and electronic services coexist.

Information Communication Technology (ICT) is a phrase defined as computing and telecommunication technologies that provide automatic means of handling and delivering information (Heeks 1998). A glossary of technological terms defines ICTs as 'all kinds of electronic systems used for broadcasting, telecommunications and computers-mediated communications' (Dutton 1996). Dutton (1996) lists examples of ICTs as 'personal computers, video games, interactive TV, cell phones, the internet and electronic payment systems'. The definition and the samples provided highlight the concepts of the meaning of ICTs without explicitly defining the boundaries of the meaning, as this may be an indication of the developments of technologies and the services they offer. Furthermore, Omwenga (2006) defines Information Communication Technologies (ICTs) as computing and communications facilities and features that variously support teaching, learning and a range of activities in education. This study relied heavily on the concept of automatic means as provided by Heeks, the concept given in Omwenga's definition and Dutton's entire view of ICTs.

A Private University is an institution of higher learning that is set up by private individual(s) or organizations mainly as a business venture or similar. On the other hand,

a public university is that institution of higher learning that belongs to the people; pertaining to a community or nation and is open to the public. It is owned by the government and is devoted or directed to the good of the country.

Theoretical Model is a collection of theories and frameworks from the literature that underpin a positivistic research study. It is a conceptual framework of how the research makes logical sense of the relationships among the several factors that have been identified as important to the problem. The theoretical model may be referred to as a conceptual framework or as the research model. The three words are used interchangeably in this study.

University means a corporate body or institution of higher learning with powers to grant degrees and includes its body of teachers, students and graduates, etc. its colleges and buildings. The body of teachers, students and graduates at the university premises at a particular time, make up the university community at that particular time. **A University Community** can therefore be defined as students and members of academic and administrative staff of a university.

A university library is a library or group of libraries established, maintained and administered by the parent university to meet the information needs of its students and members of the academic staff (Harrod 1999). Feather (*ed*.) (1997), defines a university library as "that library which obtains and maintains a collection of books and other media collections and provides information services to users, namely: teachers and students of a university". By introducing the new technology in recent past, libraries have been transformed into hybrid libraries, consisting of digital objects and providing electronic services. The investigator uses Feather's definition that sums up the description of a modern library as a hybrid library that offers both print and electronic services.

Use in this context refers to the cause to act or serve for a purpose or to exploit for one's own ends.

1.2. BACKGROUND TO THE STUDY

1.2.1. Acceptance and Use of Technology

Information systems can only add value to a country, organization or individuals if the system is accepted and used. To predict and explain the acceptance and use of a technology it is necessary to understand why people use or do not use it. Acceptance and use of new technologies has attracted significant amount of research (Hu et. al. 1999), mainly in the developed world. A number of user acceptance models have been developed, well known examples of which include: the Theory of Reasoned Action (TRA) by Fishbein & Ajzen, (1975); the Technology Acceptance Model (TAM) by Davis, Bagozzi & Warshaw, (1989) and the Theory of Planned Behavior (TPB) by Ajzen, (1991). Venkatesh at al (2003) capitalized on commonalities of the best aspects of each of some existing models to develop "The Unified Theory of Acceptance and Use of Technology" (UTAUT). This model has demonstrated up to 70 percent accuracy in predicting user acceptance of the new information technology (Venkatesh et al., 2003). By generating a significantly high percentage of technology innovation acceptance success, the model is seen as one of the best so far developed in the field (Anderson & Schwager, 2004, Moran, 2006, Marchewka & Kostiwa 2007 and others) as discussed in 2.1.2 and 2.1.3.

Previous UTAUT studies focused on small and medium enterprises (Anderson & Schwager, 2004) and large business organizations (Venkatesh *et al*. 2003). There has been no previous application of the model to library information services. Up till now there are no formal studies of user acceptance and use of new technologies in library science.

Library Science (LS) has focused on evaluating quality of service rather than evaluating why or why not services are used. Crawford and Gorman (1995) point out that the value of a library can only be looked at from the perspective of a "reader" or "user" in the ability to locate and use the material that is relevant. Nicholson's (2004) conceptual framework for holistic measurement of library quality introduced two perspectives of understanding a library service. These are the "internal perspective" (the library itself)

and the "external perspective" (the library user). Concurring with Orr et al., (1968), Taylor, (1986), Schamber (1994); Nicholson (2004) puts more emphasis on user-centered measurements of aboutness and usability.

However, evaluation models such as these in LS are built on different values, varying definitions (e.g. e-library, digital library, hybrid library, virtue library) and individualized conditions**.** This makes it difficult to apply such models to other studies, to compare them, or to make predictions using them. The need to move from practical evaluations toward a hypotheses-based exploration to improve the field of librarianship has been voiced explicitly and implicitly by several studies (McClure (1989), Nicholson 20004) and more others. McClure (1989: p. 283) emphasizes that, "Library and information science fosters little research that is intended to produce 'knowledge' for the sake of knowledge".

1.2.2. ICT services and University Libraries

A library is known as a service organization because it provides information materials useful to its patrons. Before the introduction of new technology, a tradition library was known to have a selection of acquired, stored and well organized print media (books, journals, monographs) for end users information needs. Professional people, librarians, had the duty to ensure that the "library collections" contained the required information which met the needs of the users. Services that were expected included but are not limited to: reference services, circulation services, inter-library loan services, indexing and abstracting services, bibliographic services (including cataloguing, journal indexing etc.), selective disseminations services and book reserve services (see examples in Tables 1.3 and 1.4).

However, with the introduction of new technologies in the last quarter of the past century such as ICT, all these services can be automated as e-library services such that end-users can access them by means of networked computers through the web (Internet/Intranet) or a Local Area Network (LAN). E-library services, defined as all library services which are provided by the means of new technologies include all the services listed in Tables 1.3 and

1.4. Examples of these are electronic databases that cover a wide range of full text journals, electronic books, electronic newspapers, monographs, conference proceedings and links to other networked libraries and organisations. In 2001, web-based and full-text databases which cover over 500,000 volumes of publications were provided to university libraries. After that some university libraries have gone further to automate their library holdings thereby creating their own online catalogues and other bibliographic services.

As a result of these advances, particularly the introduction of computers and other telecommunication technologies, there has been a significant change in the concept of a library and the library profession. Majority of university libraries throughout the world embarked on automating their operations and services after the 1980s. The library is equipped with ICT infrastructure such as a network server and personal computers (PCs) connected through a Local Area Network (LAN) and in most cases connected to the World Wide Web with different parts of the library, faculties and administrative buildings of the university. According to Alan (1996), the electronic system is used to create bibliographic databases, control acquisitions, cataloguing and serials, effect bar-coded circulation, book reservation and recall system, Current Awareness Services (CAS), Selective Dissemination of Information (SDI), online literature searches of international databases through CD-ROMs and via Internet and support interlibrary loan services and Electronic Document Delivery Services (EDDS). Card catalogues are replaced with computer terminals.

These changes have affected how library services are utilized and how they are provided. Leedy (1993) observes that the past was characterized by library patrons spending much of their time pouring through card catalogues and searching rows of stacks for material that may have been checked out by someone else. This process was time consuming. Library users knew a librarian as a source of assistance when the catalogue and guides were not useful. In addition, the library user often found vital information in a book located near the one he/she had used before, because library materials (books, journals) were organized by discipline.

With the use of computers and other communication networks, one can get the information required electronically from wherever it is located on the web. An information seeker is no longer confined to the walls of a library, (Kwak *et al.* 2002; Bevis and Craham 2000; Rosenberg 2005; Vinitha 2006). As ascertained by Kwak *et al.* (2002), the majority of university libraries in U.S. are now hybrid libraries, depending on both electronic and print media based on network and physical facilities. Many university libraries, including some in DCs, are part of campus-wide networks (Alan 1996; Kiondo 1997; Martey 2004; Rosenberg 1998 and 2005) and are able to offer their patrons access to networked sources of information. The main role of a librarian is now to assist end-users in searching techniques and the use of technologies. Unlike the traditional library where users require the ability to read and write, skills acquired during schooling years, in an e-library services environment, users are required to adopt ICT, have some basic computing skills and have basic information searching skills; skills which are not necessarily acquired during schooling in DCs.

1.2.3. Libraries and Developing Countries

Libraries in Developing Countries (DCs) face a fairly similar set of challenges that limit their optimal provision of services and utilization. According to Adeyemi (1991), libraries in DCs are characterized by "low technological development and low resource capacities such as finance, human and technological". In addition, he highlights that evaluation studies of the services provided are not carried out because of a low level of awareness of the relevance and importance of evaluation studies, lack of finances to do them and shortage of qualified staff with the expertise to design and carry out such studies. The importance of evaluation studies in this context are that they are means to assess the extent of implementation and to determine the impact, effectiveness or utility of a specific library service/s. Their results provide feedback to library managers/scientists and other stakeholders on the extent of change in the targeted population based on particular interventions that have been put in place and can inform any changes that are needed to improve the service/s. Because of such conditions, it is difficult to carry out successful library evaluation studies in most developing countries especially those that are least developed such as Uganda.

1.2.4. The Study Preliminary Findings

Preliminary study findings generated from the study observation chart in Appendix 5, the sample comprising eight selected universities in Uganda indicate that access to journal literature is minimal (Table 1.1). As a result of limited information resource and other constraints, some of the prevailing conditions found in DCs' universities are illustrated by the situation in Uganda. As observed from the table, preliminary findings show that two of the eight universities did not subscribe to any journals in the year 2007. This is further elaborated in Sub-Section 3.5.1.

Table 1.1: State of Eight University Libraries in Uganda by December 2007

University	Opening Hours			Qualified Staff	Book Stock	Journal Subscrip.	Seating Capacity
	Mon. to Friday	Sat.	Sunday				
Gulu	8 a.m.	8 a.m.	8 a.m.	8	18,763	10	300
	10 p.m.	6 p.m	5 p.m.				
KYU	9 a.m.	9 a.m	9 a.m	14	200,000	15	300
	11 p.m.	6 p.m.	6 p.m.				
Mak.	8 a.m.	8.30 a.m	9 a.m	44	318,175	102	6000
	11 p.m.	6 p.m.	1 p.m.				
MUST	8 a.m.	9 a.m	9 a.m	20	22,454	24	300
	10 p.m.	5 p.m.	2 p.m.				
IUIU	8.30 am	9 a.m	9 a.m	12	21,631	17	500
	9.30 am	4 p.m.	4 p.m.				
KIU	8.a.m.	8 a.m	9 a.m	6	58,546	0	2000
	10 p.m.	10 p.m.	4 p.m.				
UCU	8 a.m.	8 a.m	Closed	12	100,000	0	500
	10 p.m	10 p.m.	Closed				
UMU	9 a.m.	9 a.m	9 a.m	4	24,500	424	300
	10 p.m	5 p.m	2 p.m.				
Totals				**120**	**764,069**	**592**	**10,200**

One important intervention that can improve information access is ICT. However, in a resource-constrained setting that university libraries in DCs have to operate, ICT is expensive and out of reach to most. However in a bid to improve access and bridge the gap between the haves and have not's, donor communities have provided ICT facilities to

some university libraries. With this support they are able to offer remote library services which have improved access to information resources (Rosenberg 2005; Martey 2004; Tibenderana 2004; Kiondo 1997). In the next section, the particular situation of ICT in university libraries in DCs is highlighted.

- **Trends and challenges of Hybrid Library Services in DCs**

According to Rosenberg (2005), the trend towards the delivery of information services in university libraries using ICT gathered momentum on the African continent after about 2001. This is particularly true in the case of online information access, CD-ROM databases and serial publications (Martey 2004; Kiondo 1997). Tables 1.2, 1.3 and 1.4 list the infrastructure, facilities and electronic (e-) library services found in the eight sampled universities in Uganda. The ICT infrastructure and electronic library services are the innovations that have been introduced in many universities in most DCs.

Table 1.2: State of ICT Hardware/Infrastructure in 8 Ugandan University Libraries by December 2007.

	Public Universities				**Private Universities**			
E-Library Services	**GU**	**KYU**	**Mak**	**MUST**	**IUIU**	**KIU**	**UCU**	**UMU**
LAN			√			√	√	√
Computers	√	√	√	√	√	√	√	√
Network Library Server	√	√	√	√	√			√
Laptops	√	√	√	√	√	√	√	√
Photocopying Machines			√			√	√	√
Printers			√			√	√	√
Video Cameras	√	√	√	√	√			
Photo Cameras	√	√	√	√	√			√
Microfilm Readers		√	√	√	√		√	
Book Check Systems	√		√		√			
CD-ROM Readers/Writers	√	√	√	√	√	√	√	√
Bar Code Readers	√		√		√			
LCD Projectors		√	√	√	√			
Scanners	√	√	√	√	√		√	√
Security Check Systems			√	√	√			√
Back up Generator	√	√	√	√	√	√	√	√
Computer Laboratories	√	√	√	√	√	√	√	√
Library Software		√	√		√	√	√	√
Telephones	√	√	√	√	√	√	√	√

	Public Universities				Private Universities			
E-Library Services	**GU**	**KYU**	**Mak**	**MUST**	**IUIU**	**KIU**	**UCU**	**UMU**
Fax Machine	√	√	√	√	√		√	√
TVs						√		
Total available in each site	**13**	**14**	**20**	**14**	**17**	**11**	**13**	**16**
Percentage Over 21	**62%**	**66%**	**95%**	**66%**	**81%**	**52%**	**62%**	**76%**

Note:
√ Availability

It can be observed from Table 1.2 that all the sample study sites have computers, laptops, CD-ROMs, back-up generators, computer laboratories and telephones. At the time of conducting this study survey in the first half 2007, Makerere University, the best equipped had 95% of the 21 ICT equipment types used to offer e-library services evaluated.

Makerere University and Uganda Martyrs University (UMU) offered 92% of the 26 surveyed e-library services. Although Kyambogo University had 66% of ICT equipment, the university offered only about a third of the e-library services studied as observed in Tables 1.2 and 1.3.

Table 1.3: State of Electronic Library Services in eight Ugandan Universities by December 2007

	Public Universities				Private Universities			
E-Library Services	**GU**	**KYU**	**Mak**	**MUST**	**IUIU**	**KIU**	**UCU**	**UMU**
Library Automation			√			√	√	√
Internet Services	√		√	√	√	√	√	√
University Domain E-Mail	√	√	√		√	√	√	√
Online Journals Service	√	√	√	√	√	√	√	√
Electronic Books Services			√			√		√
Online Catalogue (OPAC)			√			√	√	√
Bibliographic Database Services	√	√	√		√	√		√
CD-ROM Services	√	√	√	√	√	√	√	√
Library Website Services	√		√	√	√	√	√	√
Library Mailing List Server			√					
Document Scanning Services	√		√	√	√	√	√	√
Electronic Reference Services	√		√		√	√		√
Electronic Information Services			√			√		√

	Public Universities				Private Universities			
E-Library Services	**GU**	**KYU**	**Mak**	**MUST**	**IUIU**	**KIU**	**UCU**	**UMU**
End-Users Training Services	√		√		√	√	√	√
E-Document Delivery Services	√		√		√	√		√
Bar Coded Circulation Service	√		√					√
Online Selective Dissemination of Information Services	√						√	√
E-Book Reserve Service	√		√	√	√	√		√
E-Interlibrary Loan Services	√		√	√	√	√		√
Printing Services	√	√	√	√	√	√		√
Photocopying Services	√	√	√	√	√	√	√	√
Digitization Services	√		√	√	√		√	√
Microfilming Services	√		√	√	√			√
Television Services						√		
Telephone Services	√	√	√	√	√	√	√	√
Faxing Services	√	√	√	√	√		√	√
Total available in each site	**20**	**9**	**24**	**13**	**18**	**21**	**15**	**24**
Percentage over 26	**79%**	**35%**	**92%**	**50%**	**69%**	**81%**	**58%**	**92%**

Note:

√ stands for availability

With these sorts of ICT innovations, especially the world wide web, university libraries in Uganda have introduced different means of delivering information to their patrons. In Makerere University Library (MuLIB) for example, a dial-up Internet system was set up for online searches and e-mail services on a commercial basis in 1997. In collaboration with the International Network for the Availability of Scientific Publications (INASP), and funding from Sida/SAREC, in 2001 MuLIB obtained access to three electronic journals databases: The Ideal Library Database, EBSCO Host Database and Blackwells Database. Since then, many other development partners that include Carnegie Co. of NY., NORAD, African Development Bank (ADB), have taken keen interest in developing and providing funds for both ICT infrastructure and electronic information resources (e-resources) (Tibenderana 2004). By December 2007, MuLIB subscribed to all the online journals and databases listed in Table 1.4.

Table 1.4: Online Resources Available to Institutions in Uganda via PERI Project by June 2007

Database	Website	Subject Coverage
AGORA (courtesy of FAO)	http://www.aginternetwork.org/en/	Agriculture, and related biological, environmental and social science
Annual reviews	http://wwwarjournals.annualreviews.org/action/showjournals	Resources in 34 scientific disciplines
Beech Tree Publishing	http://www.minabs.com	public policy for science and technology, research, environmental, social and health
Cambridge Journals Online	http://journals.cambridge.org	Linguistics, Politics, Medicine, Science, Technology, Social Science and Humanities
Cochrane Library	http://www.interscience.wiley.com/	Critical reviews abstracts and trails in all branches of medicine and health
EBSCO Host	http://search.epnet.com	a collection of online databases of journals and other learned content
Emerald Group Publishing Limited	http://www.emeraldinsight.com/login	management, librarianship, information communication and technology, most of them in full text
HINARI	http://www.who.int/hinari/en/	Medical Database available to developing countries free of subscription
Multilingual matters	http://www.multilingual-matters.net/default.html	Multilingualism and minority language right
Royal Society of London	http://www.pubs.royalsoc.ac.uk/	Science and technology
Springerlink	http://www.sprngerlink.com	Science, engineering, technology and other disciplines

Source: Makerere University Library website at **http://www.mak.ac.ug**

Electronic journals and databases are available to all university communities in Uganda through the Programme for the Enhancement of Research Information (PERI) Project, and most of them have been encouraged to build ICT infrastructure to enable access to the resources (Tables 1.2 and 1.3).

1.3. THE RESEARCH PROBLEM

The background presented in sections 1.1 to 1.2, and the literature review in Chapter 2, reveal that libraries especially those in universities are changing the mode in which they operate and offer their services to the users. Majority of university libraries are now hybrid, providing print and electronic services based on computer networks. However, since the introduction of ICT innovations, no study has been undertaken to ascertain end-users' levels of acceptance or usage behaviours of **electronic library services** (Seracevic 2004). In particular the literature review identified scarcity of research into acceptance and use of **e-library services** in DCs where evaluation studies are rare (Bar-Ilan *et al.* 2003; Hill *et al.* 1997). In shaping the above study problem, some knowledge and information gaps were identified that have informed the choice of this research. These are described in the paragraphs that follow.

According to Adeyemi (1991), "libraries in the Developing Countries are characterized by low technological development; low resource capacity such as finance and human resource; generally backwards and constrained; low level of awareness, relevance and importance of evaluation studies; lack of finances to carry out evaluation studies, and shortage of staff to carry out such studies." Because of such conditions, it is difficult to carry out successful evaluation studies in these countries.

It has been observed that most of the literature that provide technology acceptance and use models and evaluation tools and methods were developed and tested in Developed World (Anandarajan, Igbaria and Anakwe 2000, Mugenda 2008). Further more, user acceptance and use of technology has been studied in different context, none has been carried out within **e-library services'** context. Consequently, as of today, no **e-library services acceptance and use** evaluation tools has been developed (Seracevic 2004). Secondly, as revealed by literature in Chapter 2, most evaluation models in Library Science are built on different values, varying definitions and individualized conditions which restrict concurrent validity, thereby lack coherence (Seracevic 2004). This makes it difficult to apply such models to other studies (Kabede 1999). Thirdly, while

technology acceptance and use models in IS are well developed, their application in the **service** sector like libraries is new (Venkatesh *et al.* 2008).

As suggested by Venkatesh *et al.* (2003), there was need to enhance our understanding of acceptance and use of new applications' service, (**the e-library services**) which could account for additional variance in **intentions and usage behaviours**.

1.4. OBJECTIVES OF THE STUDY

1.4.1. General Objective

The general objective of this study was to design a model for measuring levels of end-users' acceptance and use of e-library services in university settings. According to Davis (1989), evaluations are mainly carried out for two reasons: to predict the acceptability rates and to find out barriers to the adoption so that necessary measures can be taken for improvement. This rationale led to the following specific objectives:

1.4.2. Specific Objectives

The specific objectives were to:

i. Review key issues in research related to acceptance and use of electronic library services in universities, especially those in Developing Countries.
ii. Design a model of acceptance and use of library services assisted by new technologies
iii. Empirically validate the designed model against the acceptance and use of electronic library services within DCs' university communities.

1.5. RESEARCH HYPOTHESES

In order to investigate the underlying problems, guided by the objectives of this study and based on Venkatesh *et al.* (2003), twelve research hypotheses were postulated. These were in two categories. The first category comprised two lead hypotheses and the second category were minor as described below:

The first category were lead hypotheses postulated to measure the predictive levels of the entire model and also to test its goodness of fit (H_a1 and H_a2 in number a). The remaining ten (H_a3a, H_a3b – H_a8a, H_a8b in numbers b, c and d) were categorized as minor and focused on each of the study constructs. Minor hypotheses were to establish the relationships between constructs.

a) The impact of the model on universities' end-user communities: The Lead research hypotheses

As stated in the previous paragraph, the lead hypotheses were to measure the predictive levels of the entire model. This is to say, the levels of influence end-users' expected benefits from e-library services impacted on their intention and use of the services.

Behaviour Intentions (Bi), Usage Behaviour (Ub) and Expected Benefits (Eb) were the outcome of the independent variables of Pe, Re, Si, and Fc. Behaviour intentions leads to usage behaviour, in that with exposure to new e-library services upon accepting the innovation gains, end-users intents (or plans) to use them and subsequently uses them.

Behaviour Intentions in this study was interpreted to mean:

> *"When one finds out the usefulness of services offered by means of technologies in libraries, one plans (intends) to use the services."*

Behaviour intentions of end-users in the eight sampled universities were assumed to influence actual usage of e-library services either at the time or in the near future. In this study the dependent variables of Bi and Ub were both investigated and measured in a way that behaviour intentions will influence usage behaviour. Information Systems and IT studies have found that Bi and Ub have significant relationship (Mathieson *et al.* 2001; Moon and Kim 2001; Chin *et al.* 2003; Venkatesh and Davis 2000 and others before them). The path coefficients from behaviour intentions to usage behaviour are significant in TAM, TPB and DTPB models (Davis 1989 and Moran 2004). According to the three models, usage behaviour was largely influenced by behaviour intentions. In other words, behaviour intentions play a big role in the prediction of usage behaviour when one had prior experience with the technology being studied (Taylor and Todd 1995b).

Usage behaviour is

> "*The degree to use e-library services after finding out their relevance and usefulness.*"

The researcher noted that usage behaviour was significantly influenced by Bi, so Bi played an important role in influencing Ub (Venkatesh *et el*. (2003). According to Taylor and Todd (1995b), Bi is more predictive of Ub when users have prior experience using a technology. This was one of the dependent variables in Venkatesh *et al.* (2003), and was retained in the current study.

Expected Benefits is a phrase synonymous with perceived usefulness found in Davis *et al*. (1989, p.985), where it is defined as:

> *"The degree to which a person believes that using a particular system would enhance his/her job performance".*

In addition to the two dependent variables of Bi and Ub, the researcher found it necessary to introduce another variable on Expected Benefits as an additional predictor of future usage of e-library services. The rationale for this is that in the model by Davis *et al.* (1989) the construct of expected benefits was one of the key identified factors. The expected benefits were assumed to influence library end-users to use library services (Theng *et al.* 2007; Thong *et al.* 2004; Fortune 2005). This construct was introduced in the research model as a dependent variable using synonymous words of those used in TAM for 'perceived usefulness'. It was assumed that members of university communities in DCs who expected some benefits from using e-library services would significantly be influenced into usage behaviour.

Advancing from the previous discussions the researcher assumed that:

- The three dependent variables would have significant influence on end-users' acceptance and use of e-library services, i.e. H_a1 & H_a2.
- If the research model would be able to measure and predict end-users' levels of acceptance and use of e-library services in a university setting, i.e. H_a1 & H_a2.

  H_a1. End-users in universities accept and use electronic library services.

H_a2. The research model constructs demonstrate some effects on end-users' Acceptance and Use of e-library services.

b) The Direct Path hypotheses

The second category of hypotheses had direct path between independent variables and dependent variables. They were expected to measure the level of influence independent constructs have on dependent constructs. Independent variables in this study are performance expectance, relevance, social influence and facilitating conditions.

The assumption that **performance expectance** was a determinant of acceptance of technology is supported by several acceptance and use of ICT/IT study models (Taylor and Todd 2001; Compeau and Higgins 1995b; Agarwal and Prasad 1998). Venkatesh *et al.* (2003) postulated that performance expectance was the strongest of the four constructs. The developers of UTAUT suggested that performance expectance construct was moderated by gender and age such that it was more significant for younger male workers. Earlier, Lynott and McCandless (2000) had suggested that this construct had a gender bias.

In the current study, the variable measured:

> "*the degree to which an individual believed that using e-library services would help him/her attain gains when undertakings his/her academic tasks".*

The independent construct was expected to have some direct influence on end-users' perceptions of Bi or Ub in their academic and professional pursuit in research, teaching and learning. This study assumed that:

- Performance expectance (Pe) would demonstrate significant effect on behaviour intentions to use e-library services.
- Performance expectance would have a positive influence with moderation from the proposed moderators in the new model such that the effect would be stronger for older male. (See H_a3b under moderators)

  H_a3a. Performance expectance demonstrates a significant effect on behaviour intentions.

Relevance is defined by Thong *et al* (2004) as:

> "*The degree to which something is closely connected with the subject of concern or the situation one is thinking about."*

In this case, it refers to 'the degree to which one believes that the introduced technology services are necessary in the performance of academic activities within one's university setting'. Studies which support the importance of this construct in other contexts include Saracevic (2004); Nicholson (2004); Kwak *et al.* (2002) among others.

This study hypothesized that:

- Relevance (Re) was expected to have some direct influence on behaviour intentions to use e-library services.
- Relevance influenced by the new model's moderators would in turn positively influences behaviour intentions such that the effect would be stronger for older users with long time experience.

H_a4a. Relevance demonstrates a significant effect on Bi.

Moran (2006); Venkatesh *et al.* (2003); Venkatesh and Morris (2000) studies report that **social influence** was as a subjective norm. Venkatesh *et al.* (2003) identified some elements of social influence in various models, including the Theory of Reasoned Action (TRA), Theory of Planned Behaviour (TPB), Decomposed Theory of Planned Behaviour (DTPB), Theory of Acceptance Model-2 (TAM2) and Combined TAM and TPB C-TAM-TPB. The theories suggested significant and non-significant effects from this construct towards intention (Venkatesh, *et al*. 2003). Thompson *et al.* (1991) and Igbaria *et al* (1996) for example, suggested that social influence had significant effects on usage. Anandarajan *et al.* (2000), Igbaria *et al.* (1996), Brown *et al.* (2006) and Kaba *et al.* (2007) whose studies were carried out in DCs also suggest that the construct has significant effects on usage.

However, Davis (1989); Mathiesson (1991); Dishaw and Strong (1999); Venkatesh and Morris (2000); Chau and Hu (2001, 2002); and Venkatesh *et al.* (2003) found that the

variable had no significant influence on behaviour intentions. Hartwich and Barki (1994) observed that the construct has some effect on usage only when studied in non-voluntary setting. These differences in findings may be due to variations in the environments in which such studies were carried out.

Venkatesh *et al*. (2003, p. 451), define **social influence** as:

> *"The degree to which an individual perceives that other important persons believe he or she should use the system."*

The current researcher used Venkatesh *et al.* (2003)'s meaning to study social influence construct and evaluated it as a direct determinant of behaviour intentions, and made the following assumptions:

- Within the context of e-library services, would social influence (Si) have an effect on behaviour intentions or usage behaviour?
- What would be the impact of social influence in the new model as far as mediator variables were concerned?

H_a5a. Social influence demonstrates a significant effect on Bi.

The construct of **facilitating conditions** is defined by Venkatesh *et al* (2003, p. 453) as:

> "*The degree to which an individual believes that an organisational and technical infrastructure exists to support use of the system."*

According to the body of literature reviewed by this study, facilitating conditions variable is the least studied in existing theories/models. Venkatesh *et al.* (2003) proposed that the facilitating conditions construct was not a significant determinant of behaviour intentions, but retained it in their model because of its importance. According to Taylor and Todd (1995b) the availability of facilitating conditions may not encourage usage. However, Kunateb and Hurt (2000) found some relationships between facilitating conditions and the actual usage of Internet-based teaching.

Despite the above findings, it was important to investigate the construct as a direct determinant of Ub in Developing Country context. The construct was assumed to be a significant determinant of adoption and use of technology as far as organizational and

technical infrastructure in DCs are concerned (Anandarajan *et al.* 2000 and 2002, Rosenburg 2005). The current study assumed that, in the context of e-library services, the construct would be very important because if there were no facilitating conditions, neither Bi or Ub would be possible. The study theorized that facilitating conditions would directly determine Ub. The construct was hypothesized as follows:

- Facilitating conditions (Fc) were expected to have direct influence on end-users' perceptions of usage behaviour in research, teaching and learning in a university setting.
- If the construct would have direct significant influence on usage behaviour.

  H_a6a. Facilitating conditions demonstrate a significant effect on usage behaviour.

c) The Moderation Impact Hypotheses

In addition, the second category of hypotheses included testing the impact of moderators' effect on independent variables on the dependent ones. The moderator variables studied are gender, age, experience and awareness.

With regard to definitions, a moderator variable is one that has some strong effect on an independent variable and dependent variable relationship. That is to say that the presence of the moderator variable effects some changes in the original relationship between the independent and dependent variables (Sakaran 2003).

According to Venkatesh *et al*. (2003), UTAUT model has four moderator variables: gender, age, experience and voluntariness. In the current study, four moderators were proposed to see whether they would have some influence on the relationship between independent variables and the dependent variables. The three moderator variables in this study (gender, age and experience) were adapted from Venkatesh *et al.* (2003). The fourth moderator variable (awareness) was a replacement of voluntariness of use which the researcher considered inappropriate in this context of e-library services. Voluntariness has been reported as a none predictor of future adoption.

Earlier studies showed that **gender** moderated the relationships between social norm, attitudinal beliefs, and perceived behaviour control. Most of these relationships were significant for female and only attitudinal beliefs were significant for males (Venkatesh *et al.* 2000, 2005; Morris and Venkatesh 2000). Venkatesh *et al.* (2003) reported that gender's moderation in the relationships between performance expectance and behaviour intentions was stronger for men; and effort expectance and behaviour intentions was stronger for women. Based on these findings and those of Morris *et al.* (2005) which show that gender differences tended to decline with sustained usage and increased experience, the study proposed to study hypotheses H_a3b, H_a4b, H_a5a, H_a6b.

It has been argued that young people tend to look for more information about what to buy, do and so forth, more frequently than the older ones (Dennis *et al*. 2009). However, older people, in Dennis' view were more satisfied and loyal to particular products or brands. Floh and Treibmaire (2006) suggest that younger people rated the importance of the quality and services of website significantly higher than did elderly viewers. In organizational settings, older workers were often driven by attitude beliefs and perceived behaviour control toward using technology. On the other hand, younger workers were influenced by attitude beliefs toward technology usage (Morris *et al.* 2005; Venkatesh *et al*. 2003; Morris and Venkatesh 2000).

Venkatesh *et al*. (2003) reported that **age** moderated the relationships in their model. The path for Performance Expectance and Behaviour Intentions was stronger for younger workers. The path for Social Influence and Behaviour Intentions had impact only on older workers under mandatory conditions. The impact of facilitating conditions towards usage behaviour was stronger for older workers who had more experience. Based on the study conceptual model, age was assumed to moderate the relationships among the proposed model's independent constructs.

Experience refers to:

> *"Individuals' level of knowledge or skill gained through involvement in or exposure to that task or event."*

The concept of experience aligns closely with the concept of experiment. The concept of experience refers to the know-how or procedural knowledge, rather than propositional knowledge or on the job training rather than learning from a book. A person with considerable experience, i.e. "empirical knowledge", in a certain field can be called an expert. Individual's level of experience in this context was measured through self assessment of basic computing skills and capability to carry out electronic searches using e-library services.

Agarwal *et al*. (2000) considered experience as an antecedent of general computer self efficacy belief. Novak *et al*. (2000) showed that expertise and proficiency among respondents influenced the use of technology. The variable was also reported to have an impact on perceived usefulness (Johnson and Marakas, 2000; Taylor and Todd, 1995b). Based on these findings, experience was assumed to moderate the relationships among the study model's constructs.

Awareness is defined as:

> *"The degree to which an individual knows about the existence of something, in this case a new technology or service offered using such a technology."*

Some people may not know that such a technology exists, for if they knew they would make up their minds either to use it or not to use it. Studies, Fortine (2005); Heinrichs *et al.* (2007); Nicholson (2004); Kwak *et al.* (2002), have shown that awareness is an important determinant of acceptance and use. As a result this variable was considered appropriate for inclusion in the model. Based on information from the literature, awareness was hypothesised to moderate the relationships among the study model's constructs.

The moderating effect of each of the four moderator variables was hypothesized as follows:

- If the moderator variables of gender (SEX), age (AGE), experience (EXP) and awareness (Aw) would have significant impact on the influence of the independent variables (Pe, Re, Si and Fc) toward the dependent variables i.e. hypotheses 3b, 4b, 5b and 6b, as outlined below:

- Performance Expectance moderated by gender and age positively influences Behaviour Intentions such that the effect is stronger for older males. (See also Pe)

  H_a3b. Performance expectance moderated by gender and age positively influence behaviour intentions such that the effect is stronger for older males.

- Relevance moderated by gender, age, experience and awareness positively impact on Bi to use e-library services such that the impact is stronger with longer periods of experience, i.e. H_a4b

  H_a4b. Relevance moderated by gender, age, experience and awareness positively influences Bi such that the effect is stronger for older users with long time experience.

- Social Influence moderated by gender, age, experience and awareness positively impact on Behaviour Intentions to use e-library services such that the effect is stronger for older females, i.e. H_a5b

  H_a5b. Social influence moderated by gender, age, experience and awareness positively influences Bi such that the effect is stronger for younger female.

- Facilitating Conditions moderated by age, experience and awareness positively influence behaviour usage such that the effect is stronger for users with increasing durations of experience, i.e. H_a6b.

  H_a6b. Facilitating conditions moderated by age, experience and awareness positively influence usage behaviour such that the effect is stronger for older users with increased experience.

d) To measure the predictive levels of each of the dependent construct, the study made further postulations.

Three dependent variables, Bi, Ub and Eb, were expected to be influenced by the independent variables in varying ways with influences by the moderator variables. The values of these variables would estimate the study population's levels of acceptance and use of e-library services in a relationship hypothesized as that:

- The dependent variable of Bi would have significant effect on Ub. This was postulated in hypothesis seven below.

  H_a7: Behaviour Intentions to use e-library services demonstrate an influence on Usage Behaviour.
- The dependent variable of usage behaviour (Ub) would have significant effect on expected benefits (Eb), i.e. hypothesis H_a8.

  H_a8: Usage Behaviour demonstrates a significant influence on the perceived benefits.

1.6. SCOPE OF THE STUDY

1.6.1. Geographical Scope

The geographical scope of this study was limited to Uganda as a representative of a Developing Country context specifically those countries in sub-Saharan Africa. At the end of 2007, twenty-seven universities existed in Uganda but only those listed in Table 4.1 deployed ICT in their library's major operations. This group formed the population from which the study sample was derived.

1.6.2 Intellectual Scope

The focus of this study was theoretical in nature. It was limited to identifying factors which affect the use of e-library services. It was further limited to including the identified factors in modifying UTAUT to design, apply, analyse and validate a new model that could measure levels of acceptance and use of electronic library services.

As explained in later chapters, the study was mainly limited to the constructs in an existing model (UTAUT) namely; performance expectance, social influence and facilitating conditions independent variables; behaviour intention and use behaviour as dependent variables; and gender, age and experience as moderator variables (Column 2 of Table 1.5). Also studied were factors identified by the researcher: one independent construct (relevance); one moderator variable (awareness) and one dependent variable (expected benefits) in Column 3 of Table 1.5. For convenience, Table 1.5 illustrates the differences between UTAUT and the Electronic Library Services Acceptance and Use

Model (ELSAUM) which arose from this study. The table also defines each of the study variables as used in the study.

Table 1.5: UTAUT Model and ELSAUM Model Variables

	UTAUT 2003	ELSAUM	DEFINITIONS
Independent variables	Performance expectancy	Performance expectancy	The degree to which a person believes that using electronic library services will help him or her in accomplishing the various academic pursuit at a typical university
	Effort Expectancy	X	The degree of ease in using the system
	Social Influence	Social influence	The degree to which important others believed s/he should use the services
	Facilitating Conditions	Facilitating Conditions	The degree to which an individual believes that an organizational and technologi infrastructure exist to support e-services
	X	Relevance	The degree to which something is closely connected with the subject of concern or the situation one is thinking about (Thong *et al.* 2004).
Dependent variables	Behaviour Intention	Behaviour Intention	When one finds out the usefulness of a technology, one plans (intends) to use it.
	Behaviour Usage	Behaviour Usage	The degree to which one plans to use a technology after he/she has found out its usefulness.
	X	Expected Benefits	Synonymous with 'perceived usefulness' defined as the "degree to which a perso believes that using a particular system would enhance his/her job performance" (Davis *et al.* 1989, p. 985).

	UTAUT 2003	ELSAUM	DEFINITIONS
Moderators variables	Gender	Gender	Gender roles have a strong psychological basis and are enduring
	Age	Age	Age has an effect on attitude
	Experience	Experience	Practical acquaintance with the required skills.
	Voluntariness	X	Is usage voluntary or mandatory
	X	Awareness	The degree an individual knows the existence of something, and its availability fo his/her use (Nicholson 2004).

Note: X = Indicates construct not in particular model.

1.7 SIGNIFICANCE OF THE STUDY AND CONTRIBUTIONS

This study provides measures of behaviour intentions and usage of e-library services using UTAUT model as its conceptual base. The study designed a transferable model of end-users acceptance and use of e-library services – the Electronic Library Services Acceptance and Use Model (ELSAUM) model. This model takes into account some aspects of unique e-library services environment with specific reference to universities in DCs. The study tested the validity of each of the constructs in the new model and found them valid.

The results of this investigation enhances our understanding of levels of end users' acceptance and use of e-library services and contributes to discussions on adoption and use of the new technologies in DCs particularly those in sub-Saharan Africa.

1.8 OVERVIEW OF THE STUDY

1.8.1 Research designs

Using both quantitative and qualitative methods, the study utilized a cross-sectional survey and structured observations to gather data for the study (illustrated in Figure 3.1). Structured observations were used to compliment the cross-sectional survey data collected from the study sample of eight university libraries with ICT facilities and electronic services. Correlation designs were used to identify associations between variables as described later in Section 3.3.1.

The main survey tool was adopted from Venkatesh *et al.* (2003) with two modifications and one addition to cater for the technology services being studied (e-library services) as described in Section 3.2. The two introduced constructs were identified from the library science literature that was reviewed. The identified constructs were the researcher's contribution to the study model. Prior to the main study, a pilot study was undertaken in two universities.

Partial Least Squares (PLS) statistical analysis was performed within PLS Graph (Version 2.91.03.04) software to generate factor loading and covariance matrix based on structural equation modeling. Stata was adopted as a statistical programme to determine the internal reliability of the constructs, to perform univariate analysis on demographic data and to obtain the statistical reliability of the construct indicators. SPSS was used to generate hierarchical regression model results, a technique which is appropriate for modeling the dependence of a continuous variable on fixed factors and covariates together with interactions as earlier used by Venkatesh *et al.* (2003).

1.8.2 The main study findings

Results from the study show that end-users in DCs universities have relatively high inclinations of intention to use electronic library services estimated at 30 percent, followed by relatively significantly lower usage behavior of the technology services estimated at 9 percent and they moderately expect the benefits estimated at 18 percent. Overall prediction of the research model was 57 percent as presented by the PLS-Graph analysis of the research structural model in Figure 4.4**.** Moreover, the entire dependent constructs of behavioral intentions, use behavior and expected benefits indicate a positive inclination towards the acceptance and usage of electronic library services (Table 5.1). The path coefficients for all the independent constructs except performance expectance (-0.013 in Table 5.2) indicate that end-users in the study had a positive inclination towards acceptance and usage of electronic library services.

1.9 STRUCTURE OF THE THESIS

The thesis consists of six chapters. Chapter One, the current chapter, describes the background to the study. Chapter Two reviews research into technology acceptance and use models as they relate to hybrid library services. Chapter Three describes the methodologies used to design, pilot the study tool and collect data to validate the research model. Chapter Four provides detailed analysis of the study data. Chapter five presents the designed new model and tests the study hypotheses against it, discusses and interprets the findings in context of related literature. The final chapter, Chapter Six, draws

conclusions of the research and implications for researchers and practitioners, and presents an agenda for future research.

1.10 CONCLUSION

This chapter sets the stage for this study. It provides the background to the problem and then poses research questions in using hypothetical logic. Noteworthy from the background provided in this chapter is that in order to bridge the information gap between Developed and Developing Countries donors have had to provide financial and other resources to universities in DCs to build ICT infrastructures to facilitate easy and quick access to information. The role that ICT have to increase access to library services was highlighted. It was noted that attitudes towards acceptance and use of the e-library services have not been studied creating a knowledge gap that this study aims to address. The strengths of UTAUT model were described as the most predictive of all the acceptance and use of new technology models. This motivated the objectives and research hypotheses formulated for the study. The next chapter is an in-depth discussion of the literature related to the study problem.

CHAPTER TWO - LITERATURE REVIEW

2. INTRODUCTION

This section reviews current research efforts to develop theories and models which can predict and explain 'intentions to use a technology' in different contexts. The work of other researchers into this topic will be reviewed, and their findings comparatively analysed to appreciate the current state of knowledge, and to identify research gaps which this work can contribute towards. Initially, a general overview of the major technology acceptance and use models found in the literature is given, then a more in-depth review of those that have implications for this study follows.

The literature review search strategy comprised key words in the citeseer (http://citeseer.ist.psu.edu/) a scientific literature digital library and search engine.

2.1. ACCEPTANCE AND USE OF TECHNOLOGY EVALUATION MODELS

This section presents a brief review of theories and model developed and used in predicting, explaining and understanding individuals' and organizational acceptance and use of new technologies. These models have progressed over many years and were as a result of endless efforts of models' validation and extension that took place when each model was presented.

Information Systems literature is quite rich with a lot of research about individual and organisational acceptance of technology innovations. To be able to explain how end users choose to accept new technologies need psychological based theories. And Social Cognitive Theory (SCT) which was developed by Bandura in 1986 presents a psychometric research view that affect people's decision making processes. The theory is important in the study of technology acceptance area because it lays the foundation of understanding human behaviour. The theory postulates that human behaviour is determined by three factors; personal, behaviour and environmental factors. While other

sociologists suggest that behaviour is a result of consequences, SCT assumes that cognitive processes have a big role on how one reacts to different situations and circumstances. Recent researches use most of Bandura's principles to measure the acceptance and use of the new technologies. Such researches are referred to as technology acceptance models most of whose constructs were integrated into the 32 condensed by Venkatesh *et al.* (2003).

The progress of technology acceptance models is presented in depth with pertinent literature by Venkatesh *et al*. (2003); Moran (2006) and Lee *et al*. (2003, that the current study acknowledges their existence and usefulness.

In general, studies of technology acceptance theories and models either focus on individual acceptance of a technology by using intention or usage as dependent variables, or focus on project implementation success in organizations. One of the prominent models, Unified Theory of Acceptance and Use of Technology (UTAUT), was designed by Venkatesh *et al*. (2003) as a hybrid of eight user acceptance and usage models. Integrated into UTAUT are the Technology Acceptance Model (TAM), Theory of Reasoned Action TRA), Theory of Planned Behavior (TPB), Motivational Model, Combined TAM and TPB (C-TAM-TPB), Innovation Diffusion Theory (IDT), Model of PC Utilization, and Social Cognitive Theory (SCT). Given the significant of UTAUT in Information systems research, a description of the individual models that contribute to it follows.

a) Theory of Reasoned Action (TRA)

The Theory of Reasoned Action focuses on attitudes toward behaviour and subjective norm (Fishbein and Ajzen 1975). The theory is psychologically based and assumes that individuals are rational and will make systematic use of information available to them. The major determinants of this model are; 'individuals' perceptions, attitudes towards the behaviour and social influence'. This model served as the foundation for explaining and predicting human behaviours. Davis *et al.* (1989) applied TRA to individual's acceptance of technology. The theory was extended to the Theory of Planned Behaviour (TPB) by

Ajzen and Fishbein, (1985). This too had an extension, the Decomposed Theory of Planned Behaviour (DTPB) by Taylor and Todd in 1995. Shepppard *et al.* (1988) observed that in order for a theory to predict specific behaviour, attitude and intentions, there must be agreed action, target, context, timeframe and specificity. The biggest limitation of this theory is that it only applies to behaviour that is consciously thought out beforehand. This theory can only explain between 19 percent and 30 percent variance of technology acceptance and use behaviour.

b) Technology Acceptance Model (TAM)

This was designed by Davis in 1989 to predict information technology acceptance and usage. TAM used the Theory of Reasoned Action (TRA) by Fishbein and Ajzen (1975) as its theoretical base. Davis emphasized user's behavioural intention to use a technology to be affected by their perceived usefulness and perceived ease of use of the technology. The model was extended to design TAM2 by including subjective norm as an additional predictor of intention in a mandatory environment. This is further discussed in Section 2.1.1 of this chapter.

c) Decomposed Theory of Planned Behaviour (DTPB)

The DTPB theory is discussed by two separate efforts. By including constructs from the Diffusions of Innovation Theory (DOI) perspective (Taylor and Todd 1995a), the DTPB is an improvement of the Theory of Reasoned Action (TRA). Constructs of DTPB include perceived usefulness, complexity, compatibility, subjective norms, self-efficacy and facilitating conditions. In their study, Taylor and Todd (1995a) wanted to examine the approprieteness of TRA, TPB and DTPB as models to predict consumer behaviour. Using structural equation model, results from this study showed that TRA and TPB were capable to predict behaviour, but the decomposed version was better at expaining the behaviour. This theory explains between twenty one percent and twenty five percent variance in technology acceptance and use behaviour.

d) Theory of Planned Behaviour (TPB)

Due to the limitations found in TRA, Ajzen and Fishbein (1985) proposed the theory of

planned behaviour. By adding the construct of perceived behavioural control to TRA, Ajzen and Fishbein, (1985) designed Theory of Planned Behaviour (TPB). TPB has been used and validated by many studies in prediction of individual intentions and behaviour of technology adoption. Taylor and Todd (1995b) criticize TPB and TRA that the models required individuals to be motivated to perform certain behaviour. According to Taylor and Todd (1995b) this assumption could have problems when studying consumer acceptance behaviour. The findings show that this theory explains between twenty one percent and thirty seven percent variance in technology acceptance and use behaviour.

Eagle and Chairken (1993) suggested that there were other variables such as habit, perceived moral obligation and self identity which could predict behaviour intentions in the context of TRA model which were not addressed when TPB was presented. The authors urgue that as a replacement for volitional control limitation found in TRA, TRB does not show how people should plan and how planning relates to TPB.

e) Combined TAM and TPB (C-TAM-TPB)

This is an integrated model which combines the constructs of TPB with perceived usefulness from TAM. Taylor and Todd (1995a) added two factors to TAM: subjective norm and behavioural perceived control to develop a more comprehensive and important determinants use of information technology. The authors suggest that their model provides enough usage for experienced and non-experienced accounting for some amount of the variance in intentions and usage behaviour. In that case, C-TAM can be used to predict future usage behaviour even when the person has had no experience. This implies that the model can be used for the prediction of future usage behaviour for those with or without experience with the technology being studied.

f) Model of PC Utilisation (MPCU)

In 1991, Thompson and others designed the 'Model of PC Utilization' (MPCU) to predict the usage of personal computers (PC). The core constructs in MPCU model are: 'affect towards use, complexity, facilitating conditions, job-fit, long-term consequences and social factor'.

g) Diffusion of Innovation Theory (DOI)

Diffusion of Innovation Theory is heavily used in many disciplines. Designed by Rogers (1983), the theory has five constructs which influence technology adoption: compatibility, complexity, observability, relative advantage and trialability. Moore and Benbasat (1991) adapted DOI determinants and developed seven constructs for individual technology acceptance. The constructs are: compatibility, ease of use, image, relative advantage, results demonstrability, visibility, and voluntariness of use. Despite its low prediction levels that range between thirty seven and thirty nine per cent, the theory has been extended to sociology, public health, communication, geography, education, and many other disciplines, thereby surpassing several other models in that context.

DOI theory tries to explain the innovation decision process, factors which determine the rate of adoption and categores of adopters. The theory helps to predict the likelihood rate of adoption of an innovation. However, it is argued that the theory does not provide evidence on how attitude evolves into acceptance and rejection decisions and how innovation characteristics fit into this process (Chen *et al.* 2002; Karahanna *et al.* 1999)

h) Social Cognitive Theory (SCT)

This was developed by Bandura (1986) to study human behaviour as highlighted in the introduction part of this chapter. Compeau and Higgins (1999) used it to study computer usage. It includes constructs of: affect, anxiety, outcome expectations-performance, outcome expectations-personal and self-efficacy.

From this brief review, it is noteworthy that TAM has been a major contributor to most of the models developed after it. With improvements by Venkatesh *et al. (*2003) that integrated the eight models into UTAUT, the predictive power of the hybrid model has increased to 70 percent which is above the value for each model separately. These two models, TAM and UTAUT provide a basis for technology acceptance and use within the context of this study. Using two thematic areas in the following sections, i) an account of literature related to TAM and UTAUT theories, and ii) literature related to acceptance and use of e-library services, the basis for the conceptual framework of this study will be made.

2.1.1. Technology Acceptance Model (TAM)

According to Davis (1989), perceived usefulness (PU) and perceived ease of use (PEOU) both affect people's intention to use a system. TAM is illustrated in Figure 2.1 and is the precursor of work in this area. The basis for TAM consists of two constructs of 'perceived usefulness' i.e. the degree to which a person believes that using a particular system would enhance his/her job performance, and 'perceived ease of use' (PEOU) i.e. the degree to which a person believes that using a particular system would be free of effort (Davis *et al.* 1989).

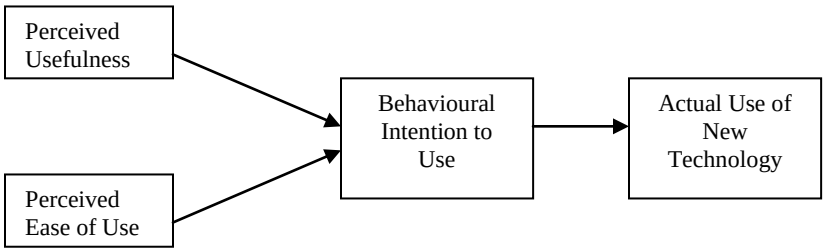

Figure 2.1: Technology Acceptance Model (Davis *et al*. 1989).

TAM theorizes that the effects of external factors like the system characteristics, exposure, on intention to use are determined by perceived usefulness and perceived ease of use. The authors conclude that perceived usefulness had a stronger correlation with user acceptance of technology. In addition to its theoretical values, TAM provides better measures for predicting and explaining the practical value for commercial dealers. The theory assumes that once a person decides to do something, he/she does so freely without

limits. However, in real life situations, there are usually some constraints such as skills, resources, time, environmental and organisational factors that control that capacity (Bagozzi 1992). This can be particularly relevant to technology acceptance and use in DCs where facilitating conditions could be a major limiting factor.

TAM has been tested and adopted by many different researchers in IS and IT. Kouibain and Abass (2006) for example modified TAM and extended it to assess the "acceptance" and "voluntary use" of camera mobile phone technology in Kuwait. In doing so, the authors divide TAM research into four categories as follows, i) those that focus on non-communication forms in workplace, for example: Davis *et al.* (1989), Igbaria *et al.* (1996), Anandarajan *et al.* (2002), Chau and Hu (2001) and Venkatesh and Davis (2000); ii) those that focus on non-communication forms for social purposes; iii) those that focus on new information and communication technology (ICT), including: Davis (1989), Cameron and Webster (2005), Lewis *et al.* (2003), Lou *et al.* (2000), Yi and Hwang (2003) and Lin (2004); and iv) studies which focus on the use of ICT for social purposes, e.g.: Li *et al.* (2005), Agarwal and Krahanna (2000) and Hung . (2003) and Yi and Hwang (2003). From Koubain and Abbas' study, this investigation learnt that a model can be extended to study different IS technologies.

In Africa, for example, TAM has been used by Anandarajan *et al.* (2000), among others, to study technology acceptance in the banking industry in Nigeria. Anandarajan and colleagues observe that most studies that have designed theories of acceptance of information technology were conducted in the developed world. They suggest that less developed countries differ in cultural convictions that may be important determinants of the adoption and use of a technology. Unlike the studies of Moran (2006) and Davis (1989), Anandarajan *et al.* found that perceived usefulness and perceived enjoyment did not motivate bank workers in Nigeria to use microcomputers. On the other hand, social influence was a major determining factor in adoption of microcomputers in Nigerian culture. This finding is similar to studies carried out in Thailand by Kripanont (2007); Kaba *et al.* (2008) in Guinea; in Korea by Jang *et al.* (2006) and in South Africa by Brown *et al.* (2006), all depicting cultures found in DCs such as Uganda.

To explain perceived usefulness and usage intentions in terms of social influence and to show how familiarity with a technology increased its use over time, TAM was theoretically extended by Venkatesh and Davis (2000) to develop TAM 2, depicted in Figure 2.2, which has more determinants. It was assumed that by understanding factors that determine the system's perceived usefulness would in turn provide measures, which would increase adoption and use of a system. To test TAM 2, the investigators used longitudinal data collection methods from four different institutions. The study found that social influence and job relevance constructs significantly influenced users' acceptance of a new system.

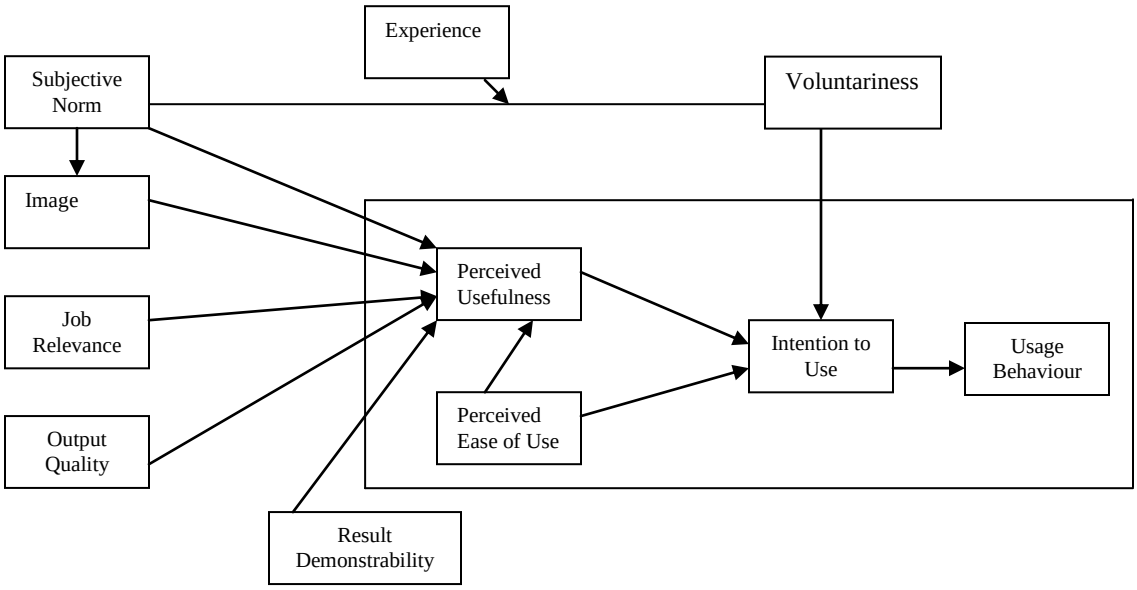

Figure 2.2: TAM 2 - Extension of TAM (Venkatesh and Davis 2000)

Thompson *et al.* (1991), Mathieson (2001) and Taylor and Todd (1995a) observed that the original TAM did not include social influence and control factors on behaviour, but found that the two factors had a significant influence on IS/IT usage. These two factors are major determinants of behaviour in the Theory of Planned Behaviour (Ajzen and Brown 1991). Taylor and Todd (1995b) added two more determinants of acceptance of a technology, 'subjective norm' and 'perceived behavioural control' and called their model 'Augmented TAM' or 'Combined TAM' illustrated in Figure 2.3. They argue that their

model could be used to predict usage for people with or without prior experience of using a technology. Taking these critisms into account, Venkatesh and Davis (2000) extended the original TAM model to explain perceived usefulness and usage intentions in terms of social influence and cognitive instrumental process. The new model was tested and adopted by other disciplines such as Ozag and Duguma (2004) who built on Venkatesh's recommendation to further investigate organizational commitment process which include person-job fit.

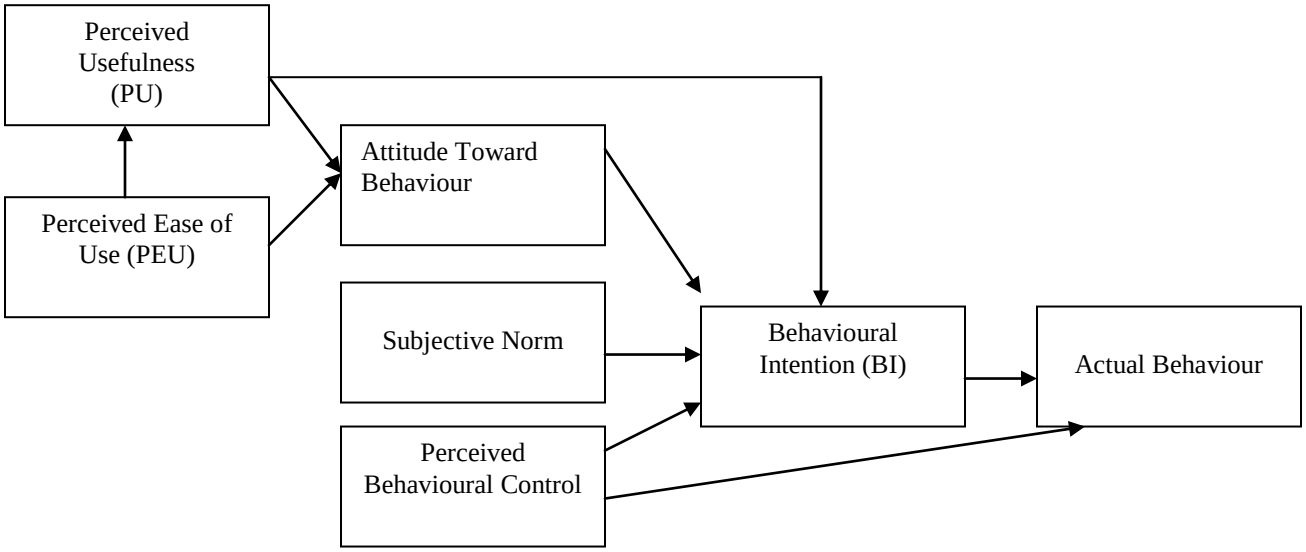

Figure 2.3: Augmented TAM (C-TAM-TPB) (Taylor and Todd 1995)

In a nutshell, TAM's major strengths are that it provides factors which lead to IS acceptance, provides room for extensions and elaborations better than other competing models (Taylor and Todd 2001). Observed shortcomings by users of TAM are that it does not predict barriers that hinder technology adoption (Taylor and Todd 2001) and its simplicity has led to its over-use at the expense of designing other models.

2.1.2. The Unified Theory of Acceptance and use of Technology Model (UTAUT)

Vanketesh *et al.* (2003) examined eight models of technology acceptance and use and chose a subset of 32 constructs they found to form UTAUT. Using data collected from two surveys and data from TAM's previous studies, Vanketesh and colleagues developed, validated, and tested a new model, depicted in Figure 2.4. Their purpose was

to improve the predictive powers of behaviour intentions to use (as shown by the generic conceptualisation in Figure 2.5) in the eight models which individually ranged from 0.19 to 0.39 variance, as listed in the last column of Table 2.2.

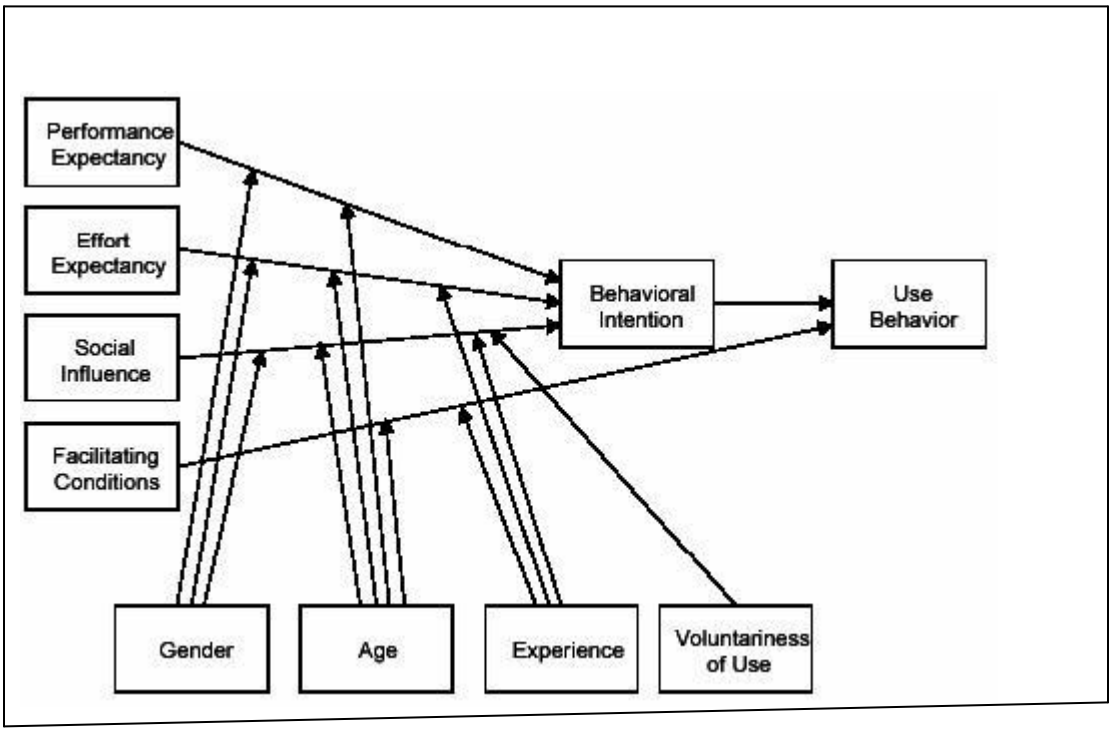

Figure 2.4: The UTAUT Model (Venkatesh *et al.* 2003).

The determinants of behaviour intention and use of technology in UTAUT are performance expectance, effort expectance, social influence and facilitating conditions (Figure 2.4). According to Venkatesh *et al.* (2003), elements related to ICT infrastructure within effort expectance constructs are captured by the UTAUT construct of facilitating conditions. UTAUT shows that when both performance expectancy and effort expectancy constructs are present, facilitating conditions become insignificant in the prediction of intention. This investigation noted that effort expectance was not present in TPB and DTPB theories (see summary of the various models in Table 2.2).

Facilitating conditions is a major construct within the context of e-library services especially in DCs (Rosenberg 2005). According to Venkatesh *et al.* (2003) gender and

age have received very little attention in technology acceptance research, yet these variables moderate most of UTAUT's four key relationships (Figure 2.4). They identified the concepts underlying the majority of User Acceptance Models as being behavioural intentions and usage behaviour, that measured to 69% variance as illustrated in Figure 2.5. Our investigation was based on a similar conceptual model as illustrated in Figure 3.2.

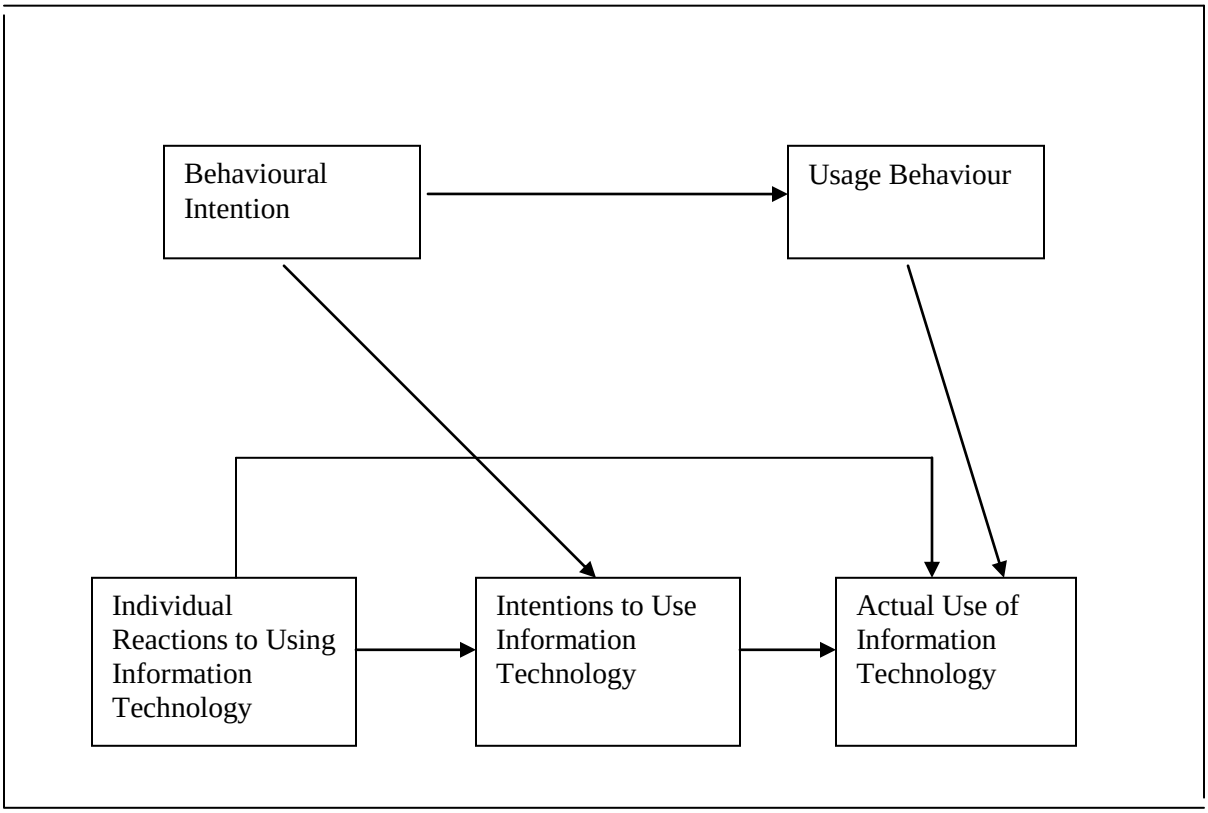

Figure 2.5: Concepts underlying User Acceptance Models (Venkatesh *et al.* 2003).

In affirmation with Moran's (2006) review, UTAUT has continued to interest more scholars in IS/IT research. According to citeseer of 22nd December 2009, 174 articles in IS and IT research had cited UTAUT since it was designed in 2003. Amongst them is Garfield (2005) who used its tools to analyze the acceptance of computers in Bentley College. Pu-Li and Kishore (2006) studied weblog systems to validate UTAUT constructs and concluded by advising researchers to be cautious when interpreting results

using UTAUT scales. Marchewka and Kostiwa (2007) sounded similar caution. The study by Louho *et al.* (2006) discusses factors that affect the use of hybrid media applications using UTAUT as their conceptual model.

Moran (2006) studied College Students' acceptance of Tablet Personal Computers and expanded UTAUT's constructs. The study introduced the determinants of "self efficacy" and "anxiety" because of their significance contribution observed in other technology acceptance models. Results of this study show a high correlation between attitude toward technology use and anxiety. Other studies include Carlsson *et al*. (2006) who studied the adoption of wireless mobile communication in Europe using UTAUT, while Anderson and Schwager (2006) examined the application of UTAUT to wireless LAN technology in smaller enterprises in the USA. Cody-Allen and Kishore (2005) extended UTAUT by adding e-quality, trust and satisfaction constructs to develop an E-Business Quality Model.

In a more extensive study, Oshlyansky *et al.* (2007) applied UTAUT to study nine different cultures. The study confirms the strength of UTAUT constructs. Results of the study show that social influence (Si) construct was strongly influenced by gender, age and experience more especially within developing cultures. In this study, some elements within the self-efficacy construct were partially captured by effort expectancy construct.

In the health sciences field, Fortine (2005) carried out a study to determine which of UTAUT variables influenced medical workers to accept CDM Toolkit. Fortine's study population consisted of 60 medical workers from seven communities in British Columbia's Northern Health Authority. Among the methods Fortine used was field observations. Interestingly, despite the fact that this study was carried out in the developed world, the study results show that social influence, usefulness and facilitating conditions were important variables in the acceptance of the new technology. In addition to the variables found in UTAUT, Fortine found participation, incentives and knowledge important factors in implementing the acceptance of CDM Toolkit. Engebretsen (2005) studied EpiHand applying UTAUT in two low-income countries in Africa. The study

found that Ugandan medical doctors were more inclined to using the new technology than their counterparts in Southern Africa. Heerink *et al.* (2006) introduced "cooperation, empathy, assertion, self control" to expand UTAUT which they thought relevant in the medical context.

Curtis and Payne (2006) applied technology acceptance and budget theories to determine barriers of technology acceptance in audit profession using a case study method. UTAUT was found accommodative enough to provide a starting point in this context. Instead of considering individual differences of age, gender and experience the study considered risk and budget pressure because of their importance in auditing. This work is an indication of UTAUT's applicability to other contexts.

Kohne *et al.* (2005) studied trade interactions that use information technology in their negotiations. In their article, the authors discuss findings from an empirical research on acceptance of features of electronic negotiation support systems (NSS). The study applied an experimental method utilizing instruments based on Venkatesh *et al.* (2003) for performance and effort expectance. Results of this study confirm the importance of UTAUT reasoning and provide good predictions for the participants' intention to use electronic negotiation support systems.

Knutsen (2005) used a subset of UTAUT to explore the relationship among expectations related to performance of a new mobile service, efforts needed to use new mobile services and how the two constructs affect attitudes toward new mobile services. The study consisted of performance expectance and effort expectance and age as an antecedent to UTAUT constructs. Effort expectance was hypothesized to affect performance expectance. The empirical results significantly verified the relationship between performance expectance and effort expectance. Increased age was found to be connected to lower levels of anticipated ease with new mobile services. However, age appeared to have a positive effect on performance expectance indicating that older individuals have higher expectations towards new mobile services (Knusten, 2005).

Marchewka and Kostiwa's (2007) findings suggested mixed support for UTAUT instrument scale items reliability. In their study, the analysis tests for facilitating conditions (Fc), self-efficacy and anxiety constructs fell below 70 percent which is an important level set by Venketash and his colleagues below which the predictiveness of the UTAUT model is less reliable. It is not surprising therefore that the results of Marchewka's study did not strongly support UTAUT.

In an effort to find out whether there is a difference in acceptance of ICT between countries, Yang and Lee (2006) adopted UTAUT and the Innovation Diffusion theories to study cellar phone in Korea and USA due to the model's popularity. The USA represented developed countries and Korea represented newly developed countries. Study results showed that ICT diffusion patterns and ICT diffusion factors differed in the two countries. The major factors for Korea adopters were performance expectancy and social influence where as effort expectancy was less important. Despite the two countries introducing the technology at about the same time, adopters in the USA were more consistent at using the mobile phones whereas those in Korea were less consistent.

In summary, the evidence presented in this section includes the historical development of TAM and highlights the current state of art in technology acceptance and use. Furthermore, the study reviewed some of the 174 recent studies in leading journals which support UTAUT (http://citeseer.ist.psu.edu/ accessed 22ndDecember 2009). This confirmed the popularity of UTAUT, its frequent use in the last six years, led to an appreciation of the research on technology acceptance and use, and has shown some research gaps. In this way, this review has contributed to the theoretical grounding and justification for this study. In the next section is a succinct review of evaluations of information systems adoption and use in relation to library services.

2.2. MOTIVATORS OF ADOPTION AND USE OF ELECTRONIC IBRARY SERVICES

Evaluation models and approaches designed so far in the library science field include recent work on Comprehensive Access to Print Material (CAPM) by Choudhury *at al.*

(2001); Library quality (LibQUAL) by Cook *et al.* (2001); PEAK by Flores (2001) and the Holistic Approach by Nicholson (2004). None of these investigations developed a theory to predict causes of acceptance and use or non acceptance and use of the newly introduced technologies in libraries. It is noteworthy that the majority of evaluation studies in librarianship place more emphasis on investigating costs associated with libraries other than investigating the benefits associated with libraries and evaluation of successes of the services. In a resource constrained settings, e.g. in Developing Countries, library services may not be optimally provided or utilised as a result of various factors as highlighted in previous sections.

Additionally, investments made to bridge the information gap need to demonstrate uptake of the services that have been made available, which requires users to accept and to use them. Evaluation studies can contribute valuable information that can be used to understand the implementation landscape and feedback to stakeholders to cause improvements for better use of the services. To appreciate the evaluations relevant to this study i.e. focusing on library services, we categorised them into two groups as described below.

2.2.1. Library services evaluation models

A wide spread search for literature revealed that there is a paucity of information in the area of models of acceptance and use of ICTs in libraries. In an effort to design an evaluation model for library quality, Nicholson (2004) developed a matrix conceptual framework for a holistic measurement and cumulative evaluation of library services (Table 2.1). The study was to sensitize library administrators about a library as a whole - from the services to the users. The model is useful in understanding where a particular type of measurement falls in perspective of the bigger body of measurement and evaluation studies. The major contribution of this model is the measurement matrix, which divides determinants of use of library services into four sections: *system, user, internal and external*, as depicted in Table 2.1. In Nicholson's model the internal evaluation falls in the system procedures and standards; and the external evaluation falls

under the users of the system to evaluate the "aboutness" and "usability" that in the long run generates knowledge and values.

In Nicholson's view, *aboutness* refers to the location of the information within the system (e-library in this case). *Usability* refers to how well the system can be used without one having problems. *Knowledge status* refers to how well one is aware of what is available, and is linked to the current study's introduced concept of awareness. *Value of* works refers to the value/benefits that the material has to the user, which is largely influenced by the relevance of the work, and is linked to the introduced independent variable of relevancy where an information seeker puts in a query, the system searches through the available resources to answer the query. If e-library services are relevant or valuable to the information seeker, the query is answered accordingly. Nicholson views a user's use of library services to be influenced by their awareness and by the relevance to them of the library's offerings. The two concepts of relevance and awareness were introduced in the Electronic Library Services Acceptance and Use Model (ELSAUM) constructs to make the research model appropriate to e-library services.

Table 2.1: Library Measurement Matrix (Nicholson (2004).

Measurement	**Topic**	
Perspective	**System**	**Use**
Internal (Library System)	Procedures Standards	Recorded interactions with interface and Materials – Bibliomening
External (User)	Aboutness Usability	Knowledge status Value of works

Nicholson's model is related to "Evidence-Based Librarianship" (EBL) by Eldredge (2000). The idea behind EBL is that librarians need to find ways to integrate available benchmarks when making decisions. According to EBL, library evaluations need to be more applied in nature, that is to say the investigation needed to start with a research question, look for evidence in literature for possible similarities then use research methods that reduce bias in order to collect data which is useful not only in solving the original problem, but what can be useful in future decision-making situations. Eldredge (2000) analyzed the relevance of information and introduces the concept of aboutness,

which is based on a content match between the query and the documents being sought. The current research took up Eldredge (2000) challenge by starting the study with some research questions as demonstrated in Sub-Section 1.5.

From another perspective, Heath *et al.* (2003) describe how digital libraries are valued by patrons and highlight how resources can be allocated to library services on demand. The method used by this study was a market survey of patrons' needs. By modifying a profit oriented services model, the services quality (SERVQUAL) model and the CAMP model, the study developed LibQUAL (library quality) model. The concept of LibQUAL is that users are in a better position to evaluate the quality of a service. The model has three scales for each question asked; desired level, actual level, and the perceived levels of satisfaction. On the other hand, the SERVQUAL model had minimum, perceived and desired levels. LibQUAL was developed to address gaps that existed in the library services studied. The investigation did not measure the adoption rates of e-services. The current study borrowed the idea of users' centred approach to the research problem.

The Comprehensive Access to Print Material (CAPM) framework provided means for prioritizing services to cater for the identified library collections gaps. CAPM framework was one of the first multi-attribute, state-preference analyses of an e-library system that can boost an existing library service (Choudhury *et al.* 2001). The authors used observation method to evaluate costs related to accessing digital information. This study borrowed the idea of observation method from the CAMP framework in carrying out this research.

2.2.2 Electronic Library Evaluation Studies

In longitudinal study of 50 experts, Kwak *et al.* (2002) developed an evaluation model for university libraries. Utilizing existing studies the authors examined different evaluation measurements which were used in traditional and digital libraries. By so doing, the authors developed an evaluation model with eight evaluation categories. At each stage of the surveys, the model constructs and indicators would be revised according to the findings and in the end the model had seven constructs with 35 items and 92 indicators.

The content validity of Kwak *et al*. (2002) model was confirmed through a survey of 184 university librarians. The investigators planned to extend their model to other types of libraries but to date; no other study has replicated that model.

Although informative, the study by Kwak *et al*. (2002) was considered too wide in scope to be used as the conceptual base for the current study. Besides, the objectives of the two studies were different, since their study evaluated a 'traditional library' and an 'electronic library'. The current study focuses on levels of acceptability and use of the electronic information services in a hybrid library setting to model a theory**.**

Lagier (2002) in her review of literature provides abstracts of works done on the evaluation of online full text and abstracts databases usage. From Lagier's work, it was clear that evaluations of online full text studies were introduced in the early 1990s and continued to increase. The study findings indicated that technology as a whole presented a big barrier to the minority cultures within her research sample. This study is quite different from the current study since Lagier's study was limited to reviewing of the literature. However, its contribution to the current study's understanding of what has been done in this field cannot be underestimated, since to some extent it formed the basis of identifying the knowledge gaps.

Bar-Ilan *et al.* (2003) carried out a survey on the use of electronic databases and electronic journals accessed through the web. Result of the survey of academic staff of Israel universities showed that the use of the resources was widespread among respondents and more than 50% found electronic services important in their academic environment. In this study, disparities were found between the usage patterns in the different disciplines. There is no documented evidence to show how the study tool used by Bar-Ilan was empirically tested and validated and, hence, could not be used by the current investigation. Besides, the study is limited to only evaluation of one e-library services – the electronic databases. This study is different from the current study because of its use of invalidated tools; its limitation to one category of users (academic staff) and

one electronic library service and did not intend to measure levels of acceptance of the services

Thong *et al.* (2004) discuss factors that lead to acceptance and use of digital libraries. The study divided the influencing factors into three types: the interface, the organizational context and individual differences. Like other technologies, the authors found that factors which influence behaviour intention to use digital libraries include among others users' perceptions of the system's usability, its usefulness and ease of use. Within an organizational context, relevance was found to be quite a prominent determinant of acceptance and use of digital technology in libraries. In the system visibility, facilitating conditions increased acceptance and use of digital technology (Fortine 2005). Thong and others studied the acceptance of digital libraries and not the services offered there in. No model resulted from this study.

Bishop (2002) examines the nature of access to information resources in relationship of access to use. The paper was based on design and activities used in the implementation of DeLIever at the University of Illinois. The study concentrates on problems associated with using digital libraries. Authentication, registration and passwords needed to login were the major constraints found by users of the system. Bishop's findings indicate that e-journal systems were not used by the majority of respondents in his study sample especially in the first year of introducing a project. The study further found that students used e-journals more frequently than faculty staff.

Choudhury *at al*. (2001), lists down studies which have attempted to develop instruments and models for analyzing digital libraries and stops at only numerating the studies carried out in this area. The study was useful to the current investigation as a collection of work done within the field of digital library studies. Borgman (2000) studied digital libraries and employed a user-centred approach. Her work provides a detailed perspective on global information infrastructure. Although Borgman's study provided information on global ICT infrastructure, the study did not go further to measure how the infrastructure was being accepted or used.

Harless and Allen (1999) introduced the concept of environmental goods in studying the use of a library. Use value reflects the value of benefits as assigned by actual users of specific services. Option value incorporates additional benefits as determined by users who might use specific library services in the future (i.e., individuals who had not used the reference service but still placed a value on its existence). The eVALUEd (electronic value) project team designed a questionnaire to collect data to evaluate methods applied in United Kingdom (UK). The questionnaire was administered to heads of Library/Information Services in Higher Education Institutions. The purpose of the study was to produce a transferable model for e-library evaluation and provide training and dissemination in e-library evaluation. Results of this investigation provide a comparison of studies based in United Kingdom. This was an up-down evaluation and was carried out in a developed country.

While IS has attracted a lot of research as far as the evaluation of technology adoption practices are concerned, it is noticeable that the library profession lacks widely accepted and applicable tools and methods for evaluating both the systems and services offered using ICTs (Winkworth 1993 and Pritchard 1995). Several researchers have echoed this sentiment and the need for such studies (Saracevic 2004, Kwak *et al.* 2002; Bishop 2002). Bawden (1990) notes that many library evaluations are done only when there is a problem or a report that necessitates quick decisions. "Just as many patients wait until the symptoms become unbearable before seeking treatment, many library decision makers wait until problems force a rapid evaluation" (Bawden 1990). The ESER Project at Glasgow Caledonia University (Graford and Rilay 2000) showed that more attention was being given to non-use of electronic library resources as increasingly recognisable problem in public libraries but not in higher education institutions.

To summarise information on all the models that have been highlighted in this literature review, the following section compares the major technology acceptance models and shows the rationale for selecting one model as the basis for commencing work on an

appropriate model that can predict levels of acceptance and use of e-library services in Uganda as an example of a Developing Country.

2.3. COMPARISON OF MAJOR TECHNOLOGY ACCEPTANCE MODELS

Analysis of major acceptance and use models shows some similarities especially in TRA, TAM, TPR, DTPB, C-TAM-TPB and UTAUT in the concept of one's perceptions in determining IT/IS acceptance and use. TAM is simple (Figure 2.1) and easy to use in different research settings (Davis *et al.* 1989). TAM compares well with TRA and TPD in comprehensiveness (Han 2003). Mathieson *et al.* (2001) compared TAM with TPD and conclude that TAM appropriately explains the construct of intention. Whereas TPB provides details and shows why a technology may not be adopted, TAM provides easy means of generating information about someone's perception of a technology. When applying theories, DTPB has more advantages than TAM because not only does DTPB identify certain decisions which can influence IT usage as TAM does, it also provides more factors of subjective norm and perceived behaviour control which are not in TAM (Ajzen and Brown 1991). By adding seven more constructs to TAM, DTPB improved the prediction powers of behavioural intent by two percent (Taylor and Todd 1995b).

However, when it comes to the prediction of IT/IS usage, TAM is still better than DTPB. TAM is helpful for system design efforts. DTPB model includes design efforts and also pays attention to control and standard efforts. Chau and Hu (2001) compare TAM, TPD and DTPB to understand individual clinicians' usage of telemedicine technology. Their findings show that TAM explained 40 per cent of the variances, TPB explained 32 percent and DTPB explained 42 percent in the doctors' acceptance of the technology. PU was a significant determinant of attitude and BI in TAM and DTPB models, PEOU did not have an effect on PU or attitude in all the three models. This finding suggests that tools developed for longitudinal studies with users and managers in ordinary business settings as subjects may not be able to be used when studying people in professional setting - the case of doctors.

According to Bagozzi (1992) if all statistical analysis and interpretation means are the same, the best acceptance and use model is the one that is simple to use. Some authors argue that compactness is not required but is only desirable to the extent that it enables the understanding of a phenomenon (Venkatesh *et al.* 2003). The eight sample models studied by Venkatesh *et al.* (2003), explained between 17 percent and 37 percent of the variance in user intention to use a technology. The variance explained in TAM2 and the original TAM models increased from 35 percent to 53 percent and to 52 percent respectively when gender was included. For studies in Developed World, Venkatesh *et al.* (2003)'s UTAUT model is comprehensive enough and above all they provide an instrument for predicting prospects of either success or failure of an introduced technology.

Table 2.2 presents a comparison matrix showing the identified gaps in the literature regarding the evaluation of acceptance and use of new technologies' services in libraries. From the hybrid library services evaluation literature, the study observed that no model has been developed to measure levels of end-users' acceptance and use of e-library services.

Table 2.2. Literature Review Matrix Summary of Studies on Acceptance and Use of Technology in Library Services

Year	Author/s	Model	Independent				Moderators				Dependent			Prediction Levels
			Performance Expectance	Effort expectance	Social Influence	Facilitating conditions	Sex	Age	Experience	Volunteriness	Behaviour Intentions	Behaviour Use	Expected Benefits	
	Information services	**Evaluations**												
1962 1995	Rogers, E. M.	IDT	√?	√?	√?	√?	x	x	x	x	√?	√?	x	0.37-0.39
1986	Banduru, A.	SCT	√?	√?	√?	√?	x	x	x	x	√?	√?	x	0.36-0.37
1975	Fishbein, M. and Ajzen, I.	TRA	√?	√?	√?	√?	x	x	x	x	√?	√?	x	0.19-0.30
1980 1991	Fishbein, M. and Ajzen, I.	TPB	√?	x	√?	√?	x	x	x	x	√?	√?	x	0.21-0.37
1989	Davis, F. D.	TAM	√?	√?	√?	√?	x	x	x	x	√?	√?	√	0.36-0.38
1995a	Taylor, S. and Todd, P.A.	DTPB	x	X	x	x	x	x	x	x	√?	√?	x	0.21-0.25
1995b	Taylor, S. and Todd, P.A.	C-TAM	√?	√?	√?	√?	x	x	x	x	√?	√?	x	0.36-0.39
2000	Venkatesh and Davis	TAM2	√?	√?	√	√?	x	x	√	x	√?	√?	√	0.36-0.37
2003	Venaktesh *et al.*	UTAUT	√	√	√	√	√	√	√	√	√	√	x	0.69
	Library Evaluation Studies													
2001	Choudhury *et al.*	PEAK	x	x	x	x	x	x	x	x	x	x	x	x
2001	Flores, N. E.	CAPM	x	x	x	x	x	x	x	x	x	x	x	x
1999	Harless, D.W, and Allen, F. R.	eVALUEd	x	x	x	x	x	x	x	x	x	x	√?	x
2004	Nicholson, S.	Holistic L. M.	x	√?	x	x	x	x	x	√?	x	x	x	x

Year	Author/s	Model	Independent				Moderators				Dependent			Prediction Levels
			Performance Expectance	Effort expectance	Social Influence	Facilitating conditions	Sex	Age	Experience	Volunteriness	Behaviour Intentions	Behaviour Use	Expected Benefits	
2002	Baruchson-Arbib, S. and Shor, F.	x	x	x	x	x	x	x	x	x	x	x	√	x
2003	Bar-Ilan *et al.*	x	x	x	x	x	x	x	x	√	x	x	√	x
2002	Bishop, A.P.	x	x	x	x	√	x	x	x	√	x	x	x	x
2005	Fortune, P. M.	x	x	x	x	x	x	x	x	√	x	x	√	x
2007	Heinrichs *et al.*	x	x	x	x	x	x	x	x	x	x	x	x	x
2002	Kwak *et al.*	x	x	√	x	x	x	x	x	x	x	x	x	x
2002	Lagier, J.	x	x	x	x	√	x	x	x	x	x	x	x	x
2000	Marchonini, G.	x	x	x	x	x	x	x	x	x	x	x	√	x
2005	Rosenburg, D.	x	x	x	x	√	x	x	x	x	x	x	x	x
2008	Nov, O. and Ye, C.	x	x	√	x	x	x	x	x	x	x	x	x	x
2007	Theng *et al.*	x	x	x	x	x	x	x	x	x	x	x	√	x
2004	Thong, *et al.*	x	x	√	x	x	x	x	x	x	x	x	√	x

Note:

x Non existent
√ Present
√? Partially present
Re Relevance
Aw Awareness

2.4. DISCUSSION ON THE LITERATURE REVIEW AND THE MATRIXES

As discussed in the review of literature, a body of research has developed significantly with the principle suggested by Bandura (1986) to measure the acceptance and use of new technologies. These theories collectively referred to as technology acceptance models include among others: IDT, SCT, TRA, TPB, TAM, DTPB, C-TAM, TAM2 and UTAUT. The study noted that Venkatesh *et al.* (2003) integrated eight of the models into a unified theory, the UTAUT. UTAUT significantly improved the predictive levels of the entire body of research of technology acceptance to 70 per cent variance prediction.

It was observed, as indicated in the second part of Table 2.2 that Library Science (LS) has focused on evaluating quality of service rather than evaluating why or why not services are used. Crawford and Gorman (1995) point out that the value of a library can only be looked at from the perspective of a "reader" or "user" in the ability to locate and use the material that is relevant. Nicholson (2004)'s conceptual framework for holistic measurement of library quality introduced two perspectives of understanding a library service. These are the "internal perspective" (the library itself) and the "external perspective" (the library user). Concurring with Orr *et al.* (1968; Taylor 1986; and Schamber 1994), Nicholson (2004) emphasizes user-centered measurements of aboutness and usability.

It was further noted that library evaluation models are built on different values, varying definitions (e.g. e-library, digital library, hybrid library, and virtual library) and individualized conditions**.** This makes it difficult to apply such models to other studies, to compare them, or to make predictions using them. The need to move from practical evaluations toward a hypotheses-based exploration to improve the field of librarianship has been voiced explicitly and implicitly by several studies (McClure 1989, Nicholson 2004) and others. McClure (1989) emphasized that, "Library and information science fosters little research that is intended to produce 'knowledge' for the sake of knowledge".

There has been no previous application of any acceptance and use of technology model to library services offered using the new technologies. Up till now there are no formal

studies of user acceptance and use of new technologies in library science. The situation has not changed much since the above observation was made as highlighted by the summary in Table 2.2.

The trend shows that some technology acceptance models have developed from others or have developed as an extension or modification of another model. It was also noted that the models have been used to evaluate current usage or predict of future usage. Most of the models were validated using either longitudinal or cross-sectional survey methods. Importantly, the majority of the models reviewed were designed in settings in Developed Countries, which may not be applicable to the settings found in Developing Countries. The need to design an evaluation model to measure end-users' levels of acceptance and use of e-library services made possible by means of new technology was apparent, particular in a Developing Country setting.

2.5. CONCLUSION

This chapter reviewed literature related to the area of this study. It was noted that although there have been several studies which evaluated libraries and the services they offer, most of such studies lacked validity and were meant to solve immediate problems. There were no established ways of evaluating either a traditional library or a hybrid library. Attempts such as those of Kwak *et al.* (2002) and Nicholson (2004) had different aims and objectives from the current study. Appropriate study constructs were indentified and were incorporated in the current study context for investigation.

Research in acceptance and use of technology theories showed that UTAUT explained behaviour intentions and usage well, and hence contributed to a better understanding of the drivers of intentions to use a new technology. The review did not identify an acceptance and use of technology model developed to cater for services offered using new technologies, e.g. e-library services, and nor was there model developed to address conditions in DCs.

In conclusion, an existing acceptance and use of technology model was identified along with additional study variables applicable to e-library services context and environments prevalent in DCs. The next chapter outlines the methodology and research designs used to carry out the main survey for the application, validation and testing of the research model.

CHAPTER THREE - RESEARCH DESIGNS AND METHODOLOGIES

3. INTRODUCTION

This chapter discusses some paradigms and different research approaches which have been used in previous and similar studies. Based on this, the approaches best suited for this current study are selected. In this regard, a conceptual framework is presented based on the technology acceptance models reviewed in the previous chapter, Chapter 2. Concluding sections of the chapter present issues related to ethic considerations, generalization, and limitations of the study.

The research methodology and designs for this study were chosen in order to achieve the set objectives. The rationale for each choice is explained and discussed in terms of research process, conceptual framework, study designs, development of the instrument, piloting the instrument, study population, sample and data collection and analysis.

3.1. RESEARCH PARADIGMS

Bryman and Bell (2007) suggests that a research strategy (method) describes the pattern of assumptions, ideas and techniques that characterize quantitative and qualitative research. The two have some similarities, differences and areas where they are similar in approach. This mainly depends on the way a problem is defined and the nature of information being sought as researchers decide on either to use one of the two or a combination of both.

In IS and social science research, several paradigms have been developed. Examples of these are positivism versus interpretive, quantitative versus qualitative, induction versus deduction and exploratory versus confirmatory (Hussey and Hussey 1997). These are briefly described in Table 3.1.

Table 3.1: Summary of the main features of various research study designs as highlighted by Fitzgerald & Howcroft (1998).

1	**Qualitative** Determining what things exist rather than how many there are. Less structured and more responsive to needs and nature of research situation	**Quantitative** Use of mathematical and statistical techniques to identify fact and causal relationships. Samples can be larger and more representative. Results can be generalised to larger populations within known limits of error.
2	**Induction** Begins with specific instances which are use to arrive at overall generalisations which can be expected on the balance of probability. New evidence may cause conclusions to be revised. Criticised by many philosophers of science but plays an important role in theory/hypothesis conception.	**Deduction** Uses general results to ascribe properties to specific instances. Associated with theory verification/falsification and hypothesis testing.
3	**Exploratory** Concerned with discovering patterns in research data and to explain/understand them. Lays basic descriptive foundation. May lead to the generation of theory.	**Confirmatory** Concerned with hypothesis testing and theory verification. Tends to follow positivist, quantitative modes of research.

As observed in Table 3.1, while qualitative methods in research are based on interpretivism, quantitative methods rely heavily on positivism. The differences between the two go beyond the analytical and methodological issues. The objective of quantitative research is to develop and employ mathematical models, theories or hypotheses related to the phenomena being studied. The process of measurement is central to quantitative research because it provides the important connection between empirical observation and mathematical expression of quantitative relationships.

Quantitative research is unlike qualitative research because qualitative work employs analyses and interpretations of observations for the purpose of discovering underlying meaning and patterns of relationships. In qualitative research, validity applies to an interpretation or description with which it is used. Kholoud (2009) argues that because the two types of methods do not study the same phenomena, both methods cannot be combined for cross-validation or triangulation purposes. The author agrees that the two

can only be combined for complementary purposes. According to Morgan (1998), the two methods have different strengths and combining them results in richer results than would have been otherwise.

3.1.1. The research methods for this study

Based on the argument advanced in the previous section and from the lessons learnt from the literature, several factors led to the choice of methods used for this study.

The current study used triangulation methods that would complement each other with the aim of achieving the best results possible. According to Tashakkori and Teddlie, (2003), triangulation is one way that involves a combination of data collection to get good results. Although the term "triangulation" has different meanings, it is associated with using combinations of methods with a strategy of convergent validity being common (Bryman 2004). Kholoud (2009) cites Johnson *et al*. (2007) who identified four types of triangulation: data triangulation, investigator triangulation, theory triangulation and methodological triangulation. Kholoud further cites the same authors for defining ways in which quantitative and qualitative methods can be combined.

From research on technology acceptance perspective, technology acceptance has a dominant theoretical urge which is positivist in nature. The current study aimed to design a predictive viable model of behaviour intentions of users of technology services. This objective required the means of a structured, well-defined framework, definite measurements that could establish relationships between variables that inferences could be made from the study sample to a larger population. Most of these qualities can be addressed by quantitative research methods (Johnson *et al*. 2007).

The impetus of this study was to test hypotheses related to the proposed conceptual framework model as well as several hypothesized relationships that were previously established in technology acceptance context. The conceptual drive of the study is deductive in nature. The study followed a confirmatory strategy of research that requires

empirical analysis; a way of proving or disproving previously assumed hypotheses related to e-library services acceptance.

However, although this study is mainly quantitative, it used qualitative methods during the preliminary stages of the study. Structured observations were used to allow in-depth assessment of the libraries in the country in order to determine those with information services that could be researched.

The eleven main steps in quantitative research process are depicted in Figure 3.1. To address the research problem, this study decided to follow that path in the order in which they appear in the figure. However, the steps sometimes overlapped during the course of the research.

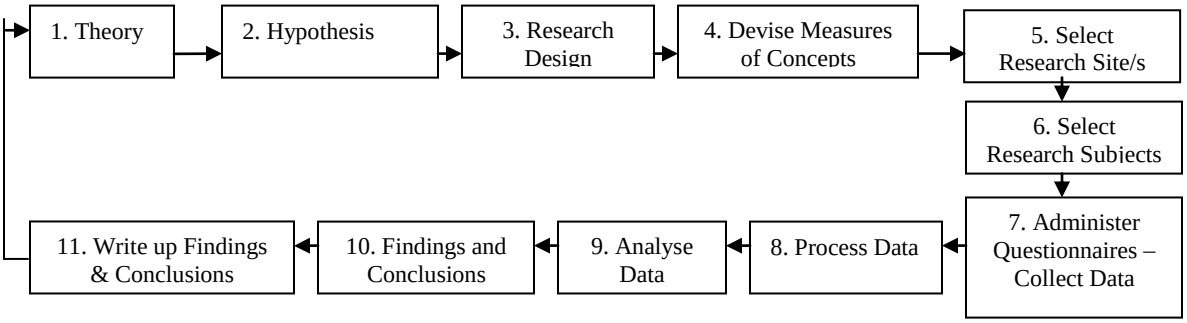

Figure 3.1: Process of Quantitative Research as outlined by Bryman & Bell (2007).

In this study, previous research theories and related literature were advanced to guide the research deductively. This is observed in almost all the chapters of this report, as briefly described here below.

Chapters one and two involved the identification of the problem and a theory for mentoring and hypothesizing of the study concepts. Chapter three describes all the processes of research methodologies and designs, designing of measurement, the selection of study sites and subjects to study and the development and administration of the data collection instrument (Steps 3, 4, 5, 6, and 7 in Figure 3.1). Chapter four covers the

processes of data processing and analysis (steps 8 & 9). Chapter five discusses the findings and interprets them in relation to findings of previous related studied (step 10). Chapter six carries on with the discussions and ends up with conclusions based on the findings. The chapter also presents an agenda for future investigations.

The section that now follows is an overview of the conceptual framework for this study.

3.2. THE CONCEPTUAL BACKGROUND

A conceptual framework is defined as a collection of theories and models from literature that underpins a positivist research (Mugenda and Mugenda 2003; Mugenda 2008). It is a concept of how the researcher makes logical sense of relationships between factors which are identified as a problem to be studied. It helps the researcher to hypothesise testable relationships which can improve the understanding of the determinants of the situation being studied (Sekaran 2003). In this study, a conceptual framework is also referred to as a theoretical framework or study model/framework. The three terms are used interchangeably.

A review of the literature of prominent models/theories and recent evaluation studies in the field of librarianship significantly support the designing of an e-library services model. It was noted that technology acceptance models have already been used to predict future use of a technology especially in the field of IS. Additionally, according to Taylor and Todd (1995a), a model should be evaluated in terms of its parsimony and its contribution to understanding of the phenomenon. The current study aimed at designing a model that can contribute to the prediction of users' behaviour in the future usage of e-library services and the understanding of the current state of users' behaviour in a university setting. In order to propose a conceptual model for the current study, the choice of the model depended on the most predictive of behaviour intentions and usage behaviour. UTAUT was identified as more comprehensive and the most predictive of all other models.

3.2.1. Basic concepts in Technology Acceptance Models Methodologies

It was noted by the researcher that the focus of research on adoption of technology affects the type of study to be carried out. The study can either use longitudinal survey method or cross-sectional survey method, depending on the situation being studied. In a longitudinal study, data are collected more than once, say twice, three times or more, over a long period of time (Sekaran 2003). In a cross-sectional study data are collected once, over a period of days, weeks or months.

The initial models of acceptance of technology focused either on **behaviour intentions** or **usage behaviour** or both depending on the time of the study (cross-sectional study or longitudinal study). Furthermore, the literature reviewed showed that some IS studies focus on one's acceptance of a technology by using **behaviour intentions** to use as the key dependent variable or **usage behaviour**.

In the next paragraphs, is a description of some differences in the two and an indication of the type of study selected for the current inquiry.

In previous technology acceptance studies, the tendency was to use cross-sectional surveys to measure only **behaviour intentions** as the major dependent variable (Agarwal and Karahanna 2000; Bhattacjerjee 2001; Chau and Hu 2001, 2002; Gefen and Straub 2000; Gefen *et al.* 2003; Hong *et al.* 2002; Venkatesh and Morris 2000) and many others. On the other hand, some studies used cross-sectional surveys to measure only **usage behaviour** as the dependent variable. These studies include among others, those by Gefen and Straub 1997; Karahanna and Straub 1999; Teo *et al.* 1999; Lederer *et al.* 2000 and Heijden 2003.

Studies which have measured both **behaviour intention** and **usage behaviour** as the dependent variables have used longitudinal research methods, for example studies by Mathieson *et al.* (2001); Moon and Kim (2001); Venkatesh and Davis (2000); Chen *et al*. (2002); Venkatesh *et al.* (2003).

Another issue that was observed from the literature is that studies which used cross-sectional methods did so if the technology being studied had either not been introduced or had just been introduced. This implies that, the users had no prior experience or were in the early stages of the experience. Such studies only measured **behaviour intentions**. An example of such studies is Chau and Hu (2002) who studied **behaviour intentions** to use telemedicine technology when it had just been introduced in Hong Kong utilizing a cross-sectional method.

Therefore **behaviour intentions** to use were measured before the **actual usage behaviour** in longitudinal studies concerned with the acceptance of a new technology. At a later stage, a similar study would measure **usage behaviour**. Venkatesh *et al.* (2003), for example evaluated **behaviour intentions** and some months/years later evaluated **usage behaviour**.

If a technology has been in use for a period of time, **actual usage** was measured using cross-sectional survey method. In other words, studies using cross-sectional surveys are mainly to evaluate current usage or prediction of future usage. The current study aimed at evaluating the present usage behaviour in an effort to predict future success of e-library services. Unlike previous studies, the researcher studied usage behaviour together with behaviour intentions.

3.2.2. The Study Conceptual Framework

From the information presented in the background, it is important to note that e-library services were introduced in universities in DCs during the past ten years or so, which is not too long ago. This duration, should be sufficient to investigate behaviour intentions as well as early usage behaviour. Using Uganda as a proxy example for DCs, by 2007 the country had twenty seven (27) universities and only eighteen (18) of them had introduced e-library services. Of the eighteen, only 9 had implemented meaningful e-library services in their daily operations. Therefore in 2007 e-library services were in the early stages of their introduction to library end users. The need to evaluate users' current behaviour intentions and usage, in order to predict future success of e-library services was the thrust

for this study. It is for these reasons that this study investigated both behaviour intentions and usage behaviour as dependent variables in addition to expected benefits.

Section 2.1 of Chapter 2 presents technology acceptance models frequently used in explaining behaviour intentions and usage behaviour. In the literature, it was observed that most of those models have been criticised for their low explanatory power in terms of behaviour intentions that ranges between 20 and 40 percent (see Table 2.2). The integrated acceptance model developed by Venkatesh *et al.* (2003) showed a great improvement in the powers to explain the variances up to 70 percent. While many studies utilized the model to evaluate the adoption of various technologies in different contexts, none have used the model to evaluate services, such as e-library services. The current study utilized UTAUT model and proposed some modifications to its constructs to strengthen it and also to support studies on e-library services. The next section is a succinct description of some of the basic concepts in the study conceptual framework.

3.2.3. Basic Concepts in the Study Conceptual Framework

To give a good understanding of the rationale of this study, it is important to define the major concepts underpinning the study. First, the problem being investigated are the services being offered in libraries using new technologies. 'Electronic library services' are one of the major concepts in the study. These have been explained and defined in sub-section 1.2.2 of Chapter 1, and will not be elaborated here. Suffice it to say that library services comprise those amenities that users access while seeking or using information provided by a library. In fact, according to the 'International Encyclopaedia of Information and Library Science', (Feather & Sturges, 1997), libraries have always been services. "This is because the offering of a collection for consultation by a body of people with a catalogue as a key to the collection is a service; in the same sense as a museum is a service".

According to the same authority, new technology has stimulated the demand and reinforced the pressure to give better services and has enabled provision of a greater variety of library services. If a library provides more than reference, it can offer much

better reference through greatly enhanced access to the contents of catalogues. Lending services are improved by the much greater control over the loan system that automation offers, and self issue systems are coming into operation. Libraries can more easily go beyond their own collections by accessing the catalogues of other libraries, in other countries as well as their own, and directing requests to them speedily; at the other end suppliers can send photocopies of articles by fast mail or courier services. If necessary these can be sent by fax, which is becoming economically competitive with sending photocopies through the mail. Computers have enabled and stimulated libraries to give individualized services to end-users – commonly called value-added services. All in all, all services previously offered by a tradition library have now been automated, and are the ones termed "electronic (e-) library services" (or hybrid library services).

The objectives of this study suggest a conceptual framework which is embedded in Technology Acceptance concepts by Venkatesh *et al.* (2003) who summarised the concepts depicted in Figure 2.5. The conceptual framework is composed of individual perceptions to use e-library services listed in Tables 1.3 and 1.4. One's perceptions to use the services could influence usage. Consequently, actual usage of the services could influence intentions to use the services (Figure 3.2). The study assumed that a research model based on UTAUT concept after some modifications and tests would have the power to explain behaviour intentions and usage behaviour and would predict future usage of e-library services.

The proposed research conceptual model in Figure 3.2 shows the direction of the assumed relationships among the modified UTAUT. The figure illustrates how some perceived factors included in UTAUT and those not included are transformed into end-users' benefits from e-library services. It is assumed that in teaching, learning and research environments prevalent in university communities, e-library services are perceived relevant when they satisfy the expectations of end-users. However, in this type of environment, some perceptions can be influenced by certain social settings and other factors arising from self intuition as pointed out by Anandarajan *et al.* (2002), Mugenda (2008) and Oshlyansky *et al.* (2007). University library end-users can be influenced by

social factors (Figure 3.2. 1, 2, 3, 4) such as individual's thoughts, feelings or actions. In this type of environment, social influence can take many forms and can be seen in conformity, socialization, peer pressure, obedience, leadership, persuasion and the likes.

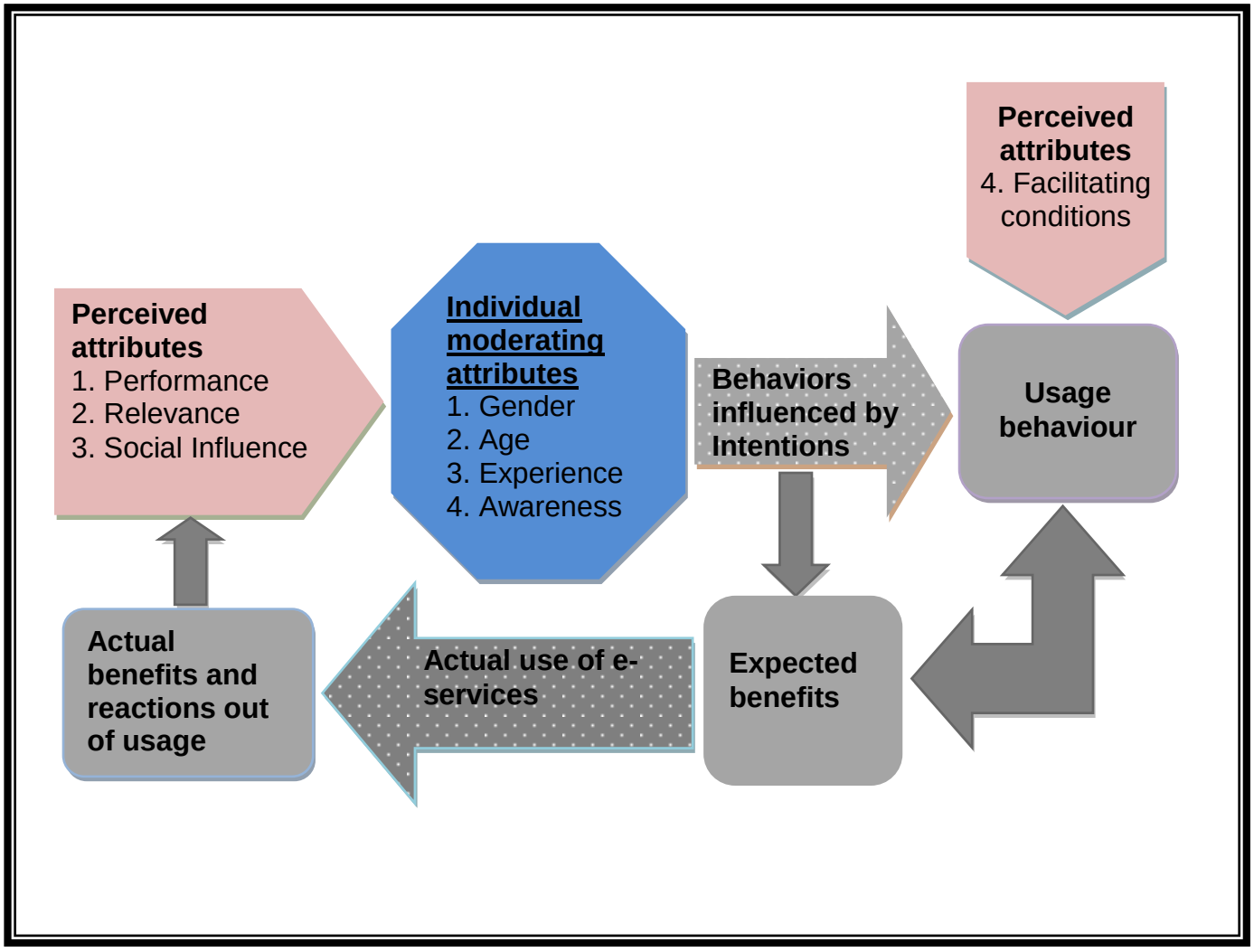

Figure 3.2: An illustration of the Research Conceptual Model based on modifications to the UTAUT by Venkatesh *et al.* (2003)

The perceptions arising from intentions to use e-library services could also be impacted upon by some socio-demographic attributes such as age, gender, and technical skills possessed by the users as suggested by Venkatesh *et al.* (2003). In most studies for example, age and experience of end-users were so pronounced (Chau and Hu 2001, Hong

et al. 2001). Academic professionals were perceived to be more attracted towards the use of a new technology compared to less experienced users such as students.

Behaviour intentions and **usage** operate in specific favorable conditions that facilitate usage of a service. The extent of e-library services usage could partly be explained by the degree of need in terms of the expected benefits to be derived out of usage. In most cases the extent of use of e-services is no doubt pronounced as pointed by Heinrich *et al.* (2007), Bar-Ilan *et al.* (2003) when learning achievements are significant. The behaviours exhibited while using e-library services can partly explain levels of benefits and the user's experience. Whether the behaviours vary from one type of environment to another was a matter of debate and further research which this study assesses within the context of DCs.

The **benefits derived** out of using e-library services tends to meet some level of peoples' expectations. The ones who seem satisfied can opt to try again and those not satisfied can opt for other mediums of library services, like books, print journals and monographs. The evolution of use of e- library services was based on the cyclic or looped study in that the use of e-library services is justifiably a continuous process not a one-off scenario. End-users venture into the e-library system that can keep them attached to it depending on the magnitude of need, the facilitating conditions prevailing and the benefits derived from usage such as improved teaching, improved research, improved coursework, better students, scholarly publications, promotion and many others.

In the context of this study the researcher conceptualized (depicted in Figure 3.2) that three factors (perceived attributes 1, 2 & 3) of performance expectancy, relevance and social influence determine behaviour intentions. On the other hand, facilitating conditions (perceived attribute 4) together with usage behaviour determine the expected benefits (as depicted in Figure 3.2). The study further postulated that the four independent variables (perceived attributes 1, 2, 3 & 4) in the model are moderated by gender, age, experience and awareness (a, b, c & d), as previously hypothesized in Section 1.4.2, iii of Chapter One.

3.2.4. Defining the study directions and variables

During the early preparatory stages of this study, a number of variables pertaining to library services were identified. These included some independent variables based on prominent theories/models identified in the literature. The study then proposed a modification to UTAUT model that integrates three variables to support inquiry in to users' behaviour intentions and use of e-library services. Introduced were 'relevance' and 'awareness' dimension with the aim of treating the variables and their dimensions as replacements to the dimension of 'effort expectance' and 'voluntariness' variables in the UTAUT model as shown in Figure 3.2. Also added to UTAUT variables, was 'expected benefits', as a dependent variable. Further explanations for these decisions are given next.

i) The justification for the study variables

Considering that targeted respondents were members of communities in a DC, comprising university staff and students, the researcher eliminated "effort expectancy" and "voluntariness of use" variables found in the UTAUT model. The two variables were considered inappropriate in the context of this study and replaced them with "relevance" and "awareness" variables respectively, and introduced a third dependent variable 'expected benefits'. This was because of the significance the three new variables have on existing LIS principles in traditional library setting (Nicholson 2004); digital library environments (Saracevic 2004 and Kwak *et al.* 2002) more especially in a DC environment (Rosenburg 2005). In the case of voluntariness, according to Agarwal and Prasad (1997) and Lucas and Spitler (1999), it is does not affect intentions to predict future usage of a technology.

Relevance and awareness constructs were a centre of debate during the pilot study discussions. Participants felt that the two were very important as far as e-library services were concerned, since the services were only introduced not too long ago. Furthermore, the constructs were said to be vital to the evaluation of library services by LIS studies (Saracevic and Kantor 1997; Kwak *et al.* (2002); Saracevic 2004; Nicholson 2004 and

others). The researcher assumed that including the three new variables would strengthen the study and improve the support for UTAUT in the study context.

As a result, the study has four independent variables, namely, performance expectance, relevance, social influence and facilitating conditions; three dependent variables, namely behaviour intentions, usage behaviour and expected benefits. Four moderator variables, namely, gender, age, experience and awareness were expected to impact on the independent variables' influence on the dependent variables. Accordingly, the variables are conceptualized in Figure 3.2, and as further explained in Sub-section 3.2.4.

Having chosen UTAUT as the theoretical basis for the study, the researcher had to fit the identified study variables from the literature review and consultations into the exiting UTAUT constructs. The study noted that UTAUT already had one of the identified variables, i.e. facilitating conditions. The study also noted that *effort expectance* construct in UTAUT was related to the identified *ease of use* construct. The constructs of *performance expectance* and *social influence* in UTAUT were assumed to be exclusively independent of the identified indicators and were retained in the study model. At this stage of the study, the findings showed that constructs such as performance expectance, effort expectance, social influence, facilitating conditions, gender, age, experience, voluntariness, awareness, expected benefits and relevance would have some impact on e-library services. These formed the variables of interest for further in-depth inquiry.

To proceed with the research all the study variables were categorized into independent factors, dependent factors and moderator factors depending on their mode of effect or association with each other. In both this study and the one carried out by Venkatesh and others, the aims were to find out which factors influence behavioural intentions or usage (Figures 2.4, 2.5 and 3.2). These two constructs were categorized as dependent factors in other studies; and so did the current study.

The study assumed that expected benefits would be a result of usage and was accordingly classified as a dependent construct in this study. The study made another assumption that

the identified factor of awareness was neither an independent nor dependent variable but could act in a moderating role. It was also noted that the moderator variable of voluntariness in UTAUT model would be redundant in the new model since it was assumed that use of e-library services was neither mandatory nor voluntary. Based on this fact, the variable was eliminated and replaced with the awareness variable. Factors which were identified to influence the dependent variables of behaviour intentions to use e-library services were categorized as independent variables and they included: performance expectance, social influence, facilitating conditions and relevance. The variables were logically organized in a conceptual framework depicted in Figure 3.2 according to their category (perceived attributes 1, 2, 3, & 4; moderator variables a, b, c, & d).

3.3. RESEARCH DESIGNS

The main purpose of the study was to test hypotheses that could explain the variance in the dependent variables. Such analyses suited a correlation study design as described hereafter.

3.3.1. Correlational Designs

Correlational research designs are founded on the assumption that reality is best described as a network of interacting and mutually-causal relationships. That, everything affects and is affected by everything else (Davis, 1998). Correlational design measures two or more variables other than manipulating one or more independent variables and eventually measuring the dependent variables.

The main premise of the study was that if a statistical significant relationship existed between the independent variables and the dependent variables it would be possible to predict the outcome of dependent variable using information available in the other variable. Within quantitative methods, this investigation used correlation research design (see Figure 3.3) to determine if there existed some relationship between independent constructs and the dependent constructs of behaviour intention to use e-library services.

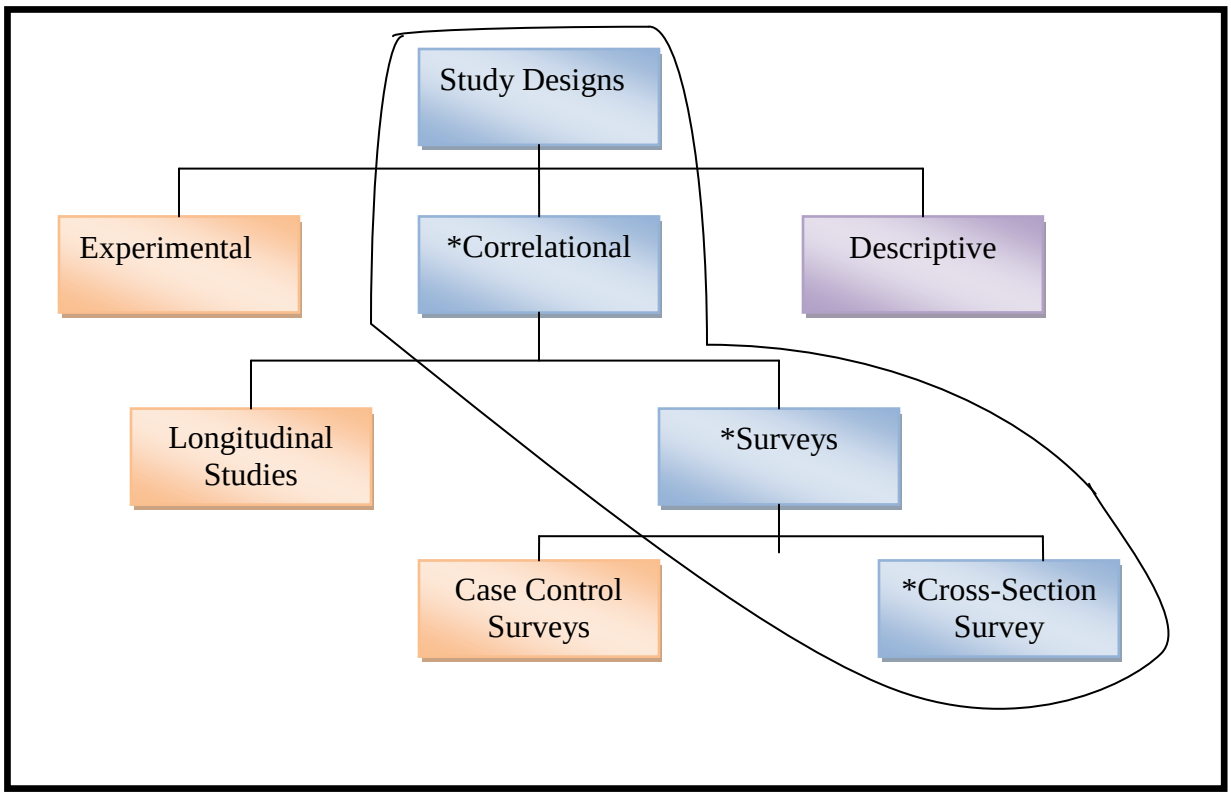

Figure 3.3: Illustration of the Research Designs according to Mugenda (2008 p.65)

In this type of scenario, the study applied reliability coefficients, multiple correlation coefficients (R2), generalized linear regression model coefficients; and path model coefficients for different study assessments of the collected data. These are discussed below.

a) ***Reliability analysis*** was carried out using ***Cronbach's Alpha*** commonly called coefficient for Internal Consistency (IC) and inter-item correlation coefficient. According to De Vellis (1991), reliability is a measure of the degree to which a research instrument would yield the same results after repeated trials. Cronbach's Alpha provides information on the degree to which each item in the construct correlates with at least one other item of the construct. The analysis can estimate the proportion of true score variance that is captured by the indicators by comparing the sum of indicator variances with the variance of the sum scale. Cronbach's statistic was computed as follows:

$$Cronbach = \alpha = \frac{number\ of\ items}{number\ of\ items - 1} * \left[1 - \frac{\sum s_i^2}{s_{sum}^2} \right] \qquad \text{Eq. 3.1}$$

Where s_i^2 denotes the variances for the number of individual items; s_{sum}^2 denotes the variance for the sum of all questions or items. If there is no true score but only error in the items (which is esoteric and unique, and, therefore, uncorrelated across respondents), then the variance of the sum will be the same as the sum of variances of the individual questions/items. Therefore, coefficient *alpha* will be equal to zero. If all items are perfectly reliable and measure the same thing (true score), then coefficient alpha is equal to 1. In this investigation, the construct would demonstrate an acceptable level of reliability if the Cronbach's alpha was at least 0.6.

b) ***Multiple correlation coefficients (R^2)***, was used to describe the extent to which a dependent variable was explained by a set of independent variables. The statistic was used to measure the predictive power of the model that has been estimated. The value of R^2 ranges from 0 to 1, and in this study, neither threshold nor the minimum value has been pre-determined but instead the statistic only states the percentage variation in the dependent variables as explained by the independent variables.

Symbolically, the (R^2) statistic was defined as follows:

$$R^2 = \frac{\left[\sum_i (observ_i - mean)(est.\ observ_i - est.\ mean)\right]^2}{\{\sum_i (observ_i - mean)^2\}\{\sum_i (est.\ observ_i - est.\ mean)^2\}} \qquad \text{Eq. 3.2}$$

Where $observ_i$ is the measurement of random variable *observ* on individual i. The *est.observ* and *est.mean* are the predicted measurements and mean values respectively. The *mean* of measurements for the *n* individuals is also factored into the calculation in equation 3.1 in order to obtain R^2.

A complete analysis of the entire model required an examination of the goodness of fit using R^2 and adjusted R-squared. The goodness of fit measures how well the model

parameter estimates were able to explain the variations in the dependent factor of the model and reproduce the sample covariance matrix. The adjusted R^2 equally measures the goodness of fit as does the R^2, but instead, the former statistic takes into account the degrees of freedom (expressed as the difference between the number of observations and number of estimated coefficients) as stated in equation 3.2. Thus,

$$Adjusted \;\; R^2 = 1 - \frac{no.\ of\ observations - 1}{no.\ of observations - no.of\ \ estimated\ \ coefficien\ ts}(1 - R^2) \qquad \text{Eq. 3.3}$$

c) The ***Generalized Linear Regression model*** (GLM) coefficients are weighted coefficients that indicate the magnitude, direction and significance of the possible linear relationship between the independent and dependent variables. The technique measures both direct and indirect effects of the independent variables on dependent variable respectively. The technique handles the moderating effects in the analysis of linear models. The GLM was appropriate because of its nature of handling fixed factors, covariates and the interaction effects. The model results, allowed a direct comparison of the variance explained from both estimation measures.

In the context of this study it was hypothesized that three factors; performance expectancy, relevancy and social influence determine behaviour intentions. On the other hand, behaviour intentions together with facilitating conditions determine usage. It was further postulated that the independent variables in the model were moderated by gender, age, experience and awareness, all of which required an appropriate modeling technique. Thus, the GLM that handled both direct and indirect effects were used in the form of the following equation (Eq. 3.4).

$$Y = X\beta + (X * M)\theta + U \qquad \text{Eq. 3.4}$$

Where Y is a matrix with multivariate measurements of the response or dependent variables,

X is a matrix of the block of independent variables;

β is a matrix of parameters to be estimated;

U is the vector of the error terms.

d) The ***path model*** employs the path analysis statistical technique for decomposing correlations into different pieces for interpretation of effect. It allows one to compare the direct effects of variables in a complex system of relationships.

The path model measures direct effects or the possible inclination of the independent variables on the dependent variable in the network of variables. The path model only establishes linear relationships between variables and also indicates the predictive power of the model being evaluated. The mathematical relationships between the variables may be expressed as a set of linear equations, called the path model. According to Keeves, (1972) the fundamental principle of the path model that allows the linear equations to be estimated is:

$$r_{ij} = \sum_{k} P_{ik} * r_{jk} \qquad \text{Eq. 3.5}$$

Where i and j denote two variables in the network and the index k includes all variables from which paths lead directly to the dependent construct (j), r is the correlation coefficient and p is path coefficient. Equation (eq 3.5) can be expanded by successive applications of the formula itself to r_{jk}. In this case, the errors from behaviour intentions and facilitating conditions all point at usage behaviour. Where i is either behaviour intentions or facilitating conditions and j is usage behaviour. Expressed in expanded form can be read directly from the path diagram by using the following direct relationships in this study:

$$\begin{aligned} BIC &= \alpha_1 PEC + \alpha_2 REC + \alpha_3 SOC \\ BUC &= \alpha_4 FOC + \alpha_5 BIC \\ EBC &= \alpha_6 BUC \end{aligned} \qquad \text{Eq. 3.6}$$

Where BIC is Behavioural Intention, PEC is performance expectance, REC is relevance, FOC is facilitating conditions, BUC is usage behaviour and EBC is expected benefits

constructs respectively. In this study, a path coefficient with a negative sign implies an inverse relationship between constructs whereas a coefficient with a positive sign implies that there is a direct relationship between two constructs.

3.3.2. Survey Designs

There are two types of surveys used when evaluating acceptance and use of technology as discussed in 3.2.1. These are longitudinal surveys and cross-sectional survey. Since e-library services being investigated were in their early years of introduction, the best survey method was a cross-sectional. By using cross-sectional survey, the study would be able to predict future usage.

i) Cross-sectional survey

The study used a survey approach to collect data that could be as representative of the real phenomena in the population from which the study sample was drawn. The study focused on the link between end-users' behaviour intentions to use and e-library services. In IS/IT evaluation studies, cross-sectional survey methods are not new because they have been used by several authors, Gefen *et al.* (2002), Chau and Hu (2001), Venkatesh and Davis (2000) and Venkatesh and Morris (2000).

A cross-sectional survey design was utilized to gather quantitative data to assess the relationships between the study variables. A cross-sectional study/research involves data collection that covers a one-off time period. Data collection of individual observations can occur at one point in time or may be over a period of days, weeks or months. In the case of the current study, the data collection period was over a period of three months. According to Mugenda (2008), Mugenda and Mugenda (2003) this sort of survey helps to establish whether significant associations among variables exist. The additional value of this type of survey is that one can generate testable hypotheses, which the current study did.

Cross-sectional designs have three distinctive features: there is no time dimension, only differences between groups are measured rather than changes over time; there is reliance

on existing differences rather than change following any intervention and there is no allowance for differences to emerge over time; and grouping individuals in the sample is based on existing differences or according to a category or the independent variable to which they happened to belong rather than random allocation. The researcher was aware of the limitations of this type of investigation, but it was beyond the study timeframe to utilize a longitudinal study. When data is collected at more than one point in time and then later on, the study is considered longitudinal (Creswell, 2003). Longitudinal studies are feasible when there is need to describe the pattern and direction of change and stability (De Vaus, 2001).

The objective of this study was to understand usage behaviour as a dependent variable that would predict the actual usage of the services in future. The current study was cross-sectional survey and academic staff and students in all the study sites had some experience. Behaviour intention is associated with self-predicted future usage of a new technology. Furthermore, measuring behaviour intention as a predictor of future usage behaviour was also important. That too was investigated in this study.

The researcher believes that the experience gained in using e-library services would impact on behaviour intentions of both the faculty staff and students if they intended to use the services in future. As reported in the conceptual framework section, Sub-section 3.2.1, behaviour intentions as a dependent variable measured in a cross-sectional study can help to identify future usage of e-library services. It is because of these reasons that the current study used a cross-sectional survey method which was carried out over a period of three months (June, July and August 2007).

3.4. STUDY POPULATION

This study targeted actual university e-library end-users in non-contrived conditions, utilizing self-reported behaviour intentions and usage behaviour as the most efficient means for the study requirements.

The geographical coverage of this study was Uganda, an independent country in East Africa. The country boarders Kenya in the east, Tanzania in the south, Sudan in the north, Congo in the west and Rwanda in the extreme south west corner (Appendix 7). The country covers a land area of 146,675 square miles.

By 2007, Uganda had twenty seven (27) registered universities of which six (6) were government funded and twenty one (21) were private (see Appendix 6). Respondents for the study were members of university communities who included students and faculty staff. The study sampled universities which had introduced ICT facilities and operations in their libraries. These are: Makerere University (Mak), Kyambogo University (KYU), Mbarara University of Science and Technology (MUST), Gulu University (GU), The Islamic University in Uganda (IUIU), Uganda Martyrs University UMU), Uganda Christian University (UCU), and Kampala International University (KIU).

3.4.1. The Study Sample

The size of the sample was influenced by the main statistical technique to be used in the study, i.e. the structural equation modeling. Other factors that affected the sample size decision were related to the complexity (for generalization purposes) of the study, expected rate of missing data, and the estimation procedure used (Hair *et al*. 2006). A minimum size of 368 usable responses was targeted, taking into account the model designing complexity and guidelines of researchers for applying multiple group analysis, where the samples requirements were expected to be over ten times the number of variable in each of the study groups (Sekaran 2003).

One important advantage of quantitative research methods is that valid inferences can be made on the study population from the findings of the study sample, as far as the sample is selected randomly enough to represent the important characteristics of the study population. So, estimating the sample size and dealing with non-response bias was essential, as far as quantitative survey design (and this study) is concerned. The question then was on the size of the study sample. To estimate this and minimize the alpha error, Fisher *et al.* (1983) formula was used (equation 3.7).

$$n = \left(Z^2 pq\right) \Big/ d^2 \qquad \text{Eq. 3.7.}$$

Where: n is the sample size estimated

Z is the statistical certainty chosen or the standard z-statistic of the normal distribution (95%) corresponding to the chosen level of significance (usually 5%).

p is the proportion of the character of interest or the estimated level/coverage to be estimated (q=1-p).

d is the maximum probable error which the researcher is willing to tolerate or the tolerated maximum value of relative sampling error (this study considered an error of 5% deviation from the results).

The student and faculty staff population in the eight universities during the 2006/2007 academic year was recorded as sixty five thousand four hundred and six (65,406) people. To estimate the sample from this large number of library patrons, the study used a sampling frame that provided a sample that could be reached at reasonable cost, within the study time period and which would give reliable data. Probability and non-probability sampling methods were used to select the respondents. The rationale behind this was to study samples with similar characteristics between universities but with some defined differences within the study sites. To achieve this, using an analytically approach the programmes taught at the eight universities were scrutinizing for commonalities in subject coverage. Only three faculties were common, namely Education, Social Sciences and Sciences including Computer Science. These faculties constituted the study target population (40% of the population) from which the study samples were drawn. The new technology services included in this study were electronic library services listed in Tables 1.3 and 1.4.

3.4.2. Sampling Design

To come up with a manageable and convenient number of randomly selected participants from a fairly large population, and for generalization purposes, multi-stage sampling

methods were used. The three sampling types followed were: purposive, stratified and convenient random sampling. These are elaborated in the following paragraphs.

a) Purposive Sampling

Purposive sampling technique was used because it allows one to study cases that have the required information defined by a set of characteristics which ensures that participants with those important characteristics are included in the sample. This richness of respondents improves the validity, usefulness and knowledge generated from investigations into the sample (Patton 2002). Furthermore; this technique was used to avoid extreme results by including it as part of multi-stage sampling to intensify the samples (Gall *et al.* 2003) and other perimeters of purposively selected samples.

Universities which were included in this study were purposively picked because they processed the required characteristics of availability of ICT infrastructure, equipment and facilities needed to support e-library services as illustrated in Tables 1.2 and 1.3. This was an important first step to fulfill the study objectives, taking into account that not all universities in Uganda had integrated ICT innovations in their operations.

In practical terms, the selection procedure proceeded as follows: A list of registered universities was obtained from the National Council for Higher Education (Appendix 6). Some members of library staff in all registered universities in Uganda were contacted to find out which ones offered electronic library services. Only eighteen universities had introduced e-library services whereas others were still in infant stages of the innovation processes or only offered Internet services to a selected number of people, or were still using a dial up system which could not allow large scale use of their services. The e-services offered tended to be limited to online journals access, Internet services and e-mail.

One other characteristic that was considered to be important was ownership of the university, i.e. government or private sector. The terminology used to describe this was "government-funded" if the majority or all of the financing for the university was from

the Government of Uganda or "privately-owned" if the university was financed by private individuals, groups or organizations. In this regard, we allocated fifty percent of the sample to government-funded universities and the remaining proportion to privately-owned universities.

During the fact finding mission in November and December 2006, it was discovered that private universities differed mainly by their funding sources, for example: some were founded purely on religious basis, while some were founded as business ventures. For instance, of the four private universities studied, one (IUIU) was founded on Islamic beliefs, the second one (UMU) founded by the Catholic Church, the third one (UCU) was founded by the Protestant Church/Church of Uganda, and KIU which was founded as a business venture. All these elements were taken into consideration within the sample of privately-owned universities. Within the government-funded group, there was not much choice since there were a total of six and out of these, Busetema (2007) and Uganda Management Institute (2006) had just been established and could not meet the study criterion for the available ICT services.

b) Stratified sampling

To increase representativeness of the study sample to various sub-groupings in the study population (Mugenda 2008; Amin 2005, Kakooza 2002), stratified sampling was include as one of the sampling methods. Most library evaluations tend to view users within a university to be students and faculty staff (Feather and Sturges 1997, Bar-Ilan *et al.* 2003; Kiondo 1997). To ensure representation of each of these two sub-groups, stratified sampling was chosen as the best technique for the study.

In practical terms the process involved the following: Within the three common faculties in each university, a proportional number of study subjects relative to the size of that sub-group in the faculty had to be undergraduates, postgraduates and faculty staff (Table 4.2). The three faculties had a total population of 28,423 library end-users which represented 40% of the study's total population (i.e. all users in the eight study universities). A

maximum sample size of n=491, was selected according Fisher *et al.* (1983) formula. (See equation 3.1).

c) Convenient random sampling

Once the number of respondents from each university and sub-group were estimated, convenient random sampling was chosen as the technique to identify respondents that would be given questionnaires. Respondents were selected from each library on every other day of the week. All e-library service users that entered the designated area on a chosen sampling day of the week were requested to participate in the study. This was a feasible and convenient way of randomizing the selection of study respondents.

d) Sample size

According to the generalisability of scientific results, guidelines for sample size estimation indicate that (Hair *et al*. 2006):

- Sample sizes larger than 30 and less than 500 are appropriate for most research.
- When samples are to be divided into sub-samples, a minimum sample size of 30 for each category is necessary.
- In multivariate research, the sample size should be several times (preferably 10 times or more) as large as the number of variables in the study. In this study, all sub-sample groups had more than 100 respondents.

Furthermore, a sample has been described as a subset of the population, comprising some members selected from the population. In the current study, the population comprised twenty seven universities of which eight were selected to represent the others. The eight universities had a population of 65,406 library end-users. The researcher decided to narrow the population down by targeting three common faculties in each of the eight universities, whose library end-user population was 28,423.

A maximum of four hundred ninety one (491) library end-users from the three common faculties in eight universities were studied.

3.5. DATA COLLECTION METHODS

According to Sekaran (2003), evaluation of acceptance and use of technology research utilizes different methods for data collection. In addition to structured interviews, surveys are common and popular. With the introduction of new technologies, surveys range between the use of non-Internet surveys and Internet surveys. The non-Internet types of surveys can be administered in a number of ways: door-to-door surveys, ad hoc mail surveys and self administered questionnaires (Sekaran 2003). Each of these ways has its advantages and disadvantages. Table 4.2 outlines the advantages and disadvantages of each type as suggested by Sekaran (2003).

Table 3.2: Advantages and disadvantages of questionnaires as a mode of data collection as outlined by Sekaran (2003).

Mode of data Collection	Advantages	Disadvantages
Personally/self administered questionnaires	Ability to rapport and motivate respondent. Doubts can be clarified. Less expensive when administered to a group of respondents. High response rate assured. Respondent anonymity is high.	Organizations may be reluctant to give company time for the survey with groups of employees assembled for the purpose.
Mail questionnaires	Anonymity is high. Wide geographical regions can be reached. Respondents can take more time to respond at convenience. Can be administered electronically if desired.	Response rate is almost always low. A 30% rate is acceptable. Cannot clarify questions. Follow-up procedures for non-response are necessary.
Electronic questionnaires	Easy to administer; can reach globally; inexpensive. Fast delivery; Respondents can answer at their convenience like the mail questionnaire.	Computer literacy is a must. Respondents must have access to the facility. Respondents must be willing to complete the survey.

Due to its ability to motivate respondent and high response rate, the current study used a personally/self administered questionnaire. Personally administered questionnaire was a better way of collecting data and were a feasible method because the survey was confined to the Republic of Uganda, a relatively small country (146,675 square miles). The

method is recognized as a reliable predictor of actual technology usage (Lederer *et al.* 2000; Karahanna *et al.* 1999; Szajna (1996).

3.5.1. Data Collection Tools

The data collection instrument comprised: i) a structured questionnaire and ii) an observation checklist. These are described in the sub-sections which follow.

i) Structured Questionnaire

The major data collection instrument was a structured questionnaire comprising a pre-formulated written set of statements adopted from Venkatesh *et al.* (2003) with a few modifications. The reasons for using a structured and self-administered questionnaire as the main data collection tool are the following:

a) Quantifiable information was required with regard to the study population's behaviour intentions to use e-library services. The tool provides for this.
b) A structured questionnaire was the most efficient and effective data collection tool especially when the study had defined variables to measure. Sekaran (2003) agrees that field studies often use questionnaires to measure variables of interest.
c) A questionnaire can be administered to a large number of individual respondents simultaneously; is less expensive, less time consuming and does not require a lot of skills, compared to conducting interviews (Mugenda 2008; Amin 2005; Mugenda and Mugenda 2003).

Forty six (46) statements formed the major section (Section 3) of the questionnaire and had a five-point likert scale with a gradation in which one (1) represented strongly agrees and five (5) represented strongly disagree (Appendix 3). According to Mugenda and Mugenda (2008), the Likert type of scales with 3 or 5 response categories are the commonly and best used rating scales.

In addition to 24 statements included in UTAUT model to measure the constructs, the study added 22 statements to address the additional constructs introduced in the new

model by the researcher. The three constructs are: relevance, expected benefits and awareness.

ii) Study Observation Checklist

The second instrument was an observation checklist chart used to verify ICT facilities and services reported by survey respondents (Appendix 5). The check list comprised of data generated from Section 2 of the structured questionnaire. In this way, it was possible to establish by firsthand account some of the information that is linked to the phenomenon being studied. Specifically the observations focused on availability and use of ICTs infrastructure, equipment, facilities and services. The observations were carried out by the researcher in a systematic manner, from one study site to another and were enhanced by information provided by staff of the sampled libraries. Data collected by this method formed part of this study, and is summarized in Tables 1.1, 1.2 and 1.3.

3.5.2. Questionnaire Development

Aware of the crucial role the questionnaire plays in any research, the study took considerable time to design it. The aim was to design a good questionnaire that would meet the research objectives set by the study and be reliable. Guided by IS technology acceptance theories, the study conceptual framework and the postulated hypotheses, the researcher designed the questionnaire; a process that took nine months (September 2006 to May 2007).

The instrument was designed during the preliminary preparations for the study. Included in the study instrument were specific modifications to enable us to determine differences among library end-users' acceptance and use of e-library services taking into account that respondents were members of a community within a developing country context. The study eliminated "effort expectancy" and "voluntariness of use" constructs, which were consider inappropriate in this context and replaced them with "relevance" and "awareness" constructs respectively because of the significance they have on existing LIS principles in traditional library setting (Nicholson 2004); digital library environments

(Saracevic 2004 and Kwak *et al.* 2002) more especially DCs' environment (Rosenburg 2005).

Without distorting the flow of words and structure in the tool developed by Venkatesh *et al.* (2003), an adapted version was designed to include the additional information required for this study. For that matter, in addition to statements which weighted constructs included in UTAUT model, the study developed statements to address constructs introduced in the research model. These are: relevance and awareness. The statements of the introduced constructs were phrased or composed with the assistance of the three academic study supervisors and validated in pilot study.

The entire study instrument consisted of five printed A4 pages and a covering letter of introduction. The letter indicated the purpose of the study and contact address of the researcher. The questionnaire had four main sections: section one has twelve questions (Q101 to Q112) concerned with demographic and institutional characters of the respondents, like sex, age group, end-user-category, university; section 2 required respondents to identify ICT hardware and e-library services available in their universities; section 3 consisted statements about the study variables (Q301 to Q308) with a 5-point Likert scale to select from where 1 = strongly agree and 5 = strongly disagree; and section 4 asked respondents to suggest possible areas of improvement in e-library services.

The data collection instrument was piloted before its use in the study. The pilot study involved twenty respondents who were knowledgeable about the services of interest. A synopsis of the findings of the pilot and the details of the development process of the study instrument are narrated in the following paragraphs.

3.5.3. Defining measurements for the study variables

Operationalisation of a construct to render it measurable was done by looking at all possible behavioural properties which make up the construct. These were then translated into observable and measurable elements in order to develop a standard measure for the

concept (see Sekaran, 2003). Operational definitions for some of the study's major constructs were specified by Venkatesh *et al.* (2003) (refer to Section 1.6.2 Table 1.5). These constructs have since been used by several other scholars who include Moran (2006), Anderson & Schwager, (2004); Kripanont (2007). Measurement items for performance expectance, social influence, facilitating conditions, behaviour intentions, usage behaviour were adopted from Venkatesh *et al*. (2003) study with some adjustments to reflect e-library services usage and behaviour intentions. Measurement items for relevance, expected benefits and awareness and their dimensions were composed by the researcher with the assistance of library science experts and the researcher's academic supervisors.

It should be noted that each of the variables was measured using statements sometimes referred to as indicators in this study. Where there are six statements/indicators, each was given a number and is accordingly measured using that number; for example, statement one to measure the performance expectance in the analysis is referred to as Pe1 and so on.

Performance expectance. This construct measured "the degree to which an individual believes that using e-library services would help him/her attain gains in pursuing his/her academic career". Venkatesh *et al*. (2003); Anderson and Schwager (2004) and Moran (2006) proposed four statements to measure 'performance expectance' construct. The four were adopted from UTAUT and used by the current study. The study contributed one additional statement, as illustrated in Appendix 3 to measure the construct. The measurements are identified as Pe1, Pe2, Pe3, Pe4 and Pe5 in the thesis text (Q02 of Section 3 in Appendix 3).

Relevance was one of the completely new independent constructs. Defined as "the degree to which something is closely connected with the subject of concern or the situation one is thinking about" the researcher composed six statements which were used to measure it. The six statements are identified in the text as Re1, Re2, Re3, Re4, Re5 and

Re6 (Q03 of Section 3 in Appendix 3). This was to find out how relevant the introduced e-library services were to the respondents' teaching, learning and research needs.

Social Influence construct measured the degree to which an individual perceives people who are associated with him/her (academically, culturally, socially etc.) believe that he/she should use e-library services. It is one of the constructs adopted from Venkatesh *et al.* (2003)'s model. The study measured the construct using four statements adopted from UTAUT. The statements are identified in the thesis text as Si1, Si2, Si3 and Si4 (See Q304 of Appendix 3).

Facilitating conditions in this study were defined according to Venkatesh *et al.* (2003), as "the degree to which an individual believes that an organisation and technical infrastructure exists to support use of e-library services". To measure this construct, the study used the four statements from UTAUT, with three additional statements. The statements are in the questionnaire and are identified as Fc1, Fc2, Fc3, Fc4, Fc5, Fc6, Fc7 in the thesis text (Q05 of Section 3 in Appendix 3).

Awareness as a moderator variable had five statements which were used to measure how much end-users knew about the existence of e-library services in their universities. There were five statements identified as Aw1, Aw2, Aw3, Aw4 and Aw5 in the instrument and the thesis text (See Section 3, Q301 of Appendix 3).

Behavioural Intention construct was evaluated using five statements; four of which were adopted from UTAUT. The statements are identified as Bi1, Bi2, Bi3, Bi4, B5. These formed Q306 of Section 3 of the questionnaire.

Usage Behaviour: The construct measured the actual usage behaviour of e-library services. It was evaluated it according to UTAUT model with additional four statements and some rephrasing in wordings. Altogether, eight statements were used by this study to measure the construct, and are Bu1, Bu2, Bu3, Bu4, Bu5, Bu6 Bu7 and Bu8. (Q08 of Section 3 in Appendix 3).

The construct of **'expected benefits'** measured the type of benefits end-users of e-library services expected from using e-library services such as current information, being more competitive, being connected to more information. The construct was evaluated using six statements developed by the researcher. The measurements are in Section 3 Q307 of the questionnaire, and identified as Eb1, Eb2, Eb3, Eb4, Eb5 and Eb6.

Demographic data: The moderator variables of "gender, age, and experience" were among the demographic data (Section 1 of Appendix 3). Respondents were asked to provide such data in terms of years (for experience), and age was categorised as in Q105. When analysing data in that question, age categories ">18–24" and ">25–34" were put in the group of young e-library users while ">45–60" and ">60+" were grouped as older e-library end-users. In the questionnaire, Q104 was for gender, Q105 for age and Q111 for experience.

3.5.4. Validating the Instrument

The instrument chosen for this study is an existing tool developed by Venkatesh *at al*. (2003) and has been used by scholars in information sciences such as Anderson and Schwager (2007); Moran (2006); Oshlayansky *et al.* (2007); and Marchewka and Kostiwa (2007) and many others.

To find out if the instrument was appropriate for research on e-library services, it was critically examined and thoroughly discussed in a pilot study at two workshops conducted at Uganda Martyrs and Makerere Universities on the 20th and 21st of April 2007 respectively. This was to ensure clarity of statements and comprehensiveness of the constructs measurements. The workshops were attended by ten participants each comprising post graduate students, qualified librarians and experienced researchers. During the workshops, participants were given a draft copy of the adapted version of the data collection instrument for critical review. Recommendations from participants were used to improve the tool. The adapted version of the instrument was structured on the

independent constructs of 'performance expectance', 'relevance', 'social influence' and 'facilitation conditions'.

One key recommendation from this process was to drop the construct of 'effort expectance' in UTAUT which participants felt was not likely to be a major influencing factor at the onset of the introduction of a new technology. Rather, the relevance of services was suggested as a major influencing factor in the study context. Accordingly, the relevance construct and possibly the three factors adapted from UTAUT were likely to be influenced by end-users' awareness of e-library services being offered. Awareness was particularly important in the context of DCs where most people were just being introduced to the new technologies.

The recommended changes were made and the resulting version of the instrument was given to the twenty participants to complete and return before the end of the workshop. All the returned questionnaires formed the foundation data used to design the study model. Preliminary findings from this pilot showed that the scales were reliable and valid. Results from the pilot were presented at an International Joint Conference on Digital Libraries in Vancouver, Canada on 20th June 2007 where experts in IS and LIS fields gave additional important input in to the instrument refinement. All the wordings and statements in the questionnaire were critically scrutinized and approved by the three academic supervisors (copy in Appendix 3). A report of the pilot study is presented in Appendix 6.

3.5.5. Qualitative data collection instrument

The second instrument was an observation checklist chart used to check ICT facilities and services reported by survey respondents (Appendix 4). The check list comprised of information linked to the data generated in Section Two of the structured questionnaire. In this way, it was possible to establish by firsthand account some of the information that is linked to the phenomenon being studied. Specifically the observations focused on availability and use of ICTs infrastructure, equipment, facilities and services. Data

collected by this method formed part of this study, and is summarized in Tables 1.1, 1.2 and 1.3.

3.5.6. Defining the Model Criteria

The study objectives and hypotheses were answered based on the following statistical and model requirements:

- The number of indicators/items per construct 2 >
- Under 10 per cent missing data to be ignored.
- Cronbach's alpha 0.6 and above
- Factor loading 0.7 and above.
- Inter-item correlation 0.5 and above
- Standardized square root of the average shared variance (AVE) should be greater than the construct correlations of the respective rows and columns.
- AVE >0.5
- The path coefficients must generate significant t-statistic, t >2
- R^2 must generate significant t-statistic t>2

3.6. DATA COLLECTION PROCEDURES

At the eight universities studied, the major participating units were university libraries and computer laboratories. Members of faculty staff were identified at their offices by visiting each office on the day of sampling. Data was collected from these areas in June, July and August 2007. With the assistance of a field research coordinator, a self-administered instrument in print format was physically handed to each respondent. Respondents were instructed not to put any personal identifiers on the questionnaire. Follow up of respondents was carried out by eighteen research assistants who were recruited, trained and assigned to collect completed questionnaires. Makerere University, which had most respondents (47%), was assigned four research assistants and the other seven universities, two each. The field research coordinator and the author visited each study site to supervise and ensure appropriate random sampling and good data collection. Fieldwork was made possible with funding from i@mak.com, the sponsors of this study.

3.6.1. Statistical Data Analysis

As discussed in detail in the subsequent chapters of this thesis, the model's data involved various steps: initially, the raw data was evaluated for statistical reliability for each of the item indicators with the view to establishing the distribution of the item indicators under study; the second stage involved obtaining the internal consistency of the block of indicators that constitute the construct, the least loaded item indicator was dropped at this stage, leaving only those with loading of 0.7 or greater; the factor weights were then established for those item indicators that demonstrated significant inclination to a factor. Using the technique of Venkatesh *et al.* (2003), the weights were then used together with the retained item indicators to generate the model's constructs and later on the model itself.

The Stata (version 9), SPSS (version 10) and PLS Graph (Version 2.91.03.04) software were utilized for analyzing the study data. The software were found to be the most appropriate for this study because of their ability to model observable and latent variables under both normal and non-normal distributions.

Stata was adopted as a statistical program because of its superiority in handling and manipulating data. Besides, the scientific program is flexible in giving statistical outputs in great detail, and was used to determine the internal reliability of the constructs, to perform covariance analysis on demographic data and to obtain the statistical reliability of the construct indicators.

SPSS was used to generate generalized linear regression model results, a technique which is appropriate for modeling the dependence of a continuous variable on fixed factors and covariates together with interactions as used by Venkatesh *et al.* (2003).

The study also adopted the Partial Least Squares (PLS) statistical analysis method developed within PLS Graph (Version 2.91.03.04) software as the most appropriate technique for handling path analysis and multiple equations modeling. PLS-Graph is

statistical software used to generate factor loadings and covariance matrix based on structural equation modeling and has been used by many researchers in technology acceptance and adoption studies (Moran 2006; Venkatesh *et al.* 2003; Chin (1998); Compeau and Higgins 1995a; and others). The software was also used to determine the validity of the different determinants or statements. PLS was also used to assess latent variables and also to weight the relationships between the statements used to determine non-observed model constructs.

3.6.2. Data management prior to data analysis

Data collected from the field for both the pilot and survey was raw and needed to be interpreted. To do this, the raw data was cleaned, coded and entered into Epi-data (version 3) and then exported and analyzed using Stata. In Stata, further editing was done to establish reliability and consistency. Callbacks were made to fill identified gaps and more cleaning was carried out as the final stage in data validation. While in Stata, demographic (Tables 4.1), and other statistical outputs were generated to establish distribution properties of the data. Several data sheets were created in Stata which include among others the main data sheet containing information obtained from the returned 445 valid responses after considering 30 cases of missing data.

3.7. ETHICAL CONSIDERATIONS

To ensure that results of the study were not compromised (Madsen 1992), and guided by scholars' principles, the researcher was scrupulously honest and did not manipulate data during collection and interpretation. The study was conducted in natural settings of the study sites. This minimized interference by the researcher with the normal flow of work.

Informed consent protocols were sought from relevant authorities in Uganda (Uganda National Council for Science and Technology in Appendix 1). By means of an introductory letter that accompanied the questionnaires (Appendix 2), respondents were informed about the purpose of the study and were assured of the safety and anonymity of the information they provided. The field coordinator and all research assistants were trained in ethical issues by the investigator.

3.8. STUDY LIMITATIONS

The study population is composed of communities in academic universities in Uganda. The sample of respondents was drawn from only eight universities of which fifty percent were government-funded and fifty percent privately owned. Respondents were selected from three faculties that were common to the eight universities which had introduced e-library services. This sampling process was designed to be random in order to minimize selection biases that could reduce the representativeness of the study sample to the study population. Despite all efforts made, it is possible that some respondents were not randomly selected. However if this was the case, the proportion was very small given the efforts made by the author to train the research assistants and supervise them.

The study used a self-reporting instrument in cross-sectional survey which at times produces distorted research findings (Lederer *et al.* 2000; Karahanna and Straub 1997 and Szajna 1996). To improve the accuracy of the data collected, triangulation using a cross-sectional survey and observation approach was employed.

The results are a good representation of the situation in Ugandan Universities, but also give some account of the situation found in DCs, by using Uganda as a proxy. The author is aware that not all developing countries have similar culture and economic constraints which limit the extent to which the findings herein can be extrapolated to other DCs. It is for these reasons that a recommendation in the concluding chapter is that other investigations to be carried out using similar instruments in other DCs. It could even be used with adaptation for a Developed country context. This is one of the proposed areas for further research in Section 6.5.

The study focused on four independent constructs of performance expectance, relevance, social influence and facilitating conditions; the dependent variable of *behaviour* intentions, usage behaviour and expected benefits and moderator variables of gender, age, experience and awareness. These may not be the only variables that influence end-users' acceptance and use of electronic library services since the model could only explain 57 percent of the variance. The model prediction level can be improved by identifying

additional constructs which were not examined by this study. Another study is being designed to include more determinants in order to improve the predictive powers of this model.

In addition to Stata and SPSS, the study was analyzed using PLS-Graph (version 2.91.03.04) for the correlation analysis a popular analysis tool for IS research in technology acceptance. Data could have been analyzed using other software packages but may not produce significantly different results. The study was limited to measuring direct relationships between constructs; future research could measure the indirect relationships.

Indeed, these were some of the limitations that may need to be considered before one applies the conclusions of this study to other context and other technologies.

3.8.1. Generalisation of findings beyond the study sample

Generalisability refers to the probability that the results of the study findings apply to other populations and other conditions (Sekaran, 2003; Mugenda 2008). Generalisation is concerned with the application of research findings to cases or situations beyond the ones covered by the study. It is the extent to which a researcher can come to conclusions about a population based on information about a sample (Hussey and Hussey 1995; Vogt 1993).

This is a standard aim in quantitative research and is normally achieved by appropaite statistical sampling procedures (Silverman 2001, 2005) and an adequate sample size. Gummesson (1991) argues that using statistics to generalise from a sample to a population is just one way of generalisation. In terms of wider generalisability, the research sampling design has to be logically developed and a number of other meticulous details in the data collection methods need to be taken in to account. A more elaborate sampling design would doubtless increase the generalisability of the results.

In this study an elaborate sampling design was used as demonstrated in Section 3.4 of this chapter. The study used a large sample of 445 respondents, and therefore results from this

study can be generalized to a broader audience. In addition, data from all respondents were further sub-divided into four sub-groups to validate the pooled model. Each of the four groups had enough data (N=122, N=323, N=210, N=235) necessary for generalisability of findings from each group.

3.9. SUMMARY AND CONCLUSION

In this chapter the researcher presented the methodologies used by the study. The methods include preliminary information gathering, the piloting of the instrument, reliability and validation of the instrument, data collection and data analysis procedures. The research instrument was piloted in two sites and showed to be reliable and valid. Results from the pilot study were presented at an international conference in Vancouver, Canada.

Data collection included a discussion of population, sample size and the survey procedure. In the data analysis section, the statistical techniques used in data analysis were examined for the purpose and benefits of the reader of this report. The minimum sample size requirement for multivariate analysis, the requirements of multivariate analysis were examined and discussed. The issue of generalisation and ethical issues were taken into consideration.

The chapter described procedures used to adapt and pilot the data collection instrument; sampling methods used to identify sample universities from which to select respondents and the software used to analyze data. The study that aimed to design a model that could measure end-users' acceptance and use of ICT services introduced in libraries, utilized quantitative and qualitative data collection methods. This enabled the study to collect quantitative data used to establish relationship between variables. The qualitative method was to be used to verify data collected by use of the self reporting survey.

Before the main survey, a pilot study was undertaken and a conceptual framework was designed. Three types of sampling designs were used to select a sample of 491 respondents from eight universities. The main data for the study were collected using a five point likert type of survey instrument which was adapted from Venkatesh *et al*.

(2003), with some modifications to cater for ICT library services and conditions prevalent in DCs. To assess content validity, the study instrument was piloted before its use in the cross-sectional survey of the 491 respondents selected from eight universities in Uganda. The questionnaire was administered to respondents by research assistants who were trained in ethical issues. Data were analysed using Stata, SPSS and PLS-Graph software for different statistical tests.

The next chapter contains a description and analysis of data and its validation. Results of the analysis from statistical packages are all presented and discussed accordingly.

CHAPTER FOUR - DATA ANALYSIS AND MODEL DESIGNING

4. INTRODUCTION

In this chapter, guided by the objectives of the study and following standards set in Chapter 3, detailed results of data analyses are presented. To find out if the sample respondents were representative of the study population according to the guidelines spelt out in Section 3.4, specifically Table 4.2**,** demographic data is analyzed. To test their internal consistency and reliability (Section 3.3), reliability coefficients were used to analyze items within the study questionnaire. Using construct validity, the study estimated how accurate the collected data represented a given construct in the study. Next, utilizing the retained constructs, the study used PLS-Graph to examine the degree to which each construct in the model was different from the others and also to measure how much variance was shared between the constructs. Structural analysis was carried out to evaluate the research model using path coefficients of each construct and squared multiple correlations (R^2) to determine how well the model fits the hypothesized relationships. Lastly, the General Linear Model (GLM) was used to find out the effects of moderator variables on the research model.

4.1. DATA EVALUATION

Respondents for this study were members of university communities in Uganda who comprised students and faculty staff. The eight universities included in this study were purposively picked because they possessed the required characteristics of availability of ICT infrastructure, equipment and facilities needed to support e-library services as illustrated in Tables 1.2 and 1.3. This was an important first step to fulfill the study objectives, taking into account that not all universities in Uganda have integrated ICT innovations in their operations.

4.1.1. The Study Population

To facilitate the selection of sites with sufficient information for this work, the researcher followed a systematic process. First, a list of registered universities was obtained from the National Council for Higher Education. Some library staff in all the registered universities were contacted to establish which ones offered electronic library services. The findings from these preliminary contacts showed that only eighteen universities had introduced e-library services. The remaining others were still in infant stages of the innovation processes or only offered Internet services to a selected number of people, or were still using a dial up system which could not allow large scale use of their services. The e-services offered tended to be limited to online journals access, Internet services and e-mail.

One other characteristic that was considered to be important in the choice of sites was ownership of the university, i.e. government or private sector. The terminology used to describe this was "government-funded" if the majority or all of the financing for the university was from the Government of Uganda or "privately-owned" if the university was financed by private individuals, groups or organizations. In this regard, the study allocated fifty percent of the sample to government-funded universities and the remaining proportion to privately-owned universities.

During the fact finding mission in November and December 2006, it was discovered that private universities differed mainly by their funding organizations for example, some were founded purely on religious basis, while some were founded as business ventures. For instance, of the four private universities studied, one (IUIU) was founded on Islamic beliefs, the second one (UMU) founded by the Catholic Church, the third one (UCU) was founded by the Protestant Church/Church of Uganda, and KIU which was founded basically as a business venture. All these elements were taken into consideration within the sample of privately-owned universities. Within the government-funded group, there was not much choice since there were a total of six and out of these, Busetema (2007) and Uganda Management Institute (2006) had just been established and could not meet the study criterion for the available ICT services. The universities selected with this

approach are listed in Table 4.1, with the four government-funded universities identified by arsterix. The table shows the year in which each university was established and the number of students and members of staff during the 2006/2007 academic year.

Table 4.1: Eight Study Universities and Number of End-Users of Library Services between April - October 2007.

University	Year Established	Under Graduates	Post Graduates	Faculty Staff	Administrative Staff	Totals
Makerere*	1922	31,390	3,000	1,061	237	**35,688**
Kyambogo*	2002	10,612	800	335	560	**12,307**
Mbarara*	1987	2,000	200	121	100	**2,421**
Gulu*	2002	3,045	150	145	107	**3,447**
IUIU	1987	2,150	130	250	180	**2,710**
UMU	1992	810	90	135	140	**1,175**
UCU	1999	5,000	200	220	250	**5,670**
KIU	2001	1,658	130	90	110	**1,988**
Total		**56,665**	**4,700**	**2,357**	**1,684**	**65,406**

To increase representativeness of the study sample to various sub-groupings, and further using stratified sampling, three common faculties in each selected university were investigated. These are Faculties of Education, Social Sciences and Science that included Computer Science. The three faculties had a total population of 28,423 library end-users which represented 40% of the study's total population (i.e. all users in the eight study universities).

Following the study guidelines in Sub-Section 3.4.1 of Chapter 3, Fisher *et al* (1983) formula in Eq. 3.6, was used to calculate the minimum number of subjects to be included in the study. The study considered p = 0.4, because the study or the number of students and staff in the chosen faculties constitute 40% of the total population across all universities, q=1-P. Since there were no authentic values of d, we adopted the value of d as 0.05 (or 5%) and likewise for the statistical significance or alpha. The minimum sample size was thus computed as:

$$n = (1.96^2 \times 0.4 \times 0.6)/0.05^2 = 368$$

However, in estimating the minimum sample size, the study took into account likely losses resulting because not all respondents would be available or willing to participate in

the study. Considering minimum response rate of 75%, the number of questionnaires which were administered to achieve the estimated minimum sample size of respondents was (100/75) x 368 = 491. It is for this reason that an additional 25% was included to the sample size. According to Bartlett *et al.* (2001), estimating response rates is not an exact science.

A target maximum sample size of 491 respondents was allocated to the selected eight universities using probability proportional to the size of the sub-groups of undergraduates, postgraduates and staff in the university population as follows: 50% of the 491 allocated to undergraduates, giving a sample of 246 undergraduate students, 30% allocated to postgraduates, giving a sample of 147 students and 20% allocated to staff, giving a sample of 98 faculty members of staff, (breakdown of the numbers in Table 4.2).

Table 4.2: Target and Sample Population

University	Faculty	Target Study Population			Study Sample Population			The Sample	
		Study strata target population by faculty			Study strata sample by faculty			Univ. Total	%
		UG	PG	Staff	UG	PG	Staff		
Makerere	Education	3,641	311	69	35	21	8	232	47
	Social Sciences	3,215	274	58	31	19	7		
	Science/Computer Science	5,337	478	244	51	33	27		
Mbarara	Education	315	26	15	3	2	2	49	10
	Social Sciences	1,234	81	22	12	6	2		
	Science/Computer Science	1,042	122	37	10	8	4		
Kyambogo	Education	1,230	105	23	12	6	3	53	11
	Social Sciences	1,086	92	38	11	6	4		
	Science/Computer Science	503	61	22	5	4	2		
KIU	Education	914	56	24	9	4	3	27	5
	Social Sciences	233	17	32	2	1	4		
	Science/Computer Science	114	16	18	1	1	2		
UMU	Education	103	16	8	1	1	1	18	4
	Social Sciences	200	23	15	2	2	2		
	Science/Computer Science	187	53	27	2	4	3		
IUIU	Education	204	35	17	2	2	2	20	4
	Social Sciences	415	21	30	4	1	3		
	Science/Computer Science	214	19	28	2	1	3		
Mukono	Education	392	14	18	4	1	2		

University	Faculty	Target Study Population			Study Sample Population			The Sample	
		Study strata target population by faculty			Study strata sample by faculty			Univ. Total	%
		UG	PG	Staff	UG	PG	Staff		
	Social Sciences	1,536	46	26	15	3	3	51	10
	Science/Computer Science	1,297	69	45	13	5	5		
Gulu	Education	239	39	11	2	3	1	41	9
	Social Sciences	939	99	21	9	7	2		
	Science/Computer Science	792	92	28	8	6	3		
Totals		***25,382***	***2,165***	***876***	***246***	***147***	**98**	***491***	**100**
Percentages		***89***	***8***	***3***	***50***	***30***	***20***	***100***	**100**

A total of 491 questionnaires were administered to the study sample in the three faculties of the eight universities according to the sample distribution guidelines in Table 4.3. At the end of the data collection exercise, 475 questionnaires had been filled and returned, representing 97 per cent of the total administered questionnaires. The collected data was then cleaned, edited, and entered in Epi Data software for exportation to Stata software for analysis.

4.1.2. Data Screening

Sixteen (16) completed questionnaires were excluded because they were from respondents outside the sampling frame: They were not from the three faculties that were pre-selected as the source of respondents in the universities. Prior to data analysis Stata was used to check for accuracy of data, missing values, outliers and normality. In so doing 11 questionnaires were found invalid due to unreliable responses. Three (3) questionnaires had insufficient data to qualify them for inclusion in the study. In total, data from 445 questionnaires were found valid and used for the study.

4.1.3. Demographic Characteristics of Respondents

Of 445 completed and valid questionnaires, 165 (37%) were from female respondents. All respondents were aged between 18 and 60 years old and had all gone through Uganda Advanced Certificate of Education, an education level accepted at all universities in Uganda. A complete analysis of respondents' characteristics is summarised in Table 4.3.

Table 4.3: Demographic Characteristics of Respondents

Categorization	Total Response	Type		Frequency	%
University	445	Public	Gulu University	40	9
			Kyambogo University	37	8
			Makerere University	210	47
			Mbarara Univ. of Sc. and T.	36	8
		Private	Islamic Univ. In Uganda	15	3
			Kampala International Un.	27	6
			Uganda Christian Univ.	46	10
			Uganda Martyrs Univ.	34	7
Faculty	445	Education		115	26
		Science and Computer Science		219	49
		Social Sciences		111	25
Gender	443	Female		165	37
		Male		278	63
Age Group	442	18-24		198	45
		25-34		160	36
		35-44		58	13
		45-60		26	6
Status	445	Academic Staff		122	28
		Post Graduate Student		100	22
		Undergraduate Student		222	50
Education Level	405	Ph. D.		27	6
		Master's Degree		93	21
		Bachelor's Degree		174	39
		Advanced Level Certificate		111	25
Ownership of Computer or Laptop	445	Yes		254	57
		No		191	43
Computer Skills	445	Yes		227	51
		No		218	49

It should be observed from Tables 4.2 and 4.3 that there are some discrepancies between the proposed proportional sample size allocations and the actual number of responses especially among academic staff respondents. The study had estimated a sample of 98 members of academic staff. However, when data was screened after the questionnaires had been returned, cleaned and edited, 122 respondents had classified themselves as academic staff. This discrepancy is because in the sampled universities, many graduate students also carry on duties of faculty academic staff. Thus, some graduate students responded to Q103 of Section 1 of the questionnaire, by categorising themselves as

faculty academic staff. Incidentally, the researcher did not envisage this anomaly. Most importantly, is the fact that respondents processed the necessary qualities needed to answer the questions for academic staff. In research, over sampling does not make the findings invalid (Salkind, 1997 and Fink, 1995) as long as it does not have a significantly large effect on the results, as in this case. The researcher therefore could not find a reason to eliminate these respondents' data.

4.1.4. Status of ICT in Ugandan Universities Library Services

Awareness of available ICTs facilities is a key pre-condition towards adoption, usage and benefiting from e-library services. In an effort to establish if library end-users knew that ICT library services were being offered, respondents were asked to indicate whether 18 types of ICT hardware facilities existed in their universities or not. About fifty percent of respondents indicated that ICT hardware facilities and services were available in their university libraries as illustrated in Table 4.4 and 4.5. Table 4.4 below is a list of ICT hardware found in the sample universities to facilitate e-library services.

Table 4.4: Availability of the ICTs Hardware in the Sample University Libraries

S/No	ICT HARD WARE	YES %	NO %	NOT SURE %
1	Computers (N=442)	97.7	1.58	0.68
2	CD-ROM Readers/writers (N=438)	55.9	15.5	28.5
3	Networked Servers (N=437)	70.9	11.9	17.2
4	Printers (N=439)	61.7	25.5	12.8
5	Photocopying Machines (N=436)	78.9	14.7	6.4
6	Local Area Network (LAN) (N=435)	72.4	8.0	19.6
7	World Wide Web (www) (N=440)	78.2	10.2	11.6
8	Generator to supply electricity (N=432)	87.7	9.9	5.4
9	Book Check Systems (N=435)	42.9	24.4	32.7
10	Security Check Systems (N=433)	40.7	29.3	30.0
11	Bar code readers (N=431)	12.3	35.9	51.7
12	Microfilm readers (N=431)	9.7	43.4	46.9
13	Photo Cameras (N=426)	18.1	47.4	34.5
14	TV Stations (N=434)	9.7	66.6	23.7
15	Laptops (N=435)	26.9	49.4	23.7
16	Scanners (N=429)	39.2	37.1	23.7
17	LDC Projector (N=429)	33.3	30.1	36.6
18	Video Cameras (N=438)	14.2	52.5	33.3

During the fact finding mission, the researcher observed that not all e-library services offered by respective universities were known to end-users especially services that enhance library collections like digitization, microfilming and interlibrary loan services, other than those where end-users were directly involved. These disparities are shown by the differences in results from the observation exercise as summarised in Tables 1.2 and 1.3 from those shown in Tables 4.4 and 4.5 arising from respondents' data. Table 4.5 below is a list of library services currently offered by the sampled university libraries as reported by respondents.

Table 4.5: ICT Services Offered by Ugandan University Libraries

S/No	TYPE OF SERVICE	YES %	NO %	NOT SURE %
1	Internet web browsing services (N=443)	85.1	8.8	6.1
2	E-mail services (N=445)	88.5	7.6	3.9
3	Full text journals articles (N=441)	65.8	11.7	22.5
4	Printing Services (N=437)	65.5	22.9	11.6
5	Photographic Services (N=439)	84.1	9.7	6.2
6	CD-ROM Services (N=434)	55.1	14.3	30.6
7	Library Website (N=435)	55.9	25.9	18.2
8	Online Public Access Catalogue (N=439)	47.4	17.8	34.8
9	Electronic Books (N=432)	44.6	25.7	29.7
10	Book Reservation and recall (N=432)	44.2	18.5	37.3
11	Bibliographic databases (N=428)	42.3	18.4	39.3
12	E-Reference and Inform. Services (N=433)	40.7	19.8	39.5
13	Current Awareness Services (N=429)	38.2	20.1	41.7
14	End Users Training Programme (N=434)	33.9	26.7	39.4
15	Indexing and Abstracting Services (N=428)	32.7	19.6	47.7
16	Document Scanning Services (N=431)	32.3	31.6	36.1
17	Selective Dissemination of Inform. (N=428)	25.7	21.0	53.3
18	E-Document Delivery Services (N=427)	19.4	33.0	47.6
19	E-Document Reserve Services (N=427)	16.4	28.1	55.5
20	Digitization Services (N=433)	13.9	35.3	50.8
21	Bar Coded Circulation Services (N=424)	10.4	29.3	60.3
22	E-Interlibrary loan Services (N=428)	9.1	42.1	48.8
23	Microfilming (N=431)	7.8	36.7	55.5

4.1.5. Statistical Reliability of Items/Indicators

An evaluation of indicators in the study constructs was carried out to analyze their reliability. Using Stata (Version 9), the study examined all items/indicators for the following: mean, standard deviation, skewness, Kurtosis and Shapiro-Wilk test statistic

with the corresponding level of significance. By definition, the mean is the average of the measurements over the sample or the population, symbolically presented as:

$$mean = \bar{x} = \frac{\sum measurement\ of\ individual\ i}{sample\ size}. \qquad \text{Eq. 4.1}$$

The mean together with other statistics like Skewness and Kurtosis was used purposively to establish the distribution of the indicators under study.

Skewness is a measure of symmetry of a distribution and Kurtosis is the peakedness of the distribution. A negative skewness value indicates that the distribution is skewed to the left while a positive skewness value implies that the distribution is skewed to the right. The fundamental formula used for computing the statistic is:

$$skewness = \frac{\sum_{i=1}^{n}(measurement\ of\ individual\ i - mean)^3}{(sample\ size - 1)S^3} \qquad \text{Eq. 4.2}$$

Where S is the standard deviation, and n is the number of data points that range from 'i' to 'n'. The skewness for a normal distribution is zero, and any symmetric data should have skewness near zero. Negative values for the skewness indicate that the data are skewed left and positive values for the skewness indicate data that are skewed right. By skewed left, one means that the left tail is long relative to the right tail. Similarly, skewed right means that the right tail is long relative to the left tail.

Kurtosis measures the relative peakedness of the mean in a distribution. The high kurtosis value is associated with a high peak near the mean with a heavy tail in one direction whereas low kurtosis is associated with a flat top near the mean. Symbolically, the kurtosis statistic is stated as follows:

$$kurtosis = \frac{\sum_{i=1}^{n}(measurement\ of\ individual\ i - mean)^4}{(sample\ size - 1)S^4} \qquad \text{Eq. 4.3}$$

Where *S* the standard deviation, n is the number of data points. Kurtosis mainly measures the peakedness of the distribution. It is a statistical practice that whenever skewness approaches zero, kurtosis should approach 3.

Low values of skewness (Column 5 of Table 4.6), kurtosis and Shapiro-Wilk test statistic are associated with high probability values indicating a normal distribution for the construct variable in question, which is the case in this study, as illustrated in Table 4.6. For skewness, we look at values between -3 and +3. From the table 4.6, all the item values are normal under the Z scores. For the kurtosis we look at values between – 4 and +4 (Joanes and Gill 1998).

According to Moran (2006) and Hair *et al*. (1998), data in psychometric studies is often not normally distributed. Results of cross-sectional survey data analysis in Table 4.6 illustrate that most study indicators are normally distributed (p-value < 0.1). For example, Aw1 (with mean=2.52, kurtosis=2.02, Skewness=0.46 & Shapiro Wilk=0.98) indicates that Aw1 is normally distributed at 1 percent level of significance. Likewise, the variable Aw2 (with mean=2.95, kurtosis=2.02, Skewness=0.15 & Shapiro Wilk=0.99) is normally distributed at 5 percent of significance. This is an indication that the construct is valued and appropriate to the study.

The preceding analysis is interpreted to mean that, according to Aw1 responses to the question "I came to know about electronic library services offered by the university because of the important role they play in an academic environment" were evenly distributed. While some respondents knew about the existence of electronic library services due to the fact that the services were important, an equal number of respondents did not know about the e-library services.

Similary, for the Pe construct, three indicators in the construct were normally rated (3.11, 2.83 & 3.84) and two indicators were highly rated (4.36 & 4.32). This is an indication

that as far as end-users of e-library services were concerned, the performance of the services was positive a little bit above their normal expectations.

Furthermore, results of analysis of the constructs in the study indicate that Aw, Si, Fc and Bi were normality distribution. These analyses results demonstrate three aspects, first is that the information contained in the each of the four constructs indicatiors which show normal distribution are representative and we can use them to make inference about the population. Secondly, the normality of the indicators facilitates further analysis without any transformation. Lastly, this indicates that the sample size was scientifically and appropriately collected with minimum errors.

Despite the fact that there are some variables (highlighted) such as Pe1, Pe5, Re5, Eb3 and Ub5 whose kurtosis are non-normal (above the – 4 and + 4 zone). It is assumed that the few non-normal score values will not significantly affect the outcome of the study results. Besides, there are more subsequent analyses that will be undertaken to establish the reliability of each indicator before the final model is developed.

This phenomenon is contrary to other studies of technology acceptance (Moran 2006; Compeau *et al.*1999). The normality of results can be explained by the fact that in some universities studied, which have e-library services, the extent of offer and usage of services is not well distributed or known to end-users whereas in other studies (Moran 2006; Hair *et al.* 1998) respondents would have adequate access to the technology studied. The current scenario created double tailed distribution, in that respondents with sufficient access and use nearly equaled those with insufficient access and usage, creating a normal distribution of data. This is observed in Columns 5 and 6 of Table 4.6 that shows skewness and kurtosis.

Table 4.6: Statistical Reliability of Item Indicators

Variables	Number	Mean	Standard Deviation	Skewness	Kurtosis	Shapiro-Wilk
Awareness						
Aw1	438	2.52	1.30	0.46	2.02	0.98*
Aw2	440	2.27	1.28	0.74	2.44	0.97*
Aw3	437	2.95	1.28	0.15	1.89	0.99**
Aw4	437	3.00	1.42	-0.01	1.65	0.98*
Aw5	364	3.65	1.31	-0.65	2.18	0.97*
Performance Expectance						
Pe1	443	1.88	1.04	1.31	**4.36**	0.94*
Pe2	441	2.01	1.07	0.91	3.11	0.97*
Pe3	434	2.12	1.14	0.82	2.83	0.97*
Pe4	429	1.98	1.05	1.13	3.84	0.95*
Pe5	431	4.14	1.05	-1.33	**4.32**	0.94*
Relevance						
Re1	440	2.78	1.27	0.19	1.98	0.99
Re2	445	1.96	0.99	1.08	3.96	0.96*
Re3	440	2.39	1.26	0.49	2.11	0.98*
Re4	433	2.58	1.23	0.29	2.05	0.99**
Re5	427	1.82	1.01	1.31	**4.38**	0.95*
Re5	413	2.72	1.44	0.33	1.75	0.98*
Social Influence						
So1	437	3.12	1.25	-0.09	1.92	0.99
So2	435	2.90	1.27	0.10	1.91	0.99
So3	432	2.47	1.23	0.55	2.36	0.98*
So4	430	2.85	1.27	0.21	1.96	0.99**
Facilitating Conditions						
Fc1	439	2.56	1.18	0.55	2.47	0.98*
Fc2	438	2.06	0.98	0.92	3.55	0.97*
Fc3	431	2.43	1.12	0.50	2.66	0.99*
Fc4	432	3.00	1.34	-0.03	1.80	0.99
Fc5	433	3.06	1.28	-0.02	1.89	0.99
Fc6	431	2.75	1.23	0.22	2.09	0.99*
Fc7	430	3.83	1.20	-0.87	2.84	0.97**
Behaviour Intentions						
Bi1	433	2.80	1.38	0.22	1.81	0.99
Bi2	426	2.83	1.36	0.17	1.82	0.99*
Bi3	428	2.79	1.38	0.26	1.82	0.99*
Bi4	427	2.64	1.38	0.37	1.92	0.99*
Bi5	367	2.15	1.29	0.94	2.74	0.96*
Expected Benefits						
Eb1	435	2.00	1.09	1.04	3.40	0.96*
Eb2	436	2.16	1.14	0.81	2.81	0.97*

Variables	Number	Mean	Standard Deviation	Skewness	Kurtosis	Shapiro-Wilk
Eb3	436	1.93	1.07	1.25	**4.07**	0.94*
Eb4	434	2.52	1.28	0.49	2.17	0.98*
Eb5	431	2.47	1.22	0.47	2.25	0.98*
Eb6	425	2.52	1.24	0.42	2.16	0.98*
Usage Behaviour						
Bu1	435	1.92	0.95	0.94	3.55	0.97*
Bu2	434	2.13	0.93	0.58	3.00	0.98*
Bu3	430	2.13	1.00	0.73	3.08	0.97*
Bu4	434	2.59	1.22	0.33	2.19	0.99
Bu5	435	1.72	0.84	1.38	**5.51**	0.94*
Bu6	435	2.60	1.15	0.36	2.42	0.99
Bu7	431	4.02	1.04	-0.91	3.22	0.97*
Bu8	427	3.88	1.11	-0.78	2.82	0.98*

Note:

* $p < 0.01$ ** $p < 0.05$ *** $p < 0.1$ No significance

After examining the normality of all indicators as demonstrated in the previous discussion, the study went on to establish the reliability of the construct that contains several iindicators, as illustrated in the subsequent section.

4.1.6. Scale Reliability Analysis

After establishing the normality of the data (Table 4.6), reliability analysis was carried out, (Also see Section 3.3.a). Reliability analysis was computed, using Eq. 3.1, to show the reliability of the data for each variable. In research, reliability is affected by a random error (Mugenda 2008; Amin 2005). As the random error in the data increases, reliability of the data decreases and *vice versa.* Errors arise from several factors such as inaccurate coding of data, ambiguous instruments used, investigator or respondents' fatigue and investigator's bias among others. In order to increase the reliability of the study findings, the current investigation minimized random errors by using multiple sampling procedures as described in Sub-Section 3.2.2, c, and the analytical results are presented in Table 4.7.

Forty six statements (herein also referred to as indicators) in the questionnaire, formed seven study constructs and one moderator (Table 4.7, Columns 1 and 2). Table 4.7 contains measures of scale reliabilities for various construct variable groups before

(Columns 2 and 3) and after (Columns 4 and 5) the analysis. Columns 2 and 3 contain the number of indicators and the corresponding reliabilities before subjecting them to the reliability test. However, the results from the reliability test indicate that some of the items were dropped because of low inter-item correlation and less cohesiveness to the construct. For example, Aw initially had 5 indicators with group reliability coefficient of 0.58. However, only 2 indicators with higher group reliability were retained after the analysis. This means that, the two indicators which are left can sufficiently explain how aware respondents are in respect to e-library services without loss of statistical information. The same argument can be extended to the remaining constructs.

As observed in Column 5 of Table 4.7, Cronbach's Alpha coefficient is higher than 0.7 for measurements of performance expectance, behaviour intentions, usage behaviour and expected benefits, and higher than 0.6 for measurement of awareness, relevance, social influence, and facilitating conditions. According to Peterson (1994), measurement scales with two or three items tend to have weaker reliability than the ones with more than three items. In this respect, awareness, relevance, social influence, and facilitating conditions constructs have only two or three items and given that the correlation between the items is significant, we considered them reliable (see Teo *et al.* 1999). Results from all study constructs' reliability coefficients range from 0.61 to 0.91 as illustrated in Column 5 of the Table 4.7 and meet acceptable technology acceptance theory and practice (Zhang *et al.* 2006; Moran 2006).

Table 4.7: Scale Reliability Analysis Results

	Before factor Analysis		**After factor Analysis**	
Construct	**Number of Questions**	**Reliability of the group**	**Retained constructs**	**Grouped alpha**
Awareness of the e-library services	5	0.58	2	0.65
Performance Expectancy	5	0.77	2	0.76
Relevance of e-library services	6	0.62	3	0.66
Social Influence	4	0.67	3	0.64
Facilitating Conditions	7	0.60	5	0.61
Behavioural Intentions	5	0.83	4	0.91
Behaviour Usage	8	0.81	6	0.70
Expected Benefits	6	0.79	3	0.77

4.1.7. Estimating the Validity of the Constructs

Validity is defined as the degree to which an instrument measures what it is supposed to measure (Mugenda 2008; Amin 2005). Validity establishes the relationships between the data and the constructs within the study and estimates how accurate the collected data represents a given construct in the study. If the study data is a true reflection of the variable, then inferences based on that data would be accurate and meaningful. According to Mugenda 2008, Amin 2005 and others, no data can have perfect validity.

Data can be validated in three ways namely; construct validity, content validity and criterion-related validity. This investigation used construct validity as explained in the following narrative.

Construct validity refers to the degree to which any measure assesses the underlying theoretical construct it is supposed to measure (Cronbach 1951; Straub *et al.* 2004). The study evaluated construct validity by performing the principal component analysis and factor analysis as discussed by Venkatesh *et al.* (2003) and Straub *et al.* (2004) and results are presented in Columns 4 and 5 of Table 4.7. Besides that, during the preparation of the instrument, construct indicators were reviewed by the researcher together with her academic supervisors. Moreover, the instrument was piloted to ascertain the information flow and identify any missing gaps as described by Straub *et al.* (2004) and was further redefined during an International Joint Conference on Digital Libraries. The survey indicators were based on most of the statements from the works of Moran (2006); Anderson and Schwager (2004); and Venkatesh *et al.* (2003). According to the pilot study findings, the instrument was found reliable and valid.

4.1.8. Reliability of the model's constructs

Table 4.8 illustrates results of all indicators together with inter-test correlation which was obtained from the Cronbach alpha statistic. In statistical sense and practice, a correlation coefficient of over 0.60 is considered to show a reasonable measure of agreement between the two variables in question. Secondly, Cronbach Alpha compensates and

adjusts for overlapping responses. Expressed as a function of the number of test items and the average inter-correlation among the items, the basic formula for average inter-item correlation derived from Cronbach alpha is:

$$\bar{r} = \frac{no.of\ items\,(1-\alpha)+\alpha}{\alpha} \qquad \text{Eq. 4.4}$$

Where $\bar{r}$ is the average inter-item correlation among the items. One can see from this formula that if you increase the number of items, you increase Cronbach Alpha and the average inter-item correlation. On the contrary, if the average inter-item correlation is low, alpha will be low. This makes sense intuitively if the inter-item correlations are high, then that is evidence that the items are measuring the same underlying construct. That is what is meant when someone says they have "high" or "good" reliability. This refers to how well the item measures a single unit-dimensional latent construct. In simple terms, high inter-item correlation reflects greater agreement among respondents.

Standard correlation, raw alpha, standard alpha coefficients, also determines group raw alpha and group standard alpha respectively. This was analysed and results are presented in Table 4.8. With the exception of awareness, a moderator, the seven constructs have group and standard alpha greater than 0.60, a level that is considered acceptable (Moran 2006 and Gerfen and Straub 2005) and met the reliability requirements. Awareness, as a moderator, has a tolerable group alpha of 0.58 which is above 50% and is acceptable, more especially since the variables weighted significantly in other measures.

This implies that most of the study indicators satisfy the group reliability test but a few of them fall short on individual alpha. For example, Aw1, Aw2 and Aw4 did not pass the reliability test because of giving individual alpha less than the average of 0.5 (Column 3 of Table 4.8). This implies that not all construct items are significant to the construct. There may be greater cohesiveness among some of the variables than others.

Table 4.8: Reliability Coefficients of **Aw, Pe, Re, Fc, Si, Bi, Ub and Eb Construct Indicators

Variables	Inter-test correlation	Standard Alpha	Group Alpha
Awareness (Aw)			
Aw1	0.66	0.48	0.58
Aw2	0.66	0.48	
Aw3	0.47	0.61	
Aw4	0.71	0.46	
Aw5	0.55	0.55	
Performance Expectance (Pe)			
Pe1	0.73	0.71	0.77
Pe2	0.79	0.69	
Pe3	0.76	0.70	
Pe4	0.74	0.72	
Pe5	0.50	0.82	
Relevance (Re)			
Re1	0.60	0.62	0.62
Re2	0.71	0.53	
Re3	0.68	0.57	
Re4	0.59	0.62	
Re5	0.59	0.59	
Re6	0.43	0.69	
Social Influence (Si)			
Si1	0.76	0.53	0.67
Si2	0.78	0.51	
Si3	0.61	0.69	
Si4	0.67	0.64	
Facilitating Conditions (Fc)			
Fc1	0.62	0.52	0.60
Fc2	0.47	0.58	
Fc3	0.63	0.50	
Fc4	0.52	0.59	
Fc5	0.55	0.57	
Fc6	0.59	0.55	
Fc7	0.33	0.64	
Behaviour Intentions (Bi)			
Bi1	0.85	0.75	0.83
Bi2	0.89	0.74	
Bi3	0.89	0.73	
Bi4	0.83	0.76	
Bi5	0.33	0.91	

Variables	Inter-test correlation	Standard Alpha	Group Alpha
Usage Behaviour (Ub)			
Ub1	0.77	0.77	0.81
Ub2	0.75	0.78	
Ub 3	0.74	0.78	
Ub 4	0.61	0.81	
Ub 5	0.64	0.80	
Ub 6	0.55	0.82	
Ub 7	0.55	0.82	
Ub 8	0.55	0.82	
Expected Benefits (Eb)			
Eb1	0.67	0.77	0.79
Eb2	0.78	0.73	
Eb3	0.69	0.76	
Eb4	0.65	0.78	
Eb5	0.71	0.76	
Eb6	0.71	0.76	

Note:

Aw	Awareness	Fc	Facilitating conditions
Bi	Behavioural intentions	Pe	Performance expectance
Bu	Behavioural Usage	Re	Relevance
Eb	Expected benefits	Si	Social influence
Aw2	Indicator 2 of awareness	Fc2	Indicator 2 of facilitating conditions
Bi2	Indicator 2 of behavioural intentions	Pe2	Indicator 2 of performance expectance
Bu2	Indicator 2 of behavioural usage	Re2	Indicator 2 of relevance
Eb2	Indicator 2 of expected benefits	Si2	Indicator 2 of social influence
	Question/item/statement/indicator	Used interchangeably in this study	

In order to reduce the dimensionality of the study variables without major loss in information, a technique called factor analysis was employed. Results of the analysis using the technique are presented in subsequent Sub-Section 4.2.9, Table 4.9.

4.1.9. Factor Analysis of Variables for the Research/Pooled Model

Factor analysis is a technique used to reduce the dimensionality of data without losing vital statistical information. It is also used to express some variables (observable variable) as linear combinations of factors (latent variables). Methodologically, a linear factor model relates to the response variable (or the questions/indicators or item questions on

likert scale) to the values of a limited number of factors, with the relationship described by a linear equation. In its generic form, it is written as:

$$observable\,\text{var}\,iable = r_i = \alpha_{i1} f_1 + \alpha_{i2} f_2 + ... + \alpha_{im} f_m + \varepsilon_i \qquad \text{Eq. 4.5.}$$

where:

r_i = the observable variable to be assigned to the factors i
α_{i1}= the change in the response variable i per unit change in factor 1
f_1 = the value of factor 1
α_{i2} = the change in the response variable i per unit change in factor 2
f_2 = the value of factor 2
f_m = the value of factor m
α_{im} = the change in the return on asset i per unit change in factor m
m = the number of factors
e_i = the portion of the response variable i not related to the m factors

The dimensionality of the 46 indicators which made up the survey instrument used to determine the latent constructs were analysed. This resulted in the removal of **eighteen** indicatiors, retaining only twenty eight. Each indicator in the study constructs was evaluated for internal consistency (IC) within the model. If any indicator with IC less than 0.7, they were removed and the ICs were recalculated. The next lowest indicator IC, if it is lower than 0.7 was also removed and recalculation process was repeated. The process continued until no IC factor for one construct was less than 0.7. The iterative process for all the constructs is displayed in Table 4.9.

Based on the above factors, the research/pooled model was analyzed and retained indicators with factor loadings greater than 0.7, considered to explain over 50 percent of the variations in a particular measure (Moran 2006; Gerfen and Straub 2005). An indicator with factor loading greater than 0.7 shows a significant relationship with its associated construct (Chin 1996). Results of analysis in Table 4.9, (Column 5) attest to this fact after the fourth loading which is between 0.70 and 0.94 variance. Considering

the research/pooled model, the retained indicators (28) together with their constructs are illustrated in Column 6 of Table 4.9. The final research model has 28 indicators which are used to design the model as observed in Figure 4.4.

Table 4.9: Factor analysis and weights of the retained indicators for the pooled Model

Scale items	Initial Loadings	Second Loadings	Third Loadings	Fourth Loadings	Weights/ Scores
Performace Expectance (Pe)					
Pe1	0.75	0.81	0.87	0.92	0.54
Pe2	0.82	0.86	0.90	0.92	0.54
Pe3	0.56	0.56	0.51	DRD_3	
Pe4	0.55	0.51	DRD_2	DRD_2	
Pe5	0.55	DRD_1	DRD_1	DRD_1	
Relevance (Re)					
Re1	0.62	0.62	0.67	0.72	0.39
Re2	-0.05	DRD_1	DRD_1	DRD_1	
Re3	0.67	0.67	0.75	0.81	0.44
Re4	0.80	0.80	0.82	0.80	0.43
Re5	0.65	0.64	0.58	DRD_3	
Re6	0.60	0.60	DRD_2	DRD_2	
Social Influence (Si)					
So1	0.86	0.86	0.86	0.86	0.32
So2	0.84	0.84	0.84	0.84	0.31
So3	0.84	0.84	0.84	0.84	0.31
So4	0.70	0.70	0.70	0.70	0.26
Facilitating Conditions (Fc)					
Fc1	0.92	0.92	0.92	0.92	0.28
Fc2	0.82	0.84	0.84	0.84	0.25
Fc3	0.64	0.65	DRD_2	DRD_2	
Fc4	0.73	0.75	0.77	0.77	0.23
Fc5	0.76	0.76	0.78	0.78	0.23
Fc6	0.63	DRD_1	DRD_1	DRD_1	
Fc7	0.71	0.71	0.72	0.72	0.21
Behaviour Intentions (Bi)					
Bi1	0.91	0.91	0.91	0.91	0.27
Bi2	0.91	0.92	0.92	0.92	0.27
Bi3	0.90	0.90	0.90	0.90	0.27
Bi4	0.89	0.89	0.89	0.89	0.27
Bi5	0.24	DRD_1	DRD_1	DRD_1	
Expected Benefits (Eb)					
Eb1	0.70	0.76	0.84	0.89	0.40
Eb2	0.80	0.86	0.92	0.94	0.42

Scale items	Initial Loadings	Second Loadings	Third Loadings	Fourth Loadings	Weights/ Scores
Eb3	0.71	0.71	0.73	0.72	0.32
Eb4	0.72	0.69	0.58	DRD_3	
Eb5	0.69	0.65	DRD_2	DRD_2	
Eb6	0.59	DRD_1	DRD_1	DRD_1	
Usage Behaviour (Ub)					
Bu1	0.55	DRD_1	DRD_1	DRD_1	
Bu2	0.62	0.61	DRD_2	DRD_2	
Bu3	0.73	0.73	0.70	0.70	0.18
Bu4	0.72	0.71	0.72	0.72	0.18
Bu5	0.80	0.81	0.83	0.83	0.21
Bu6	0.87	0.88	0.89	0.89	0.23
Bu7	0.79	0.81	0.82	0.82	0.21
Bu8	0.76	0.77	0.79	0.79	0.20
Awareness (Aw)					
Aw1	0.75	0.80	0.83	0.87	0.57
Aw2	0.29	DRD_1	DRD_1	DRD_1	
Aw3	0.73	0.78	0.81	0.87	0.57
Aw4	0.63	0.57	0.58	DRD_3	
Aw5	0.47	0.44	DRD_2	DRD_2	

Note:

**The subscript of the DRD_i indicates the iterative order in which the indicator was dropped*

From Table 4.9 one observes that, initially, performance expectance (Pe) construct (see Column 1) had 5 statements marked Pe1, Pe2, Pe3, Pe4 and Pe5 starting from the second row of the table. The five indicators arise from Q302 of the questionnaire (Appendix 3, Section 3). For example, Pe1 represents indicator one: "I find electronic library services useful for my teaching/study/research." Of the five indicators in the construct, three (Pe3, Pe4, Pe5) were dropped. The first indicator to be dropped according to Table 4.9, column 3 was indicator Pe5 during the second loading. After the third loading, indicator Pe4 was dropped the indicator Pe3 was dropped after the fourth loading, leaving two indicators (Pe1 and Pe2) which had acceptable standard of 0.92 with a weight score of 0.54.

Generally, the retained indicators contain relatively the same information as the original number of variables. For example, performance expectance originally had five indicators and only two were retained after factor analysis, implying that the two items significantly

explain great variability of the construct without loss of information. The same explanation or reasoning can be extended to other constructs and its associated indicators.

Results in column 6 of the table contain equally useful information, in that the weights or factor scores are eventually used to calculate the quantities of latent variables. For example, the quantities for the performance expectancy construct (Pe) can be computed as Performance expectance construct = Pe1 0.54 + Pe2 0.54. The two indicators are the ones which later contributed to the study model in Figure 4.4 for the Pe construct. This analysis was carried out on all the five sample models, and the results are summarized in Table 4.10.

The study identified five sample models based on homogenous groupings of the study population which were defined in Section 3.8.1**.** The sample models are:

i) Pooled model, comprising all respondents, i.e. n=445 respondents.
ii) Academic staff model, consisting of respondents who were employees of the universities, as academic staff, i.e. n=122 respondents.
iii) Students model, postgraduate and undergraduate students at the universities were grouped into this model, n=323 respondents
iv) Makerere University model, comprising all respondents from this university, n=210 respondents
v) Other universities model, grouping of respondents from universities other than Makerere university, i.e. n=235 respondents

Table 4.10 provides summaries of all the sample models of Table 4.9 indicating results after the fourth loading and associated weights of each remaining indicator. The number of indicators left for each construct are the ones seen e.g. in Figure 5.2 for the staff model, Figure 5.3 for the students' model, Figure 5.4 for Makerere University Model and Figure 5.5 for the Other Seven Universities' model.

Table 4.10: Retained Scale Items and Factor Loadings for all Defined Five Models

Construct	Scale Items	Research/ Pooled Model		Staff Model		Students' Model		Makerere University Model		Other Universities Model	
		LDS	WTS	LDS	WTS	LDS	WTS	LDS	WTS	LDS	WTS
Performance Expectancy	Pe1	0.92	0.54			0.92	0.54	0.96	0.39		
	Pe2	0.92	0.54	0.71	0.41	0.92	0.54	0.95	0.39		
	Pe4			0.79	0.45			0.75	0.31	0.85	0.58
	Pe5			0.77	0.44					0.85	0.58
Relevance	Re1	0.72	0.39	0.83	0.25					0.76	0.41
	Re3	0.81	0.44	0.83	0.25	0.87	0.57	0.91	0.54	0.80	0.43
	Re4	0.80	0.43	0.84	0.26	0.87	0.57	0.91	0.54	0.78	0.42
	Re5			0.80	0.24						
	Re6			0.70	0.21						
Social Influence	So1	0.86	0.32	0.87	0.27	0.90	0.41	0.94	0.39	0.83	0.30
	So2	0.84	0.31	0.96	0.30	0.81	0.38	0.89	0.37	0.84	0.30
	So3	0.84	0.31	0.83	0.26	0.86	0.35	0.83	0.35	0.86	0.31
	So4	0.70	0.26	0.90	0.28					0.77	0.28
Facilitating Conditions	Fc1	0.92	0.28	0.95	0.23	0.91	0.33	0.95	0.39	0.93	0.26
	Fc2	0.84	0.25	0.95	0.23	0.81	0.29	0.96	0.39	0.81	0.23
	Fc4	0.77	0.23	0.84	0.20	0.78	0.28	0.76	0.31	0.82	0.23
	Fc5	0.78	0.23	0.83	0.20	0.78	0.28			0.84	0.24
	Fc7	0.72	0.21	0.91	0.22					0.76	0.21
Behaviour Intentions	Bi1	0.91	0.27	0.96	0.28	0.88	0.27	0.84	0.28	0.94	0.27
	Bi2	0.92	0.27	0.90	0.26	0.93	0.28	0.84	0.28	0.95	0.27
	Bi3	0.90	0.27	0.91	0.26	0.91	0.27	0.87	0.29	0.92	0.26
	Bi4	0.89	0.27	0.92	0.26	0.88	0.26	0.86	0.29	0.90	0.25
Expected Benefits	Eb1	0.89	0.40			0.88	0.39	0.97	0.37	0.71	0.28
	Eb2	0.94	0.42			0.94	0.42	0.97	0.37	0.84	0.33
	Eb3	0.72	0.32			0.74	0.33	0.85	0.32		
	Eb4			0.85	0.35					0.80	0.31
	Eb5			0.94	0.39					0.80	0.32
	Eb6			0.88	0.36						
Behaviour usage	Ub2			0.75	0.15						
	Ub3	0.70	0.18			0.73	0.22			0.75	0.18
	Ub4	0.72	0.18	0.89	0.18					0.76	0.19
	Ub5	0.83	0.21	0.97	0.20	0.79	0.23			0.86	0.21
	Ub6	0.89	0.23	0.96	0.19	0.88	0.26	0.97	0.37	0.88	0.22
	Ub7	0.82	0.21	0.96	0.19	0.82	0.25	0.96	0.36	0.80	0.20
	Ub8	0.79	0.20	0.81	0.16	0.81	0.24	0.85	0.32	0.81	0.21
Awareness	Aw1	0.87	0.57	0.74	0.44	0.89	0.55	0.80	0.46	0.89	0.56
	Aw3	0.87	0.57	0.79	0.46	0.89	0.55	0.73	0.42		
	Aw4			0.70	0.42			0.74	0.43	0.89	0.56

Note:

LDS = Loadings *WTS = Weights*

Results in Table 4.10 demonstrate and show indicators which satisfied the required tests and were adopted and used information contained in them to generate the latent construct quantities and subsequently design the model as illustrated in the sections that follow.

4.2. VALIDATION OF THE STUDY MODEL CONSTRUCTS

Consequently, retained indicators were evaluated in their construct groupings. Construct validity was carried out to evaluate the extent to which the examined indicators represented the theoretical latent construct, (Hair *et al.* 2006). Construct validity can be evaluated in three ways, namely; convergent validity, discriminate validity and methodological validity.

Convergent validity of a construct is the extent to which indicators of a specific construct share a high proportion of variance in common. In the entire sample analysis, convergent validity was presented after applying the required modification; all indicator loadings in the standardized regression weights analysis results were above 0.6 since the study criterion is to be at least 0.5 and above. Variance extracted measures (Table 4.11) are all above 0.5. According to Byrne (2001) an indicator that has a standardized regression weight and AVE below 0.05 plus a standardized residual covariance with other indicators above 2.58 should be dropped (removed).

On the other hand, discriminate validity is the extent to which a construct is different from others. Under the study, the discriminate validity of all the sample models' constructs were evaluated in PLS Graph. This was to measure the Average Shared Variance (AVE) between the constructs and their indicators (see Moran 2006; Fornell and Larcker 1981). It was calculated according to the standard following formula:

Assuming that there are two variables (x and y) to correlate, then the average shared variance or the covariance of the two variables is:

$$Covariance(x,y) = \frac{\sum (x - mean\ of\ x)(y - mean\ of\ y)}{sample\ size - 1} = \frac{sum\ of\ squares\ \&\ cross\ products_{xy}}{sample\ size - 1} \qquad \text{Eq. 4.6}$$

Where ***x*** and ***y*** are variables of interest whose relationship is to be investigated. If x is the same as y, then the computation based on the above formula yields the variance.

Discriminate validity further confirmed and verified that the diagonal elements are higher than the off diagonal values in the corresponding rows and columns, and the diagonal elements are the square root of the shared variance between the constructs and their indicators. The study measured the average shared variance between all the constructs in all the five identified models. The analysis results displayed in Table 4.11 illustrate that each construct is different from the others in the model and confirm that at least 50 percent of the measurement variance was captured by the construct. All the five models' constructs have AVE greater than 0.5 and the diagonal elements (**in bold**) greater than the correlation values in the respective corresponding rows or columns.

The data show that the measures of the constructs examined in this study are robust in terms of their internal consistency reliability as indexed by coefficient alpha. The results also demonstrate satisfactory convergent and discriminant validity of measures as alluded to by Fornell and Larcker (1981). The analysis results demonstrate that the constructs have the relevant information as the original independent indicators. Further more, discriminant test results illustrate that the constructs can be modeled in path analysis without violation of path model assumptions as indicated in equation 3.5.

Table 4.11: Average Shared Variance (AVE) and Correlation Matrices of Latent Variables.

				Pooled Model (n=445)				
	AVE	**Pe**	**Re**	**Si**	**Fc**	**Bi**	**Ub**	**Eb**
Pe	0.85	**0.92**						
Re	0.59	0.35	**0.77**					
Si	0.76	0.35	0.38	**0.87**				
Fc	0.66	0.36	0.44	0.74	**0.81**			
Bi	0.81	0.21	0.38	0.50	0.52	**0.90**		
Ub	0.62	0.37	0.47	0.24	0.28	0.23	**0.79**	
Eb	0.72	0.34	0.36	0.63	0.67	0.55	0.42	**0.85**
				Staff Model (n=122)				
	AVE	**Pe**	**Re**	**Si**	**Fc**	**Bi**	**Ub**	**Eb**
Pe	0.55	**0.74**						
Re	0.64	0.66	**0.80**					
Si	0.77	0.50	0.71	**0.88**				
Fc	0.81	0.49	0.79	0.92	**0.90**			
Bi	0.85	0.19	0.37	0.56	0.52	**0.92**		
Ub	0.79	0.57	0.57	0.42	0.46	0.19	**0.89**	
Eb	0.79	0.39	0.64	0.28	0.33	0.12	0.34	**0.89**
				Students Model (n=323)				
	AVE	**Pe**	**Re**	**Si**	**Fc**	**Bi**	**Ub**	**Eb**
Pe	0.83	**0.91**						
Re	0.74	0.45	**0.86**					
Si	0.74	0.44	0.28	**0.86**				
Fc	0.66	0.46	0.33	0.67	**0.81**			
Bi	0.81	0.32	0.41	0.46	0.54	**0.90**		
Ub	0.64	0.39	0.41	0.15	0.17	0.28	**0.80**	
Eb	0.74	0.41	0.26	0.58	0.65	0.56	0.38	**0.86**
				Makerere University Model (n=210)				
	AVE	**Pe**	**Re**	**Si**	**Fc**	**Bi**	**Ub**	**Eb**
Pe	0.81	**0.90**						
Re	0.83	0.92	**0.91**					
Si	0.77	0.63	0.63	**0.88**				
Fc	0.81	0.95	0.96	0.64	**0.90**			
Bi	0.72	0.58	0.55	0.54	0.59	**0.85**		
Ub	0.85	0.66	0.64	0.45	0.67	0.68	**0.92**	
Eb	0.86	0.67	0.64	0.55	0.68	0.41	0.46	**0.93**
				Other Universities Model (n=235)				
	AVE	**Pe**	**Re**	**Si**	**Fc**	**Bi**	**Ub**	**Eb**
Pe	0.61	**0.78**						
Re	0.62	0.30	**0.79**					
Si	0.69	0.23	0.38	**0.83**				
Fc	0.69	0.33	0.37	0.80	**0.83**			
Bi	0.86	0.05	0.35	0.51	0.50	**0.93**		
Ub	0.67	0.31	0.41	0.19	0.17	0.12	**0.82**	
Eb	0.61	0.31	0.43	0.40	0.42	0.42	0.58	**0.78**

Note:

AVE Average shared variance Fc Facilitating conditions

Pe	Performance expectancy	Bi	Behaviour intentions
Re	Relevance	Ub	Usage behaviour
Si	Social Influence	Eb	Expected benefits

Diagonal elements are the square root of the shared variance between the constructs and their measures, off-diagonal elements are correlations between constructs.

4.2.1. The Study Model from the Pooled Data

Based on calculations in Eq. 3.2, the pooled structure model was analysed to determine the correctness of the study model. The analysis included the R-squared for the dependent constructs (Cohen, 1988). The PLS-Graph was used to determine how well the model fits the hypothesized relationship by estimating the square multiple correlations (R^2) for each construct in the model. The R^2 measures a construct's percentage variation that is explained by the model. The R^2 values are displayed below each dependent construct. In e-library services' analysis the constructs are behaviour intentions (0.301), usage behaviour (0.091 and expected benefits (0.182).

Looking at results from the analyses for the pooled model's data which are depicted in Figures 4.4 the following are noted as key to the model figures:
The study variables observed in Figures 4.4, the measured indicators are shown in square shaped small boxes which match statements 1 – 8 on a Likert scale. These correspond with retained indicators that make up each construct as shown in Table 4.9

Figure 4.1: Square shaped measured indicators

Latent variable are shown in circle shapes.

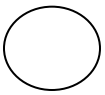

Figure 4.2: The latent variable

One headed arrow connector indicates a causal path from a construct to an indicator.

Figure 4.3: One headed arrow connector

Other headed connectors indicate covariance between constructs. For example, in Figure 4.4, there is one headed connector indicating the covariance between Pe and Bi showing that Pe contributes -0.013 variance towards Bi. Furthermore, it is also observed that the construct of Pe in the same figure, has a causal path from two indicators, i.e. indicators Pe1 and Pe2.

The contribution to the study model of 0.30 variance by the dependent construct behaviour intentions is based on covariances -0.013 from 'performance expectance', 0.231 from 'relevance' and 0.423 from social influence. The causal path from behaviour intentions points to four indicators, i.e. Bi 1, Bi 2, Bi 3 and Bi 4.

The number (R^2 0.301) below the circle that donates the dependent construct behaviour intentions is the variance contribution to the model. The R^2 values are displayed below each dependent construct in each of the pooled models Figures 4.4. The same logic is used to conceptualize all the sample models in Figures 5.2, 5.3, 5.4 and 5.5

Figure 4.4 depicts the research structural model that illustrates the path coefficients and R^2 for dependent variables. Considering the R^2 value for each dependent variable of the 'research/pooled model, results illustrate that behaviour intentions predicts 30.1% of the variance of end-users' acceptance and use of electronic library services and that usage behaviour predicts 9.1% while expected benefits predicts 18.2% of the variance of services acceptance and usage. This implies that 30 percent of end-users of e-library services in the sampled universities intend to use the services in future, while 9 percent already use the services and 18 percent use the services or plan to use the services because of the benefits they expect from them.

This demonstrates that the pooled model predicts 57 percent of the total variability, which is accepted, and well above the average. This implies that the model meets the requirements of predictive power and robustness. In other words, the study can adopt the model and make inferences.

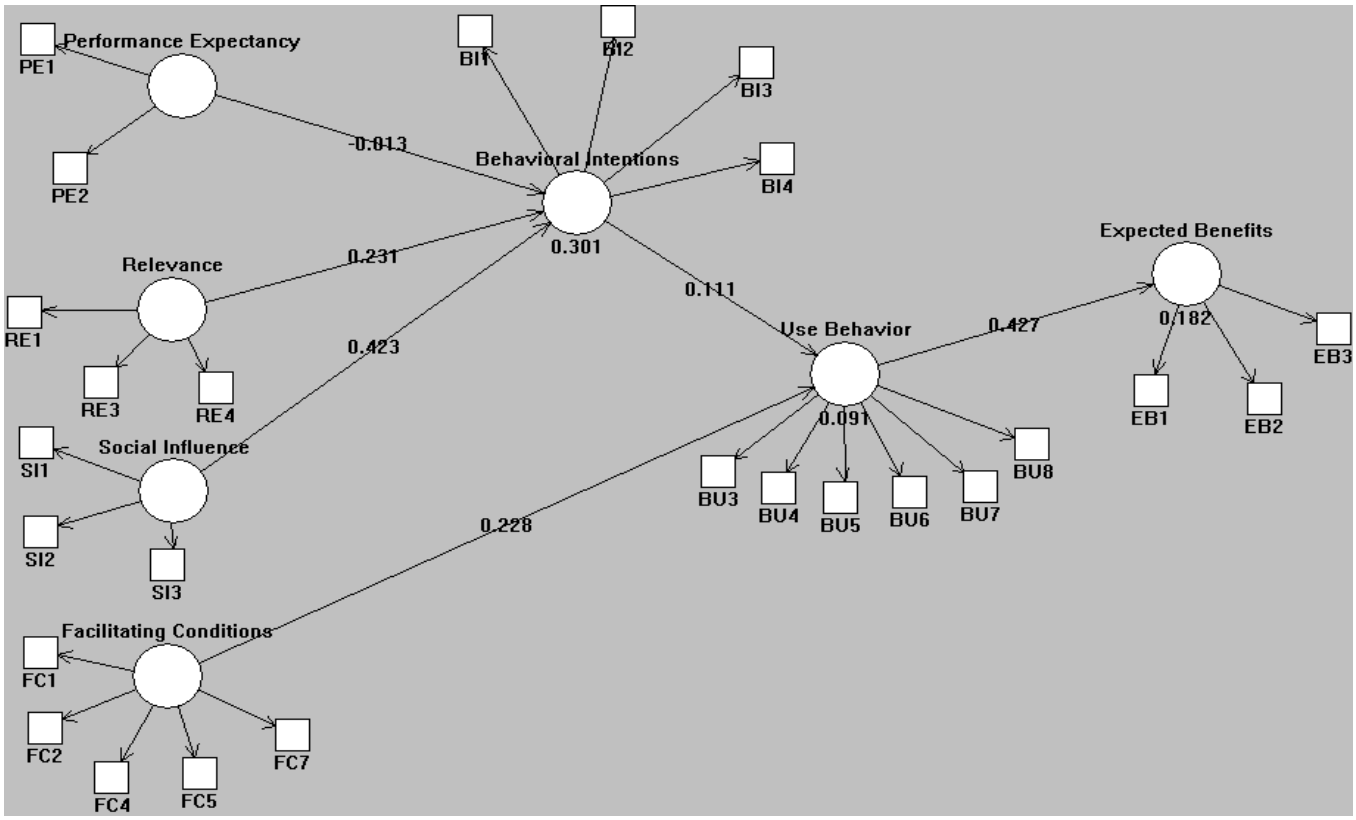

Figure 4.4: Research Structural Model (From Pooled Data)

In formula form the modeling is as follows:

Bi = -0.013 Pe + 0.231 Re + 0.423 Si	(R^2=0.301=30.1%)	
Bu = 0.111 Fc + 0.228 Bi	(R^2=0.091=9.1%)	Eq. 4.7
Eb = 0.427 Ub	(R^2=0.182=18.2%)	(Ref. Eq. 3.6)

4.2.2. The effect of moderator variables on the research pooled model

The effects of moderator variables (defined in Table 1.5 and Sub-Section 3.3.2, a) on independent variables of the research/pooled model was analyzed using Generalized Linear Model (GLM) in SPSS (version 10). Equations 3.3 and 3.4 test results are depicted in Table 4.12. This approach was used to test the hypotheses for the research model with the moderating effects (Ha3b, Ha4b, Ha5b, Ha6b), and to determine differences in the goodness of fit as expressed by the R^2.

Apart from age, sex and experience of e-library services end-users, the other variables in the model analysis were left as continuous variables. The categorization of age, sex and experience were guided by questions (Q105; Q104; Q110) in the questionnaire. Sex was a dummy variable where male was =1 and female was =0. Age was categorized into four groups as shown in row 5 (Table 4.3) of which the age group 18 to 44 years was classified as "young" and the group aged 45 and above was classified as "old". The experience of the respondents was also categorical where more than 6 years of exposure to the services implied that the respondent was very experienced in using ICT and less than 3 years implied less experienced.

Results of moderator variables generated from GLM are illustrated in Table 4.12 which provides details of the model tests for behaviour intentions, usage behaviour and expected benefits, including lower level moderating effects. The variances explained by direct effects (Column 3 of Table 4.12) for the pooled model including interaction are illustrated. For example in the table, it shows that the effects of social influence on behaviour intentions is moderated by sex, experience, age and awareness (-0.25), such that it was stronger for younger females.

Table 4.12: GLM Results for the Research/Pooled Model

Dependent factor	Independent variables	Direct + Int. (N=445)	Comments
Behaviour Intentions	R^2 (Regrn)	0.14	
	Adj. R^2 (Regrn)	0.09	
	Intercept	0.14*	
	Pe	-0.93**	
	Re	-0.42	
	Si	1.27*	
	SEX	-0.37**	
	Aw	0.06	
	EXP	-0.17**	
	AGE	-0.46	
	Re * SEX	0.08	Effect stronger among males, though insignificant.
	Pe * AGE	0.10	Effect stronger among older users though insignificant.
	Re * EXP	0.14	Effect stronger among experienced, though insignificant.
	Re * AGE	0.18	Effect stronger among old users though insignificant.
	Re * Aw	0.03**	

Dependent factor	Independent variables	Direct + Int. (N=445)	Comments
	SEX * Si	-0.05	Effect stronger for females.
	AGE * Si	-0.22*	Effect stronger with younger users.
	EXP * Si	-0.09***	Effect stronger with few years of experience.
	Aw * Si	-0.94**	
	SEX * Pe* AGE	0.34	
	SEX * EXP * AGE * Aw * Si	-0.25***	Effect stronger in younger females.
	SEX * EXP * AGE * Aw * Re	0.096*	Effect stronger in experienced males.
Usage Behaviour	R^2 (Regrn)	0.06	
	Adj. R^2 (Regrn)	0.04	
	Intercept	2.79*	
	Bi	0.07*	
	EXP		
	Aw		
	AGE		
	Fc	0.08	
	Aw * Fc	0.03**	
	SEX * Fc	0.07	Effect stronger for males though insignificant.
	EXP * Fc	0.01	Effect stronger for experienced, though insignificant.
	AGE * Fc	-0.08	Effect stronger for older users though insignificant.
	Aw * EXP * AGE * Fc	0.05	Effect stronger for experienced males though insignificant.
Expected Benefits		0.18	
	R^2 (Regrn)	0.39	
	Adj. R^2 (Regrn)	0.15	
	Intercept	0.56*	
	Ub	0.51*	

Note:
**** P <0.01 (significant at 1%), ** P<0.05 (significant at 5%), & * P<0.1 (significant at 10%)*

The analysis results presented in Table 4.12 demonstrate that the moderator variables have some impact on the final study pooled model graphically shown in Figure 5.1. Both Table 4.12 and Figure 5.1 show where there is significant effect of moderator variables on independent variables in this study. For the study pooled model, one can observe that almost all independent variables are moderated in varying degrees. The four moderators all had in varying ways an impact on Re and Si variables. Facilitating conditions variable was moderated by three variables: age, experience and awareness and Pe was moderated only by two: gender and age. All these are observed in Table 4.12 and also in Figure 5.1.

According to the results depicted in the table, the effect of Pe construct towards Bi was moderated insignificantly by sex and age. This implies that Pe construct was not dependant on either sex or age of the survey respondents. In otherwords, the negative contribution of Pe construct towards Bi was not significantly influenced by either age or sex. However, relationships between Si construct towards Bi to use e-library services was positively affected by sex, age, experience and awareness that the effect was stronger among younger females, as further discussed in Section 5.4 of the next chapter. As far as the Re construct in the pooled model is concerned, it had moderations from sex, age, experience and awareness variables and the effect was stronger in experienced male. That is to say that experienced males were positively influenced by the moderator variables towards Bi of e-library services. Althogh Fc towads usage behaviour was moderated by experience, age and awareness variables, the effect had no significant effect on the construct.

4.3. SUMMARY AND CONCLUSIONS

Presented in this chapter are analyses used in the designing of a model. The designed model is used to predict end-users' acceptance and use of library services made possible with new technologies as was conceptualised in Figure 3.3 of Chapter Three. The service oriented model has four independent constructs of performance expectance, relevance, social influence and facilitating conditions; four moderator variables of gender, age, experience and awareness; and together influence the dependent constructs of behaviour intentions, use and expected benefits. To validate the model, the study defined five sample models including the research pooled model. Data for designing the other four sample models was also analyzed to further validate the research pooled model. All the analysis that was carried out confirmed the reliability and validity of data and the study constructs. The research structural pooled model was designed using PLS-Graph software.

In the next chapter the research pooled model is presented along with analyses of its goodness of fit. The model is further validated using the four sample models. The

research pooled model is used to test the research hypotheses. Interpretations of the results are given and discussions made of the study results in comparison to related previous studies.

CHAPTER FIVE - TECHNOLOGY SERVICES ACCEPTANCE AND USE MODEL

5. INTRODUCTION

In the previous chapter, following guidelines outlined in the methodology, the study data were analysed in terms of reliability and validity. Also analysed in the same chapter were the study constructs. Accordingly, indicators which did not meet the set standards were eliminated. Indicators that met the set standards were included in designing the research (pooled) model which is presented and validated in the current chapter.

In Chapter five, the research model designed from the pooled data (n=445) is presented. Using data extracts from the demographic information provided by respondents, the designed model was empirically validated. After the validation, the designed model was used to test the research hypotheses. The last part of the chapter is a discussion and interpretation of the findings of the study. This was done construct by construct.

To enable validation of the research pooled model data from 445 respondents were grouped in to four sample sub-models (see Sub-Section 4.1.7, Tables 4.10 & 4.11) using demographic characteristics provided by respondents as follows: staff sub-group model n=122; students sub-group model n=323; Makerere University sub-group model n=210; and the seven other universities sub-group model n=235.

5.1. THE RESEARCH MODEL

In designing the new research model, two kinds of data analysis were carried out to test the study proposed research model. First, the study tested the model by analyzing factors which influence library end-users' behaviours. This step yielded positive results which are presented in Figure 4.4. These results were further validated and results presented in Figures 5.2, 5.3, 5.4 and 5.5. However, this analysis did not consider the impact of moderator factors. The second step was to evaluate the impact of moderator variables on

the independent factors using GLM. For the research pooled model, this is presented in Sub-Section 4.3.2 of Chapter 4, and results summarised in Table 4.12.

The research model comprises of four latent variables, namely: independent constructs of 'performance expectance, relevance, social influence and facilitating conditions'. The four determinants in the model either influence 'behavioural intentions' or 'usage behaviour'. In this study, usage behaviour was postulated to determine expected benefits. And, like its original model, (the UTAUT), the designed new model's independent constructs are moderated in varying ways by gender, age, experience and awareness. The concept of the proposed model is depicted in Figure 3.2 as adapted from UTAUT by Venkatesh *et al.* (2003). Figure 5.1 is an illustration of the study research model and equation 4.7 describes the formula underlying the model.

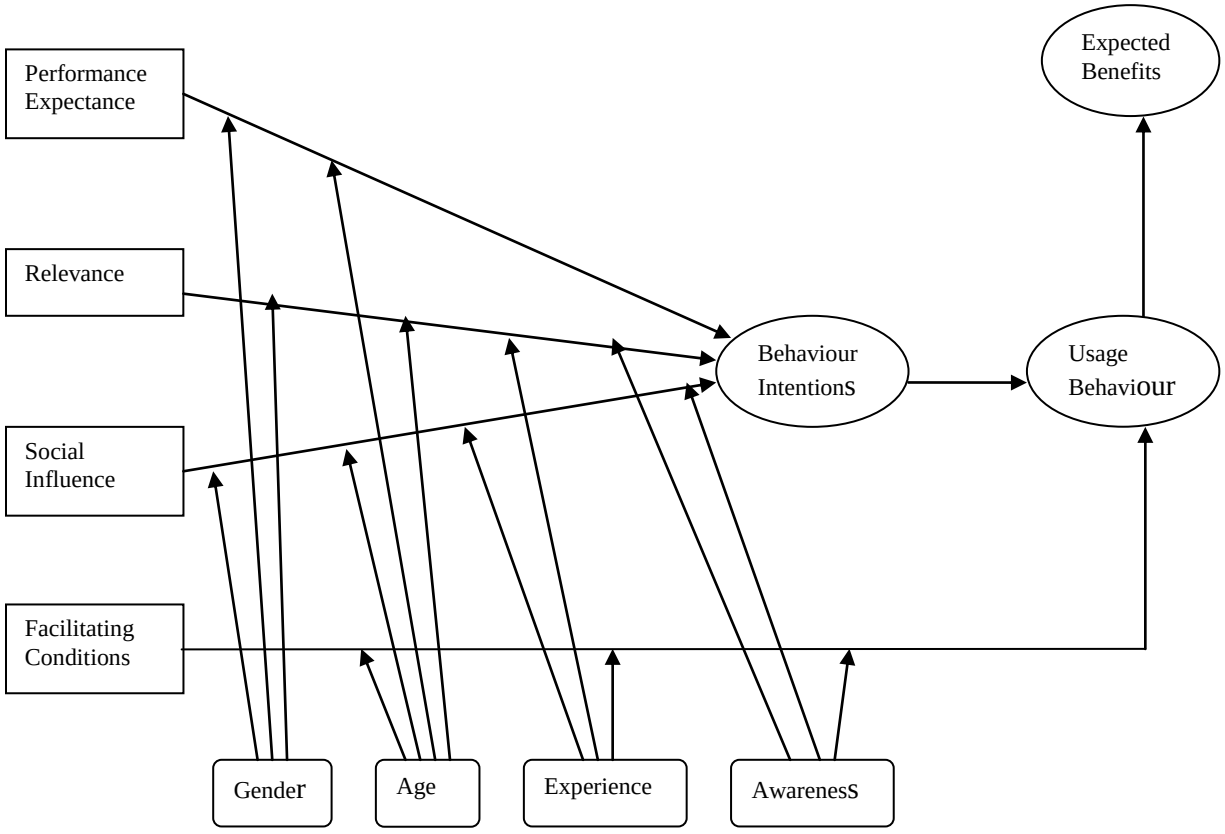

Figure 5.1: Electronic Library Services Acceptance and Use Model, an Adaption from (Venkatesh *et al.* 2003).

Formula for the Research Model

$$\left.\begin{array}{ll} Bi = -0.013\ Pe + 0.231\ Re + 0.423\ Si & (R^2=0.301=30.1\%) \\ Bu = 0.111\ Fc + 0.228\ Bi & (R^2=0.091=9.1\%) \\ Eb = 0.427\ Ub & (R^2=0.182=18.2\%) \end{array}\right\} \quad \text{As in Eq. 4.7}$$

5.1.1. The Significance of the Research Model's Dependent Constructs

To determine the correctness of the designed research model, the study used PLS-Graph version 2.91.03.04, to estimate R^2 for dependent constructs and the average variance (see Fornell and Larckel 1981; Cohen 1988). The software established how well the research model fits the hypothesized relationships using square multiple correlations, (R^2) for each construct in the model. The General Linear Model (GLM) was used to evaluate the dependence of dependent factors on fixed factors and covariates.

According to Garrison (2005), a complete analysis of a model requires an examination of both the goodness of fit criteria using R-squared, adjusted R-squared and factor loadings. The goodness of fit values (R^2 and Adjusted R^2) measures how well the model parameter estimates are able to predict the model performance and also generate the sample covariance matrix. This allows a direct comparison of the variance explained from both estimation measures.

Factor loadings and R^2 were used to evaluate the entire model and goodness of fit. The technique works in such a way that the postulated model is taken as true and adjusts the parameter estimates while minimizing the covariance difference between population parameters and the sample estimates.

The significance of the model's constructs was determined by calculating the t-test for the dependent variables using the formula presented in equation 5.1. The t-ratio test is a one sample test used to determine the significance of the model predictive power under the null hypothesis that a particular R^2 value is equal to zero against the alternative that

the predictive value is significantly different from zero. By default, the null hypothesis is rejected if the computed t-statistic is greater than the absolute t-statistic recorded at 2 (reflecting a 95 percent level of significance).

The computed t-statistic was generated using the formula below:

$$t - ratio\ statistic = \frac{Estimated\ coefficien\ t\ (\hat{\beta})}{S\tan dard\ error\ of\ esimated\ coefficien\ t\ (\hat{\beta})} \qquad \text{Eq: 5.1}$$

The study used significance measurement to determine the levels of influence the dependent constructs have towards acceptance and use of e-library services. A summary of results from a t-ratio test statistical analysis on dependent constructs (behaviour intentions, use behaviour and expected benefits) of the research/pooled model, is presented in Table 5.1 (output from PLS-Graph, version 2.91.03.04).

Table 5.1: T-ratio test and R^2 for the Research (pooled model) Dependent Constructs

Dependent construct	R^2	t-test statistic	Probability value
Behavioural intentions	0.30	42.99	<0.001
Behaviour usage	0.09	86.58	<0.01
Expected benefits	0.18	44.72	<0.01

Note:
H_0: Null hypothesis is that R-squared values are zeros against the alternative that R-squared values are greater than zeros. We reject H_0 if the t-statistics are greater than 2.0 with significant probability value

It can be observed that all the dependent constructs in Table 5.1 have a significant positive inclination (<0.001, <0.01 and <0.01) towards acceptance and usage of electronic library services.

Regarding the t-test statistic results in Column 3 of Table 5.1, behaviour intentions construct recorded a computed t-statistic of 42.99 which is greater than the absolute t-statistic recorded of 2**,** indicating that the null hypothesis is rejected in favour of the

alternative. A similar argument is advanced for the other constructs, and all the sample models throughout the study.

According to the R^2 values shown in Table 5.1 of the three dependent constructs, the prediction of the model is 57 percent variance. This is a key finding, indicating that the majority of sample end-users in the study were inclined towards acceptance to use e-library services. This finding responds to the general objective of this study which was to design a technology services model for measuring levels of end-users acceptance and use of e-library services in a university setting. The finding also caters for the second research objective and answers the study's first hypothesis to find out whether university end-users in the study context intended to use e-library services.

Results of an analysis of the path coefficients of the four independent constructs are presented in Table 5.2. Apart from 'performance expectancy' construct, the path coefficients of the other three independent constructs in the research model contribute positively towards end-users' acceptance and use of the services across all the five models.

Table 5.2: Path Coefficients of Independent Constructs Towards Dependent Constructs of the Pooled Model.

Construct	Pooled Model	Towards
Performance Expectancy	-0.01	
Relevance	0.23	Behaviour Intentions
Social Influence	0.42	
Facilitating Conditions	0.23	Usage Behaviour

Considering the path coefficients of the Pooled Model, relatively high inclinations are associated with Si construct (42%) (Column 2, Row 4 of Table 5.2) followed by Re construct's positive contribution (23%) to the model (Column 2, Row 3). Si construct has the highest path coefficients contribution towards Bi. Unlike the Pe construct which contributes negatively in the pooled models, Re construct contributes moderately towards Bi. The Re construct is a contribution of the researcher in the model. This finding answers the second research hypothesis which inquired into the effectiveness of research

model's constructs and other relevant constructs introduced in the new model. The support for the hypothesis is partial, because of the negative contribution from performance expectance construct which is part of the new model.

After testing the fitness of the research model, the next step was to empirically validate the model using extracted data from the study's population.

5.1.2. The Study Model Validation

To empirically validate the new research model, the study analyzed data from four sub-groups extracted from the cross-sectional survey. The extracted data was categorized as follows: staff sample model n=122; students sample model n=323, Makerere sample model n=210; and other seven universities sample model n=235.

Figures 5.2, 5.3, 5.4 and 5.5 illustrate the results from validation analyses of the four sample models, i.e. staff sample model, students sample model, Makerere sample model and other seven universities sample model. The results further confirm the efficacy of the new model as will be outlined in sub-sections a, b, c, and d that follow.

a) The PLS-Graph output of the analysis of the staff sample model (n=122) is depicted in Figure 5.2.

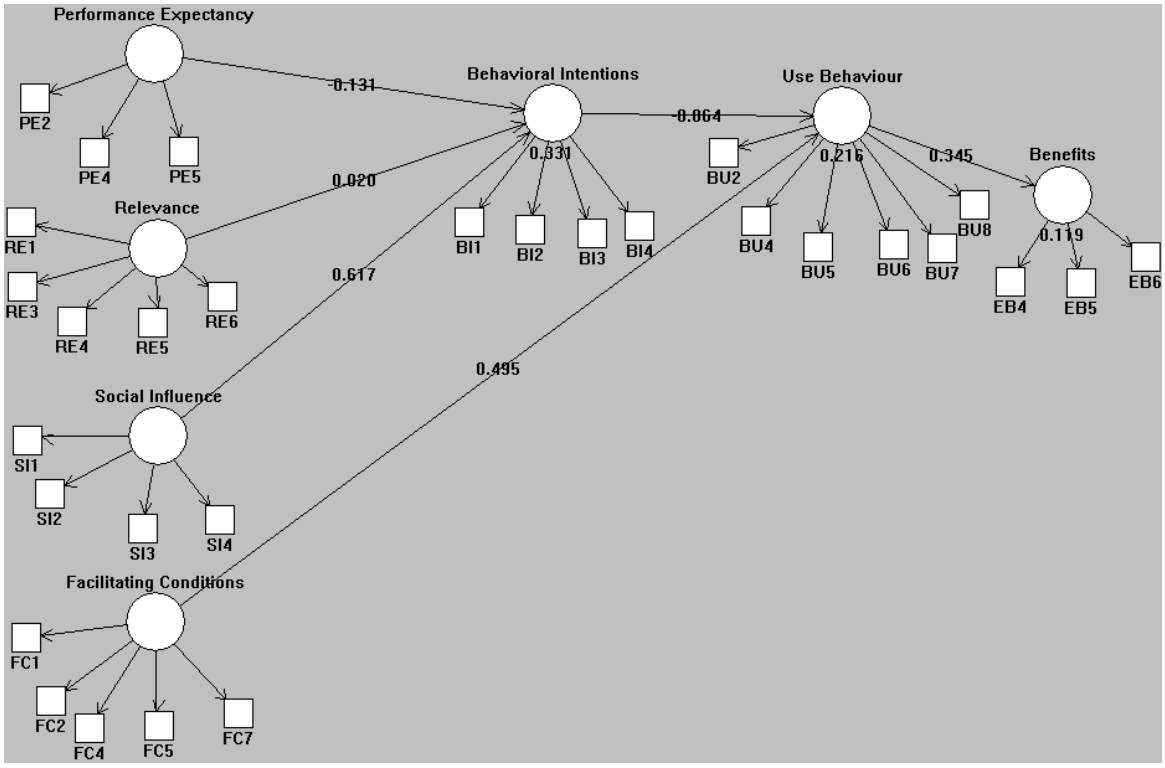

Figure 5.2: Staff Structural Model Results

Note:

Retained indicators for the staff model are reflected in Columns 5 and 6 of Table 4.10. Also refer to Figures 4.1, 4.2 & 4.3.

Out of the 46 indicators evaluated, the staff model retained 30 indicators as summarised in Table 4.10. The analysis of the prediction for the dependent constructs in this model indicate that Pe has a negative influence of -0.131 variance towards Bi; Re has positive influence of 0.020 towards Bi and Si influenced Bi positively by 0.617. On the other hand, Fc construct, together with Bi influenced Ub (0.495 for Fc and 0.345 respectively), as observed in Figure 5.2 and Column 2 of Table 5.7.

In addition, the study used the staff data to analyze the impact of moderators on the independent variable. Results of the analysis of data for this sub-model indicate that the independent variables of Pe, Re, Si, and Fc were moderated in varying ways by the four moderators (as shown in Table 5.3). The GLM results together with relevant explanations in the comments column are highlighted in Table 5.3. One can observe from the table that in the rows for Bi, Si construct is influenced by experience (EXP), such that the effect is

(-0.35**) stronger for respondents with fewer years of experience. The effect of SEX and AGE on Pe construct towards Bi was 0.73***. This analysis indicates that the effect was stronger for older male users of e-library services.

Table 5.3: GLM Results for the Staff Model

Dependent factor	Independent variables	Direct + Int. (N=122)	Comment
Behavioral Intentions	R^2 (PLS)	0.33	
	R^2 (Regrn)	0.45	
	Adj. R^2 (Regrn)	0.30	
	Intercept	0.32	
	Pe	1.98	
	Re	-3.62**	
	Si	2.31*	
	SEX * Pe	-0.93	
	Aw* Pe	-0.83*	
	Re * SEX	0.77	
	Pe * AGE	0.37	
	Si * EXP	-0.35**	Effect stronger with few years of experience
	Re * AGE	-0.05	
	Aw* Re	0.94*	
	SEX * Si	-1.32	
	AGE * Si	-0.39*	
	Exp * Pe	0.16	
	Aw * Si	0.03	
	SEX * AGE * Pe	0.73***	Effect stronger for older males
	Si * Exp * SEX	0.38	
	SEX * Exp * Re	0.20	
	SEX * Exp * AGE * Pe	-0.48***	Effect stronger for older females with little experience.
	SEX * Exp * AGE * Re	0.48***	Effect stronger older males with more experience.
	SEX * Exp * AGE * Aw * Pe	0.08*	Effect stronger for older males with more experience.
	SEX * Exp * AGE * Aw * Re	-0.10*	Effect stronger for older females with little experience.
	SEX * Exp * AGE * Aw * Si	0.16**	Effect stronger in older males with less experience.
Usage Behaviour	R^2 (PLS)	0.22	
	R^2 (Regrn)	0.11	
	Adj. R^2 (Regrn)	0.03	
	Intercept	2.40*	
	Bi	0.05	
	Fc	-0.13	
	Aw * Fc	0.03	

Dependent factor	Independent variables	Direct + Int. (N=122)	Comment
	SEX * Fc	0.15	
	Exp * Fc	0.12***	Effect stronger with more experience
	AGE * Fc	0.14	
	SEX * Exp * Fc	-0.08	
	AGE * Aw * Fc	-0.07	
	SEX * Exp * AGE * Fc	-0.02	
	Aw * Exp * AGE * Fc	-0.04***	Effect stronger in older users with little experience
Expected Benefits	R^2 (PLS)	0.12	
	R^2 (Regrn)	0.08	
	Adj. R^2 (Regrn)	0.06	
	Intercept	0.12**	
	Ub	0.06*	

Note:
* p<0.01, ** p<0.05, *** p<0.1

b) Secondly, the model was analyzed using data from student respondents. Figure 5.3 presents results of students (n=323) structural model from PLS-Graph showing the path coefficients. The figure also shows the number of indicators that contributed to each of the model's constructs.

The prediction of the dependent constructs in the students' model indicate that Pe has a positive influence of 0.026 variance towards Bi, Re has 0.296 also towards Bi and Si influenced Bi positively to the tune of 0.370. On the other hand, Fc construct, together with Bi influence Ub (0.024 for Fc and 0.273 for Bi respectively), as observed in Figure 5.3. Overall, the students' model predicts 53 percent variance of acceptance to use e-library services.

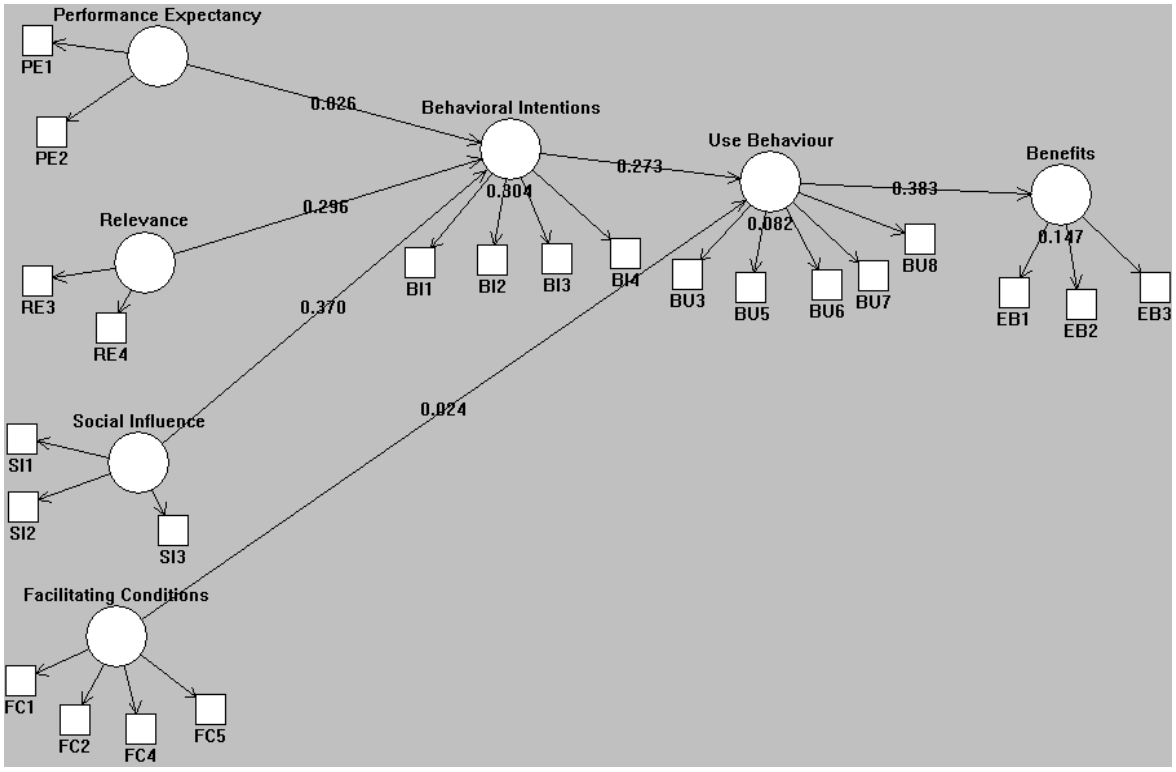

Figure 5.3: Students' Structural Model

Note:
Retained indicators for the students' model are reflected in Columns 7 and 8 of Table 4.10. Also refer to Figures 4.1, 4.2 & 4.3.

Next, using data from student respondents, the study analyzed the impact of moderators on the independent variables. Results of the analysis of GLM are depicted in Table 5.4 showing areas of significances in Column 3 of the table and some explanations in column 4.

Table 5.4: GLM Results for the Students' Model

Dependent factor	Independent variables	Direct + Int. (N=323)	Comments
Behavioral Intentions	R^2 (PLS)	0.30	
	R^2 (Regrn)	0.10	
	Adj. R^2 (Regrn)	0.06	
	Intercept	1.57**	
	Pe	-0.78**	
	Re	0.29***	
	Si	0.92*	
	Aw	0.23	

Dependent factor	Independent variables	Direct + Int. (N=323)	Comments
	AGE	-0.05	
	SEX * Pe	0.17**	Effect stronger for males
	Aw* Pe	0.07	
	Pe * Exp	0.11	
	Pe * AGE	.143	
	Re * Exp	-0.07	
	Re * AGE	-0.13***	Effect stronger in younger users
	Aw * Si	-0.14**	
	Si * Exp	-0.05	
Usage Behaviour	R^2 (PLS)	0.08	
	R^2 (Regrn)	0.06	
	Adj. R^2 (Regrn)	0.04	
	Intercept	2.39*	
	Bi	0.08**	
	Fc	0.21	
	Aw	0.20	
	AGE	-0.07	
	Aw * Fc	0.03	
Expected Benefits	R^2 (PLS)	0.15	
	R^2 (Regrn)	0.12	
	Adj. R^2 (Regrn)	0.09	
	Intercept	0.78***	
	UbC	0.05**	

Note:
* p<0.01, ** p<0.05, *** p<0.1

c) Thirdly, results of data analysis from PLS-Graph for Makerere Model are depicted in Figure 5.4. (n=210).

The Makerere structural model in Figure 5.4 also shows that three independent constructs (Pe, Re and Si) influence Bi, while Fc together with Bi influence Ub. Usage behaviour alone influence Eb. In this structural model, two indicators contributed to Re construct; three indicators contributed to Pe, Si, Fc, Ub and Eb; four indicators contributed to Bi construct. Out of the 46 indicators, Makerere structural model retained only 21 indicators. The retained indicators in this model are summarised in Column 9 & 10 of Table 4.10

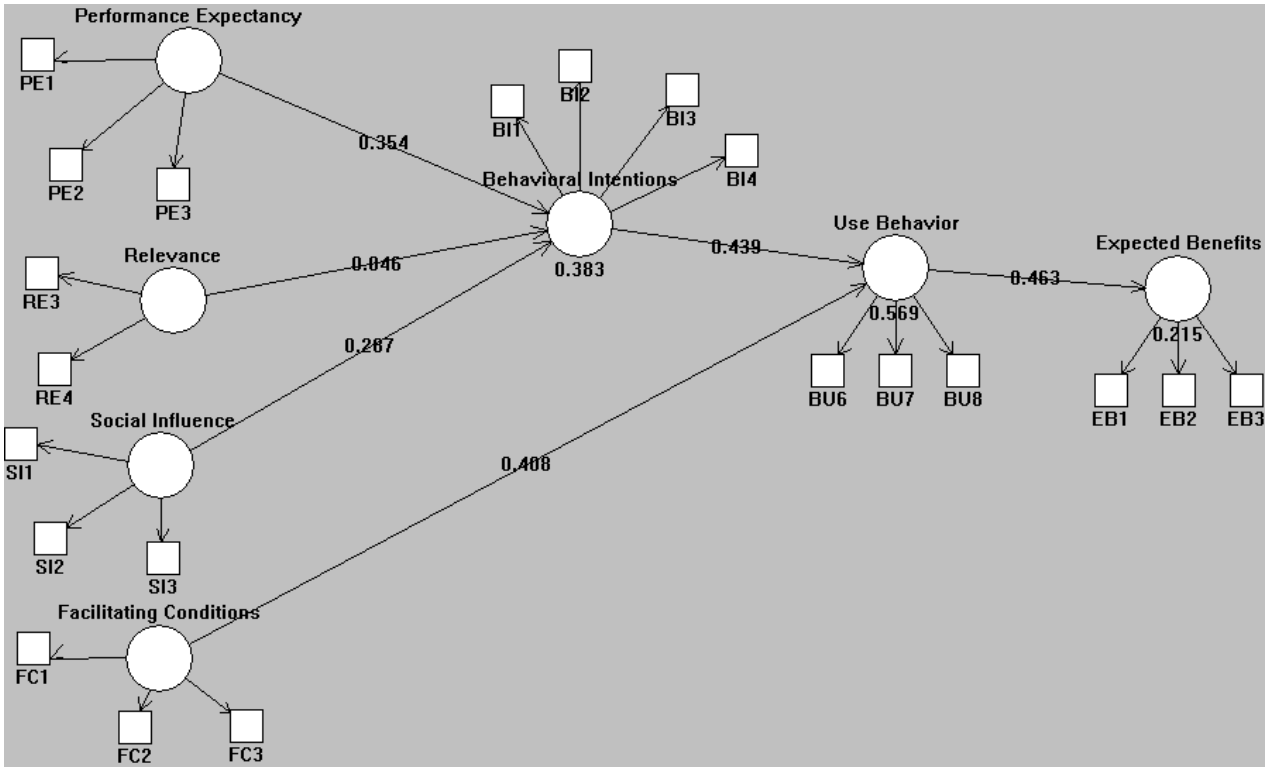

Figure 5.4: Makerere University Structural Model

Note:

Retained indicators for the Makerere University model are reflected in Columns 9 and 10 of Table 4.10. Also refer to Figures 4.1, 4.2 & 4.3.

The prediction of the dependent constructs in Makerere model indicate that Pe has a positive influence of 0.368 variance towards Bi, Re has 0.046 also towards Bi and Si influenced Bi positively to the tune of 0.267. On the other had, Fc construct, together with Bi influence Ub (0.408 for Fc and 0.438 for Bi respectively), as observed in Figure 5.4. Overall, the Makerere model proved to be the most predictive of all the sample models.

A GLM analysis of the moderator variables for Makerere University model was done and results are displayed in Table 5.5.

Table 5.5: GLM Results for Makerere University Model

		Makerere	Comments
Dependent factor	**Independent variables**	**Direct + Int. (N=210)**	
Behavioral Intentions	R^2 (PLS)	0.38	
	R^2 (Regrn)	0.15	
	Adj. R^2 (Regrn)	0.08	
	Intercept	0.44	
	Pe	-0.09	
	Re	0.08	
	Si	1.09**	
	SEX	0.22	
	Aw	0.21	
	EXP	0.16	
	AGE	0.23	
	SEX * Pe	-0.27	
	Pe * AGE	0.17	
	Si * EXP	-0.09	
	SEX * Si	0.24	
	AGE * Si	-0.27***	Effect stronger among the younger users
	Aw * Si	-0.08	
	SEX * EXP * AGE * Aw * Si	3.67	
Usage Behavior	R^2 (PLS)	0.57	
	R^2 (Regrn)	0.08	
	Adj. R^2 (Regrn)	0.03	
	Intercept	1.74**	
	Bi	0.13**	
	EXP	-0.06	
	Aw	0.09	
	AGE	0.74*	
	Fi	0.86*	
	SEX	0.16	
	Aw * Fc	-0.05	
	SEX * Fc	-0.29**	Effect stronger among the females
	EXP * Fc	-0.02	
	AGE * Fc	-0.32*	Effect stronger among the younger users
	SEX * EXP * AGE * Fc*Aw	0.01	
Expected Benefits	R^2 (PLS)	0.22	
	R^2 (Regrn)	0.06	
	Adj. R^2 (Regrn)	0.02	
	Intercept	1.81*	
	UbC	0.12	

Note:
* p<0.01, ** p<0.05, *** p<0.1

d) Lastly, an analysis of data from the other seven universities using PLS-Graph is presented in Figure 5.5 (n=235).

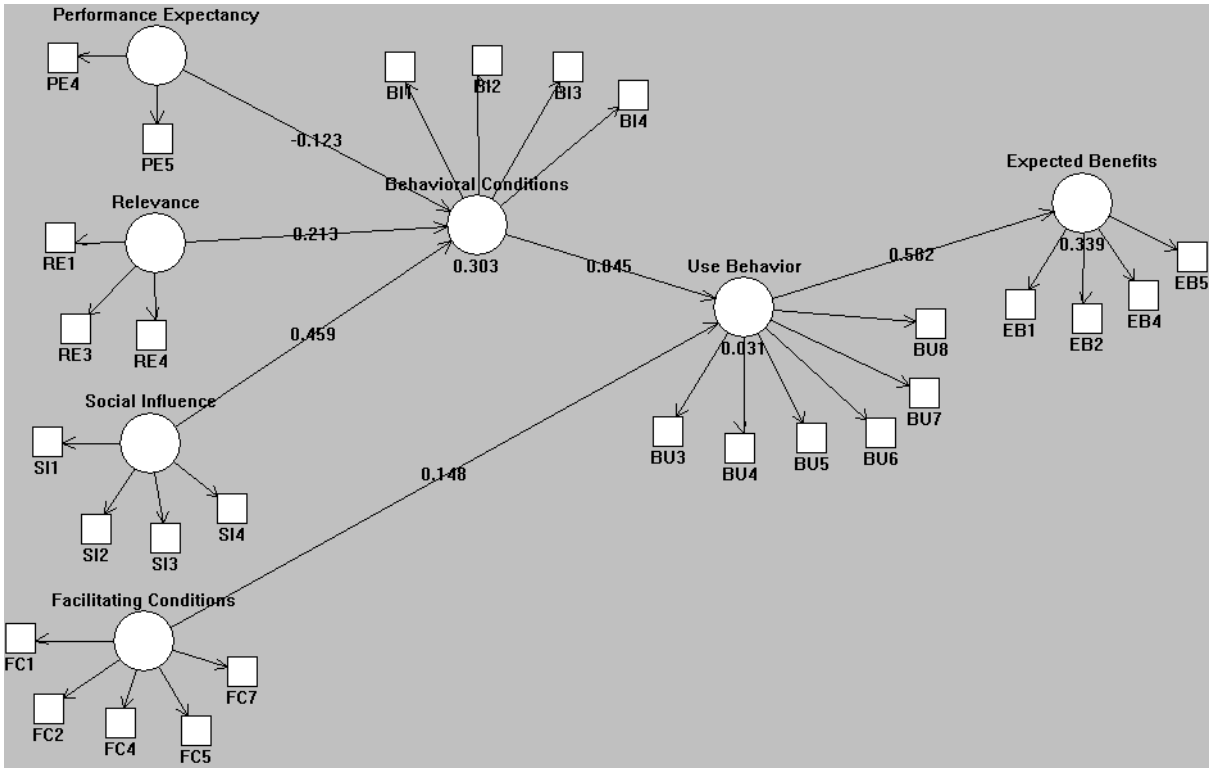

Figure 5.5: Other Universities Structural Model

Note:
Retained indicators for the Other Universities' model are reflected in Columns 11 and 12 of Table 4.10. Also refer to Figures 4.1, 4.2 & 4.3.

The other seven universities' structural model in Figure 5.5 also shows that three independent constructs (Pe, Re and Si) influence Bi, while Fc together with Bi influence Ub. Usage behaviour alone influence Eb. In this structural model, two indicators contributed to Pe construct; three indicators contributed to Re construct; four indicators contributed to Si, Bi, and Eb constructs; five and six indicators contributed to Fc and Ub constructs. Out of the 46 indicators, the other seven universities structural model retained 28 indicators. The retained indicators in this model can be reviewed in Column 11 and 12 of Table 4.10

The prediction of the dependent constructs in the other seven universities' model indicate that Pe has a negative influence of -0.123 variance towards Bi, Re has 0.213 also towards Bi and Si influenced Bi positively to the tune of 0.459. Fc construct, together with Bi influence Ub (0.148 for Fc and 0.845 for Bi respectively), as observed from Figure 5.5. Overall, the other seven universities' model predicted 67 percent variance towards acceptance to use e-library services.

Results of GLM analysis of the moderator variables for the other seven university model are displayed in Table 5.6.

Table 5.6: GLM results for Other Seven Universities Structural Model

		Other universities	**Comments**
Dependent factor	**Independent variables**	**Direct + Int. (N=235)**	
Behavioral Intentions	R^2 (PLS)	0.30	
	R^2 (Regrn)	0.14	
	Adj. R^2 (Regrn)	0.08	
	Intercept	3.02**	
	Re	0.07	
	SEX	-0.79	
	Aw	0.02	
	EXP	-0.19	
	AGE	-0.31	
	SEX * Pe	0.02	
	Pe * AGE	0.06	
	Si * EXP	0.05	
	SEX * Si	0.32	
	AGE * Si	0.07	
	Aw * Si	0.01	
	SEX * AGE * Pe	-0.04	
	SEX * EXP * AGE * Aw * Si	-0.08***	Effect stronger among the less experienced old females
Usage Behavior	R^2 (PLS)	0.03	
	R^2 (Regrn)	0.10	
	Adj. R^2 (Regrn)	0.05	
	Intercept	1.51***	
	Bi	0.45*	
	EXP	0.52**	
	Aw	0.59*	
	AGE	-0.62**	
	Fi	0.49**	
	SEX	-0.57	
	Aw * Fc	0.16*	

		Other universities	Comments
Dependent factor	**Independent variables**	**Direct + Int. (N=235)**	
	SEX * Fc	0.18	
	EXP * Fc	-0.17**	Effect stronger among less experienced
	AGE * Fc	0.16***	Effect stronger among the older users
	SEX * EXP * AGE * Fc*Aw	0.03	
Expected Benefits	R^2 (PLS)	0.34	
	R^2 (Regrn)	0.19	
	Adj. R^2 (Regrn)	0.18	
	Intercept	0.88*	
	UbC	0.56*	

Note:
* p<0.01, ** p<0.05, *** p<0.1

5.1.3. Significance of Results from the Four Sample Models' Constructs

After the validation of the research model, the study evaluated the significance of the four sample models' constructs. Results of the analysis are summarized in Tables 5.7 and 5.8 showing path coefficients of each independent construct towards each dependent variable in the four sample models.

Referring back to the research pooled model results in Table 5.2, apart from 'performance expectance' construct, the path coefficients of the other three independent constructs (Re, Si, Fc) contributed positively towards end-users' acceptance and use of the services. In Table 5.7, relatively high inclinations are associated with Si construct (62%) found in the academic staff model (Column 2, Row 4) followed by its positive contribution (42%) in the research pooled model (Column 2, Row 4 of Table 5.2). Makerere model (Column 4 of Table 5.7) has the highest influence from most independent constructs followed by the academic staff model (Column 2 of Table 5.7). It is only in the Students' and Makerere models where the path coefficient of Pe construct showed positive inclinations towards intention to use e-library services at 3 percent and 35 percent respectively.

Table 5.7: Path Coefficients of Independent Constructs Towards Dependent Constructs in Each of Four Models.

Construct	Staff	Students	Makerere University	Other Universities
Performance Expectancy	-0.131	0.026	0.354	-0.123
Relevance	0.020	0.296	0.046	0.213
Social Influence	0.617	0.370	0.287	0.459
Facilitating Conditions	0.495	0.024	0.408	0.148

In Table 5.7, Si construct has the highest path coefficient contribution towards Bi to use e-library services (between 27% and 62%) in all the five models, followed by Fc construct (between 2% and 50%). Unlike the Pe construct which contributes negatively to three of the five sub-models, Re construct contributes moderately towards Bi to use e-library services in all the five models. This confirms the fact that three constructs of Re, Si and Fc are significant determinants of acceptance to use e-library services in university settings in DCs.

Table 5.8: Percentage Variation in Each Dependent Construct

Construct	Behavioural Intentions	Behaviour Usage	Expected Benefits
Staff Model	0.33	0.21	0.11
Student Model	0.30	0.08	0.14
Makerere	0.38	0.56	0.21
Other Universities	0.30	0.03	0.33

From Table 5.8 above, the study observes that Ub has the lowest variance contribution in most of the sample models (0.08 and 0.03), as further interpreted after testing research hypothesis Ha8 in Sub-section 5.3.4, b. Nevertheless, the dependent variable contributes highly towards the Makerere Model at 56 percent variance, a sign that e-library services were being effectively utilized at Makerere University where majority of the studied services are being offered.

The analysis of the four sample models, results show a replica of the research pooled model (and also results of the Pilot study in Appendix 6). For example, all the four models' independent constructs were moderated in varying ways by gender, age, experience and awareness. Furthermore, three independent constructs (Re, Si, and Fc)

contributed positively towards the predictive levels of the dependent constructs in all the four sample models. In most sample models, Pe construct contributed negatively to the dependent variables. This is an area for further investigation. All the above findings prove that the new designed model is valid.

5.2. ELECTRONIC LIBRARY SERVICES ACCEPTANCE AND USE MODEL

The study conceptualized a research model in Figure 3.2 which was an adoption from UTAUT that incorporated some principles of library services evaluations. The conceptualized model assumed that four factors (Pe, Re, Si and Fc) would possibly influence Bi to Ub and in turn, Ub would possibly influence Eb. The four factors which were assumed to influence Bi to Ub were expected not to depend on any variable. With these assumptions, the dependent factors (see Figures 4.4; 5.2; 5.3; 5.4 and 5.5), are shown to depend on others and have a single arrow (like Figure 4.3) pointing to them. On the other hand, the independent factors are expected not to depend on any other factor, and do not have a single pointer directed to them (Chin, 1998).

After all the modifications, analyses and tests, the designed research model in Figure 5.1 is called the Electronic Library Services Acceptance and Use Model (ELSAUM). This is because, UTAUT by Venkatesh *et al.* (2003) was designed to evaluate technology acceptance, while the new research model evaluates library services made possible by means of technology. According to the tests, analyses, and validation results, the ELSAUM was found fit. Its validation is presented in the first part of this chapter. The next step is to test the postulated research hypotheses in relation with similar studies.

In Chapter One, twelve research hypotheses were postulated. The hypotheses were all presented in alternative form. According to the ELSAUM data analysis (Table 5.1, Figures 4.4 and 5.1), the hypotheses with direct path are listed in Table 5.9, and are analyzed first.

5.2.1. Testing Hypotheses with Direct Effect

Under the null hypothesis, a particular R^2 value is equal to zero against the alternative that the predictive value is significantly different from zero. By default the alternative hypothesis is supported if the computed t-statistic is greater than the absolute t-statistic record of 2 (reflecting a 95 percent level of significance). Accordingly and based on t-test statistic measures in Table 5.1, a summary of results of testing the research hypotheses with direct effects on the model is given in Table 5.9. This is discussed in details in Sub-Section 5.3.2.

Table 5.9. Analysis of Direct Path Hypotheses

No.	Hypotheses	Results
Ha1	*University end-users accept and use electronic library services*	Supported
Ha2	*H_{a2}: The study model constructs demonstrate an effect on end-users' acceptance and use of electronic library services*	Partially supported
Ha3.a	*Performance expectance demonstrates a significant effect on* behavioural *intentions*	Not supported
Ha4.a	*Relevance demonstrates a significant effect on* behaviour *intentions*	Supported
Ha5.a.	*Social Influence demonstrates a significant effect on* behaviour *intentions*	Supported
Ha6.a	*Facilitating conditions demonstrate a significant effect on usage* behaviour.	Supported
Ha7	Behaviour *intentions demonstrate an effect on usage behaviour*.	Supported
Ha8	*Usage behaviour demonstrates a significant effect on perceived benefits.*	Supported

The construct of Pe in Ha3a had a negative effect on the model and the hypothesis was rejected due to the negative effect of the construct (-0.013) towards behaviour intentions. Furthermore, due to the negative contribution to the model by the Pe construct which is part of the entire model, hypothesis Ha2 was partially rejected and partially supported. This is further discussed in Sub-Section 5.3.3 of this chapter. The remaining three independent constructs contribute positively to the dependent variables in the model and hypotheses concerned with their influence are all supported.

5.2.2. Hypotheses with Moderation Impacts

SOUTAUT model, like its original theory UTAUT, has moderating factors that impact on the four independent variables and together influence the dependent variables. In the context of this study independent constructs' hypotheses (Ha3-Ha6 bs) were tested based on the GLM results of the ELSAUM in Table 4.12**.** In Table 5.10 the study presents a summary of results of testing research hypotheses with moderation impacts on the independent constructs and further discussed in Sub-Section 5.3.3 of this chapter.

Table 5.10: Analysis of Hypotheses with Moderation Impacts

No.	Hypotheses	Results
Ha3.b	*Performance Expectance moderated by gender and age positively influences behaviour intentions such that the effect is stronger for older males.*	Not supported
Ha4.b	*Relevance moderated by gender, age, experience and awareness positively influences* behavioural *intentions such that the effect is stronger for older users with long time experience.*	Supported
Ha5.b	*Social influence moderated by gender, age, experience and awareness positively influences* behaviour *intentions such that the effect is stronger for younger females.*	Supported
Ha6.b	*Facilitating conditions moderated by age, experience and awareness positively influences usage behaviour such that the effect is stronger for old users with increasing experience*	Not supported

It can be observed that of the four hypotheses, two were supported and the other two were rejected. It is observed that the two rejected models one of them is based on Pe construct which has a negative effect on ELSAUM.

5.3. DISCUSSIONS AND INTERPRETATION OF RESULTS

As discussed in the four previous chapters, data was collected from 445 end-users of e-library services in eight sample universities. The data were used to develop five separate models from different sub-groups. One of the five models, the Pooled Model that was designed from the pooled data of 445 respondents. This constituted the ELSAUM Model. Data extracted from the 445 respondents was categorized according to the demographic information into four sample models. The four categories' data were used to empirically validate the ELSAUM model. This was done in Sub-Section 5.1.2. It is the

ELSAUM model (research/pooled) which was used to test the postulated research hypotheses.

In this section is a discussion of the results from hypotheses tests comparing the results with similar studies and providing explanation for the findings**.**

During data evaluation and analysis it was noted in Table 4.10 that Makerere Model retained 21 indicators which is below the other models' retained indicators. This can be attributed to the fact that knowledge associated with e-library services access and use is possibly more among staff, compared to other category of respondents and Makerere University sample population was more of students than staff.

The study postulated twelve research hypotheses based on ELSAUM model path coefficients results depicted in Figure 4.4 and t-test statistics in Table 5.1. The path coefficients results for the other four sample models (Figures 5.2, 5.3, 5.4 and 5.5; Tables 5.7 and 5.7) were used to assess the validity and reliability of ELSAUM model (Figure 5.1) and for comparison purposes. Based on the analyses of ELSAUM model, the study was able to respond to the research hypotheses, summaries which were presented in Tables 5.9 and 5.10.

5.3.1. Results of Entire Research Model Propositions (Ha1 and Ha2)

The study results presented in Table 5.1 for the R^2 and Figures 4.4 and 5.1 statistically support the proposition that at the sampled universities, end-users have relatively high inclination towards behaviour intention to accept and use electronic library services at 30 percent, followed by relatively low level of usage behaviour of the electronic library services at 9 percent and they moderately expect benefits from the services at 18 percent. This gives the overall prediction level of ELSAUM model at 57 percent as presented by PLS-Graph.

Dependent constructs (Bi, Ub, and Eb) in all the five models including the research model indicate a positive inclination towards the acceptance and usage of electronic

library services. The path coefficients for all constructs except Pe indicate a positive inclination towards acceptance and usage of electronic library services. This finding shows that end-users in university environments accept to use electronic library services. This is in line with findings of Engebretsen (2005) who studied medical workers in South Africa and Uganda and found that Ugandan doctors were more responsive to the new technology compared to those in South Africa.

The question on whether "the research model constructs demonstrate an effect on end-users' acceptance and use of e-library services" was partially supported. The partial support was brought about by the positive path coefficients in the three model's constructs (Re, Si, & Fc) towards the dependent constructs and negative path coefficient from Pe construct (Figure 4.4 ; 5.1 and column 2 of Table 5.2). The construct of 'Pe' demonstrates a negative effect on Bi to acceptance and use of e-library services. The support for research model in the study is partial because Pe is a component of the new model. The negative contribution of Pe construct to the model is contrary to other studies' findings where the construct contributed positively towards acceptance and use of technologies as discussed in Sub-Section 5.3.2.

5.3.2. Results from ELSAUM's Independent Constructs Hypotheses (Ha3– Ha6)

a) Performance Expectance Construct

The contribution from 'Pe construct' in the study was a point of concern in the third postulation, (Ha3a). The tests indicate that the construct has a negative effect on Bi to use electronic library services. Results from the three sample models with respect to Pe construct were consistently low (at minus -0.013; -0.131; and -0.123). It is only in Makerere University and the students' models where Pe contributes positively (0.35 variance and 0.2 variance respectively) towards Bi.

The findings are contrary to those of Moran (2006) and Venkatesh *et al.* (2003) whose studies were conducted in USA. The construct constituted one of the strongest determinants within the study by Venkatesh *et al.* (2003). While this could be attributed to the technology studied which in this study is different from that studied by Venkatesh

and others, it could also be an attribute of the environment/culture (Anandarajan *et al.* 2002; Brown *et al.* 2006; Kaba *et al.* 2008; Oshlyansky *et al.* 2007). As pointed out by Im, Hong and Kang (2007) "the impact of performance expectance in UTAUT model would be greater in countries with pragmatic culture, while the impact of social influence would be greater in countries having tight social interactions". This concern should be investigated because it has been observed in this study. It is possible that this construct, like effort expectance construct in UTAUT model which was recommended for removal by the pilot study participants could easily have been mistaken with facilitating conditions construct. Perhaps it may have been hard to differentiate for example the effect of slow bandwidth as an attribute of facilitating conditions or performance expectance. For this reason, it would be interesting for another study to be carried out without this construct and see if the predictive levels of ELSAUM could improve above 57 percent.

Another way of looking at the negative contribution of the construct could be from the angle of the technology that was studied. Perhaps, the construct of performance expectance may not easily be applied to service oriented evaluations since the effect of performance expectance may not be felt. With hindsight from the experience in undertaking this study, it is possible to say that the effect of 'performance expectance construct' is best applied when one is evaluating the acceptance and use of a system and not a service. In this case where one is evaluating services which are provided through ICTs, it is reasonable to say performance expectance is not applicable in such context.

The effect of Pe on Bi is negative (-0.013) implies that end-users perceive e-resources as non-performing. However, this effect is as a result of mixed effects from various end-users. For example, Makerere University Model (Figure 5.4) indicates significant positive inclination, which means that the effect of other universities outweighed the Makerere effect to generate negative outcomes. This results can further be understood that, the other universities, like the newly established universities had few library facilities, implying that equipping these other universities with library facilities is critical.

b) Relevance Construct

In this study relevance construct was regarded as the "degree to which electronic library services are closely associated with the enhancement of one's academic pursuit". The construct was a contribution by the researcher to the model to find out how end-users perceived e-library services relevant to their daily pursuit in an academic environment. The postulation that relevance is one of the determinants to behaviour intentions was supported by the finding that the Re construct is responsible for 23 percent contribution to Bi in the model. This contribution was significant as far as this study is concerned. Respondents consider using e-library services as being relevant in their routine academic pursuits as the results presented in Table 5.2 show.

The relevance of information influences behavioural intention to use and thus affects expected benefits (Hong et *al.* 2001; Nicholson 2004). Within ICT services acceptance and use context, the factor of relevance was appropriate given that unless users perceive the service to be appropriate to their work and well being, they would not spend their precious time to use it. Results of this study reaffirm findings carried out in services oriented studies (Schamber 1994; Hong *et al.* 2001; Kwak *et al.* 2002; Nicholson 2004; Nov and Ye 2008), which showed that relevance had significant effect on usage of library services.

The results imply that relevance has 23 percent inclination towards behaviour intentions to use e-library services. This depicts that end-users perceive e-library services as relevant in their day-to-day academic pursuits, more especially the academic staff who normally use the services to update their teaching materials and individual research activities. Students are consumers of the staff's generated knowledge and so are either compelled or see it relevant to use e-library services as may be directed by the lecturers or in their own course work and study activities.

c) Social Influence Construct

The fifth research hypothesis (Ha5a) was supported by the positive path coefficient from Si construct of 0.42 (Figure 4.4 and Table 5.2) contribution towards behaviour intentions

to use electronic library services. This contribution was the highest among the independent constructs in the ELSAUM. This is an indication that the construct is a major driver of acceptance of services made possible by means of technology within DCs context.

This finding is in contrast with a number of other studies (Chau and Hu 2001; Davis 1989; Dishaw and Strong 1999; Mathieson 1991; Venkatesh and Morris 2000; Venkatesh *et al.* 2003) who found that social influence had no significant effect on behaviour intentions. Such studies were carried out in the developed world, e.g. USA and Japan. Whereas the African environment/culture seems to favour social groupings, it is argued that the developed world is characterized by individualism (Maznevski and DiStefano 1995).

According to Anandarajan *et al.* (2000, 2002); Kripanont (2007); Baba *et al.* (2008); Brown *et al.* (2006), Oshlyansky *et al.* (2007), social influence has a significant effect on behaviour intention to use a new technology. In the e-library services context, social influence was found to be one of the driving forces of behaviour intention to use. This can be explained by the fact that studies in most DCs like Guinea, South Africa and Taiwan found similar results. An important implication of this difference is that findings derived from acceptance and use of technology studies in Developed Countries should be applied with caution to Developing Countries. Results of the current study show that there exists statistically significant positive relationship between social influence and behaviour intentions. In other words university library end-users in Uganda are influenced by their social grouping, more especially young female.

These results are consistent with those of Kaba, N'Da and Mbarika (2008), Uzoka, Shemi, and Seleka (2007), Anandarajan *et al.* (2000 and 2002) and several others, which show that social pressure is one of the determining factors that influence IT/ICT acceptance and use in African environment.

However, the study findings agree with works of Moran (2006), and Hartwich and Barki (1996) who suggest that the subjective norm was more important in technology use as it was perceived to be in a free and voluntary setting. Among university communities in Uganda, e-library services use amongst academic staff tends to be more mandatory compared to students and so it is interesting to find that the predictive power of social influence for staff is the highest (0.617) compared to students (0.37).

d) Facilitating Conditions Construct

The hypothesis regarding the construct of facilitating conditions without any moderation impact was supported by 22 percent contributions to behaviour usage. The variance contribution towards usage behaviour is significant. The construct contributed highly in almost all of the sample models, the highest contribution was observed in the staff model (0.49, Table 5.6 & Figure 5.2). The students' model generated the least contribution (0.02). This is an indication that available technology facilities favor faculty members of staff and less so students.

Again, Taylor and Todd (1995b) and others suggest that the presence of facilitating conditions may not encourage usage. Limayem and Hirt (2000) found that facilitating conditions construct was significantly related to actual usage of Internet-based teaching. If users experience some barriers in any form especially if it is time consuming, users in an academic environment may abandon the whole idea of using the services. Results of the current study confirm the findings of Fortune (2005) and Bishop (2002), that facilitating conditions encourage the acceptance and use of services.

5.3.3. Results of Hypotheses with Moderation Impact

It is clear from the study analysis that various factors determine acceptance vis-à-vis non-acceptance of e-library services in addition to those provided in UTAUT model. This study examined some of such factors which include: Pe, Re, Si and Fc. According to the ELSAUM model (Figures 4.4 and 5.1), the independent constructs were moderated in varying degrees by gender, age, experience and awareness resulting in influences on the

model's dependent variables. In this section, the impact of the four moderator variables on the research pooled model is discussed.

Increasing age was found to be connected with lower anticipated ease of use of new technologies (Knutsen, 2005). However, Kripanont, (2007)'s study found that the effect of Si and Fc on Ub in teaching were moderated by age such that the effects were significant for older individuals. In addition, age impacted the relationships between usage and behaviour intentions such that the relationship between usage behaviour in other tasks and behaviour intentions in teaching tasks were more important for younger individuals than older ones. Similar to Kripanont's study, in this study, age has a positive effect on performance expectance, indicating that older individuals have high expectations towards the new e-library services as observed in Table 4.12 (Pe * AGE 0.10.) with a significance value of 10 percent.

According to Venkatesh and Morris (2000), gender and age roles have a strong psychological basis and are relatively enduring, yet open to change over time. The authors agree that the two variables play significant moderating roles in technology acceptance. Given the traditional setting in most DCs' schooling environment and job related factors; the assumption regarding the impact of gender and age on Pe construct was not supported (positive but insignificant coefficient (0.10) for research/pooled model. It is argued that access to use e-library services was independent of age and gender (Table 4.12).

However, the assumption is supported by the staff data (Table 5.3; 0.37), which suggests that the effects of job-related factors influence individual's behaviour towards acceptance and usage of e-library services. For example, academic staff in most universities who include female (Table 5.3; 0.73***) have adopted the e-learning system of instruction and are therefore compelled to acquire the skills to deliver on their teaching and other academic responsibilities. In the staff model the impact of sex and age on Pe construct was found to be stronger for older males in the study. This finding is in line with

Kripanont (2007)'s study, but is contrast with Venkatesh *et al*. (2003) that found the effect stronger for younger male workers.

The hypothesis on **relevance** construct with the moderation effect was supported. The impact on Re construct being moderated by gender, age, experience and awareness on Bi was positive (beta coefficient = 0.096, $p<0.01$) as seen in Table 4.12**.** The Re construct was more salient for experienced individuals; gender differences could have been driven by factors related to gender roles. Increased age is associated with more learning and attention to information on the job (Plude and Hoyer 1985; Kripanont 2007). As suggested, Re was a strong determinant of individuals' intention to use e-library services, and more so for older and experienced male workers.

When moderated by gender, age, experience and awareness, **Re** construct had significant and positive effects on intentions to use e-library services. This can be explained by the fact that most university libraries in DCs hardly have enough print library information materials to satisfy the needs of all their patrons. University library users have had to turn their attention to e-library services because they saw them as indispensable resources for their academic progress. The implication of this finding is that end-users, (irrespective of gender, age, experience and awareness) perceive e-library services to be relevant to their academic work and therefore use them or intend to use them. This is particularly true because when relevance construct is moderated by awareness, there is a significant relationship at $p<0.01$ as per the regression results (Table 4.12).

The role of **social influence** in technology acceptance studies is subject to different interpretations and moderations such as gender, age and experience (Venkatesh and Davis 2000; Dishaw and Strong 1999). This suggests that women are sensitive to others opinions and therefore find social influence more significant when forming an opinion to use a new technology (Miller 1976; Venkatesh *et al. 2*000). Gender effects can be driven by psychological effects within a society's gender roles. In confirmation of results by Morris and Venkatesh (2000), the study results show that young e-library services end-users put a lot of emphasis on social influence especially the female ones. The construct

moderated by gender, age, experience and awareness, the hypothesis is supported by the research/pooled model, as results in Table 4.12 ($p<0.1$; -0.25) indicate in favour of older females.

According to the findings (Table 4.12), the construct of Si impacted heavily on female e-library services users more than their male counterparts (-0.25). Results further suggest that younger people in an academic environment were more socially influenced than the older ones (-0.22). Furthermore, end-users of e-library services that were aware of the existence of the services were less influenced by the society's norms (-0.09 effect stronger with few years of experience).

Facilitating conditions are modeled as direct influence of usage and also moderated by age, experience and awareness (Table 4.12 & Figure 5.1). The assumption that Fc moderated by the three variables positively influence usage such that the effect is stronger for older users with more experience" was not supported by the study data (-0.08). The explanation for this is that there are no multiple avenues for help and support to use e-library services throughout the sampled universities thereby imposing barriers to sustained usage of resources. In the sample universities, most end-users irrespective of age, experience or awareness of the services take their own initiatives to learn how to use e-library services with minimum support from the universities' management.

Lack of **awareness** was identified as one of the factors that hinder the acceptance and use of e-library services (0.06 in Table 4.12). It was noted that majority of potential users of e-library services did not know that the services were offered by their library. The implication for this finding is that librarians and all stakeholders need to be proactive in publicizing the services. All library users need to be sensitized about all services offered using the new technologies. Failure to publicize the services effectively results in none adoption and non use. A point of concern raised by this and other studies is that although some ICT/IT systems existed, they were not effectively utilized, a situation which does not make economic sense (Bishop 2002; Marchewka and Kostiwa 2007). Developing

Countries need to make good use of the new technology so as to position themselves on the world stage since ICT is the way to go.

Gender, age, experience and awareness were found to moderate most of the determinants of intentions to use e-library services. With the exception of facilitating conditions and performance expectance constructs, the other two independent constructs in ELSAUM model were positively moderated by all the four moderators. The two constructs which were not moderated by the four moderators are the ones that had negative effects on behaviour intentions to use. However, like the findings of Venkatesh *et al.* (2003), performance expectance construct was moderated by gender and age. In the case of UTAUT, the moderator variables influenced the construct positively towards behaviour intentions, whereas in the current study the influence was negative, an indication that the construct was inappropriate in this study context.

Worthy of further investigation are the differences arising from age, gender and discipline on the adoption of e-library services.

5.3.4. Results of Hypotheses from the Dependent Variables (Ha7 & Ha8)

a) Behaviour Intentions

Behaviour intention to use technology is a major concept and can explain a big part of end-users' actual usage in that it is a driving factor towards the individual's usage behaviour. Consistent with studies (Davis 1989; Fishbein and Ajzen 1975; Ajzen and Brown 1991; Taylor and Todd 1995a) on intentions to use technology (Section 2.1), behavioural intentions in this study have a significant positive (30%) contribution towards usage of e-library services. Most respondents had adequate experience with the technology studied and in particular with the Internet. Behavioural intentions were the most predictive in all the five models (Column 2; Table 5.8). This is understandable because individuals in an academic environment have the desire to improve their skills and knowledge therefore harbour intentions to use the e-library services.

Analysis of relationships between independent constructs and behaviour intentions and usage behaviour (Table 5.7) showed that it is the availability of facilitating conditions, group characteristics (staff, students) and social influence which result in significant positive relationships associated with using e-library services. Lack of ICT infrastructure or accessibility of associated equipment like computers, computer laboratories, enough bandwidth, limit the adoption and use of the services. Acceptance of e-library services can only be achieved if the environment is conducive enough for end-users. According to Venkatesh *et al.* (2003), facilitating conditions construct is not significant a determinant of intention, but was retained in their model due to the importance attached to it by Taylor and Todd (1995b).

b) Usage Behaviour

People will use e-library services if they perceive that using such services will help them achieve the desired goal (passing examination, getting promotion etc). Hypothesis eight is supported by the path coefficient which acts as correlations between usage behaviour and expected benefits (Figure 4.4; Table 5.1). Usage behaviour contributes positively by 9% towards expected benefits in the research pooled model. It is noticeable that the contribution of this variable is the highest in the Makerere model setting (Column 3, 4th row in Table 5.7). This can be explained by the fact that Makerere University has the most variety of e-library services studied.

It is worth noting that expected benefits construct was included by the investigator. The purpose was to ascertain any possible benefits end-users expected as a result of accepting and using electronic library services. Results of this finding reaffirms Teo *et al.* (1999)'s results which show significant relationship between benefits and Internet usage. In the absence of current print materials in university libraries as observed in Sub-section 1.2.3 and table 1.1, specifically Columns 6 and 7 of the same table, end-users in DCs find e-library services more beneficial.

c) Expected Benefits

Expected benefits construct was found to be one of the factors which directly influence acceptance and use of electronic library services (Tables 5.1 and 5.8). End-users use of e-library services are mainly concerned with benefits they expect to derive from the services. Respondents did not find sufficient reasons to move away from using the traditional library to electronic library services because they felt that there were no additional benefits to gain from using the services. This is consistent with Saxton (1997) and Bar-Ilan *et al.* (2003) findings.

The implication from the above finding is that in order for services made possible by means of ICT/IT to be accepted and used, they need to be perceived more beneficial to other rival services. To accelerate the acceptance of these services there is need to put emphasis on the benefits to be gained from using the services. In academic environments, some benefits can be tagged to the use of the services, e.g. staff promotion and better grading of examinations for students. Example of this is where other universities especially those in Southern Africa insist that students at all levels of study must include web based references in their work assignments be it course work or term papers. Academic staff need to be encouraged to include web based resources in their references when writing journal articles and giving references to their students.

The implication for this finding is that librarians need to be quite effective and efficient in the provision of the services so that end-users do not get disappointed. It was found that the most prominent factor that contributed to non-acceptance and use of e-library services was the lack of awareness among end-users. This was an indication that the services were not well publicised. There is a great need for librarians to develop a proactive promotional and marketing strategies of the services, to make them more relevant to end-users.

5.3.5. Findings from the ELSAUM Model

Consistent with many studies (Heinrichs *et al.* 2007; Rosenburg 2005; Vinitha 2006, Kiondo 1997) ICT is changing the face of university libraries, their organizational

structures and the way in which they deliver services to end-users. The need to find how the changing library environment affects usage was an area of concern (Eldredge 2000; Heinrichs *et. al*. 2007, Nov and Chen 2008). It is one thing to introduce changes, and another for the changes to be accepted. This study looked at factors which lead to e-library services acceptance and use especially in DCs where technologies are relatively new.

Considering ELSAUM model, tests from the model indicate that behaviour intentions predicts about one third of variance of end-users' accept and use electronic library services, and usage behaviour predicts about one tenth, while expected benefits predict one fifth of the variance of acceptance and usage. This showed that ELSAUM model predicts about three fifth of end-users' acceptance and usage of technology (in this case electronic library services) in the sample of universities. The greatest contribution being the Bi, an indication for future usage of the services. These results support most of the study hypotheses with the exception of Ha3.a, Ha3.b and Ha6.b**.** The study research model is a contribution to literature and discussions on acceptance and use of technology as far as end-users of information technologies services are concerned.

Though the model is highly predictive by dependent constructs as observed by R^2 of 0.57 path coefficients (Figure 4.4 and Table 5.1), end-users in the sample universities have not felt the impact of e-library services in terms of performance expectancy. This may be because it was a bit early for this kind of study to be carried out in Uganda. Nevertheless, this study is a positive step towards applying UTAUT model in context of DCs and towards improving our understanding of e-library service adoption in such countries. Results of this study have far-reaching implications for DCs because most evaluation models are designed without taking into consideration different environments (Cheung and Burn 1994; Mugenda 2008), and yet studies in DCs tend to take such indicators wholesale. Conducting evaluation studies in IS without taking into account the social conditions of other cultures could lead to misleading results (Anandarajan *et al.* 2002; Brown *et al.* 2006; Kaba, N'Da and Mbarika 2008; Oshlyansky *et al*. 2007).

Comparing the four generated models (Figure 5.2., 5.3., 5.4., 5.5 and Table 5.6), academic staff model showed that this group of respondents was more aware of the services as their model received the highest variance of 0.33 from Behaviour Intention, Use Behaviour had 33 percent variance and Expected Benefits had 11 percent variance. The three dependant constructs predict 65 percent variance in the academic staff model. This can be explained by the fact that members of any academic staff in a university are expected to read ahead of their students as well as produce academic literature without which they cannot be promoted to higher ranks. Staff in these universities receive the support of their management probably more than students.

On the other hand, the students' model (Figure 5.3) showed relatively high support from behaviour intentions which contributed 30 percent variance and relatively less support from the Use Behaviour at eight percent variance and expected benefits at 14 percent variance, totaling to 52 percent variance prediction powers. The students' low support could be attributed to some deficiencies within the service delivery mechanisms such as publicity (awareness) and other associated university support facilities which favour faculty members of staff more than students. Whereas members of the academic staff stay longer at the university, the students come and go and hence the problem of publicizing the services to students during their short stay at the university. Although results show that the students' current usage of e-library services is low, future usage is expected to rise significantly at 30 percent variance, as facilities and awareness of the services improve for them.

Makerere University respondents showed the highest perception of 38 percent variance for Bi, compared to other universities' at 30 percent variance; Ub was at 56 percent variance compared to only 3 percent variance for other universities and Eb contributed 0 of 21 percent variance and 33 percent variance, for Makerere University model (Figure 5.4). Better acceptance and use of the e-library services may be explained by the fact that Makerere University is the first university in the Uganda, is government funded, has experienced academic staff and generally students with better entry qualifications given the stiff competition for places. We also observed that Makerere University has the best

ICT infrastructure and e-library services compared to other universities illustrated in Tables 1.2, 1.3, 1.4, 3.1, 3.2 and 4.11 also Sub-sections 1.1.1, 4.4.4. This is interpreted to mean that acceptance of e-library services is largely dependent on all shades of facilitating conditions.

In order to make the services effectively used, students in universities need to be facilitated in terms of access to new technologies. It is expected that technology facilitating conditions should enable institutional management to over come possible impediments to usage (Taylor and Todd 1995b). This agrees with Venkatesh *et al.* (2003), who established that facilitating conditions construct was non-significant in predicting usage. In the context of this study, respondents indicate that the factor of facilitating conditions was significant for them in influencing the acceptance and usage of e-resources. The presence of facilitating conditions is related to actual usage of Internet technology based teaching and learning (Limayem and Hirt 2000).

5.4. SUMMARY AND CONCLUSION

There were two main and ten minor hypotheses in this study. The hypotheses were formulated according to the research model (ELSAUM model) and were examined to see if the data supported or rejected them. Study data were analyzed using PLS-Graph and the GLM regressions based on tests performed on the twelve study hypotheses and results are presented in Table 5.8 and 5.9. Of the twelve study hypotheses, eight (66%) were supported, one (8%) was partially supported and three (25%) were rejected. It is noticeable that of the three rejected hypotheses, two of them (17%) emanated from Pe construct which had a negative effect on Bi to use e-library services. The other rejected hypothesis is associated with Fc construct and the moderation impacts (Ha6b).

Due to relevance of e-library services, social influence within the society and facilitation conditions, the study findings indicate a positive inclination of end-users in Uganda's university communities toward acceptance and use of e-library services. The staff in the sample universities enjoyed and benefited from support by management and therefore used the services more than the students. The independent construct of 'performance

expectance' in the study context had a negative effect on the model, in contrast to UTAUT model. Until proven as an influencing factor, performance expectance construct showed no effect on the research model. Most independent constructs in the ELSAUM model were moderated by gender, age, experience and awareness, the implications of which are further discussed in 6.6.

The findings of this study outlined in this chapter contribute to a better theoretical understanding of factors that affect the acceptance and usage of e-library services especially in DCs. The study serves as a basis for other studies some of which are suggested in Section 6.5 of the next chapter.

CHAPTER SIX - SUMMARY, CONCLUSIONS, RECOMMENDATIONS AND AREAS FOR FUTURE RESEARCH

6. INTRODUCTION

The multi-centre cross sectional survey of 445 respondents that was carried out by this study was able to design and validate a measurement for acceptance and use of information technology services with samples from a Developing Country. In this chapter we summarize the major milestones made by this study. A summary of the thesis is presented in Section 6.1. Major findings of the study are highlighted in Section 6.2. In light of the study findings, Section 6.3 makes recommendations for library professionals, library users, university administrators and information systems scientists. Section 6.4 highlights contributions made by the study and proposes an agenda for future research in Section 6.5. Section 6.6 concludes the entire report and points out the implications of the findings.

6.1. SUMMARY OF THESIS

As discussed in the previous chapters, the main purpose of this investigation was to design a model for measuring levels of end-users acceptance and use of e-library services. The study first described the current state of affairs regarding the development of electronic library services in DCs, specifically in the sample universities. Secondly, the study identified an appropriate theoretical model – the UTAUT by Venkatesh *et al.* (2003). The study proceeded to highlight the historical development of technology acceptance models with emphasis on TAM the pre-cursor model. The study reviewed UTAUT model and recent studies which have supported it with a view to finding out its strengths and weaknesses and whether it had been applied to studies in the current context. The model was selected because: a) it had the highest predictive powers; b) it was the latest; c) it allows additions and modifications and d) it has not been used within e-library services' context. The review of literature revealed that two of UTAUT

constructs were not appropriate to this study context, namely effort expectance and voluntariness of use.

In the Library Science literature review (Section 2.2), the study identified factors which influence acceptance of usage of library services. The study then postulated that including some of the identified constructs would strengthen the study and improve the support for UTAUT model in e-library services context. The study has four research objectives and hypothesized them (Sub-section 1.4.3). The study then proposed a conceptual framework based on UTAUT, which incorporated the other identified constructs. A study research model was then designed, validated and tested using twelve research hypotheses. Initially, a pilot study was conducted to test the study instrument, after which the instrument was adopted in the light of the findings.

A cross-section survey involving 491 respondents from eight universities was conducted in June, July and August 2007. Data from the sample respondents were collected and analyzed and was utilized to design and validate the final model – the ELSAUM. According to the findings, the major determinants of end-users behaviour intentions and usage behaviour of e-library services were relevance, social influence and facilitating conditions. The fourth construct, of performance expectance contributed negatively to the model. The model's constructs were moderated in varying degrees by gender, age, experience and awareness.

6.2. MAJOR FINDINGS

The study had four specific objectives outlined in Section 1.4 and highlighted below**:**

i. *Review key issues in research related to acceptance and use of technology.* This objective was met by the information provided in chapter two. This objective was achieved by the review of literature specifically the information provided in the first row of Table 2.2. Factors which were thought to influene acceptance and use of electronic library services especially in DCs as modeled by Venkatesh *et al.*

(2003) were identified as; performance expectance, relevance, effort expectance, social influence, facilitating conditions, awareness, gender, age, experience, voluntariness, behaviour intentions, usage behaviour and expected benefits. However, effort expectance and voluntariness were thought that they would not effectively influence the acceptance and use of electronic library services. Instead, within the context of this study, relevance, awareness and expected benefits were investigated and believed would contribute to the modification of UTAUT to predict acceptance and use of e-library services.

ii. *Design a model of acceptance and use of library services assisted by new technologies.* This objective was addressed by designing a research model which was hypothesized as described in Chapter One, conceptualized as depicted in Figure 3.2, designed using data from 445 respondents as illustrated in Figure 4.4 and presented in Figure 5.1. The model was then validated and hypotheses tested against it in Chapter 5. The study model called the "Electronic Library Services Acceptance and Use Model", abbreviated as ELSAUM has the following features: four independent constructs of *performance expectance*, *relevance*, *social influence* and *facilitating conditions* which are moderated by *gender*, *age*, *experience* and *awareness* and all together influence *behaviour intention* to *use* e-library services due to *benefits expected* from them.

The major finding is that the research model was influenced positively by three of the four independent factors; *social influence*, *relevance* and *facilitating conditions*. The fourth independent construct of *performance expectance* had a negative contribution to the model. The predictive powers of dependent constructs on the model were 57 percent variances of end-users acceptance and use of electronic services. Because of the benefits they expect and society's expectations, end-users in Uganda's universities were positively inclined to accepting to use e-library services.

iii. *Empirically validate the designed model against the use of electronic library services by members of university communities in DCs.* This objective was addressed in Chapter 5, specifically Sub-Section 5.1.2 and 5.1.3; and all the hypotheses testing and interpretations and discussions in Chapter 5, Sections 5.2.1 up to Section 5.4. Accordingly, the model was validated against the use of e-library services in eight university settings in Uganda and found fit to be generalized on similar populations in DCs.

6.3. RECOMMENDATIONS ON CURRENT LIBRARY SCIENCE AND INFORMATION TECHNOLOGY PRACTICES

6.3.1. Library professionals

Results of this study can help librarians to better appreciate and tackle the real needs of end-users, so as to have positive effects on acceptance and use of e-library services. In this regard, it will be useful if the model designed and tested through this study is disseminated to library professionals in developing countries such as Uganda, to improve knowledge of the factors that influence usage of their services..

Librarians in DCs such as Uganda, lack tools that they can use to evaluate their services in order to identify areas to improve. The ELSAUM model offers an opportunity to develop a generic checklist (example in Table 6.1) that can be used for this purpose. For example, questions on the important determinants of ICT library services can be included in the checklist.

Table 6.1: Example of a generic checklist for improving conditions in the Library, focusing on facilitating conditions

Instructions

To enable management improve Library Facilitating Conditions, tick one number for each of the following statements:

1= strongly agree; 2 = Agree; 3 = Neutral, 4 = disagree; 5 = strongly disagree

Q	Facilitating conditions	1	2	3	4	5
1	The university has the necessary facilities needed for me to use electronic library services.					
2	I have the skills required to use electronic library services.					
3	Electronic library services are compatible with the university Local Area Network (LAN).					
4	Librarians are always available to assist me with electronic library services difficulties.					
5	I have the resources necessary to use the library online catalogue (OPAC)					
6	I find librarians friendly and skilled in problem solving related to accessing online resources					
7	I can access electronic library resources on Internet without any problems.					
8	The university has enough bandwidth to enable access electronic library services.					

Thank you for taking the time to complete this form

6.3.2. Library users

It is vital to increase end user awareness of the e-library services that are currently available. The findings of this study show that independent variables (relevance, social influence and facilitating conditions) which were moderated by awareness significantly influenced intentions to use (Table 4.12 and Figure 5.1). The study results showed that performance expectance construct which is not moderated by awareness (Figure 5.1) has a negative effect on intentions to use the services. The awareness effect in libraries can be achieved through pro-active activities such as induction of new students, leaflets distributed to lecturers and students and posters displayed around the university. A video

to introduce university students to library facilities could be prepared for viewing in library foyers e.g. at the beginning of each academic semester and can be provided for individual viewing in the libraries' audio-visual rooms.

Efforts also need to be made to improve the appropriateness of services, i. e. relevance. This could involve an evaluation of current needs of students and lecturers. Leaflets and print guides to CD-ROMs and online journals and database information sources needed for specific university courses can be distributed or e-mailed to relevant departments or individuals. This should be part of the Online Selective Dissemination of Information Services (OSDIS), one of the important functions of an academic library which seems to have been ignored in many DCs due to lack of skilled manpower and resources.

Since the study has demonstrated that social influence is one of the drivers of technology acceptance and use in DCs, small learning groups of students working together should be encouraged, especially during the first year at university.

6.3.3. Governments, University administrators and IS scientists

Stakeholders (including policy makers, university administrators, and IS scientists) must understand factors that promote the adoption and use of these technologies in order for ICT projects to be targeted to deliver greater benefits to their beneficiaries. University administrators need to improve infrastructure for ICT in their university libraries. One obvious recommendation is that enough computers connected to the internet be provided. In the same vein, the speed of internet connectivity should be high enough to make the experience of web browsing a pleasant one. This requires that the bandwidth availed to libraries should be tailored to demand for the services. Although bandwidth is currently expensive, this investment may be worth it if graduates are able to use these skills to improve their academic skills thereby contributing to the reputation and marketability of the university. It is likely that the cost of internet bandwidth will decrease in the near future and so, universities should take advantage of this when it happens.

University administrators need to support their libraries with appropriate policies and development plans that promote ICT use in the delivery of library and other information services. Given the limited financial resources available to address all the challenges that universities face, it is important that the bottlenecks to use of ICT library services are prioritized and tackled in a stepwise manner with the resources currently available. At the same, time, university administrators of government universities especially, should provide timely information in to the governments budgeting process so as to align their priorities with the funding that the government can provide.

There is need to carry out in-depth investigations to better understand how these constructs influence user behaviour and use of electronic library services. These studies could also seek to determine possible solutions to some of the obstacles identified in this study such as poor facilitating conditions. IS and LS professionals need to co-operate in these kind of studies as well as in training of their colleagues and trainees. If this kind of co-operation is established, it will improve the library profession because it will give opportunity for librarians to learn from IS and be better equipped to handle the demands of the digital library environment.

There is need to research into the possible merge of the two professions into one IS/LS professional because it appears that currently both professionals do almost similar functions with regard to ICT information services. We have seen the roles of librarians change from the one in the traditional library environment. To have the competencies and skills to cope with the change to an ICT environment, governments in DCs need to invest in the pre-service training of librarians. Already qualified librarians in service need to be reoriented to ICTs through refresher courses or on-the-job training.

On a national scale, governments in DCs need to invest in large ICT infrastructure as one of the developmental needs for their populations. This will contribute towards cheaper and more accessible Internet, which in turn will benefit universities and hence improve the facilitating conditions of library end-users.

6.3.4. Monitoring and evaluation of library services

The researcher recommends that librarians define main indicators that are good determinants of usage behaviour some of which we have suggested in this study. Three such indicators are proposed as follows:

i. A measure of the available infrastructure can be the ratio of computers to students (post graduates and undergraduates). To begin with, a suggested target ratio would be one functional computer to ten students: Universities would strive to achieve this target by planning and budgeting towards this. Over time, progress towards this target can be monitored and evaluated to determine if the ratio is appropriate or not.

ii. A measure of awareness of ICT library services can be obtained by sampling a homogenous group of students and monitoring changes over time. This measure can be derived from the proportion of students who have correct knowledge of the services provided by their library.

iii. A measure of usage behaviour can be the proportion of student assignments (or something similar) that use web-based referencing.

6.4. STUDY CONTRIBUTIONS

This study contributes to e-library literature by providing a transferable model for measuring levels of acceptance and use of services as far as the perceptions of end users are concerned. It is the first such study. The major contribution of the current study is derived from the novelty of identifying determinants of acceptance and use, and thereafter using them to design an e-library services evaluation model. The Electronic Library Services Acceptance and Use Model (ELSAUM) model designed by this research has filled a major gap in understanding user acceptance of library services.

Secondly, the study contributes to the discussion on the adoption of new technology, using the example of e-libraries in an African environment. The study is significant to IS because of the fresh ideas from a different discipline (LS), which have been used to design the theory. The study has also added to the knowledge of ICT adoption in developing countries.

Thirdly, the study provides insights on two of the socio-economic factors of gender and age as they relate to acceptance and use of e-library services in a university setting. Venkatesh *at al.* (2003) found that gender has received very little attention in technology acceptance research literature, yet their study results indicate that it moderates three of the four key relationships.

Finally, the study increases understanding of acceptance and utilization of e-library services in Uganda's universities. The research report has the potential to lead to improved understanding of the consequences of e-library systems usage. The study results could help university administrators in less developed countries assess the likelihood of success of an introduced new technology

In summary, the study is significant because it:

i. Preliminary study findings provided up to date information about library services in Uganda, a Developing country more especially with regards to hybrid library services.
ii. Contributes to IS research.
iii. Provides a transferable model for measuring levels of acceptance and use of end-users of ICT services as far end users communities' perceptions.
iv. Contributes to discussion on adoption and use of new technology with special reference to e-library services.
v. Brings fresh ideas on developing theories of IS adoption.
vi. Provides information on two socio-economic factors, e.g. gender and age as they relate to acceptance and use of e-library services in university settings.
vii. Provides knowledge about levels of acceptance and utilization of e-library services in universities.
viii. Has the potential to assist university administrators to assess the likelihood of success when introducing new technology.

6.5. AREAS FOR FURTHER RESEARCH

It should be noted that the variables in ELSAUM model explain only 57% of the variance of behaviour intentions and usage behaviour. Another 43% of variance remains unexplained suggesting a need for more studies to incorporate additional variables in this model.

The validity of the ELSAUM model could be enhanced by undertaking a longitudinal study design in a similar or different environment. Furthermore, a similar study could be carried out within Uganda, using samples from more universities than those in this study.

It is possible that the analysis of the data for this study which deals with electronic library services acceptance and use may not easily be generalized to other ICT services and to other DCs. Consequently, the research model needs to be tested on other types of technologies and in other countries in order to reinforce its external validity.

The model and the developed tool need be tested on a global context in order to reinforce the external validity of the study. As a follow up, a large-scale study with a bigger sample from universities in the East African Region is being designed.

It was noted that the performance expectance construct has a negative effect on the model. Future investigation need to leave out this construct and instead replace it with the effort expectance construct which the current study eliminated to see whether the predictive powers of the model improve.

The model needs be tested and validated in other contexts. Future work should be directed to exploring the socio-psychological basis of gender as a means for better understanding its moderating role in the model. Further investigations are needed to identify cultural aspects which affect the influence of the three constructs (Social Influence, Relevance, and Facilitating Conditions) and any others towards behaviour intentions and usage behaviour.

Lastly, future research could measure indirect relationships between independent and dependent variables; for example indirect effects of performance expectance, relevance, and social influence towards usage behaviour.

6.6. CONCLUSIONS AND IMPLICATIONS

Analysis of results from the study showed that among ELSAUM's independent variables, only *relevance* that predicts 23 percent variance and *social influence* that predicts 42 percent variance have significant influence on end-users' intention to use e-library services. As in the original model UTAUT, *facilitating conditions* directly influenced usage by 23 percent variance in ELSAUM model. Surprisingly, results showed that *performance expectance* had a negative effect on intentions, of minus -0.013 variance. And because of this, the construct was proposed for exclusion in future ELSAUM model studies. Most importantly, the study showed that the new model (ELSAUM) had power to explain 57 percent variance in acceptance and use of e-library services.

These findings present a number of challenges for information scientists and university administrators in DCs as discussed in Section 5.2. Recall the library environments described in Sub-section 1.2.1. To allow DCs to benefit from opportunities offered by new ICTs and ultimately, to achieve a true information-based society, it is important that concerned stakeholders understand factors that promote the acceptance and use of new technologies. One step is for libraries to put in place strategies to ensure that ICT services are accepted and used. In Sub-Section 1.2.2, it was noted that some advantages (Leedy, 1993) stemmed from using ICT in libraries. These include better ability to locate and access any type of information on the network; yet DCs rely heavily on inadequate traditional library collections which are only accessed within the library. In Sub-section 1.2.3, the study noted that development partners have provided support to build ICT infrastructure and facilities in most DCs including Uganda. The infrastructure and facilities have enabled library end-users to have access to a variety of information which is available on the wide world web (www). To optimally harness the value of these important resources, end-user communities of these libraries need to accept and use the

services offered using new technologies. The study identified some factors that determined acceptance and use of the new technology services specifically in libraries (Section 2.2). Some of the identified factors were incorporated in UTAUT model and conceptualized in Figure 3.2, designed as illustrated in Figures 4.4, validated by four-sample models in Figures 5.2, 5.3, 5.4, and 5.5, interpreted in Section 5.2, tested in Sub-Section 5.2.2, discussed and interpreted in Section 5.3.

Three important factors were found to motivate university students in making full use of the services. These are: i) facilitating conditions which include among others, good network infrastructure, good computer hardware and software, good facilities, supportive and sufficient library staff; ii) relevance of e-library services, which includes appropriateness to courses being taught and research currency; and iii) Social influence which included cultural groupings, class groupings, and the like. All these contributed towards optimal use of e-library services. The major missing links identified by this study were; lack of knowledge of their existence (awareness of e-services), lack of searching skills, lack of facilities and inadequate contextualization of the services to the social norms found in DCs.

The study findings in Sub-Section 5.3.2, d, showed that due to unfavorable *facilitating conditions* experienced by university students of 0.02 variance, their use of e-library services was low at 0.08 variance. Furthermore, the study reaffirmed findings of Limayem and Hirt (2000), Bishop (2002) and Fortune (2007) that facilitating conditions directly influenced usage. The level of usage by students, who formed the bulk of the population in universities, could be raised by improving the facilitating conditions for them. The improvements could be in the area of unrestricted access to computers and computer laboratories, friendly, adequate and ICT skilled library staff, enough bandwidth to support the demand for online information searches and longer library opening hours.

The study data showed that facilitating conditions which comprised of both technical infrastructure and organizational structure of services directly influence usage of e-library services. As Nicholson (2004) suggests (Section 2.2), electronic library services involve

several elements which included: access to ICT infrastructure and information, the manner in which librarians deliver these services, and the consistency and reliability of the services. The manner of delivery and its consistency and reliability were considered to be part of the facilitating conditions. Heinrichs *et al.* (2007) found that university librarians' skill in delivering services impacts on users' perceptions. Thus, to attract end-users to use e-library services, librarians needed to improve the manner in which they deliver services. Additionally, librarians needed to ensure that the services were reliable, could be accessed at any given time and electronic information could be accessed quickly without any hassles. For example, university administrators need to invest in sufficient internet bandwidth that can cope with the many users on campuses as well as other required ICT facilities.

As more end-users perceive the relevance and expect benefits from e-library services the greater will be their use of the services. Similarly, the more confident end-users perceive their ability to use the services, the greater will be their intentions to use of the services. The approach to promote end-users' ability to use e-library services is through regular and consistent e-services searching skills capacity building.

Findings from the ELSAUM model, in Figure 4.4 showed that relevance played a significant role with 23 percent variance on the perceptions of end-users' intentions to use e-library services. However in both the academic staff and Makerere University models, the influence of the construct was relatively low at two percent variance and five percent variance respectively. The study observed that the construct's influence on the students model in Figure 5.3 of 29.6 percent variance and other university model in Figure 5.5 at 21.3 percent variance was significant, and hence the major contributor to the results of the constructs to the ELSAUM model. This was an indication that academic staff from all study sites and Makerere University Library end-users inclusive did not find the available e-library services relevant to their teaching, learning and research needs. Electronic library services need to be made more relevant to intended users, in alignment with their desire to improve their academic status. Faculty staff need to find the information they require to enable them to improve their academic status;

write research papers; and get up to-date information they need to improve their teaching and well being. Until e-library services are made more relevant to teaching, learning and research, the attraction to usage will remain low. Faculty staff may have to participate in the selection of e-library services to be offered to end-users, just as it is the practice in the selection of books to be acquired for a university library.

It is argued that e-library services offer potential to improve individual user's information searching and retrieval skills (Borgman *et al.* 2000). These skills could give additional advantage to a prospective employee's portfolio. Online information searching is an important and powerful skill, which when combined with knowledge of information sources and methods of accessing information can be valuable and marketable assets. These skills are components of university education (McLelland 1994). Universities in DCs which are equipped with e-library services are the best study centres where these skills can be acquired. It is important, therefore, for university libraries to develop students' information searching skills, which is one aspect of facilitating conditions, especially since this construct was found to contribute only four percent variance to the students' model.

If senior university administrators understand and use the findings of this research to design interventions that target e-library service end-users who are less inclined to use the services in their academic pursuit, not only will graduates in DCs have better professional practices and personal development, universities will also be helped to achieve their educational goals, thereby improving the wellbeing of society.

A general observation is that DCs tend to adopt technology that originates from the Developed World (Mugenda, 2008). Mugenda's study and several others (Anandarajan *et al.* 2000; Yang *et al.* 2006; Oshlyansky *et al.* 2007) show that the adoption process needs to take into consideration local contextual issues that can affect optimal utilization of the new technologies. This study is a small step in that direction.

To ensure success of ICT investments in DCs some of which have provided library end-users access to vast information resources as reported in Sub-sections 1.2.2 and 1.2.3, there was need to evaluate what was currently available so that remedial steps can be taken. University libraries needed to define indicators that can be realistically and reliably used to monitor trends in ICT library services usage. By using simple indicators (recommended in Sub-section 6.3.1), it will be possible for an institution to appreciate the status of electronic library services, monitor changes (for example on an annual basis), define targets and introduce improvements informed by evidence.

Use of ICT library services is not just an end in itself. Whereas it is important as noted above, to equip users with the skills to use ICT library services, the academic environment should be able to create demand for these services by institutionalizing the use of skills such as literature searches and referencing of web-based resources. In this way, students will be even more motivated to acquire these skills and use them in their work as a requirement for academic excellence. In turn, the services offered should be able to meet these requirements.

According to the findings of this study, the research reported in this thesis contributes to technology adoption and library science literature, as well as to e-library practice. Its emphasis was on Developing Countries. Many avenues for future research have been opened.

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APPENDICES

Appendix 1: Research Approval Letter from National Council for Science and Technology

MAKERERE UNIVERSITY
SCHOOL OF GRADUATE STUDIES

FORM No. RG 03

BOARD OF POSTGRADUATE STUDIES AND RESEARCH
RESEARCH GRANT RELEASE WARRANT

DATE: **May 9, 2005**

TO: The Director
School of Graduate Studies

RE: **INITIAL GRANT/SUPPLEMENTARY GRANT FOR PROJECT NO: I@Mak/2005/0082 I**

..... **Phase** .....

Please release them sum of dollars **Five thousand United States Dollars.**

.....

US$5,000

To **Mrs. Tibenderana Priska K.G.**

For research purposes, per authority given by the Board of Research and Publications

Meeting of **February 24, 2004**

Ref: **Approved** For 6 months from **June – November 2005**

For research project entitled:

Effects of Information and Communication Technologies on Services Provision in Selected University Libraries in Uganda.

.....

Approved by the Uganda National Council for Science and Technology (date)

.....

UGANDA NATIONAL COUNCIL FOR SCIENCE & TECHNOLOGY
12 APR 2005
APPROVED
P. O. BOX 6884, KAMPALA (U)

Roy B. Twinomujuzi
SENIOR ASSISTANT REGISTRAR

STAMP 09 MAY 2005

MAKERERE UNIVERSITY SCHOOL OF GRADUATE STUDIES
DIRECTOR'S OFFICE

100193

UGANDA NATIONAL COUNCIL FOR SCIENCE & TECHNOLOGY
12 MAY 2005
APPROVED
P. O. BOX 6884, KAMPALA (U)

Appendix 2: Letter of Introduction to Respondents

Department of Information Systems,
Faculty of Computing and Information Technology,
Makerere University,
P. O. Box 7062,
Kampala.

22nd April, 2007

Dear Prof./Assoc. Prof./Dr./Mr./Mrs./Ms…….

RE: A FRAMEWORK FOR EVALUATING END-USER'S ACCEPTANCE AND USE OF ELECTRONIC LIBRARY SERVICES IN UNIVERSITIES IN DEVELOPING COUNTRIES: Modification in the Unified Theory of Acceptance and Use of Technology.

Information and Communication Technologies (ICTs) have become one of the greatest innovations in the history of Libraries. ***According to ICT Sector Strategic Plan of the World Bank (2002), ICT consists of hardware, software, networks and media for collection, storage, processing, transmission and presentation of information (voice, data, text and images). ICTs, in this study represent the tangible hardware and the intangible software.***

The new information technologies were introduced in Uganda's University Libraries in the 1990s. Since then, no empirical study has been carried out to find out levels of users acceptance of these technologies.

As part of a Ph. D study, I am carrying out a survey to find out levels of end-users' acceptance and usage of electronic library services in developing an evaluation framework. You have been identified as one of the respondents for the survey. I am, therefore, attaching a five page questionnaire, which I kindly ask you to answer as accurately and honestly as possible. The success of this study depends largely on the way you answer the questions and the fact that you answer each/all question/s. Your responses will be treated with ***STRICT CONFIDENTIALITY***. It is hoped that the results of this study will serve as a guide to university libraries in Developing Countries on how best to use ICTs, thereby lead to improved services. In addition, the study tools will chart an evaluation framework for future surveys.

I thank you very much for your time and responses.

Yours faithfully,

Prisca Tibenderana, BLS, MLS (ABU)
Ph. D. Candidate, Registration No. 2003/HD18/2566U, FCIT, Mak.
Contact phone: +256-772-537171

Appendix 3: Study Instruments

Questionnaire for Library Services Users: ***Academic Staff and Students***

SECTION 1: BACKGROUND INFORMATION					
Q101	**What is your University? _____**				
Q102	**What is your Faculty/School/Institute? _____**				
Q103	**What is your status at the University?**				
i.	Undergraduate student		iv.	Administrative Staff	
ii.	Post graduate student		v.	Others (specify)_____	
iii.	Academic Staff				
Q104	**What is your sex?**				
i.	Female		ii.	Male	
Q105	**What is your age bracket?**				
i.	>18-24		iv	>45-60	
ii.	>25-34		v	>61+	
iii.	>35-44				
Q106	**What is your highest qualification?**				
i.	Ph. D.		iv.	Advanced Level Certificate	
ii.	Masters Degree		v.	Undergraduate Diploma Certificate	
iii.	First Degree		vi.	Others (Specify)_____	
Q107	**How long have you been at the university?** (In years) _____				
Q108	**Do you have basic computer skills?**				
i.	Yes		ii.	No.	
Q109	**Do you own a computer or a laptop?**				
i.	Yes		ii.	No.	
Q110	**When was your first encounter with computers/laptops**				
i.	>1-2 years ago		iii.	>6-10 years ago	
ii.	>3-5 years ago		iv.	>10 years ago	
Q111	**Are you aware of the available electronic library services in your university?**				
i.	Yes		ii.	No.	

Q112	Do you feel that you have enough skills to use electronic library services available in your university effectively?				
i.	Yes		iii.	No.	
ii	To some extent				

Section 2: STATUS OF ICTs LIBRARY SERVICES (E-library)

Q201	**Is the following ICT hardware available in your library? Please, tick *yes, no or not sure* in each row as appropriate. Do not skip any row please.**			
	ICT Hardware	**Yes**	**No**	**Not Sure**
1	Computers			
2	Laptops			
3	Networked Servers			
4	Printers			
5	Scanners			
6	Local Area Network (LAN)			
7	World Wide Area Network			
8	LDC Projector			
9	Video cameras			
10	TV Stations			
11	Microfilm readers			
12	Bar code readers			
13	CD-ROM Readers/writers			
14	Book Check Systems			
15	Security Check Systems			
16	Photocopying Machines			
17	Photo Cameras			
18	Generator to supply electricity whenever there is load shading			
19	Others (Specify) _____			
Q202	**Does the library in your university offer the following ICT services? Please, tick *Yes, no or not sure* in each row as appropriate. Do not skip any row please.**			
	Type of Service	**Yes**	**No**	**Not Sure**
1	Internet web browsing services			
2	E-mail services			
3	Full text journals articles			
4	Online Public Access Catalogue (OPAC)			
5	Bibliographic databases			
6	Indexing and Abstracting Services			
7	CD-ROM Services			
8	Electronic Books			
9	Library Website			
10	Document Scanning Services			
11	Electronic Reference and Information Services			
12	End Users Training Programme			

13	Electronic Document Delivery Services			
14	Electronic Document Reserve Services			
15	Bar coded Circulation Services			
16	Current Awareness services			
17	Selective Dissemination of Information (SDI)			
18	Book Reservation and recall			
19	Electronic Interlibrary Loan Services			
20	Printing Services			
21	Photographic services			
22	Digitization Services			
23	Microfilming services			
24	Others (Specify)_____			

SECTION 3:

In the subsections that follow, please indicate by way of ticking in the right column, the extent, to which you agree with the given statements in relation to ICT library services in your university, where:
1= strongly agree; 2 = Agree; 3 = Neutral, 4 = disagree; 5 = strongly disagree

Q301	**Awareness of the electronic library Services**	**1**	**2**	**3**	**4**	**5**
1	I came to know about electronic library services offered by the university because of the important role they play in an academic environment.					
2	I knew about e-library services offered by my university because they are very relevant.					
3	My colleagues and friends told me about the existence of electronic library services.					
4	I came to know about e-library services because of the facilitating conditions around.					
5	I knew about e-library services from the library website					
Q302	**Performance Expectancy**	**1**	**2**	**3**	**4**	**5**
1	I find electronic library services useful for my teaching/study/research.					
2	The available electronic library services enable me to find information quickly than it would have been otherwise.					
3	Using electronic library services increases my chances of getting information that helps me with teaching/research/study productivity.					
4	Using electronic library services increases my chances of finding the information I require for writing academic papers/class assignments.					
5	I do not use e-library services because they are not user-friendly.					

Q303	**Relevance of Electronic Library Services**	**1**	**2**	**3**	**4**	**5**
1	I find e-library services relevant because they increase my self esteem or recognition amongst colleagues					
2	I find e-library services relevant for our local academic environment because of the links they provide to the outside world.					
3	I find e-library services relevant for our local environment because currently there are no enough print books and journals in our library to circulate.					
4	I find e-library services relevant for our local environment because our library does not have recently published books and journals					
5	I find electronic library services relevant for my personal development because I am able to get information I require in my field to write papers/class assignments.					
6	I can access e-library services whenever I am as long as I have a computer connected to the university intranet.					
Q304	**Social Influence**	**1**	**2**	**3**	**4**	**5**
1	My colleagues and friends have influenced me to use electronic library services.					
2	People who are important to me have influenced me to use electronic library services.					
3	Management of this university has supported the use of electronic library services.					
4	The society around me has influenced me to use electronic library services.					
Q305	**Facilitating conditions**	**1**	**2**	**3**	**4**	**5**
1	The university is very supportive and has provided necessary facilities needed for me to use electronic library services.					
2	I have the skills required to use electronic library services.					
3	Electronic library services are compatible with the university Local Area Network (LAN).					
4	There is always uninterrupted electricity supply to enable me access e-library services					
5	The university has high speed Internet connection that allows me quick access to e-library services					
6	Librarians are available to assist me with electronic library services difficulties.					
7	I do not use e-library services because I can hardly get time to learn how to use them or use them					
Q306	**Behavioural Intention to use electronic library services**	**1**	**2**	**3**	**4**	**5**
1	I intend to use the electronic library services in the next six months.					

2	I predict I shall use electronic library services in the next six months.					
3	I plan to use the electronic library services in the next six months.					
4	I must use the electronic library services in the next six months.					
5	I already use electronic library services					
Q307	**Expected benefits of the e-library services**	**1**	**2**	**3**	**4**	**5**
1	I use electronic library services so that I can gain access to both offline and online library resources.					
2	I use e-library services so that I can become competitive in my profession					
3	I use e-library services so that I can remain current in my field of study/research.					
4	I use e-library services because I have been able to save costs on purchasing books or journals.					
5	I use e-library services because they help me to improve my typing skills or Internet searching skills.					
6	I use e-library services because I can communicate with my peer groups or colleagues					
Q308	**Behavioural usage**	**1**	**2**	**3**	**4**	**5**
1	I find using e-library services enjoyable					
2	I find the process of using e-library services pleasant					
3	E-library services make my work interesting					
4	Once I start using e-library services, I find it hard to stop					
5	Using e-library services is educative					
6	Using e-library services is fun					
7	Using e-library services is boring					
8	Using e-library services is frustrating					

SECTION 4: Recommendations

Q401. Please indicate any other e-library services you know of (if any) and would like to see in your university library?

1. _____
2. _____
3. _____

Q402. Please indicate any other e-library information resources you know of (if any) and would like to see in your university library?

1. _____
2. _____
3. _____

Q403. What suggestions would you like to make to ensure that non-users of e-library services can use the
resources?
1. _____
2. _____
3. _____

Q404. Please, what recommendations would you like to make to improve e-library services in your
University?
1. _____
2. _____
3. _____

I thank you.

Appendix 4: Venkatesh *et al.* (2003) Instrument – seven point lirket scale

Used 7 point likert scale. 1= strongly agree; 4= Neutral, and 7 strongly disagree

Behavioural Intention to Use E-Library Services

I intend to use the system in the next <n> months.
I predict I would use system in the next <n> months.
I plan to use system in the next <n> months.
I do not plan to use system in the next <n> months.

Performance Expectancy

I would find the system useful in my job.
Using the system enables me to accomplish tasks more quickly.
Using the system increases my productivity.
If I use the system I will increase my chances of getting promotion.

Effort Expectancy

My interaction with the system would be clear and understandable
It would be easy for me to become skillful at using the system
I would find the system easy to use
Learning to operate the system is easy for me

Social Influence

People who influence my behaviour think that I should the system.
People who are important to me think that I should the system.
The senior management of this university has been helpful in the use of the system.
In general, the university has supported the use of the system

Facilitating Conditions

I have the resources necessary to use the system.
I have the skills required to use the system.
The system is not compatible with the campus LAN
Librarians are available to assist with the system difficulties.

Voluntariness of Use

Although it might be helpful, using the system is not compulsory in my organization.
Organization management does not require me to use the system.
My colleagues expect me to use the system.
My use of the system would be voluntary.

Appendix 5: Study Observation Checklist

A Framework for Evaluating End-Users' Levels of Acceptance and Use of Electronic Library Services in Universities.
Cross-Validation of Findings
December 2007

UNIVERSITY:				
DATE OF VISIT:				
Availability of Hardware				
	ICT Hardware	**Units**	**Yes**	**No.**
1	Number of Books (text books, reference books etc.			
2	Number of Journals (annual subscriptions) Databases Number of Journal (print journals)			
3	Number of Computers			
4	Number of Computer Laboratories			
5	Number of professional staff			
6	Library Software used			
	Are the following hardware available	**Units**	**Yes**	**No.**
1	Computerized systems (which system)			
2	Networked Servers			
3	Brochures			
4	Scanners			
5	World Wide Web (www) address			
6	LDC Projector			
7	Video Cameras			
8	TV Stations			
9	Microfilm readers/writers			
10	Bar code readers			
11	CD-ROM Readers/writers			
12	Book Check Systems			
13	Security Check Systems			
14	Photocopying Machines			
15	Photo Cameras			
16	Generator to supply electricity when there load shading			

	Availability of Electronic Services			
	Type of Service	**Yes**	**No.**	
1	Library Opening Hours: Monday to Friday: Saturdays: Sundays:			
2	Expected Readers			
3	Internet Web browsing services			
4	E-Mail services			
5	Access to Journal articles			
6	Online Public Access Catalogue (OPAC)			
7	Bibliographic databases			
8	Indexing and Abstracting Services			
9	CD-ROM Services			
10	Access to Electronic Books			
11	Library Website			
12	Document Scanning Services			
13	Electronic Reference and Information Services			
14	End-Users Training Programme			
15	Electronic Document Delivery Services			
16	Electronic Document Reserve Services			
17	Bar coded circulation services			
18	Current Awareness Services			
19	Selective Dissemination of Information Services			
20	Book Reserve and Recall services			
21	Electronic Interlibrary loan services			
22	Printing Services			
23	Photocopying services			
24	Digitization services			
25	Microfilming services			

Appendix 6: Summary of Results of the Pilot study

To make the instrument appropriate to e-library services, we piloted it in two workshops which were conducted at Uganda Martyrs and Makerere Universities on the 20th and 21st of April 2007 respectively. The workshops were attended by ten participants each who were post graduate students, qualified librarians and experienced researchers. All the returned questionnaires formed the foundation data used to design the study model. Demographic profiles of respondents of the pilot study was that forty five percent of respondents were from Makerere University while fifty five percent were from Uganda Martrys University. Forty five percent of respondents were female and 55 percent were male as observed in Column 3 and 4 of Table A6.1 below.

Table A6.1: Demographic Characteristics of Pilot Study Respondents

	Univers.		Sex		Status			Education			Discipline			Owner		Skills		Awanes		Age	
	Mak	Umu	M	F	St	PG	U	P	Ms	B	Sc	Md	LS	Pc	No	Y.	N.	Y.	N.	**30%**	**>18-24**
No.	9	11	11	9	6	7	7	6	10	4	16	1	3	15	5	20	0	20	0	**50%**	**>25-34**
%	45	55	55	45	20	30	30	30	50	20	80	5	15	75	25	100	0	100	0	**20%**	**>35-44**

Analyses of the study instrument items for reliability and valididy according to Moran (2006), items with less than 0.7 were removed. The key assumption for this procedure was that items belonging to the study domain would have an equal amount of common core. If all items in a measure are drawn from the domain of a single construct, responses to those items are inter-correlated.

Table A6.2: Scale Reliability and Group Alpha of Retained Constructs

Construct	Initial Questions	Reliability of the Group	Retained Questions	Group Alpha
Awareness	4	0.593	2	0.70
Performance Expectance	4	0.903	4	0.90
Relevance	5	0.677	2	0.95
Social Influence	4	0.753	2	0.77
Facilitating Conditions	7	0.755	4	0.79
Behaviour Intentions	5	0.900	4	0.96
Acceptance and Use	6	0.760	5	0.96
Expected Benefits	4	0.940	4	0.79

To measure the appropriate scores of reliability, the study tested the coefficient alpha at the sometime and resolved according to Nunnally & Bernstein (1994: 246) that coefficient alpha shoud be 0.7 or more. Within the dimensions of all the constructs in the pilot study, the coefficient alpha was between 0.70 to 0.97 (Table A6.2, Column 5).

Construct Validity

The pilot study model constructs were evaluated using discriminate validity. This was to measure the average shared variance (AVC) between the constructs and their indicators (Moran, 2006; Venkatesh *et al.,* 2003; Fornell & Larcker, 1981). Discriminate validity is adequate when constructs have the shared variance greater than 0.5. This implies that any single construct is different from the other constructs in the model, and also indicates that at least fifty percent of the measurement variance was captured by the construct (Moran, 2006; Chin, 1998). The discriminate validity was further confirmed if the diagonal elements are significantly higher than the off diagonal values in the corresponding rows and columns, and the diagonal elements are the square root of the shared variance between the constructs and their indicators. Table A6.3 shows the average shared variances and the correlation coefficients of latent variables for the pilot study model. Since all constructs have average shared variances (AVC) greater than 0.5 and the diagonal elements (**in bold**) greater than correlation values in the respective corresponding rows or columns, the instrument therefore demonstrates acceptable levels of efficiency and truthfulness (validity and reliability) and successful discriminate validity (Moran, 2006; Chin, 1998). As a result of tests, the instrument was taken as reliable and valid and the process of developing the structural and theoretical model continued to the main survey of 491 samples.

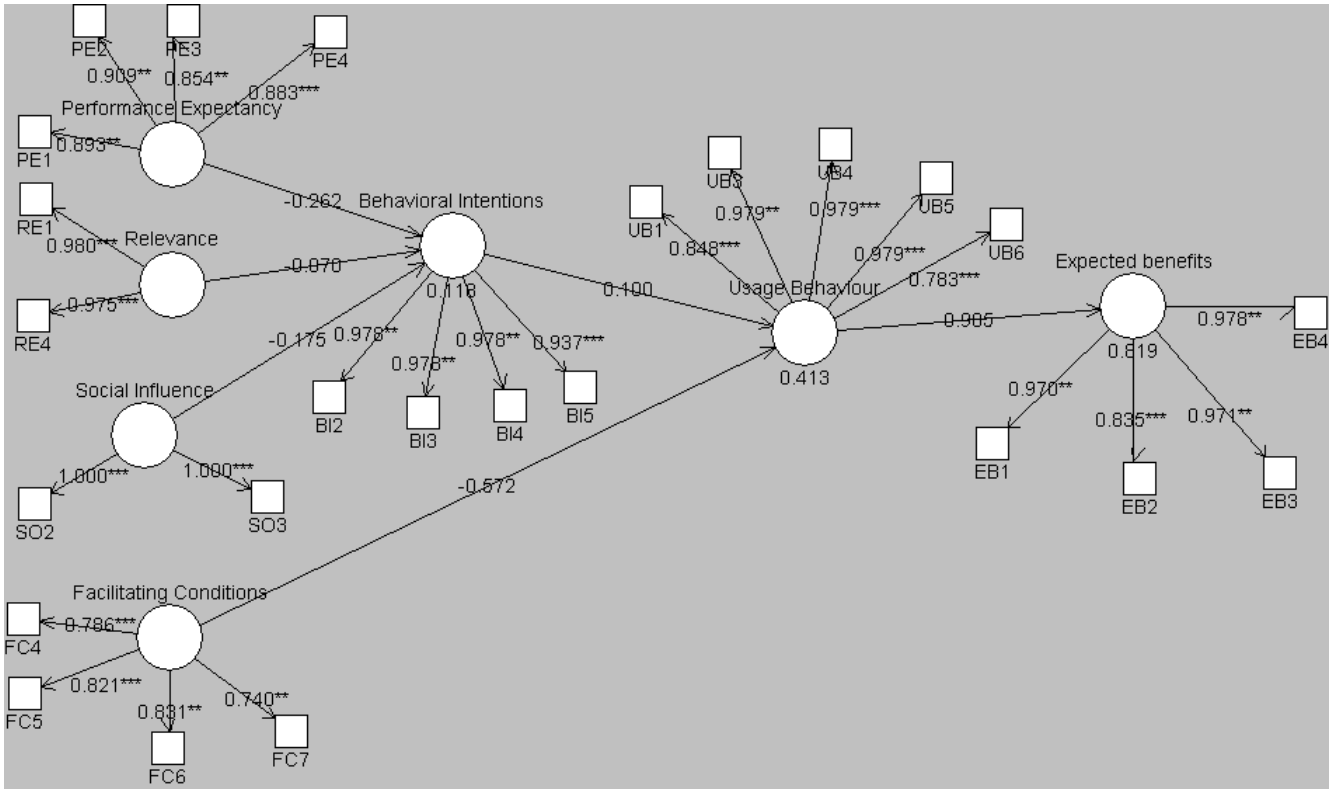
Table A6.3: The Average Shared Variance (AVE) and Correlation Matrix of Latent Variables.

Pilot Study Model (N=20)								
	AVE	**PE**	**RE**	**SI**	**FC**	**BI**	**UB**	**EB**
PE	0.78	**0.88**						
RE	0.96	0.85	**0.97**					
SI	0.99	(0.15)	(0.11)	**0.99**				
FC	0.63	0.09	(0.04)	(0.15)	**0.79**			
BI	0.93	(0.29)	(0.27)	(0.13)	(0.66)	**0.96**		
UB	0.84	(0.19)	(0.19)	(0.09)	(0.64)	0.49	**0.91**	
EB	0.88	(0.13)	(0.14)	(0.09)	(0.49)	0.23	0.91	**0.93**

Development of the PILOT structural and Theoretical Model

To determine the correctness of the model we carried out structural analysis. We adopted non parametric predictive measures - the path coefficients and Squared Multiple Correlation (R^2) which were generated by the PLS-Graph. The beta coefficients and Squared Multiple Correlation (R^2) were also generated using regressions to determine the direct and interaction effects of independent factors on dependent factors and also to establish how well the model fitted the hypothesized relationships. Also analysed were the t-tests to determine the significance of the dependent model constructs in the model. We used bootstrap methods in PLS-Graph to handle model comparison tests and measure the strength of the relationship between constructs in the model (Wixom & Watson, 2001). The R^2 values are displayed below each dependent construct in Figure A6.1 The Figure presents the pilot study structural model.

Figure A6.1: The PLS-Graph Structural Model



Appendix 7: Table showing Universities in Uganda by 2007

No.	Name	Code	Physical Location	District	Founding Body	Year Commenced
1	African Bible College	UI.PI.005	Lubowa, Entebbe Road,	Kampala	Private	2005
2	Aga Khan University (AKU)	220012	Makerere Road, Kampala	Kampala	Private	2001
3	Bishop Stuart University	UI.PL.008	Mbarara	Mbarara	Private	2006
4	Bugema University	220004	Gayaza, Zirobwe Road,	Luwero	Adventist Church	1994
5	Busetema University	110005	Busetema, Busia District	Busia	Government	2007
6	Busoga University	220005	Iganga Campus	Iganga	Church of Uganda	1999
7	Entebbe University					
8	Fairland University	UI.PL.007	Muvule Crescent, Jinja	Jinja	Private	2005
9	Gulu University (GU)	110003	Gulu Municipality	Gulu	Government	2002
10	Islamic University in Uganda (IUIU)	220001	Kumi Road, Mbale Municipality	Mbale	Organisation of Islamic Conference	1988
11	Kabale University	UI.PL.003	Kikungiri Campus, Kabale	Kabale	Private	2005
12	Kampala International University (KIU)	UI.PL.001	Kansanga, Ghaba Road, Kampala	Kampala	Private	2004
13	Kampala University	22010	Ggaba, Kampala	Kampala	Private	2000
14	Kami University	UI.PL.002	Ngero Campus	Kumi	Private	2004
15	Kyambogo University (KUA)	110004	Kyambogo, Kampala	Kampala	Government	2002
16	Lugazi University	UI.PL.010	Lugazi, Kampala-Jinja Road	Lugazi	Private	2007
17	Makerere University (Mak)	110001	Makerere Hill, Kampala	Kampala	Government	1922
18	Mbarara University of Science and Technology (MUST)	110002	Mbarara Municipality	Mbarara	Government	1989
19	Mountains of the Moon University	UI.PL.004	Fort-Portal	Fort-Portal	Private	2005
20	Muteesa 1 Royal University	UI.PL.011	Kakeeka-Mengo, Kampala	Kampala	Private	2007
21	Ndejje University	220002	Ndejje, Luwero	Luwero	Church of Uganda	1992
22	Nkumba University*	220007	Bayita Ababiri, Kampala-Entebbe Road	Wakiso	Private	1994
23	St. Lawrence University	UI.PL.009	Nabunya Road, Mengo - Kampala	Kampala	Private	2007
24	Uganda Christian University *	220008	Mukono Town	Mukono	Church of Uganda	1999
25	Uganda Martyrs	220003	Nkozi, Kampla-	Mpigi	Catholic	1993

No.	Name	Code	Physical Location	District	Founding Body	Year Commenced
	University*		Masaka Road		Church	
26	Uganda Pentecostal University	UI.PL.006	Fort-Portal Town	Fort-Portal	Private	2005
27	Uganda Management Institute		Jinja Road, Kampala	Kampala	Government	2006

*Source: Courtesy of Council for Higher Education (April 2008). * Shows Charted Universities*

Appendix 8: Map of Uganda showing Locations of Study Sites