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Status of Information and Communication Technologies in Academic Libraries in Central Uganda

Mini-dissertation by

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Declaration

This thesis is the original work of the researcher and has not been submitted in any other form to any academic institution for any award. Where use was made of works of others, this has been duly acknowledged in the text and included in the list of references.

Mary Acanit

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Abstract

Library users are constantly expecting new services, which puts tremendous pressure on academic libraries to re-organise their work patterns and devise better ways of service delivery in order to remain relevant. Although there are a lot of developments taking place in terms of information and communication technology (ICT), academic libraries in Sub-Saharan Africa are at different levels of ICT deployment both between different countries and within the same countries. The aim of this study is to determine the status of ICTs in Academic libraries in Central Uganda. The descriptive study employs a survey methodology gathering both quantitative and qualitative data. Data was collected from library staff responsible for the day-to-day management and administration of ICT at 17 of the 22 academic libraries in Central Uganda using survey questionnaires and interviews over a period of twelve months. Findings indicate that there is an improvement in the status of ICTs in academic libraries in Central Uganda although they are deployed at a minimum level. Funding, power fluctuations and low bandwidth still pose a major threat to ICT adoption in academic libraries in Central Uganda. This report informs government, libraries, LIS schools, LIS professional bodies and policy makers on the future course of action regarding ICT deployment and curricula. Notably, there is need for government to support infrastructural development; engage in public-private partnerships for infrastructural developments; exempt taxation of ICT equipment and supplement funding at universities. Libraries should dedicate more funds to purchase ICT equipment; automate all library functions; develop local capacity to manage ICT projects; promote awareness about ICT services and support initiatives from local and international library associations. LIS schools should conduct a curriculum review to reposition the LIS study program to the present and future needs of the job market; monitor and advice government on policy issues affecting higher education include the need to align ICTs to national development. LIS professional bodies need to champion the cause for the standardization of LIS study programs, promote networking and knowledge sharing; articulate national e-strategies and play advisory role to government, LIS schools and libraries.

Key words: Academic libraries, university libraries, Central Uganda, ICTs, emerging trends, funding, library automation, skills

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List of Abbreviations

ADB	African Development Bank
CCNY	Carnegie Corporation of New York
CD-ROM	Compact Disk Read Only Memory
CDS/ISIS	Computerised Documentation System-Integrated Set for Information Systems
CUUL	Consortium of Uganda University Libraries
DoI	Diffusion of Innovation theory
FSN&R	Faculty of Special Need and Rehabilitation
ICT	Information and Communication Technologies
IFLA	International Feederation of Library Associations
IGU	Income Generating Unit
ILS	Integrated Library System
INASP	International Network for Availability of Scientific Publications
IR	Institutional Repository
IT	Information Technology
KyULS	Kyambogo University Library Services
LAN	Local Area Network
LIS	Library and Information Science
LSP	Library Service Platform
MARC	Machine Readable Catalogue
NCHE	National Council for Higher Education
OPAC	Online Public Access Catalogue
OSS	Open source software
PPDA	Public Procurement and Disposal of Public Assets Authority
RDM	Research data management
RENU	Research and Education Network for Uganda
SaaS	Software-as-a-Service
SSA	Sub-Saharan Africa
TEEAL	The Essential Electronic Agricultural Library
TOE	Technology-Organisation-Environment framework
ULIA	Uganda Library and Information Association
USDL	Uganda Scholarly Digital Library project

Chapter 1 Introduction

This chapter gives an overview and motivation for the study. It describes the background to the study, statement of the problem, purpose and objectives of the study, research questions, scope of the study and rationale for the study. The chapter further provides an overview of the methodology, clarification of terms and the final section presents the division of chapters of the mini-dissertation.

1.1. Background to the study

Libraries are the early users of computers with automation activities starting in the USA and the UK in the 1950s and 1960s respectively (Mutula, 2004: 281; Mohsenzadeh & Isfandyari-Moghaddaam, 2009:986). Automation was initially targeted at circulation, acquisitions and the catalogue so as to efficiently and effectively expedite library operations and services with minimal costs (Ramzan & Singh, 2009:574). Library systems were initially run on mainframe computers using local programming language expertise (Mutula, 2004:281). During the 1950s and 1960s, online information retrieval systems were developed by database producers such as Chemical Abstracts, National Library of Medicine and the Institute of Scientific Information (Mutula, 2004: 281).

One of the earlier initiatives for library automation in Africa included the use of Computerised Documentation System-Integrated Set for Information Systems (CDS/ISIS), a software package developed by UNESCO that was largely available at no cost to libraries. CDS/ISIS facilitated the development of in-house databases of local collections. Penetration of Information and Communication Technologies (ICTs) in East Africa started in 1987 albeit at a slow pace (Sager & Walterson, 2005:5). Odero-Musakali and Mutula (2007:464) assert that many public university libraries in the region still use traditional methods to provide services with many library employees reluctant to embrace ICTs in their operations. Academic libraries have limited funds and rely heavily on the government whose budgetary allocations have continued to dwindle. According to Mutula (2004: 282) even allocated funds are often not remitted on time or worse still, not remitted at all. Consequently libraries have had to depend on gifts, donations and exchanges. Libraries have opted to rely on students and non-professionals to carry out professional duties at nominal rates because they do not have

enough funds to hire professionals (Mutula, 2004:282). This means that the full benefits of ICTs cannot be realized should they be widely deployed.

Development partners like the International Network for the Availability of Scientific Publications (INASP), Sida/SAREC, Carnegie Corporation of New York, NORAD and African Development Bank (ADB) have played a key role in ICT diffusion in academic libraries in Uganda by developing and providing funds in ICT infrastructure and electronic information resources (Tibenderana & Ogao 2008). This has prompted many academic libraries in Uganda to build ICT infrastructure and change their mode of operation and operate in a hybrid environment. Subsequently, ICTs have opened up library systems to the internet and led to the global evolution of digital libraries (Mutula 2004).

Makerere University Library in Kampala, Uganda used to conduct literature searches using Personal Computers (PCs) and CD-ROMS while local databases like the African Index Medicus were developed using CDS/ISIS (Musoke 2008:535). In 2003, Makerere University library acquired Virtua Integrated Library System (ILS) and an Oracle server which revolutionalised access to the library collection (Musoke, 2008:535). By 2008, many Ugandan libraries had embarked on computerization of their services and these include: Uganda Martyrs University (UMU), Uganda Christian University, and Gulu University and Kyambogo University (Buwule, 2014: 14; Tibenderana & Ogao, 2008:324).

According to Buwule (2014:14), the first attempt to automate Kyambogo University Library Services (KyULS), also in Kampala, Uganda was initiated at the Faculty of Special Needs and Rehabilitation (FSN&R) library in 2009 using Microsoft Access. However, due to lack of library networking at the time, the Microsoft Access database was not accessible to the rest of the KyULS service centers namely: Barclays library; Faculty of Education library; and West End Library (Buwule, 2014: 14; Kyambogo, 2015). As a result of Koha training organized by the Consortium of Uganda University libraries (CUUL) for its member institutions in 2012, KyULS considered setting up an automated library system using Koha ILS. Later in 2013, Koha was installed in KyULS by members of staff who attended Koha training (Buwule, 2014).

Although several scholars have reported about the application of ICTs in academic libraries, there is no recent literature that specifically discusses the status of ICTs in academic libraries in central Uganda.

1.2. Purpose and objectives of the study

Over time, ICTs have modified the identity and the role of the library and libraries need to continuously evolve as a result (Erlandson, 2010). The rapid increase in mainstream technology adoption within a social, mobile, interactive and collaborative information environment raises the expectations of library users in terms of ICT (Carlucci Thomas, 2010; Iglesias, 2010).

ICTs present a number of opportunities for libraries in Sub-Saharan Africa (SSA) including organizing information for use, provision of value added ICT-based information service, library cooperation and resource sharing, management information systems, institutional repositories, digital libraries and capacity building (Chisenga, 2006:3). ICTs provide a platform for value addition in libraries as they present a variety of digital-based information resources to their users. ICTs can be used to automate core library functions, promote library cooperation and resource sharing, establish digital institutional repositories and develop ICT-based capacity building programmes for users (Krubu & Osawaru, 2011:3). The future of universities lies in their ability to embrace and leverage the potential of ICTs at all levels of strategic business activities (Odero-Musakali & Mutula, 2007:464). Several scholars have indicated that library users increasingly demand advanced methods of data acquisition, manipulation and application (Cholin, 2005: 191; 2008:323; Odero-Musakali & Mutula, 2007: 464; Tibenderana & Ogao, 2008:323).

Despite the global technological advancements, Sub-Saharan Africa still lags behind in terms of ICT penetration compared to the developed world. Chisenga (2006:2) explains that much as academic libraries in the Sub-Saharan African region have integrated ICTs in their routines, there are still disparities in the numbers of ICTs available and the levels of ICT usage among libraries within the same country and between countries in the sub-Saharan region. It is therefore, pertinent for academic libraries to embrace ICTs, failure of which,

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their parent institutions will stand to lose students to universities with greater access to ICT-based resources.

Chisenga (2006:16) goes on to explain that introduction and use of ICTs in libraries depends on adequate funding for hardware, software, purchase and license fees, software upgrades, and telecommunications among others. Despite academic libraries in Sub-Saharan Africa embarking on different strategies to ensure sustained funding of library projects, inadequate funding has remained one of the challenges to meeting the needs of library users including the need for ICT services (Musoke, 2008:536). Adoption of ICT to meet user needs call for re-organisation, change in work patterns, demand for new skills and overall transformation in the way information is accessed. Gbaje (2012:30) contends that the most crucial element in developing a successful library is having the right staff with appropriate ICT skills in place.

The Ugandan National Council of Higher Education (NCHE) indicates that there are 38 licensed and recognised universities in Uganda; thirty two (32) of which are private while six (6) are public (NCHE, 2015). Twenty two (22) of these universities are in Central Uganda constituting 57.89% majority. The libraries in these universities are deemed as the nerve centers of teaching, learning and research in their parent institutions. ICTs are the way to go to for libraries to meet the ever-changing and growing needs of users.

The purpose of this study is to investigate the status of ICTs in academic libraries in Central Uganda, available ICT skills, sources of funding and emerging trends. The objectives of the study are as follows:

1. To establish the status of ICT infrastructure and ICT-based services in academic libraries in Central Uganda.
2. To investigate the factors for and against ICT adoption in academic libraries in Central Uganda.
3. To ascertain the sources of funding for ICT in academic libraries in Central Uganda.
4. To establish the ICT skills of library staff in academic libraries in Central Uganda.
5. To establish the emerging trends in usage of ICT applications in academic libraries in Central Uganda.

1.3. Research questions

The main research question for this study is: What is the status of ICTs in academic libraries in Central Uganda? In order to meet the objectives the following research sub-questions will be answered:

1. To what extent have ICTs been deployed in academic libraries in Central Uganda and what services does it support?
2. What factors have influenced adoption of ICTs in academic libraries in Central Uganda?
3. What is the source of funding for ICT in academic libraries in Central Uganda?
4. Do library staffs in academic libraries in Central Uganda have the necessary skills to manage ICTs?
5. What are the emerging trends in ICT applications in academic libraries in Central Uganda?

1.4. Scope of the study

The study was carried out in 22 academic libraries attached to both private and public universities in Central Uganda. The study was carried out within a period of twelve months. The study targeted library staff responsible for the day to day management and administration of ICTs in academic libraries.

1.5. Rationale for the study

Institutions today aim at understanding their own financial, staffing and operational status in order to support informed decision-making and optimise the utilization and beneficial impact of their resources. Magutu et al. (2011:1) explain that benchmarking can be used as a tool, a methodology and technique for continuous improvement in an organisation. Benchmarking allows libraries seek to improve the performance of their systems and practices within their environments. Comparison can be made against peers, aspirant peers or even own institution over time (Lang, 2015:42). Benchmarking can not only be used to assess retrospective achievement and determine prospective direction and priorities as motivation for investment but also to show accountability to students, citizens, ministries, and other stakeholders (Heeks, 2008).

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This study is expected to provide an inventory on the utilization of ICTs in academic libraries in Uganda allowing institutions to benchmark themselves in terms of ICT infrastructure, ICT-based services, funding, staff and emerging technology trends. By revealing gaps in ICT deployment in academic libraries in Uganda this study will inform libraries, government, policy makers, Library and Information Science (LIS) professional bodies and associations and LIS schools when determining their future courses of action in terms of ICT selection, use and curricula.

1.6. Clarification of key terms

1.6.1. Information and Communication Technologies (ICTs)
The description of ICTs have been evolving over the years and been used interchangeably with information technology (IT) to accommodate all forms of electronic and telecommunication devices. Walmiki & Ramakrishnegowda (2009: 236) describe ICTs as the digital convergence of computer technologies, telecommunication and other media communication technologies.

ICTs in libraries concern the use of electronic infrastructure and associated facilities to record, store and share information across geographic distances:

- "All the computer and related hardware, software, e-mail, internet, library management systems, electronic databases, Compact Disc-Read-Only-Memories (CD-ROMs) and other information access technologies involved in the recording, storage and dissemination of information through the libraries" (Ramzan & Singh, 2009:574).
- "All the electronic infrastructure and facilities employed by libraries to improve and provide efficient services and comprises of hardware, software and communication links between the service outlets of different libraries to facilitate the sharing of common resources; especially the library networks" (Issa & Ayodele, 2011:2).

1.6.2. Academic library
Borrowing from Krubu and Osawaru (2011:2) academic libraries are libraries established with the main purpose of supporting learning, teaching and research processes in tertiary institutions of learning.

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1.7. Division of chapters

Chapter 1 provides an overview of the study and raises issues that prompted the researcher to study the status of ICTs in academic libraries in Uganda. It provides the background of the study, statement of the problem, central research question and sub-questions, scope of the study and rationale for the study.

Chapter 2 explores related literature on what has been researched and published in regard to application of ICTs in academic libraries. It discusses ICTs and library automation, factors influencing ICT adoption in academic libraries, sources of funding for ICTs in academic libraries, qualifications and ICT skills for library staff in academic libraries. The chapter also makes mention of literature on emerging trends in ICT usage in academic libraries.

Chapter 3 provides a detailed description of the methodology that the researcher used to find answers to the research questions. Specifically, the chapter discusses the research design, research strategy, study population, sampling techniques, data collection methods and instruments data analysis, data interpretation and ethical considerations.

Chapter 4 reports on the research findings and presents the results of the data collected.

Chapter 5 presents a summary of the research and makes conclusions based on the findings discussed in Chapter 4.

Chapter 2 Literature Review

ICTs are transforming academic libraries the world over. The main focus of this chapter is to review, understand and synthesize literature relevant to this study with the aim of identifying gaps in that can be addressed by this study. The focus for this chapter is on what has been written about the status of ICTs in academic libraries in general and in Uganda in particular. The chapter describes the application of ICTs in academic libraries at a global perspective, the link between ICTs and library automation, history of library automation, funding of ICTs in academic libraries, library staff ICT skills and training and emerging trends in the usage of ICTs.

2.1. Application of ICTs in academic libraries

Application of ICTs in higher education continues to grow and libraries have to adjust to the trends. It is believed that the future of scholarly communication will inevitably be based on capabilities of interoperable network technology. Academic libraries exist to support the missions and goals of the institutions of higher learning through their collections and services (Ramzan, 2010). It is therefore, the duty of academic libraries to provide information to meet the teaching, learning and research needs of their clients. This has necessitated libraries to evolve with the times and take up ICTs in order to provide timely and up-to-date information for their clients (Okiy, 2010). The use of the library as physical place is fading away. Rather than the quiet study, students prefer to use the library for discussion, socialisation and light reading (Lippincott; 2005). Libraries are transforming their spaces to offer both physical and virtual spaces like information commons and multimedia production areas (Lippincot, 2005: 64).

A closer scrutiny of the literature reveals that studies have been carried out about application of ICTs in academic libraries. Davarpanah (2001) studied the level of Information Technology (IT) application in Iranian academic libraries and concluded that overall ICT applications in Iranian university libraries are at different sections of housekeeping,

information services while networking focused on cataloguing, serials control, CD-ROM and National databases and local area network respectively.

ICTs have enormous benefits in the economic, scientific, academic, social, political, cultural and other aspects of life. ICTs are the new game changers for academic libraries in terms of networking, automation, technical communication, digital libraries among other uses (Saleem et al., 2013: 52). ICTs in academic libraries have also been credited for their efficiency in providing timely and up-to-date information to users irrespective of the geographic location (Saleem, et. Al, 2013: 52)

Davarpanah (2001: 444) found out that ICTs are necessary in order to exploit the current information explosion and spur development. Ramzan and Singh (2009) did a study on the status of IT applications in Pakistani libraries and reported that despite efforts of both government and the private sector to make technology available to all libraries under their jurisdiction; academic libraries across Pakistan are far behind in achieving excellent ICT levels. Kumar and Biradar (2010) did a survey on the use of ICTs in college libraries in Karnataka, India. For successful use of ICT facilities and library automation, their study recommended more funding for the purchase of books and journals, putting in place computer and internet facilities, implementation and maintenance of a fund for library automation costs, a change in the mind-set and attitude of library staff towards ICT applications and introducing a variety of training programs in ICT applications.

Furthermore, a study by Krubu and Osawaru (2011) on the impact of ICT in Nigerian University libraries concluded that there is a remarkable rise in the use of ICTs in academic libraries with a majority of the libraries being ICT driven. Still in Nigeria, Ashcroft and Watts (2005) studied 'ICT skills for information professionals in developing countries: perspective from a study on the electronic information environment'. The study noted that despite many free electronic resources made available through international initiatives, lack of awareness hindered the use of those resources.

Odero-Musakali and Mutula (2007) carried out a study on internet adoption and assimilation in Kenyan university libraries and found out that there is a clear underutilization and considerable disparities between and within the libraries in their levels of ICT deployment

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and use. Omona and Ikoja-Odongo (2006) studied application of ICTs in health information dissemination in Uganda concluded that the use of ICTs in information provision remains low with donors providing a majority of the available ICTs.

The Statement by Okojie (2010:407) below sum up the status of ICTs in Sub-Saharan African libraries:

> *"Many university libraries do not have adequate number of computers; internet-services are poor while automated services are limited. Indeed, many of the libraries that have computers use them mainly for word-processing and such basic tasks. Maintenance of ICT infrastructure, renewal of software licenses and contracts are other challenges faced by libraries. The implication of these challenges is that the service provided to users is not as effective and satisfactory as they should be, with the resultant effect that the users seek alternative sources of gathering information outside the library system".*

2.2. ICTs and library automation

According to Murthy and Cholin (2003: 2), library automation is the application of ICTs in the management of key library functions like acquisitions, Circulation, Cataloguing, Serials control and the Online Public Access Catalog (OPAC). Libraries and library consortia have turned to Integrated Library Systems (ILS) to manage their collections. Reitz in Stilwell and Hoskins (2012:1) define ILS as "an integrated set of applications designed to perform the business and technical functions of a library, such as acquisitions, cataloguing, circulation, and the provision of public access."

The advent of the internet, worldwide web and open source technologies has led to the increasing availability of free ILS (Müller, 2011:57). When choosing ILS software, libraries not only base their decision on the performance and efficiency of the system, but also on the flexibility to adapt to the future needs.

Ramzan (2010: 46) narrates that in their automation efforts, libraries first started adopting software applications and Machine Readable Cataloguing (MARC) in the 1970s. By 1980s, network technologies, CD-ROMs and communications technologies began to infiltrate the

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library arena. The early library automation initiatives were targeted at circulation, acquisitions and the catalogue functions with the aim of improving efficiency and effectiveness of library operations and services. Wang and Dawes (2012:76) explain further that library automation systems also called the ILS have undergone transformation from inception to rapid implementation and global adoption from the late 1980s to early 1990s. With the advancements in information technology, the library is faced with tremendous changes in terms of both resources and services it provides. Electronic resources are outpacing physical resources while more digital resources such as digital collections, institutional repositories, and e-books have taken root. On the other hand, library users are interested in instant searching, finding and accessing of information (Wang & Dawes, 2012:77). Because of the user demand for accurate and immediate information, new and improved functions have been introduced to academic users of the automated library systems (Wang, 2009:207).

According to Ramzan and Singh (2008: 574) ICTs make possible the integration of different library activities, eliminates repetitive work and reduces duplication of efforts. Furthermore, ICT facilitates timely, simultaneous and remote access to information. The involvement of libraries in routine activities of cataloguing, classification, acquisition, accessioning, abstracting, indexing and information retrieval; coupled with the growing number and needs of users calls for automation (Kargbo, 2009:46). Magara (2002:253) in his study about application of digital libraries and electronic technologies deciphered that library automation facilitates resource sharing, digitizing information, Online Public Access Catalogue (OPAC), information services, acquisitions, database management, information analysis and design, networking, bibliographic services, circulation, online searching, abstracting and indexing, teleneting, website management, union catalogue and distance education. Talemwa (2011: Online) shares the same views with Magara (2002:253) that library automation is critical for effective communication, information sharing, management of e-resources, sharing resources between institutions, enhancement of research, aiding information search and retrieval among users.

It is believed that library automation leads to better and improved service delivery. Correspondence and communication will be simplified, library operations and management

will improve, resource sharing is made easy and ultimately, there will be a reduction in costs (Kargbo, 2009:47). To add their voice to the benefits of automation, Kumar and Biradar (2010: 279) report that library automation is known to reduce duplication of work, increase user satisfaction and attitudes towards the library, reduces time and effort spent performing a given task as well as improves in communication and dissemination of information. Indeed, library automation has redefined the nature of work, functions and interpersonal relationship in libraries.

Library automation projects however, do not come easy as Eneya (2009) testifies of the automation story of library systems at University of Malawi. The automation project faced challenges such as unreliable power supply; few computers to access the OPAC; frequent breakdown of servers and computing equipment; lack of in-house capacity to maintain the system; failure to remit license fee after the donor project ended; slow internet connection; and lack of trained personnel to run the automation project (Eneya 2009:78). With experience from the automation project of University of Malawi Library Systems, Wella (2011) stresses that project management skills are a critical success factor for library automation projects.

Egunjobi and Awoyemi (2013:14) while discussing the experience of library automation with Koha stated that libraries with limited funds should start off with open source systems in a bid to implore management to appreciate library automation projects and later request for library financing. Ani et al. (2005:702) contend that with ICTs library users can access a variety of online services offered from different parts of the world. With automation, the size of the library does not matter, rather access to automated services and online visibility should be the benchmark for the 21st century academic library.

2.2.1. History of library automation in Uganda

Mulimila (2000: 186) states that during the period 1987 to 1997 IT applications started penetrating East African countries with government owned academic libraries struggling to catch up with the rest of the world in IT application. Academic libraries at the time owned microcomputers while CD-ROMs were seen as the ideal first step towards library automation. Mulimila (2000:187) explains that the introduction of IT in East Africa was marred by "shortage of trained and skilled personnel, financial constraints with major donor

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dependence; lack of co-operation among university libraries; inadequate telecommunication facilities, power cuts; and attitudinal problems".

When discussing library automation in Uganda, most of the early literature points to Makerere University library partly because the library had existed for a very long time as compared to other universities that only sprouted in the mid-1990s (Ilako & Ikoja-Odongo, 2011:2; Kakai, 2009:1). According to Sager and Walterson (2005), Makerere University Library integrated IT in its operations as a vital tool for accessing, finding, extracting and communicating information. Later, Makerere University Library transitioned from the use of CD-ROMs for literature searches to use of local databases such as the African Index which were developed using CDS/ISIS (Musoke, 2008:535). Subsequently, Makerere Library progressed from the use of e-mail by means of a dial-up system to wireless connection and by 2003, the library acquired Virtua Integrated Library System (Musoke, 2008:536). Kakai (2009:3) explains that due to heavy involvement in research, Makerere Library was eager to implement a digital library under the Uganda Scholarly Digital Library (USDL) project. By 2006, Dspace was installed on a small server in Makerere Library, with technical assistance from the IT department at Makerere University. The USDL team continued collecting and uploading content in Dspace and USDL was then launched in June 2006 (Kakai, 2009:2).

Tibenderana and Ogao (2008:323) report that in 2001, Makerere Library entered collaboration with the International Network for the Availability of Scientific Publications (INASP), and funding from Sida/SAREC and 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 Corporation of New York (CCNY), NORAD, African Development Bank (ADB), have taken keen interest in developing and putting funds in both ICT infrastructure and electronic information resources (e-resources). This has encouraged most Ugandan universities to build ICT infrastructure to enable their patrons' access to the resources.

2.3. ICT infrastructure for academic libraries

Adequate ICT infrastructure with sufficient number of networked computers is essential if a library is to offer vibrant ICT based services (Rosenberg, 2005: 7). The Local Area Network

(LAN) of a university system is relevant so as to provide electronic information resources and services to the end users at their points of access (Walmiki & Ramakrishnegowda, 2009:239). In a library setting, users can be alerted of new information resources such as books and journals, and can recommend or request for information resources via the campus LAN.

Multimedia presentations, CD-ROMs, the internet, and DVDs have and continued to transform conventional classrooms (Ramzan, 2010:44). Satellite communications, internet and video technology facilitate remote instructions eliminating the time and space barriers. Thus application of ICTs has provided one of the best innovations that have changed the shape of libraries and role of librarians at an unprecedented pace. It is now pertinent for academic libraries to plan, implement and develop infrastructure to be able to manage the challenges ahead of them (Walmiki & Ramakrishnegowda, 2009:241).

Academic institutions in Africa need to be aware of the benefits of ICTs, improve attitude and devise sustainable measures of maintaining ICT infrastructural projects in the continent (Tusubira, 2005: 90). A dynamic ICT policy and master plan drawn with the inclusion of all key stakeholders such as university council, management, academic staff and students will help academic institutions achieve their strategic objectives using ICTs as a vehicle (Tusubira, 2005: 92).

It is not possible to discuss ICT infrastructure for academic libraries without drawing from the whole wider experience of the African continent. Although globalisation is creating a world that is increasingly getting interconnected, Africa is still struggling to get on the information highway It is noted that African universities do not have sufficient infrastructure to effectively exploit ICT resources to reliably deliver digital resources and services over the internet (Alemneh & Hastings, 2006: 7). The picture on the ground is that of clusters of computers and networks that are either badly networked or are islands of low bandwidth connections with frequent breakdowns (Adam, 2003: 196). According to (African Union, 2014:34), Africa's position in Personal computers other than mobile phones is still low compared to the developed world.

However, the situation is gradually changing with the implementation of various digital initiatives and ICT infrastructural projects across the continent. Mayer et al. (2008) document ICT infrastructural investment in the African continent. The authors advocate for universal coverage of ICTs and argue that once achieved, fulfilling universal access to ICT services becomes a question of what level of services constitute a human right, what skills are required and whether the political will exists to invest in public funds to bring people and services together (Mayer et al., 2008: 2). The rapid growth in mobile network infrastructure is greatly expanding access to telecommunication across the African continent (Williams et al., 2011) and this directly influences academic libraries to tap into the opportunities available using mobile technologies. There is a breakaway of state-owned monopoly as operators of all ICT services (Omona & Ikoja-Odongo, 2006, 45; Williams et al., 2011: 9) and such reforms have opened up intense competition which has led to a fall in prices and significant rise in the number of subscribers.

With the introduction of broadband, institutions world over started investing on fiber-to-the-home access networks capable of providing fast broadband service (Williams et al., 2011). In Uganda, Research and Education Network for Uganda (RENU) in partnership National Information Technology Authority of Uganda (NITA-U) and SEACOM has done a commendable job to lay fiber optic cables to universities in Uganda (RENU, 2014). Kyambogo University being a beneficiary of RENU initiative now boasts of campus-wide internet connectivity.

To address the gaps created by increased subscription, efforts have been made to connect to the sub-marine fiber-optic infrastructure to supplement the terrestrial backbone network (Williams, et al, 2011) as shown in Figure 1. This is significant to provide high bandwidth and low-cost alternatives to satellites carrying traffic to and from the African region.

2.4. ICT-based services in academic libraries

It should be noted that 'technology by itself does not provide value to library users rather it is the librarian who uses technology as a strategic resource to manage library resources, services and systems and assists users in the effective use of technology' (Ramzan, 2010:5). Little wonder that computers, printers and other hardware, software, internet and other types

Figure 1: Sub-marine fiber optic cables in Africa (2011)
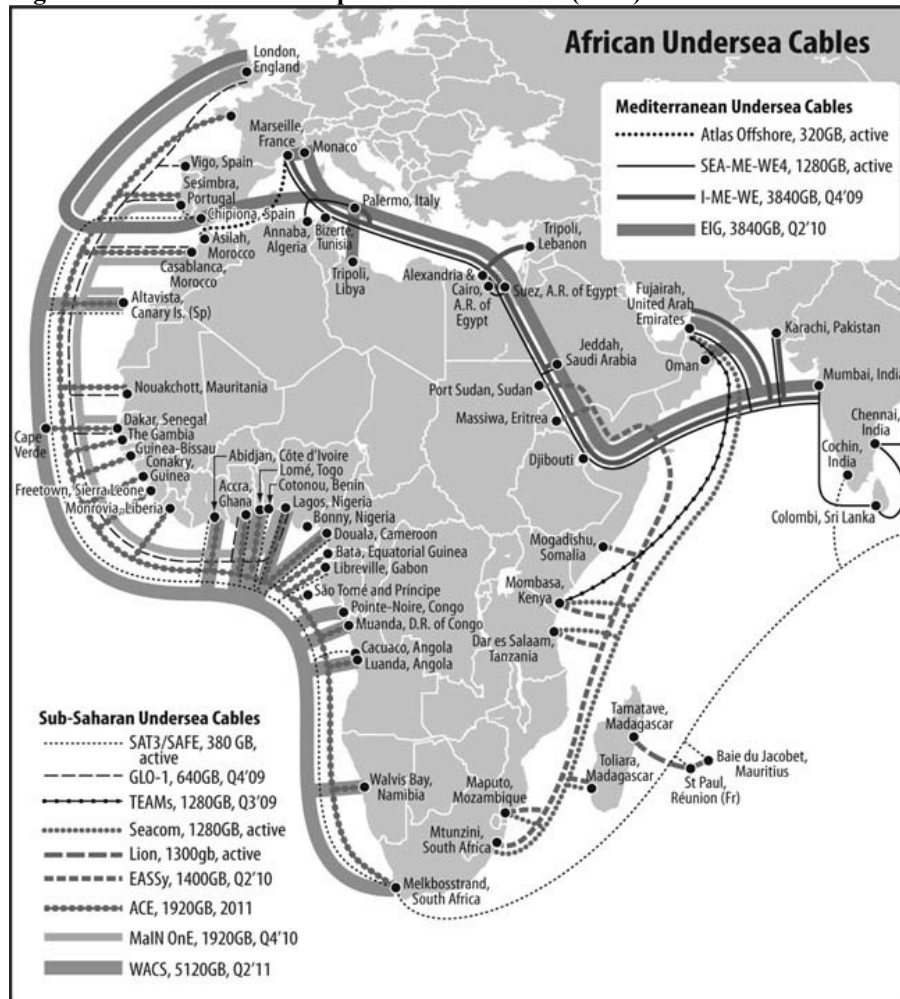
Source: (Hamilton in Williams, 2011: 63)

of ICTs have emerged as indispensable tools that aid librarians in serving their users. ICTs are not an end by themselves but a means to an end. This section describes some of the ICT based services that academic libraries are offering.

2.4.1. Internet access

The internet is "a single major force of change in higher education" (Al-Ansari, 2006:791) and the most commonly used ICT in academic libraries throughout the world (Ingutia-oyieke & Dick, 2010: 66). Eneya (2009:74) states that ICTs offer speed, accuracy and efficiency in the processing, presentation and retrieval of catalogue information. According to Okojie (2010:404), ICT penetration has provided alternative sources of information through the World Wide Web, online resources, and databases among others. Library users are turning to

the internet as the preferred means of accessing information and in response, academic libraries are devising innovative and sustainable alternatives so as to remain relevant.

It is not a surprise that the advances in ICTs have rendered the internet as a viable option to access global information resources such as e-journals, e-prints, online databases among others (Ani & Ahiauzu, 2008: 509). The internet makes possible information sharing, timely access to information and collaboration. The internet is increasingly becoming a means to accessing electronic information resources and services in higher institutions of learning by both academic staff and students to support teaching, learning and research.

World over, the internet is regarded the "most effective and efficient medium of knowledge transfer and dissemination from the advanced nations to the developing nations in the digital age" (Ani, 2010:557). However as a result of the digital divide, developing countries are still grappling with the challenge of inequitable access to the internet. African Union Agenda reports Africa to have a paltry 16% internet penetration as compared to 80% in developed countries (African Union, 2014: 5). Despite the inadequate financial capacity to sustain internet access, academic libraries further witness constant breakdown in internet connectivity even after contracting companies to provide internet services (Ani, 2010:557). These pose a challenge of access to sustainable and reliable internet. According to Grimson et al. (2007:63), having computers in the library is one thing but it is only worthwhile to provide wireless internet since some of the library users have personal laptops.

2.4.2. Electronic Resources

Electronic resources are dynamic in nature and the complexity of such collections poses a challenge in managing them (Weir, 2012:70:1). Dadzie (2005:290) states that e-resources are indispensable research tools which complement print-based resources in a traditional library. E-resources provide seamless access to the user irrespective of time and geographical location. Moreover, the space requirements for e-resources are less compared to print materials in a physical library. Electronic access to information supported by ICTs has transformed libraries from traditional to digital. In order to cater for the needs of users, libraries have to adapt to working and providing services electronically. With initiatives from PERI, academic libraries in Africa are now accessing electronic journals and books via online platforms instead of using CD-ROMS. Dadzie (2005:291) and Weir (2012:70) note ways of

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improving access to e-resources and these include: management of the website lists, use of federated search engines like Lib-hub, including web pages on the library catalogue (OPAC), digital archiving and persistent identification, e-resource portals, subject indexes, link resolvers, discovery services such as Google scholar, browsing lists and embedded lists.

2.4.3. Institutional Repositories

Institutional Repositories (IRs) are one of the strategic ways in which academic organisations manage their intellectual output. Thus IRs are used by institutions as a tool for collecting, storing and disseminating scholarly output both at organizational level and outside the organisation (Jain, 2010:127) The success of IRs is largely dependent on IT to efficiently manage intellectual output and promote further learning and research activities. IRs are credited for:

- increasing visibility and prestige of their institutions;
- acting as a hub for the centralization, storage and long term preservation of institutional output;
- supporting learning, teaching and research activities; and
- maximising availability, discoverability and functionality of scholarly works at minimal costs to the user (Jain, 2010:128).

Whereas the operational responsibility of IR is located at different administrative units in different universities, the success of IRs depends on cooperation among librarians, records managers, IT specialists, archivists, faculty and policy makers (Ashok, et. al., 2013: 481). Libraries however, play a leading role in helping researchers not only access IR content, but also get that content to the IR in the first place. Some of the systems available to run IRs are DSpace, Digital commons, Fedora, Greenstone, EPrints among others.

2.4.4. Digitisation

Ani & Ahiauzu (2008:519) define digitization as the process of converting information in to a digital format. Digitisation facilitates access to primary electronic sources from any remote geographical location and reduces on movements or postage expenditures for inter-library loan. Digital libraries are essential to the human development through distribution of humanitarian information on topics such as good governance, health, agriculture, nutrition,

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education, hygiene, sanitation and good governance (Byamugisha, 2010: 46). In academic libraries, digitization contributes to building information collections locally. However, academic libraries are faced with sustainability issues ranging from economic sustainability, finding champions, funding sources and self-sustained growth. Unlike their traditional counterparts, digital libraries need to justify their existence (Byamugisha, 2010: 51).

2.5. Factors influencing the diffusion of ICTs in academic libraries

Walmiki and Ramakrishnegowda (2009:236) believe that university libraries being part of a subsystem of higher education should be trend setters when it comes to ICT adoption. Introduction of ICTs in academic libraries has been spurred by the need to make accessible the best possible information across time and space (Cholin, 2005:190). This can only be enhanced by networks since they have the potential to improve library services in several ways. However, Chisenga's (2006: 18) revelation that academic libraries in the Sub-Saharan region are struggling to keep pace with the dynamic ICT industry brings debate on the factors that influenced the diffusion of ICTs in these libraries.

Advances in computing and telecommunication, information explosion, availability of online databases, reduction in the cost of hardware and software, the infiltration of the internet, availability of cost effective means of communication and the growth in the demands of users have spurred the increasing use of ICT in libraries across the globe (Ramzan & Singh 2009:574; William et al., 2011: 3). In Uganda, liberalisation of the telecommunication's sector in 1997 led to the influx of private investors and promoted ICT penetration in the country (Omona & Ikoja-Odongo, 2006: 45). This has made internet access affordable and opened doors to real-time access to resources and services provided by various libraries across the globe (Gbaje, 2012:31).

However, not all is rosy when it comes to fully exploiting the advantages arising from the use of ICTs. Despite the fact that Africa has the lowest income per-capita in the world, the pricing regime for ICT tariffs and custom duties does not promote connectivity (Alemneh & Hastings, 2006:9). African higher institutions of learning pay 50 times more for their bandwidth compared to their counterparts in the rest of the world (Steiner in Alemneh &

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Hastings, 2006:9). Okojie (2010:407) decries that libraries in Africa are still experiencing difficulties to catch up with the new waves of change brought about by ICTs and many researchers share the same view when it comes to factors that have militated against ICT adoption in Sub-Saharan Africa. Library administrators lack technical ICT background and knowledge to adequately manage and operate ICT facilities and equipment at strategic level (Ani et al., 2005:706; Chisenga, 2006: 18; Kargbo, 2009:48). In addition, there are no properly established ICT strategies and management information systems that provide consistent figures to justify ICT use.

Inadequacy of web technologies, poorly skilled librarians, high cost of equipment and poor ICT and telecommunication infrastructure have hindered academic libraries in Sub-Saharan Africa from providing online information services Gbaje, 2007b: 14; Minishi-Majanja, 2007:3). Furthermore, Fabunmi (2009: 203) attributes the deplorable state of ICTs to the marginalization of academic libraries by the academic community. There is a communication gap between librarians and their users, librarians and university management, and among librarians at both local and international level. Also, the mode of teaching is centered on classroom learning rather than independent research (Fanbunmi, 2009:203) with little integration of ICT in library and information curricula (Ashcroft & Watts, 2005). The inadequate training of library personnel and hardware procurement pose a higher challenge to the adoption of ICT in developing countries. Some librarians also see ICTs as a threat to their job security as stated by Ondari-Okemwa (1999:231):

> *"Some library staff members believed, and still believe that the introduction of an automated library system would automatically lead to loss of their jobs. This may be more myth than reality but some library staff members have had to treat the system with suspicion".*

Watts and Ibegbulam (2006:59) emphasise that ICT infrastructure is one of the factors hindering access to online information. According to Cholin (2005:192), despite libraries procuring computer systems, the maintenance of those systems remains low due to poor management strategies. Even the physical facilities in libraries are in deplorable state (Fabunmi, 2009: 203).

The cost of computers remain high and the ones acquired by many academic libraries are outdated models that do not stand the test of time (Minishi-Majanja, 2007: 3). Moreover, with constant introduction of new technology, the rate of obsolescence of computer systems is higher and this requires libraries to constantly update their hardware and software and encourage their staff to attend refresher courses (Cholin, 2005:192). Academic libraries therefore require more financial support to be able to constantly keep up with ICT trends. However, because of limited financial resources, libraries have to make a choice between maintaining the old systems and acquiring new systems. What is further disheartening is that some governments perceive ICTs as luxury items and therefore impose heavy taxes for the importation of computers, communication equipment and other peripherals hence rendering them even more expensive (Minishi-majanja, 2007: 9).

Poor funding also makes academic libraries unable to attract technology literate staff and purchase appropriate ICT equipment (Ashcroft & Watts, 2005; Talemwa, 2011: online). Government being the major source of funding for many African universities has hampered the rate of diffusion of ICTs in academic libraries. This is because the funds released by government are not adequate to cater for the ICT projects and sometimes do not come on time. To make matters worse, the available funds are sometimes misappropriated by university management (Odero-Musakali & Mutula, 2007: 466). Poor funding without express assurance that even the allocated funds will be provided has slowed ICT diffusion (Minishi-Majanja, 2007: 5). In private universities, their main source of funding is the fees levied of students (Ikoja-Odongo in Minishi-Majanja, 2007:5). Given that private universities are profit oriented, they tend to invest on inexpensive infrastructure and equipment (Minishi-Majanja, 2007:5). Low internet connectivity has equally hampered accessibility to ICT due to low bandwidth, technical faults and bad network configuration.

Other factors against ICT adoption include lack of a national ICT policy, the perennial power problem, lack of trained personnel and the negative attitude of the university management (Ani et al., 2005:706). It should be noted that national ICT policies help regulate satellite communication, telecommunication, Internet Service Providers (ISPs), government and cross-border data flows. Many countries are not willing to enact and implement policies that are viewed as reducing on the tax base.

It is hoped that the general reduction in prices of hardware and the development of open source software can go a long way in encouraging ICT adoption in academic libraries (Minishi-Majanja, 2007:3). Other scholars suggest that tackling telecommunication barriers will go a long way in improving usage of ICTs (Mohsenzadeh & Isfandyari-Moghaddaam, 2009:995). Government intervention in infrastructural developments, political stability, and good governance plays a major role in addressing the subject of ICT infrastructure (Minishi-Majanja, 2007: 4). Watts & Ibegbulam (2006:59) in their report about access to electronic health care information resources in developing countries opine that there is need for both library staff and users to have the right information seeking skills and ICT skills to be able to find relevant information resources. A summary of factors influencing ICT adoption is shown in Table 1.

2.6. Sources of funding for academic libraries

Chisenga (2006:16) explains that introduction and use of ICTs in libraries depends on adequate funding for hardware, software, purchase and license fees, software upgrades, and telecommunications among others. Unfortunately many libraries do not have ICT budget and this explains why early library automated systems were donations from external organisations, there is dependence on donor funding for library ICT projects, library automation is not complete due to failure to migrate to modern library systems or failure to maintain the old systems (Chisenga, 2006:16). Despite the claim that investing in ICTs is cost effective, the total cost of ownership of ICTs has remained high in African Universities. This is brought about by lack of ICT plans or budgets, ongoing budget cuts from governments, higher dependence on donations, lack of prioritization of ICTs and lack of centralized financial planning (Adam, 2003) .

Table 1 Summary of factors influencing ICT adoption in academic libraries

Positive Factors	Negative Factors

i) Advances in technology (Ramzan & Singh 2009)	i) Limited skills of both library staff and users (Ani et al., 2005: Chisenga, 2006: Gbaje, 2007b; Kargbo, 2009)
ii) Liberalisation of the Telecommunications sector (Omona & Ikoja-Odongo, 2006;	ii) Poor funding (Ashcroft & Watts, 2005; Minishi-Majanja; Odero-Musakali & Mutula, 2007; Talemwa, 2011)
iii) Reduction in the cost of hardware and software (Ramzan & Singh 2009:574) (Ramzan & Singh 2009:574)	iii) Misappropriation of available funds (Odero-Musakali & Mutula, 2007)
iv) Infiltration of the internet (Ramzan & Singh 2009)	iv) Failure to integrate ICT in library and information curricula (Ashcroft & Watts, 2005).
v) Growth in the demands of users (Ramzan & Singh 2009:574)	v) Power fluctuations (Ani et al, 2006)
vi) Government intervention in infrastructural developments (Minishi-Majanja, 2007)	vi) Negative attitude of the university management (Ani et al, 2006)
	vii) Poor infrastructure (Minishi-Majanja, 2007)
	viii) High cost of equipment (Alemneh & Hastings, 2006)
	ix) Lack of strategy
	x) Marginalisation of libraries by academic community (Fabunmi, 2009)
	xi) Negative attitude of librarians (Ondari-Okwema, 1999)
	xii) Poor state of physical facilities
	xiii) Low bandwidth (Minishi-Majanja, 2007)

Cholin (2005: 192) studied the application of information technology for effective access to resources in Indian libraries and found that many academic libraries are experiencing budget cuts for books and serials. According to Ani et al. (2005:705), the sources of funding for ICT in academic libraries in Nigeria are the federal government and the University library fund. This is the situation in many African countries where government is the main source of funding for academic libraries as recounted by Omona and Ikoja-Odongo (2006) and Minishi-Majanja (2007). In a report by Liang (2004: 68), government only funds public universities whereas private universities depend entirely on revenue generated by charging fees and donations. Okojie (2010:404) further narrates that libraries primarily rely on their parent institutions for funding. However, during the economic downturn in the late 1970s, government funding diminished across all sectors in Sub-Saharan Africa and libraries were equally affected. Not only that, as civil wars ravaged many African countries, funds were diverted to funding wars rather than on development programmes and education.

Many suggestions have been put across to improve funding for ICTs in academic libraries. Ani et al (2005:707) state that the awareness of the need to automate library services and the opportunities in sourcing for funding from individuals/alumnus and foreign donors gives a

green light towards the adoption of ICTs in academic libraries. Amakuedee (2005: 451) recommends that libraries should be provided with adequate funds to purchase computers of their choice to fund the library automation projects. Mohsenzadeh & Isfandyari-Moghaddaam (2009) suggest providing special budget for the development of ICT infrastructure for academic libraries. According to (Adam, 2003: 211) co-operation amongst institutions can be effective in cutting costs and increase on exchange of content between universities and other higher institutions of learning, research organisations and libraries as shown from the experience of Kenya Educaiton Network (Kenet). This calls for the involvement of all key stake holders like government agencies, private foundations, professional organisations, etcetera to effectively mobilise ICT resources to meet the growing demand for innovation and access. In Makerere University, a library development fee of UGX 123, 500/= was levied on each student and is used to expand library services and sustain ICT infrastructure in the library (Talemwa, 2011: online).

2.7. Library Staff ICT Skills and Training

The emergence of new technologies has prompted the requirements for ICT skills in library and information science practice. Minishi-Majanja (2007:2) states that the increasing globalization made possible by ICTs has led to improved study programs in Library and Information Science (LIS) schools and consequent adoption of ICTs in LIS workplaces like academic libraries. This calls for more infusion of ICT knowledge and skills in LIS curriculum and a robust diffusion of ICTs in LIS workplaces. Academic libraries have embraced ICTs to efficiently perform their traditional roles through automation of functions such as referencing, cataloguing, bibliographic services, serials management, acquisitions and circulation. Minishi-Majanja (2007: 2) stresses that "knowledge of networking, communication and retrieval technologies have become a core of the LIS profession." In addition, a LIS graduate is expected to be competent in basic computer-information science connectivity, knowledge of the internet, networking, software and hardware evaluation, database management and collaborative reference work.

Amakuedee (2005: 451) is of the view that staff be professionalised and skilled enough to handle library IT projects. Not only that, a firm training program is relevant for filling in the skill gaps. Wella (2011) did a study about the planning for the University of Malawi library

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automation project and noted that project management skills are lacking amongst many librarians involved in library automation projects. Wella (2011:77) suggests that librarians in the African continent be equipped with project management skills and principles such as project planning, project scope, project risk planning and management; project resource planning, feasibility and piloting, project costing and project communication. Not only the above, the emergence of digital technologies and digital libraries has had many consequences in the organisational structure, staff resources, workload and existing practices. This has prompted academic libraries to restructure staff responsibility and library activities to suit to the changing needs. Libraries are confronted with the responsibility of ensuring that the personnel hired are able to impact on the traditional activities as well as cope with the technologically demanding activities of the library (Choi & Rasmussen, 2009:458).

Similarly in South Africa, IT plays a major role in the LIS job market as witnessed by a steady increase in the requirement for advanced IT skills (Shongwe, 2014:8). She also agrees with Minishi-Majanja (2007: 2) that the IT skills requirements are more oriented to computer science, Information Systems and Computer Engineering disciplines than with LIS. Therefore, introducing advanced IT courses in LIS curriculum will go a long way in meeting the employers' expectations.

In Uganda, ICT related courses have been incorporated in the LIS curriculum as Okello-Obura & Kigongo-Bukenya (2011:2) recount. Both private and public universities in Uganda offer programmes in Library and Information Science. LIS education in Uganda started in 1963 at the East African School of Library and Information Science (EASLIS) with a Certificate in Librarianship (Okello-Obura & Kigongo-Bukenya, 2011:2). Later, a Diploma and Postgraduate Diploma were introduced. Today, EASLIS provides Diploma, Bachelors, Masters and PhD programs in Library and Information Science. Other institutions providing study programs in LIS and related fields are Kyambogo University, Kabale University, Uganda Christian University (UCU), Uganda Management Institute, Kabale University, Cavendish University Uganda and Busoga University (Okello-Obura & Kigongo-Bukenya, 2011:2).

NCHE (2014: 129-172) in Uganda stipulates the minimum standards for the study program of Bachelor of Library and Information Science in the country. Some of the ICT related modules stipulated by National Council for Higher Education include:

- Information Technology I,
- Information Technology II,
- Automation of library and information systems,
- Introduction to systems analysis,
- Website development and document management,
- Databases and database management systems,
- Electronic records and archives management,
- Desktop publishing, and
- Data communication and networks.

Gbaje (2012:30) contends that the most crucial element in developing a successful library is having the right staff with appropriate ICT skills in place. In light of the above discussion, librarians need to continuously train and retrain to be able to effectively provide relevant library and information services.

2.8. Emerging Trends in ICT usage in academic libraries

There are many emerging trends that are influencing the mode of service delivery in the library and information science market place. Some of the trends worth mentioning are cloud computing, library service platforms, use of open source software, Research Data management, Bibliometrics, use of mobile technologies, web 2.0 technologies among others. Some of these trends are briefly described in the following paragraphs.

2.8.1. Cloud computing

Mell and Grance in Abubaker et al. (2014:1) define cloud computing as "a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources like networks, servers, storage applications and services". According to Abubaker et al (2014:1). Cloud computing encompasses three service management models and four deployment models (Liu & Cai, 2012:24). The service management models include: Software as a service; platform as a service and infrastructure as a service. Deployment

models are private cloud, community cloud, hybrid cloud and public cloud. According to Abubaker et al. (2014:2), Cloud computing fills the gap created by infrastructural barriers to make remote access of information resources. Cloud computing is characterized by on-demand service, broad network access, resource pooling, rapid elasticity and measured service (Grant, 2012: 5). Cloud computing can also help libraries cope with budget cuts and constrained financial resources (Liu & Cai, 2012:24). However, it is important to address issues of internet broadband, economic development, security and privacy and trust when embarking on cloud computing (Abubaker et al., 2014:2).

2.8.2. Library service platforms

Breeding (2009:60) envisioned a future where automation in academic libraries would consider giving all formats of library collection a leveled ground to accommodate the hybrid physical and digital existence facing libraries today. Upon the realization that ILS are focusing mainly on physical collection on the library, academic libraries had to go an extra mile to identify ways of managing electronic resources. Companies started the production of Library Service Platforms (LSPs) in order to address the need for library systems that can manage both print and electronic resources (Breeding, 2015). Library service platforms are deemed to replace both conventional ILS and Electronic Resource Management Systems. Some of the features offered by LSPs are Search and discovery (De-coupled), management of print and electronic resources, improved workflows, inter-operability, cloud based and analytics or business intelligence (Chad, 2016: online). LSPs are also known as the 'next generation of library systems' with examples such as Alma by Exlibris, Intota by Serials Solutions, Sierra by Innovative Interfaces, Blue Cloud Campus by SirsyDynix and WorldShare Management Systems by OCLC (Grant, 2012).

2.8.3. The rise of Open Source Software

Breeding (2009:56) asserts that the changes facing library automation are dramatic and tumultuous where mergers are taking place resulting in fewer but larger companies taking on library automation. Smaller companies are giving way and some automation products are disappearing from the market. The limited options for traditional commercial vendors have given way for open source alternatives like Koha, Evergreen and OPALS (Open-Source Automates Library system) to thrive. In addition, the Open Source Software (OSS)

movement has provided academic libraries with cheaper options. Wang & Dawes (2012:77) acknowledge that the OSS movement like Open Archive Initiative (OAI), DSpace, and Koha have challenged commercial proprietary systems in both market share and in terms of sophistication and functionality. It is believed that OSS can go a long way in cutting costs which are one of the barriers to ICT adoption. Academic libraries are adopting open access and open content strategies such as self-archiving and open access journals. In addition, libraries are incorporating the OpenURL link resolvers, federated search platforms, digital asset management systems and Electronic Resources Management Systems (ERMS) (Breeding, 2009:98). What remains waiting is the development of Open Source LSPs (Grant, 2012:8).

2.8.4. Research data management
Another growing concern for librarians is Research Data Management (RDM) where services have shifted from supporting dataset recovery and desktop analysis to repository, reference and education services (Corrall et al., 2013:645). Corrall et al. (2013) further points out the roles that librarians are involved to assist researchers on:

- Use of available technology, infrastructure, and tools
- Handling and management of unpublished research data
- Data deposit in an institutional repository
- Data deposit in external repositories or data archives
- Finding relevant external data sets
- Technical aspects of digital curation
- Developing data management plans
- Developing tools to assist researchers manage their data and
- Development of institutional policy to manage data.

2.8.5. Bibliometrics and citation technologies
Library involvement in bibliometrics has shifted from collection development to research evaluation and impact assessment for individual researchers, academic groups, organizational units and whole institutions, offering opportunities for strategic alignment of library services with institutional goals and development of new audiences and partnerships. To this end,

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libraries are involved in providing bibliometrics support using citation reports and impact calculations for academic units and training researchers. Further opportunities are evident in the area of trend analysis, publishing strategies, faculty reviews, grant writing and job applications (Corrall et al., 2013:666).

2.8.6. Provision of mobile technologies in academic libraries

Academic libraries have introduced loaning of mobile devices like laptops, cameras, MP3, headphones, phone chargers and internet-enabled devices like iPods (Lippincott, 2010:208). This is because academic programs are integrating use of particular mobile devices for course works. The libraries are making sure that library content and services will be able to interoperate with the device and platform selected. Provisions for electrical outlets, lending of e-book readers preloaded with content is being carried out in academic libraries. Mobile devices have increasingly become instruments for the creation of digital content and not necessarily for accessing content. The mobile revolution poses both challenges and opportunities for academic libraries. Libraries have also introduced contactless mobile payments that use Radio Frequency Identification (RFID) technology (Lippincott 2010:210).

2.8.7. Web 2.0 technologies in academic libraries

Web 2.0 was coined by O'Riley to mean "a business revolution in the computer industry resulting from the use of the internet as a platform, and an attempt to understand the rules for success on that new platform" (O'Riley in Arif & Mahmood, 2012:470). Some of the web 2.0 technologies like blogs, microblogs, wikis, RSS feeds, Social bookmarking, media sharing, networking sites have been incorporated in to teaching and learning processes of higher education. In the face of emerging technologies, libraries have adopted the terminology 'library 2.0' as a way of integrating Web 2.0 in the library environment.

Use of Web 2.0 is gaining a considerable influence from academic libraries endeared by the new discovery layer interfaces and ability to receive web-enabled comments from library users (Breeding & Breeding, 2009: 59; King & Brown, 2009: 34). Web 2.0 are also considered innovative and interesting resources for librarians to serve as quickly and effectively as possible (Arif & Mahmood, 2012:471). RSS feeds are used to capture different formats of content such as text, photos, audio or video. Libraries can use RSS feeds to update users of new events and services (King & Brown, 2009:34). Libraries can adopt tagging as a

way to categorize the Web in personally meaningful ways. Scholars are of the view that knowledge sharing and creation is more efficient in wikis than in expert-based systems because users understand each other and share common problems and language within their community (Kim & Abbas, 2010: 213)

2.11.6 Systems librarianship evolving

The influx of ICTs has affected restructuring of staff in libraries to support the changing needs of users. Libraries therefore have had to revise current staff positions to be able to address the skills and knowledge gaps (Choi & Rasmussen, 2009:457). Some of the skills requirements include knowledge of imaging technologies, optical character recognition, mark-up languages, cataloguing and metadata, indexing and database technology, user interface design, programming, Web technology and project management (Tennant in Choi & Rasmussen, 2009:647). Amakuedee (2005: 452) suggests that to efficiently run the library ICT projects, libraries need to create the post of systems librarian to act as the overseer and advise management on issues of ICT. Goetsch (2008) observed that by 2005, the position of systems librarian was slowly being replaced by job positions such as digital initiatives librarian, web development librarian, library system developer and electronic resources librarian. A study by Shongwe (2014:6) revealed that the position of systems librarian required applicants to be:

> *"Proficient in electronic library systems, computer software packages, computer hardware, computer networking (LAN), information security, and systems administration. Educational qualifications listed were university degrees in information science, baccalaureus bibliothecologiae (BBibl.), computer science, and IT. The successful applicant would be in charge of the administration of systems and networks, the implementation of e-strategies, and the training of staff in ICT operations".*

The role of systems librarians are shifting from managing locally hosted library systems to cloud-based library services which involves dealing with campus IT and the vendors (Liu & Cai 2012:126). This means that systems librarians must update their IT professional skills to accommodate emerging technologies and changing IT management and service delivery models. In addition, the systems librarian needs to communicate with library administrators

about the importance of their involvement in decision making. Issues to put forward are institutional IT infrastructure, networking and security (Liu & Cai, 2012:27).

2.9. Theoretical framework

The study is informed by the Technology-Organisation-Environment (TOE) Framework. The TOE framework was first developed by Tornatzky and Fleischer to study the adoption and use of technological innovations(Oliveira & Martins, 2011:112). The TOE framework identifies three aspects of an organisation's context that influence the adoption and implementation of technological innovations (Oliveira & Martins, 2011:112):

1. The technological context covers both internal and external technologies relevant to the organization.
2. The organisational context includes descriptive measures regarding the organisation such as firm size and scope, managerial structure and internal resources.
3. The environmental context is the arena in which the firm conducts its business and includes the industry, competitors and dealings with the government.

A literature review by Oliveira and Martins (2011) reveals that many scholars agree that the TOE framework has a solid theoretical basis, consistent empirical support and the potential of application to Information Systems (IS) innovation domains, though specific factors identified within the three contexts may vary across different studies. In addition, the TOE framework is consistent with Rogers' (1962) Diffusion of Innovation (DoI) theory in that Rogers emphasized both internal and external characteristics of the organisation and these are incorporated in the environment context in the TOE framework. The environmental context presents both constraints and opportunities for technological innovation. According to Minishi-majanja & Kiplang'at (2005), Library and Information Science (LIS) is an innovation-based discipline that calls for innovative application of knowledge, skills and technology (Minishi-Majanja & Kiplang'at, 2005:219).

Figure 2 suggests 8 adoption predictors within the context of the TOE framework. In the technology context are Infrastructure and ICT skills of library staff; in the organisational context are size, top management support, availability of funding and the demand for new

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services; in the environmental context are emerging trends, and competition from other universities.

Figure 2: Research Model

Technological Context

Infrastructure

ICT skills of library staff

Organisational context

Size

Top Management support

Availability of funding

Demand for new services

Status of ICTs in Academic libraries

Environmental context

Emerging trends

Comparison with other academic libraries
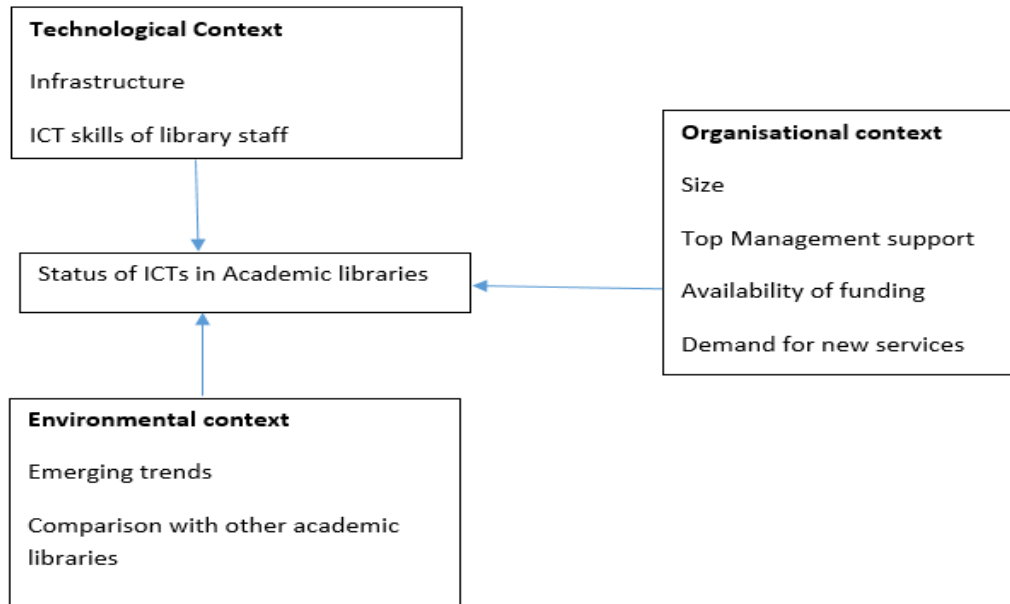
Source: Modified from Pan & Woan-Yuh (2008:96)

2.10. Summary

ICTs have brought tremendous changes in the way academic libraries deliver their services. This however, does not change the role of libraries as being facilitators in the creation, preservation and dissemination of knowledge for posterity; rather, it is a new and efficient way of doing the same things. Librarians are challenged to constantly up-date their skills in order to remain relevant in this digital age.

The above discussion propounds what scholars have found on the application of ICTs in academic libraries at both global level and in Sub-Saharan Africa. The chapter highlights the meaning of ICTs; the role that ICTs have played in library automation; and a brief on library automation in Ugandan libraries. The drivers and barriers to ICT adoption are also elaborated upon. Libraries are still grappling with the challenge of funding. The chapter also makes mention of infrastructure to support use of ICTs in academic libraries and library services that are associated with ICTs and the emerging trends that are causing a revolution in the use of ICTs in academic libraries

However, there is scanty literature that specifically discusses application of ICTs in academic libraries in Uganda, let alone Central Uganda. It is prudent to understand how Ugandan libraries are utilizing ICTs; the challenges that they may be facing amidst global and industry pressures and what the future holds for these libraries in terms of ICT usage.

Chapter 3 Research methodology

The goal of the study is to determine the status of ICTs in Academic libraries in Central Uganda. The methodology discussed in this chapter is in support of answering the central research question, namely, what is the state of ICTs in academic libraries in Central Uganda with specific reference to ICT infrastructure, factors influencing the acquisition and adoption of ICT, sources of funding, available ICT skills and emerging ICT trends?. This chapter presents the research design, data collection methods, data collection instruments, population of the study, sampling and data collection procedure. In addition, data analysis and interpretation, limitations and ethical considerations are described.

3.1. Research design

According to Creswell (2009:3), a research design is "a plan or procedure for research that span the decisions from broad assumptions to detailed methods of data collection and analysis". A research design describes the structure and process of conducting a research project and provides a detailed plan and method for systematically and scientifically obtaining required data (Amin, 2005). Creswell (2009:3) contends that the choice of research design is influenced by the researcher's orientations to inquiry and methodological preferences (Creswell, 2009).

The researcher employed a survey research design to collect the primary data. According to Sachdeva (2009: 119), a survey is "one of the most important measurements of applied research." Survey research encompasses two broad categories, namely, the use of questionnaire and the use of interviews. Surveys are useful in assessing the attitudes and making projections about subsequent behaviour. According to Busha and Harter (1980), surveys are the most appropriate methods to generate vast amounts of predominantly quantitative data from a large number of respondents.

The researcher opted for the surveys because surveys are less costly and the limited time available for data collection would not warrant the use of other methods. One of the cost effective and convenient ways of dispatching survey questionnaires is by use of web-based

tools like e-mails (Zhang, 2000: 57). However, the challenge with web-based questionnaires is that completion rates are dependent on whether the respondent has access to internet, computer networks or has the skills to use survey tools and accept and feel comfortable with internet survey (Zhang, 2000:58). In a bid to minimize the low response rates associated with web-based questionnaires, the researcher sent via e-mail, a link to the online questionnaire only to the target group that was not easy to reach by physical contact and printed self-administered questionnaires that were later distributed to respondents within reach of the researcher.

3.2. Data collection methods

Data refers to a set of natural phenomena descriptors that can be based on either experience, observation or a set of other evidences and can be inform of words, numbers or images expressed as a set of variables (Sachdeva, 2009:116).Bearing in mind that collecting representative dataset that is time bound and involves several organisations is faced by resource and access limitations, the researcher ensured that the scale of data collection was modest in order to ensure the participation of all the libraries concerned just like in a benchmarking study reported by Laeven and Smit (2003).

The researcher used questionnaires and interviews as primary forms of data collection with document analysis and observation to collect secondary data for the study of academic libraries in Central Uganda. Sachdeva (2009: 116) explains that since primary data is collected by the researcher him/herself, it is more reliable because the researcher knows where it came from, how it was collected and how it was analysed. While secondary data does not represent the original thinking of the researcher, it is useful for analysing, explaining, combining and refining information collected from the primary sources.

The study sought to conduct a census of all 22 academic libraries in Central Uganda. These required ample time for the researcher to contact each of the libraries and seek permission to carry out the research. Consequently data collection at most of the libraries was limited to questionnaires. Questionnaires however do not allow an in-depth investigation of the phenomenon under study. Questionnaires were sent out to different academic libraries while interviews were carried out in only one library. In the course of distributing and collecting

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questionnaires, the researcher carried out observation of ways different libraries were conducting their business using ICTs. Later, documents contents were analysed based on the documents that the respondents were willing to provide. Some of the documents reviewed are library reports and library web-pages. The researcher also reviewed literature related to application of ICTs in academic libraries to add insight to the study. At the researcher's own institution semi-structured interviews were conducted given ease of access and close proximity since interviews allows for improved response rates. For purposes of data analysis, the questions in the interview guide were similar in structure to the questions posed in the questionnaire. Each of the data collection methods employed in this study are discussed in more detail below.

3.2.1. Questionnaire method

A questionnaire as a method is a means of eliciting feelings, beliefs, experiences, perceptions or attitudes of a sample of individuals (Amin, 2005: 224). Previous researchers have used a questionnaire and proved it to be successful for gathering qualitative data (Krubu & Osawaru, 2011; Ramzan & Singh, 2008; Tibenderana & Ogao, 2008). A questionnaire is one of the cost effective ways to collect data from large sets of populations; yields high quality usable data with a good response rate and it is believed that anonymity in the use of self-administered questionnaires encourages more honest and frank answers compared to face-to-face interviews (Kelly, 2000:147; Marshall, 2005: 131). In addition, questionnaires reach a large and geographically dispersed community at a relatively low cost (Pickard, 2007: 183) as the case was in this study.

However, there are some limitations of a questionnaire and these include: questionnaires are not suitable for illiterate subjects or visually impaired persons; it is not possible for the researcher to determine if the questionnaire was actually filled by the intended respondent; in case of unclear questions, the researcher is unable to clarify; unless there are several open ended questions, the respondents cannot present their own perspective on the phenomenon under study; it is noted that when poorly planned and administered, questionnaires can have a recruitment bias and have the potential to intrude on the respondent's privacy (Marshall, 2005; Murray, 1999:148). Another challenge with the questionnaire is the lack of opportunity to talk directly with the respondent.

3.2.2. The interview method

An interview is a conversation initiated by the interviewer for the purpose of obtaining research related information with the main focus on content specified in the research objectives (Amin, 2005). Interviews are more personal forms of research as compared to the questionnaire. The researcher deployed structured interviews for ease of comparison of responses and to eliminate question variability between web-based questionnaires and structured interviews (Sachdeva, 2009:176). The structured interview targeted at obtaining richer data from members of library management of KyULS, the researcher's place of employment.

3.2.3. Observation method

As a secondary form of data collection, the researcher carried out observations during the course of distributing and collecting questionnaires. In seeking to explore the natural scene, the researcher aims to be unobtrusive as possible so that neither the researcher's presence nor methods disturb the situation. Issues worthy observing were library networking, access to the internet, accessible OPAC, availability of computers and size of library buildings and any other ICT infrastructure that was visible at the time of data collection.

3.5.4 Document content analysis

Document content analysis method involves studying and replicating valid inferences from documents relating to the phenomenon under study. Cohen et al. (2007:475) state that content analysis is "the process of summarising and reporting written data – the main contents of data and their messages." Document content analysis was carried out as a secondary form of data collection based on available documents and willingness of participants to provide the relevant documents.

3.3. Data collection instruments

The study was based on the main research question, what is the status of ICTs in academic libraries in Central Uganda, and the resulting sub-questions. The questions asked in both the questionnaire and interview guide sought to address the research questions as shown in Table 2.

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Table 2 Mapping of data collection instrument sections with number of questions to research questions

Research sub-question	Section addressing sub-questions in questionnaire / interview guide
i. To what extent have ICTs been deployed in academic libraries in Central Uganda and what services does it support?	Section A: Status of ICT infrastructure and ICT based services
ii. What factors have influenced of ICT adoption in academic libraries in Central Uganda?	Section B: Factors for and against ICT adoption in academic libraries
iii. What is the source of funding for ICT in academic libraries in Central Uganda?	Section C: Funding of ICTs in academic libraries
iv. Are library staff in Academic libraries in Central Uganda skilled enough to manage ICTs?	Section D: Library staff ICT skills and training
v. What are the emerging trends in ICT applications in academic libraries in Central Uganda?	Section E: Emerging trends in usage of ICT applications in academic libraries

Please refer to Appendix A: Survey questionnaire for the survey questionnaire and Appendix B: Interview guidefor the interview guide.

The purpose of collecting data is to gain insight on the state of ICT applications in academic libraries. The researcher used questionnaires and semi-structured interviews to collect primary data. The questions posed in both the questionnaires and semi structured interviews were harmonised to provide uniform data for analysis and ensure validity and reliability.

Amin (2005:284-305) notes that validity and reliability of instruments is very critical to the research process. Thus validity of instruments is the ability of the instrument to measure exactly what it was intended to measure while reliability is the ability of the instrument to consistently produce the same results if it is subjected to the same tests. The purpose of reliability is to minimise errors (Amaratunga et al., 2002: 28). The questionnaire was piloted among library personnel working at the researcher's institution to test its usability and ethical concerns. The methods and designs were triangulated so as to ensure validity of the findings. Methodological triangulation entails using more than one method of data collection (Noor, 2008: 1602). Data collected was checked for consistency and conformity with existing literature and was used in this study to generate answers to questions that sought to address the central research problem and improve the strength of the study.

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3.4. Study population

Lunsford & Lunsford (1995: 105) describes a population as a well-defined group of people or objects that share the same observable characteristics. This is shared by other scholars like Babbie (2007:111) and (Stangor, 2011:110) who state that a population is a larger pool of elements included in the study from which a researcher draws conclusions relevant to the study. A population must therefore be accessible, quantifiable and related to the purpose of the research.

This study targeted academic libraries attached to universities in Central Uganda. The study population comprise heads of libraries/departmental libraries/branch libraries, systems librarians and library ICT support staff since these people directly oversee the administrative, managerial and technical aspects of library ICT services. Notably, members of library ICT support staff are included in the study so as to provide insight on how to address the research objectives of the study.

3.5. Sampling

Amin (2005:232) states that a sample is a portion of elements to be selected for the study and must have the same characteristics inherent in the population. A sample should therefore be representative of the population and the size should be adequate enough to be subjected to a fair statistical analysis. Sampling comes in handy given that it is not always possible to study the whole population. The advantage of using a sample is that it involves a smaller number of subjects, more time efficient, less costly and potentially more accurate. However, care must be exercised during sampling to avoid the possibility of bias in selection of the subjects which may lead to error in interpretation of results and decrease the generalizability of the results beyond the subjects under study (Lunsford & Lunsford, 1995:105).

The sample frame for this study was restricted to a census sample of 22 academic libraries in Central Uganda. These libraries were identified based on the information provided by the National Council for Higher Education (NCHE) the regulator of tertiary and higher institutions of learning in Uganda (NCHE, 2015: Online). The researcher focused on academic libraries for purposes of consistency and because of their leading role in introducing latest ICTs in libraries (Ramzan, 2010:102). Central Uganda on the other hand

was chosen because it is the region with the highest number of universities in Uganda also representing the most established and esteemed universities in the country. Of the 22 universities, only two i.e. Makerere University and Kyambogo University are public universities while 20 are private universities as shown in Table 3 below.

Table 3 Universities in Central Uganda

No.	Name of University	Type	District	Year established
1	Africa Bible University	Private	Wakiso	2005
2	Africa Renewal University	Private	Wakiso	2013
3	Aga Khan University	Private	Kampala	2001
4	Bugema University	Private	Luweero	1994
5	Cavendish University	Private	Kampala	2008
6	International Health Sciences University (IHSU)	Private	Kampala	2008
7	International University of East Africa	Private	Kampala	2010
8	Islamic Call University College	Private	Kampala	2011
9	Kampala International University	Private	Kampala	2001
10	Kampala University	Private	Kampala	2000
11	Kyambogo University	Public	Kampala	2002
12	Makerere University	Public	Kampala	1922
13	Muteesa 1 Royal University	Private	Kampala	2007
14	Ndejje University	Private	Luweero	1992
15	Nkumba University	Private	Wakiso	1999
16	St. Augustine International University	Private	Kampala	2011
17	St. Lawrence University	Private	Kampala	2007
18	Uganda Christian University	Private	Mukono	1997
19	Uganda Martyrs University	Private	Mpigi	1993
20	Uganda Technology and Management University (UTAMU)	Private	Kampala	2013
21	Victoria University	Private	Kampala	2010
22	Virtual University of Uganda	Private	Kampala	2011

The researcher used purposive sampling to select respondents for the study from each of the universities. Kothari (2004:15) explains that purposive sampling is applicable when the group under study is relatively small and the characteristics warrant in-depth investigation. In addition, Pickard (2007: 64) notes that purposive sampling allows the selection of information rich cases that yield an in-depth response due to their wider knowledge of the phenomena under study.

In each of the academic libraries, the researcher inquired if there were librarians in the positions of heads of libraries/departmental libraries/branch libraries, systems librarians and

library ICT support staff. Some of the libraries surveyed had only one or two personnel manning the whole library system, while other libraries had more than ten librarians. For libraries with only 1-3 personnel, all the librarians and IT support staff were included in the study. Where the libraries had more than 10 personnel, the researcher sought out the librarians who were in the positions of Head of libraries/departmental libraries/branch libraries, systems librarians and library ICT support staff.

3.6. Data collection procedure

In order to ensure that each respondent submitted only one form, the researcher first set out to distribute questionnaires to informants who were easily reachable. Appointments were made with respondents on when the researcher would collect the filled out questionnaires. Online questionnaires designed via Google Forms were later sent out to informants who were not available at their workstations at the time the researcher distributed printed questionnaires. After distributing questionnaires, the researcher scheduled appointments for interviews for members of library management of KyULS to ensure that both the researcher and the respondents have ample time to participate in the study.

The researcher constantly checked, crosschecked and verified the data collected from questionnaires, interviews and during document analysis. The researcher edited data and results to eliminate errors. The researcher made sure that accurate and complete notes are taken during the interviews and responses on questionnaires. The researcher kept in contact with the supervisor and informants to iron out issues that needed clarification. Filled questionnaires and interview recordings were duly verified to ensure completeness of information.

The study targeted a population of 88 respondents across 22 academic libraries in Central Uganda. However, due to the fact that some universities may not have all the positions of University Librarian, Systems Librarian, Heads of Departmental Library, and Head of Branch Library in their staff establishment, the researcher employed purposive sampling to include holders of positions and persons carrying out the roles that were targeted in the study. This affected the response rate. According to Stangor (2011: 109), response rate refers to the percentage of informants who successfully participate in the study.

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Out of 44 questionnaires that were distributed, 28 were completed and returned. This culminated into a response rate of 63.63% by questionnaire method. 2 of the returned questionnaires were however invalid and this brings the total number of analysed responses by questionnaire method to 26 i.e. 59.09%. On the other hand, 7 out of 8 members of management of KyULS were interviewed. One informant was not interviewed because she was away on annual leave at the time of data collection. This yielded a response rate of 87.5%. Table 4 shows the response rate.

Table 4 Response rate for the study by data collection method

Data collection method	Sample size	Response rate	Usable responses	Effective response rate (%)
Questionnaires	44	28	26	92.86
Interviews	8	7	7	100
Overall	**52**	**44**	**33**	**75**

At institutional level, 17 out of 22 (77.2%) academic libraries in Central Uganda were represented in the study. Two of the participating libraries are attached to public universities (100%) while 15 (75% rate) are attached to private universities as shown in Table 5 below.

Table 5 Response rate by university

Status	University	Number of target population sampled	Number of respondents from university	Response rate from university (%)	Participation rate of university (%)
Public	Kyambogo University	8	7	87.5	21.21
	Makerere University	5	3	60	9.09
Private	African Bible Renewal University	1	1	100	3.03
	Aga Khan University	3	1	33.33	3.03
	Bugema University	3	2	66.67	6.06
	Cavendish University	2	2	100	6.06
	International University of East Africa	2	2	100	6.06
	Kampala International University	4	4	100	12.12
	Kampala University	1	1	100	3.03
	Muteesa 1 Royal University	3	2	66.67	6.06
	Ndejje University	3	2	66.67	6.06
	Nkumba University	4	1	25	3.03
	St Augustine International University	1	1	100	3.03
	St. Lawrence University	1	1	100	3.03

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Uganda Christian University	3	1	33.33	3.03
Uganda Martyrs University	2	1	50	3.03
Victoria University	1	1	100	3.03
Virtual University of Uganda	1	0	0	0
Uganda Technology and Management University	1	0	0	0
African Bible University	1	0	0	0
Islamic Call University	1	0	0	0
International Health Sciences University	1	0	0	0
Total	**52**	**33**	**58.6**	**100**

The geographic locations of the sampled universities that participated and did not participate in the study are shown in Figure 3.

Figure 3: Map of Central Uganda Showing distribution of universities

3.7. Data analysis and interpretation

Amaratunga et al. (2002: 280) explains that data analysis and interpretation forms a major part of research. According to Rugg & Petre (2006: 154), a clear and specific research problem coupled with a good research design will make data analysis flow well. Data analysis is a process that begins from preparing data for analysis and involves coding, editing, data entry, verification, analysis and interpretation (Amin, 2005: 306). Lichtman (2014:62) cautions researchers to analyse data in a manner that guards against misstatements, misinterpretations and fraudulent analysis. In this study, the researcher was mindful of the fact that some of the institutions being investigated has either one or two personnel manning the whole library system and participated in the study. In order to protect the identity of such respondents and guard against attributes that may negatively reflect on their parent institutions (Creswell, 2009: 87), data was analysed on a generic level and not broken down by university.

Given the benchmarking nature of the study, the researcher was guided by the TOE framework to identify relevant sources of data that included academic libraries, develop appropriate data collection instruments, develop procedure for data analysis and draw inferences using both qualitative and quantitative approaches (Creswel, 2007:4). The theoretical framework guided in the recruitment of participants to the study. Data was collected using both questionnaires and interviews based on key variables that influenced the study and circumstances under which key variables may differ were examined. Data verification was done to ensure that all responses were readable and complete, all important questions were answered (Yiro, 2012:459) while data logging was carried out to merge data from the survey questionnaire and the interview. Interview data was transcribed coded and interpreted based on themes. A descriptive analysis of data was carried out, cross-tabulation employed to determine key variables and data was presented in form of tables and charts.

3.8. Limitations

The investigation was carried out at a time when non-teaching staff at public universities had gone on a sit down strike due to failure by government to enhance their salaries (Agunyo, 2015, online; Uganda Radio Network, 2015: online). Among the universities that were affected by the sit down strike are Kyambogo University and Makerere University. This

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delayed data collection since the researcher had to track the respondents outside their work places and some appointments especially for interviews were postponed. In addition, the data collection period also coincided with the 81st IFLA General Conference and Assembly that took place from 15th-21st August 2015 at Cape Town, South Africa (IFLA, 2015: online). Some of the respondents were either preparing for the conference or attending the conference and this equally had an impact of delaying data collection and lowering the response rate. Nevertheless, appointments were re-scheduled and online questionnaires helped bring to speed the data collection process.

In addition to the above, the use of questionnaires did not give room for in-depth investigation, questions were subject to misinterpretation since the researcher was not available in person to clarify and. However, the questionnaires were pre-tested among colleagues to ensure that questions did not deviate from addressing the central research question and all questions were as clear as possible. The study also was not exhaustive of all ICT equipment but rather focused on relevant ICTs used in the recording, storage and dissemination of information through the libraries as described by Ramzan and Singh (2009).

3.9. Ethical considerations

With due consideration of confidentiality, authenticity and credibility of the research report; the researcher sought to protect the research participants, develop the trust of participants, guard against misconduct and impropriety that will reflect on selected universities and cope with new challenges and problems (Creswell, 2009: 87). To that effect:

- The data collection instruments were pre-tested among some of the members of KyULS in order to ensure validity and reliability of data.
- Data collection instruments were presented to the research and ethics committee of the University of Pretoria for ethical clearance.
- An ethical clearance letter was obtained from the University of Pretoria and attached to the data collection instruments so as to duly associate the researcher with the stated research, and create assurance of how data collected will be used
- The researcher ensured that prior consent of the respondents was obtained before involving them in the study.

- The privacy of respondents was respected, and anonymity and confidentiality observed throughout the study.
- Literature and any works consulted and used during the study are acknowledged.
- Finally, the research findings shall be disseminated according to the University of Pretoria guidelines.

3.10. Summary

The above discussion presents the methodology that was adopted to investigate the status of ICTs in academic libraries in Central Uganda. The chapter blends with evidence available in the literature to justify the approaches adopted by the researcher. It includes the research approach and design, population and sampling, data collection methods, data collection instruments, data collection procedure; application of questions to the study, data analysis and presentation; data quality control; validity and reliability; and ethical issues.

Chapter 4 discusses the empirical findings obtained using the methodology outlined in chapter three above.

Chapter 4 Presentation and discussion of results

The chapter presents findings obtained from the study and discusses the findings in relation to the literature on application of ICTs in academic libraries in Central Uganda. The data for the study was obtained using the methodology described in Chapter 3. A survey questionnaire was sent to 22 academic libraries while interviews were conducted to members of library management of KyULS. Data analysis was performed as described in Chapter 3. The findings of the study are presented and discussed according to the research sub-problems stated in Chapter One.

4.1. Demographic data

To provide a background to the discussion on status of ICTs in academic libraries in central Uganda, the researcher provides a description of informants. These include their gender, job title, highest educational qualification, and period worked at the institution. The purpose of describing informants is to provide the researcher with an overview of the kind of informants involved in the study and ensure that the targeted sample of the population actually participated in the study.

4.1.1. Gender of Informants

More males (51.5%) compared to females (48.5%) participated in the study. The gender disparities however was not considered a variable in the study of the application of ICTs in academic libraries in Central Uganda although different gender may play differing leadership roles in the application of ICTs in academic libraries (Kim and Abbas, 2010:217). Table 6 below represents the gender of respondents.

Table 6 Gender of respondents

S No.	Gender	Count	Percentage (%)
1	Male	17	51.5
2	Female	16	48.5
3	Total	33	100

4.1.2. Job titles of respondents

This study targeted informants from academic libraries who are in the position of University Librarian, Head of Branch Library, Head of Departmental Library, IT technical support, Systems librarian.

Table 7 Responses by job titles

Job title	Count (n=33)	Percentage (%)
University Librarian	9	27.27
Head of Branch Library	8	24.24
Assistant Librarian	6	18.18
Systems Librarian	5	15.15
IT technical support	4	12.12
Library Assistant	1	3.03
Head of Departmental Library	0	0

Table 7 shows a higher representation of University Librarians (27.27%) who are the accounting officers in their respective libraries. According to Section 35 of the University and other Tertiary Institutions Act 2001 (as amended in 2003 and 2006), the University Librarian shall be "responsible for the development, control, management and coordination of all library and information services of the University". The participation of University librarians in this study is very significant to fulfilling the purpose of the study. No head of a departmental library participated in the study while each position in the rest of the target group was represented in the study. It is also apparent that the nomenclature of librarians in academic institutions in Uganda places the University librarian at the highest position in a library hierarchy, followed by Senior Assistant Librarian, Assistant Librarian, library assistant and library attendant for persons with LIS qualifications.

4.1.3. Academic qualifications of the informants

Cholin (2005: 192) explains that there is a tendency to undermine professionals in the lower qualifications in the decision making process of a university library system in the absence of highly qualified professionals. A majority of the respondents had Bachelor's degrees at 54%, followed by Masters Holders at 11%, PhD at 9.1% and Diploma at 3%. This shows that a higher percentage of personnel manning the ICT duties are qualified enough to handle the responsibilities. Table 8 below represents the academic qualifications of respondents.

Table 8 Academic qualifications of respondents

Academic qualification	Count (n=33)	Percentage (%)
PhD	3	9.1
Master's Degree	11	33.3
Bachelor's Degree	18	54.5
Diploma	1	3

NCHE statutory instruments for quality assurance for higher institutions of learning dictate that a University Librarian must hold at least a minimum of PhD qualification while that of Senior Assistant Librarian and Assistant Librarian are Master's degree and Bachelor's degree respectively all within Library and information science and related disciplines. The Universities and other Tertiary Institutions Act (2001) recognises all professional librarians holding at least a Bachelor's degree in Library and Information Science as academic. In Makerere, 49 out of the 72 of the established posts are held by graduate librarians (Talemwa, 2011: online). In the responses shown in table 8 above, universities have made effort to recruit holders of at least bachelor's degree to work in the libraries. This implies that such staff have at least undertaken an IT related course at university (NCHE, 2011). What remains wanting is whether the ICT skills acquired during university education are relevant to the needs of the LIS job market.

4.1.4. Period worked at the institution

In order to show the extent of knowledge and experience acquired, respondents were asked to indicate the period spent working at the current institution. A majority of the respondents (63.6%) had only worked at their respective institutions for a period of less than 5 years. 33.3% had worked for a period of 6-10 years while 3% had worked for a period of between 11-15 years at their institution.

Table 9 Period worked at the institution

Period worked	Count (*n*=33)	Percentage (%)
0-5 Years	21	63.6
6-10 years	11	33.3
11-15 years	1	3
Over 15 years	0	0

IT technical knowledge and skills has become pertinent in the LIS profession and yet there is critical shortage of such skilled workers in African Universities (Adam, 2003: 209; Minishi-Majanja, 2007:2). According to Tusubira (2005:96) due to scarcity and high costs of hiring ICT experts in African Universities, academic institutions should target bright students pursing IT courses and hire them when they graduate. Although a high staff turnover could imply that libraries are constantly losing staff with good ICT knowledge and experience, and taking note that a majority of respondents represent are graduates, institutions stand to benefit from the creativity of early career employees before they move on (Tusubira, 2005: 96).

4.2. Status of ICT infrastructure and ICT-based services

According to Ejedafiru (2010: 2),) ICTs have diversified access to library materials from resources within the library walls to access to universal information. The introduction of ICTs has facilitated resource sharing from a traditional approach to a modern approach. International co-operation is made possible where co-operating libraries are able to share resources and carry out inter-lending services. However, developing countries have had a challenge in building robust ICT infrastructure (Abubakar et al. 2014:1). This section addresses questions that were posed to provide answers to sub-question 1, namely, to what extent has ICTs been deployed in academic libraries in Central Uganda and what services does it support?

4.2.1. ICT infrastructure put in place to facilitate use of ICT based services in the library
All libraries surveyed reported having the basic ICT infrastructure to facilitate access to ICT based services in the library. 84.4% reported having a Local Area Network (LAN); 84.4% have internet access; 68.8% have a library website; 56.3% had their libraries networked and 3.1% indicated other unspecified infrastructure.

Although there is increased penetration of internet in academic libraries surveyed, overall internet penetration in Africa is still low with only 16% compared to 80% in the developed world (Africa Union, 2014:34). Some academic institutions have their library service centers dispersed across the university campus and this requires a wide network to enable information exchange and communication across the libraries. According to Saleem et al. (2013: 50) library networking is "a group of libraries and information centers interconnected

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Figure 4: ICT infrastructure that has been put in place to facilitate the use of ICT-based
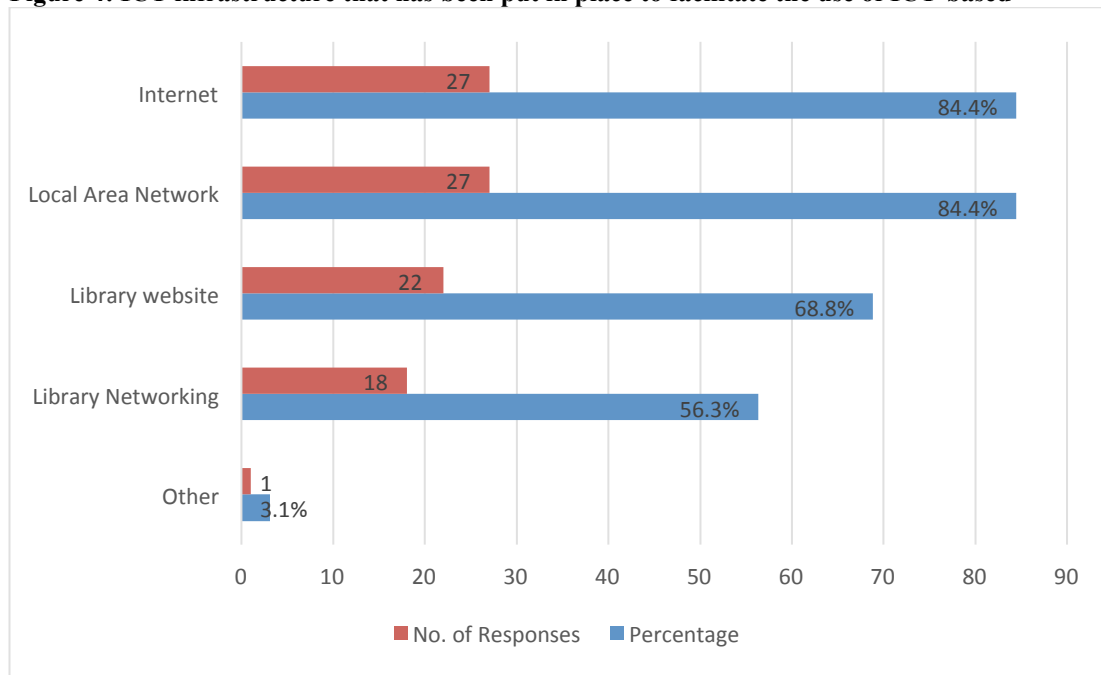
for some common pattern or design for information exchange and communication with a view to improve efficiency". However, lack of clear ICT strategy with each department operating as an island of its own makes it hard to network libraries (Adam, 2003). Until the coming of RENU in 2014, service centers for Kyambogo University Library Service for instance relied on internet subscription from faculties since each faculty operated its ICT budget and had separate Internet Service Providers (Buwule, 2014:15). Indeed, the positive impact of RENU is re-echoed in one of the statements from and interviewee:

> "With the coming in of RENU to provide internet across higher institutions of learning, the libraries have been left with no choice but to tap in the available opportunities. From the time of establishment of the university in 2002 until 2014, there was no campus wide network. Each department in the university had its own service provider and managed its subscription. This jeopardized the automation efforts of the library since and the fact that the library service centers were scattered across the university meant that networking of library resources was not possible. However, after RENU laid fiber optic cables, internet access has been harmonized and the network is campus wide. The library has gone ahead to install network access

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points both wired and wireless and the library automation system is centralized to cater for all service centres. Now users with their own laptops and smartphones can access internet on the go within campus"

A LAN in an academic library is essential to providing uninterrupted access to electronic resources at the users point since publishers of e-resources provide access via IP address authentication (Walmiki & Ramakrishnegowda, 2009: 239) . Internet acts as a window to the world of knowledge and it can be used to facilitate library activities like acquisition, technical processing and serials management (Walmiki & Ramakrishnegowda 2009).

4.2.2. ICT-based services offered in the library

Respondents were asked to list some of the ICT based services offered in their libraries. The services targeted were those aimed at facilitating information access and sharing with the library user in perspective. Respondents were however, not probed on the reasons for their choice of ICT-based services. Responses show that E-resources are provided at 94.1% of the libraries with the exception of only one library. The widespread use of E-resources can be attributed to the need to complement print-based resources and the extensive benefits associated with the use of e-resources (Dadzie, 2005).

Internet remains an indispensable tool for facilitating access to e-resources (Ani & Ahiauzu, 2008: 510) and has been widely deployed in 94.1% of academic libraries in Central Uganda. Other services rendered are OPAC 82.4%, Printing 64.7%, computer use 78.8%, photocopying 52.9%, scanning 47. 1%, institutional repository 41.2%, 55.3% and digital archiving 17.6%. Ejedafiru (2010:2) elaborates that ICTs have diversified access to library materials from not only within the library walls, but also provided access to universal information and promoted sharing of library materials, library co-operation and inter-lending services. ICTs are indeed shaping academic libraries in central Uganda from a traditional approach to a modern approach of service delivery (Ogunsola, 2011: online).

The researcher probed further on the websites of academic libraries surveyed so as to acknowledge how the ICT-based services are package. The library web page of Makerere University Library was sampled and describes ICT services offered. Notable are electronic databases; online catalogue; undergraduate dissertations; institutional repository; e-books,

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Figure 5: ICT-based services offered in the libraries
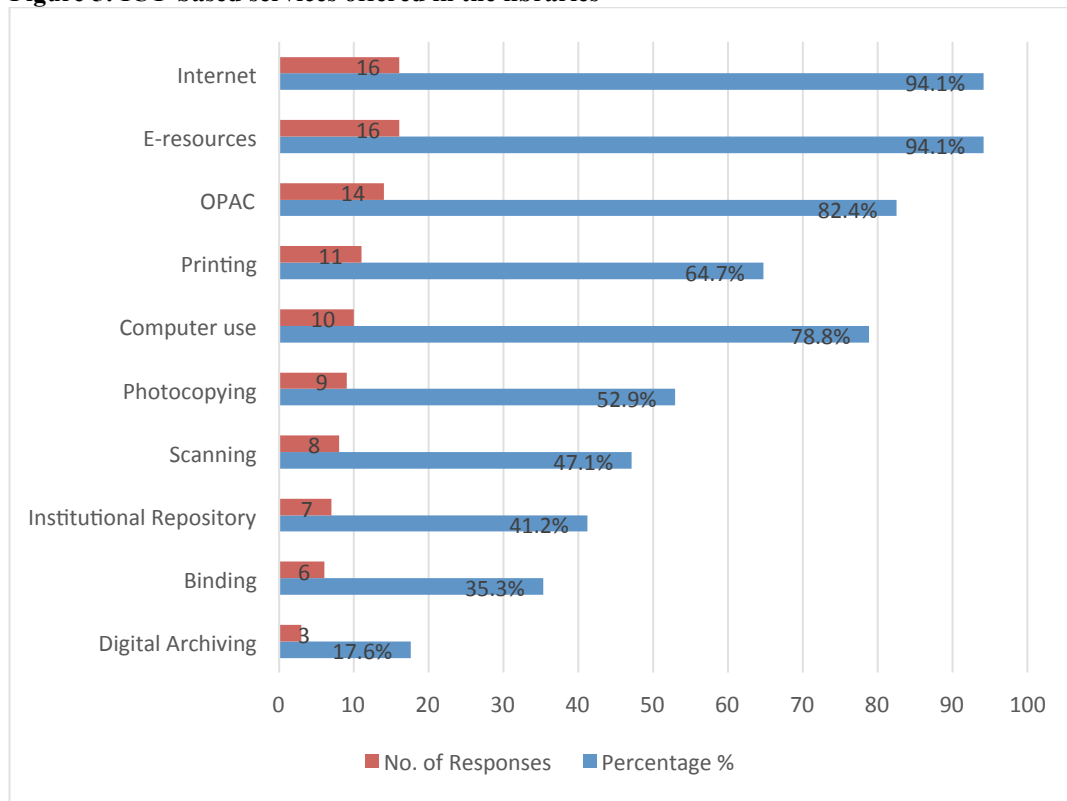
open access resources; The Essential Electronic Agriculture Library (TEEAL) and a live chat box. TEEAL is an off-line full-text and searchable database of articles from more than 325 high-quality research journals in agriculture and related sciences (TEEAL, 2010: online). TEEAL project is championed by Albert Mann Library at Cornell University and the latest TEAL set contains research material from 1993 to 2012. In addition, the library uses lib-hub that offers federated searches to library e-resources and there is a live chat box to officer online reference services. ICT based services are not peculiar to Makerere University or academic libraries in Central Uganda only but have been widely deployed in libraries world over (Musoke, 2008; Ramzan, 2010; Rosenberg, 2005; Rosenberg, 2006).

4.2.3. Number of ICT equipment available at each library
LIS profession is one of the fastest growing professions in the world and libraries have metamorphosed from traditional and manual systems to IT driven systems (Ogunsola, 2011: online). The traditional systems are in principle used to organize and communicate knowledge to clients across the globe. According to Ramzan and Singh (2008: 576), ICT

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Figure 6: Screenshot of Makerere University Library web page showing some of the ICT-Based services
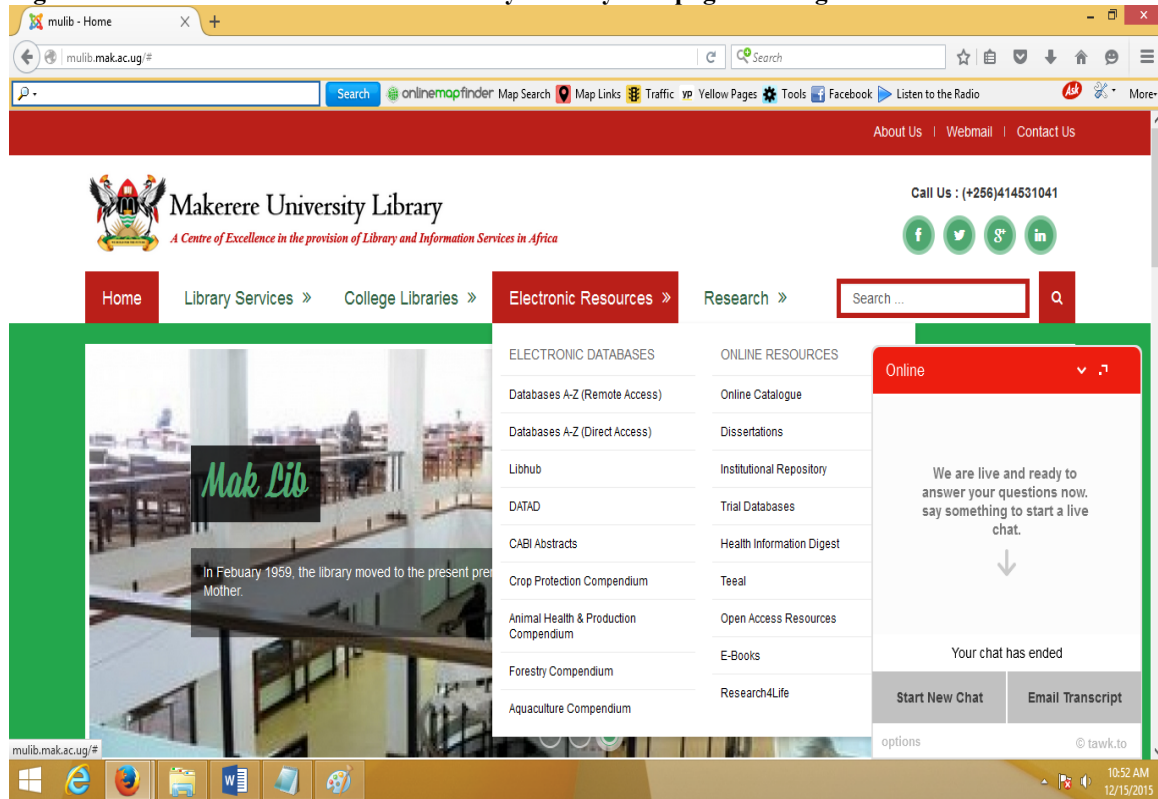
equipment are considered basic tools to facilitate access, storage, retrieval and dissemination of information in academic libraries. It is impossible to deliver a vibrant ICT service without having the basic ICT equipment. The study sought to know how much of ICT equipment were available at each of the libraries under study in order to understand whether academic libraries in Central Uganda are keeping up with the changes in the industry. Respondents were therefore, asked to state the number of desktops, laptops, servers, tablets, scanners, photocopiers, and printers available in their libraries. The responses were broken down to show equipment to facilitate access and equipment used for reprography and digitisation.

Table 10 Numbers of ICT equipment available for both library staff and user access points

Number	Desktops		Laptops		Tablets		Servers	
	n=17	*%*	*n=17*	*%*	*n=17*	*%*	*n=17*	*%*
None	2	11.76	4	23.53	13	76.47	2	28.57
1-30	5	29.41	12	70.59	3	17.64	15	88.23
31-60	4	23.53	1	5.88	1	5.88	0	0
61-90	2	11.76	0	0	0	0	0	0
91-120	0	0	0	0	0	0	0	0
121-150	2	11.76	0	0	0	0	0	0
150+	2	11.76	0	0	0	0	0	0

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Table 11 Numbers of ICT equipment used for reprography and digitisation services

Number	Scanners		Photocopiers		Printers	
	n=17	%	*n=17*	%	*n=17*	%
None	4	23.53	6	0	5	29.41
1-30	12	70.59	11	64.7	11	64.7
31-60	1	5.88	0	0	1	5.88
61-90	0	0	0	0	0	0
91-120	0	0	0	0	0	0
121-150	0	0	0	0	0	0
150+	0	0	0	0	0	0

It is not shocking to see from Table 10 and Table 11 above that there is a very low level of deployment of ICTs in academic libraries in Central Uganda with only 11.76% of the libraries having over 150 desktop computers. Moreover, two libraries did not have a computer workstation. The researcher also observed that even the established computer rooms are either ill-equipped or are too small to accommodate a bigger number of computer workstations.

The African Union (2014b) observes that Africa's position in the use of personal computers other than mobile phones is still low as compared to the developed world holds and this holds true in academic libraries in Central Uganda. The state of higher education report by NCHE decried the low number of computers available to both staff and students in Uganda (NCHE, 2013: 34). Although NCHE (2013) highlights the need for each staff of an academic institution to own a computer and be computer literate, improving the computer to user remains a challenge to be addressed. Disparities in the level of ICT deployment among institutions are also visible in the libraries under study with a few libraries having all ICT equipment stated while others do not have at all.

There is need for academic libraries in Central Uganda to deploy more ICT equipment because the functions and relevance of digital libraries are gradually eroding the usefulness of traditional libraries (Ogunsola, 2011). Adequate ICT infrastructure coupled with a sufficient number of well networked and interconnected workstations is essential if an academic library is to offer e-resources and deliver ICT based services (Rosenberg, 2005: 7). Academic institutions in Uganda, just like the rest of Africa need to address infrastructural challenges

like low band width, poor and telecommunication infrastructure; overcome perennial power problems and adopt national ICT strategies and policies, in order to realise heavy deployment of ICTs (Adam, 2003; Mayer, et al., 2008; Mutula, 2005).

Figure 7: Library computer room at Aga Khan University (Photo by Mary Acanit)

4.2.4. Condition of ICT equipment

Respondents were asked to rate the state of ICT equipment at their institutions. 71.9% stated that their ICT equipment were in good condition; 15.6% were fair; 9.4% were excellent and 3.1% were in poor state. No institution however reported to have computers in very poor state.

Figure 8: Condition of ICT equipment
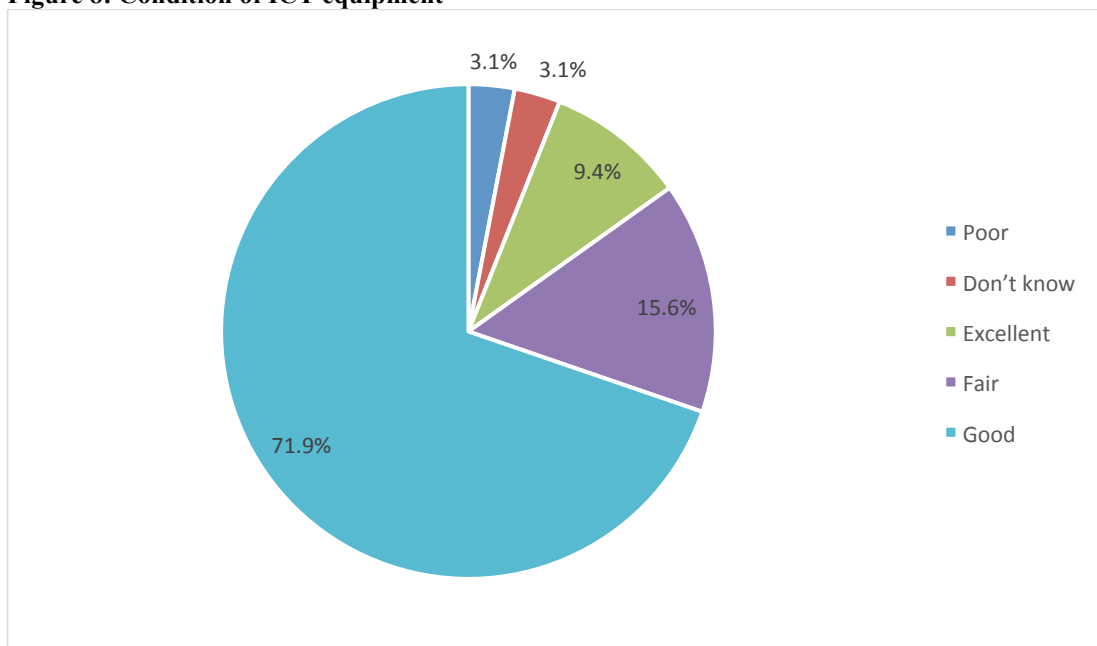
Despite the reportedly low deployment of ICT equipment, the overall status of the available equipment was in good condition. This can be attributed to either good maintenance (Section 4.2.7.) or recent acquisitions of hardware (Rosenberg, 2005: 7). ICT projects are capital intensive in nature and maintenance of ICT equipment helps to reduce on the total cost of ownership (Adam, 2003). IT support staff, computer technicians and all personnel manning ICT equipment need to be applauded for the job well done

4.2.5. ICT equipment lent to users

Lippincott (2010:206) believes that mobile computing has a great significance to educational institutions and asserts that libraries traditionally serve as a public good; and indiscriminately providing services to those who cannot afford some types of content on their own. As a result, libraries have gone out of the way to loan a variety of mobile devices. While loaning of mobile devices is a practice in academic libraries in developed countries, the practice is not applied in academic libraries in central Uganda as evidenced in Table 12 below. One library loans out laptops while DVDs and CD-ROMs are each lent out by 76.47% of the libraries. ICT equipment like tablets, iPads, flash disks, telephone accessories and digital cameras are not lent out. Other mobile devices such as digital cameras, telephone accessories, flash disks, iPads and tablets are not lent out.

Table 12 ICT equipment lent to users

Equipment	Count (*n*=17)	Percentage (%)
CD-ROMs	13	76.47
DVDs	13	76.47
Laptops	1	5.88
Digital cameras	0	0
Telephone accessories	0	0
Flash disks	0	0
Ipads	0	0
Tablets	0	0

4.2.6. Responsibility for maintaining ICT equipment

Library IT support staff ranked higher (60.6%) in maintenance of library ICT equipment followed by the university ICT office/directorate. However, some of the respondents interviewed explained that in cases where there was no technical expertise, an outsourced company would be called in to carry out maintenance of some ICT equipment like

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photocopiers. This is a positive step towards addressing the barriers to ICT adoption (Alemneh & Hastings, 2006; Amekuedee, 1995; Mutula, 2005).

Figure 9: Responsibility for maintaining ICT equipment
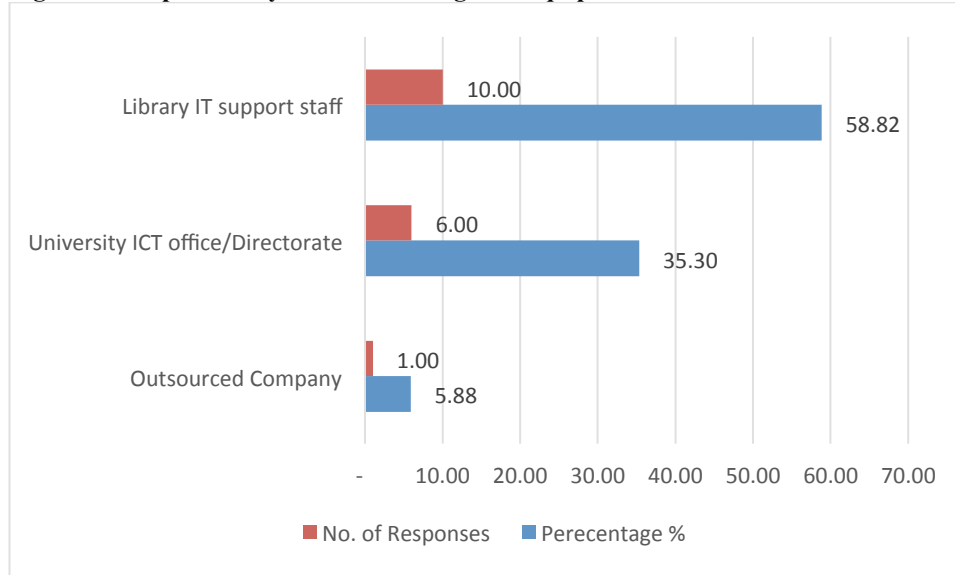
4.2.7. Frequency of maintenance of ICT equipment

94.12% of the libraries had their ICT equipment checked on routinely yearly basis and only 5.88% indicated that their library never carries out maintenance of their ICT equipment. These results can provide a possible explanation as to why equipment are reported to be in good condition as stated in Section 4.4.5.

Table 13 Frequency of maintenance of ICT equipment

Frequency of maintenance	Count (n=17)	Percentage (%)
Never	1	5.88
Every year	16	94.12
Every two years	0	0

One of the interviewees stated that: *"Since there is a computer technician employed in the library, maintenance is carried out frequently whenever ICT equipment break down…ICT equipment are monitored on a daily basis".*

Due to the higher costs involved in hiring IT experts, libraries should continuously develop local capacity and IT technical expertise among librarians to execute timely maintenance and prolong the lifespan of equipment (Adeyodin, 2005: 259).

4.2.8. Status of library automation

Library automation systems or ILS play a key role in acquisition, organization, management, storage, retrieval and dissemination of information. Balnaves (2008:1) states that ILS are expected to deliver the full breadth of OPAC, circulation, serials management, reports and have capabilities to interact with external interfaces like Z39.50 compliant. 82.35% of the respondents stated that their libraries are automated while 17.65% reported not to have automated their library.

Figure 10: Status of library automation
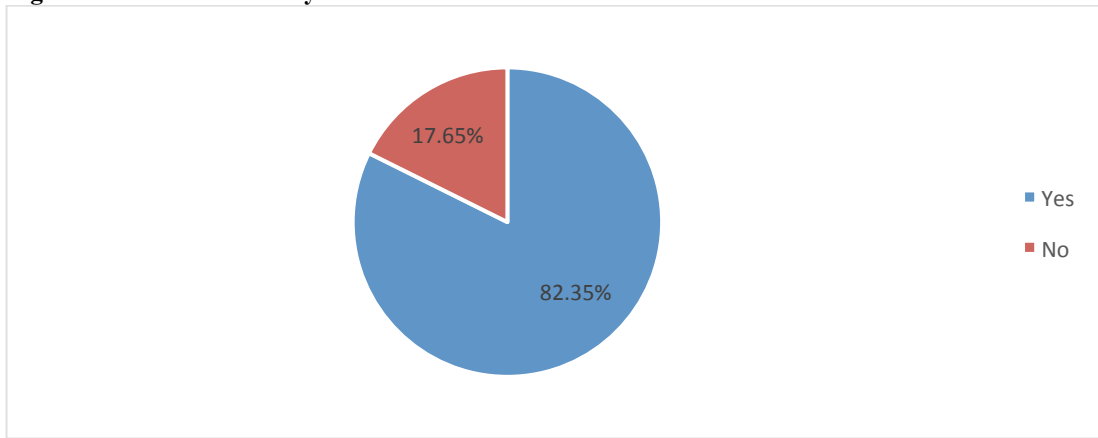
The high number of automated libraries can be attributed to the coming of open source library automation software. Open source software are increasingly becoming popular among developing countries and come in handy because the costs involved are insignificant compared to the breadth of functions that they provide (Balnaves, 2013; Egunjobi & Awoyemi, 2012).

4.2.9. Systems used for automation and year initiated at different academic libraries

Academic libraries in central Uganda are using both commercial and open source software for their automation projects. Systems cited for automation are Sirsidynix Symphony workflows, Virtua, Education Resource Management System, Koha and DuraSpace. Automation is still an ongoing process in academic libraries in Central Uganda. The earliest automation initiative is reported in 2003 at Makerere University. However, automation efforts gained momentum in the Ugandan market in 2010 with the entry of Koha ILS as shown in Table 14 below.

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Table 14 Library Automation systems used and year initiated by academic libraries

Institution	Application used	Year Initiated
Uganda Matyrs University	Koha	Unknown
Makerere University	Virtua	2003
Aga Khan University	SirsiDynix Symphony workflows	2009
Africa Renewal University	Koha	2010
Ndejje University	Koha	2010
Uganda Christian University	Koha	2010
Kampala International University	Koha	2011
Bugema University	Educational Resource Management System	2012
Kampala University	Koha	2013
Kyambogo University	Koha	2013
Victoria University	Koha	2013
St. Lawrence University	DuraSpace	2013
Muteesa 1 Royal University	Koha	2014
International University of East Africa	Koha	2015
St Augustine International University	Koha	2015

The modules catered for by Koha ILS include circulation, patron management, serial management, acquisitions management, cataloguing and reports module. In addition, there is a tools module, authorities and administration modules. These modules can be assigned in part or in full to library staff depending on their responsibilities. Koha is appealing to libraries because: it is open source; has reputable developers; user friendly; and has had many installations with success stories across the globe (Balnaves, 2008).

From Figure 12, it can be seen that not all library functions have been fully automated. There are mixed reactions on what automation means. Some respondents believe that having an OPAC translates in to full automation as noted in the response *"Our library catalogue is now available online. Users can access it anywhere"* whereas other respondents are of the view that their libraries are yet to attain full automation

> *"Koha has over eight modules but since we installed it 2 years ago, we have only utilised two modules that is: cataloguing and OPAC. Registration of patrons is still done manually. So our library still has a long way to go to attain full automation".*

Figure 11: A screen shot of Koha Super librarian staff interface for Kyambogo University Library Services
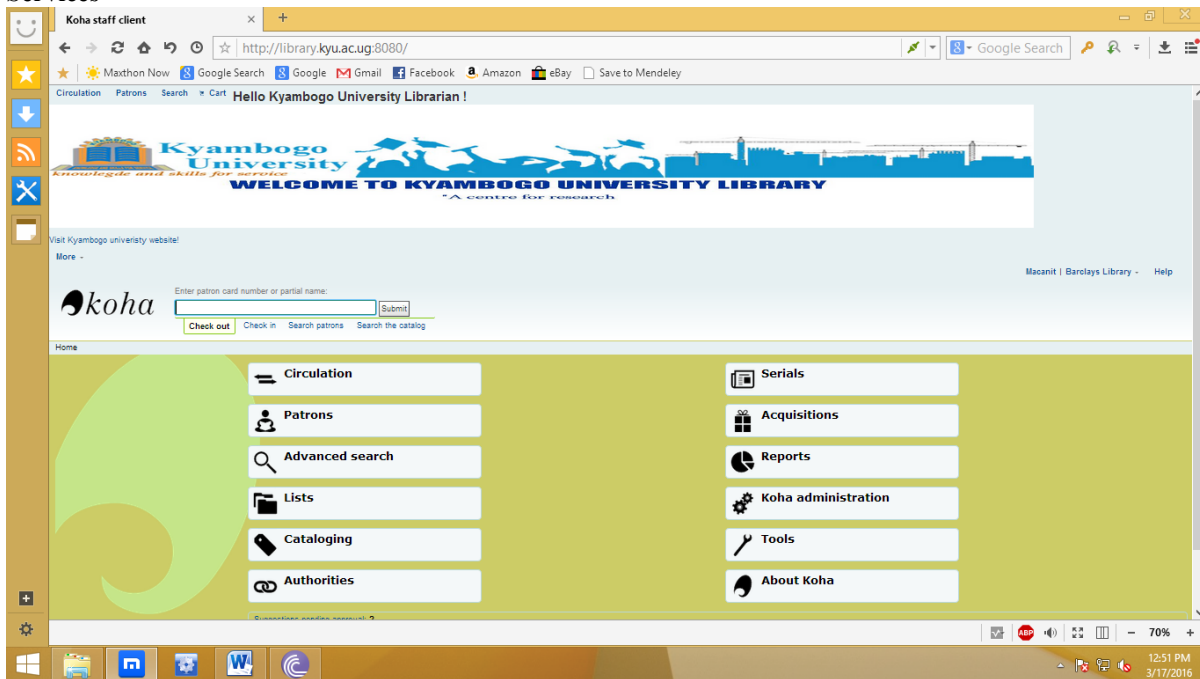
Figure 12: Library functions that have been fully automated
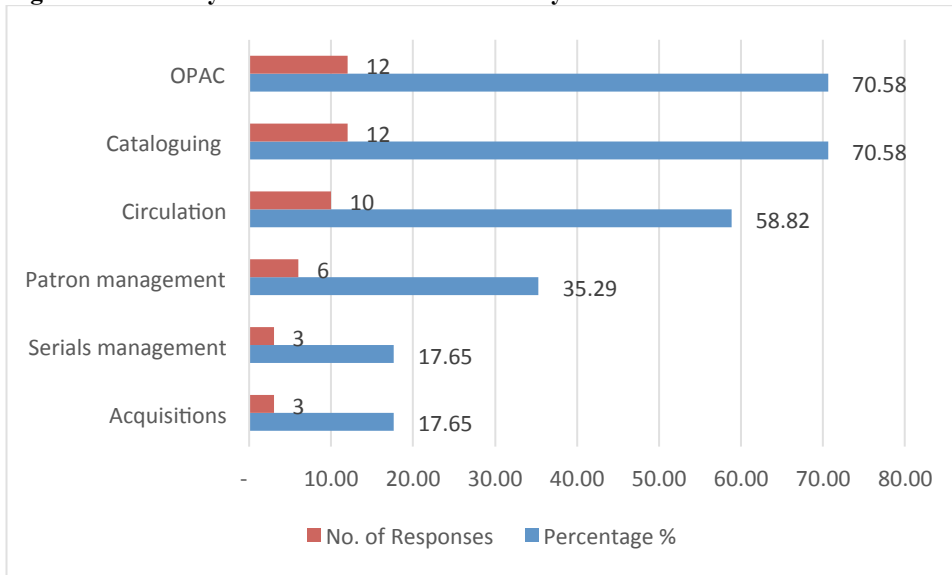
Rosenberg (2005) explains that due to difference in plans and ambitions, the level of library automation in academic libraries also varies. Hopkinson contends that the wealth of possibilities for library automation in developing countries is limited by high costs of hardware and software, power fluctuations, limited ICT skills, lack of technical support, and lack of concerted effort between and among institutions to initiate and maintain automation

projects (Hopkinson, 2009). There is need for academic libraries in Uganda to investigate and address barriers towards full automation to optimally benefit from automation and match their counterparts in the developed world.

4.2.10. Status of Institutional Repository
The digital revolution is influencing how scholars create, communicate and preserve knowledge therefore, Institutional Repositories (IRs) are increasingly becoming an essential component of academic institutions (Davis & Connoly, 2007: 3; Nagra, 2012). An IR is a digital collection of an organisation's intellectual output (CARL, 2016: online). Building an IR requires careful planning and enthusiasm from the academic community. 41.18% of the institutions surveyed reported having an IR while 58.82% did not have.

Figure 13: Status of Institutional Repositories
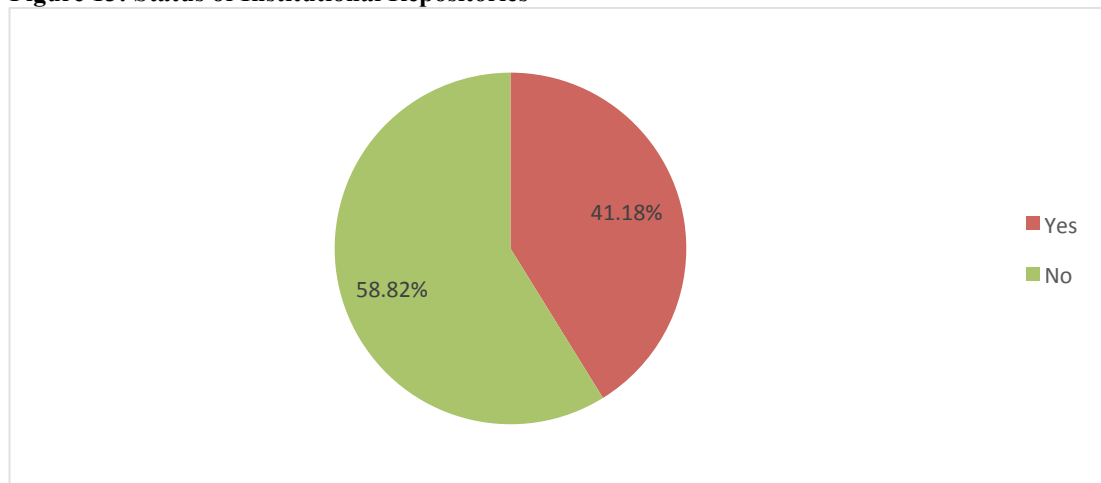
There is a growing use of IR across academic and research institutions (CARL, 2016) and libraries in Uganda are gradually integrating IRs in their institutions. Libraries need to make critical decisions and choices in matters of staffing, technology, metadata, and choice of content and repository management before designing institutional repositories (Nagra, 2012). Ultimately, funding remains a critical factor that should be considered in repository building (Deventer & Pienaar, 2008: 3).

4.2.11. Platform on which the IR is running
Institutional repositories are credited for showcasing and improving access to an institution's research output as well as facilitating the development and sharing of digital teaching

material. The applications hosting the institutional repositories are Dspace, Duraspace and Digital Commons as reflected in Table 15 below.

Table 15 Applications hosting institutional repositories at various libraries

IR Application	Institution
DSpace	Makerere University
	Ndejje University
	Kampala International University
	Uganda Christian University
	Bugema University
Dspace	St. Lawrence University
Digital Commons	Aga Khan University

Dspace is one of the pre-dominant IR software platforms that is capable of hosting a wider variety of materials and provides greater preservation and access to intellectual output much to the liking of academic institutions (Burns, et al., 2013: online). Repository content can include courseware, datasets, books, technical reports/working papers, presentations, conference proceedings, thesis and dissertations and journal articles (Burns, et al., 2013: online). In addition, digitizing materials for IRs is a very costly venture and the fact that Dspace is an open source application makes it suitable for libraries with small budgets.

4.2.12. Challenges faced in the provision of ICT-based services
The researcher sought to understand the challenges hampering the provision of ICT based services in the libraries. The responses cited are represented in Table 16.

Table 16 Challenges faced in the provision of ICT based services

Challenge	Count (*n*=33)	Percentage (%)
Low bandwidth	11	33.33
Unstable power supply	11	33.33
Poor ICT skills	10	18.18
Inadequate ICT equipment	5	15.15
Inadequate funds to purchase ICT equipment	4	12.12
High cost of ICT equipment	2	6.06
Poor attitude towards the library	2	6.06
Lack of management support	1	3.03
Bureaucratic tendencies	1	3.03
Lack of ICT infrastructure	1	3.03
Inadequate physical space to house ICT facilities	1	3.03
Lack of awareness about the library services	1	3.03

The researcher observed that print resources occupy most of the space leaving no room to accommodate ICT equipment. In addition, the library services are not networked at some institutions. Users are very comfortable with the traditional services and do not demand ICT-based services as one of the respondents stated:

> *"Our users are so complacent with the current services. If they added their voice to that of the library to continuously demand for better facilities and services, university management would be compelled to act accordingly".*

The challenge of low bandwidth and unstable power supply remains to haunt not only academic institutions in Uganda, but has been noted to affect a majority of academic institutions in the African continent (Adam, 2003; Gbaje, 2007a; Haliso, 2011; Minishi-Majanja, 2007; Mutula, 2005; Stilwell & Hoskins 2012;). However, academic institutions should seek, develop and promote better strategies to improve bandwidth capacity and conserve existing circuit capacity in order to increase access to ICT based services (Adam, 2003). There is need to devise better strategies to increase funding for ICTs.

4.3. Factors for and against ICT adoption in academic libraries

Academic institutions have developed IT strategies so deal with the rapid changes in technology and of libraries have embraced the use of ICTs in transforming service delivery. The study investigated drivers and barriers to ICT adoption in academic libraries in Central Uganda to address the second research problem namely, what factors have influenced ICT adoption in academic libraries in Central Uganda? Responses were analysed and presented.

4.3.1. Experience in adopting ICTs in academic libraries
Respondents were asked to rate their experience on adopting ICTs in their libraries. The responses show that 51.5% have a good experience, 27.3% found it very easy to embrace and roll out ICTs, and 15.5 % have a poor experience (Figure 14).

Figure 14: Experience in adopting ICTs
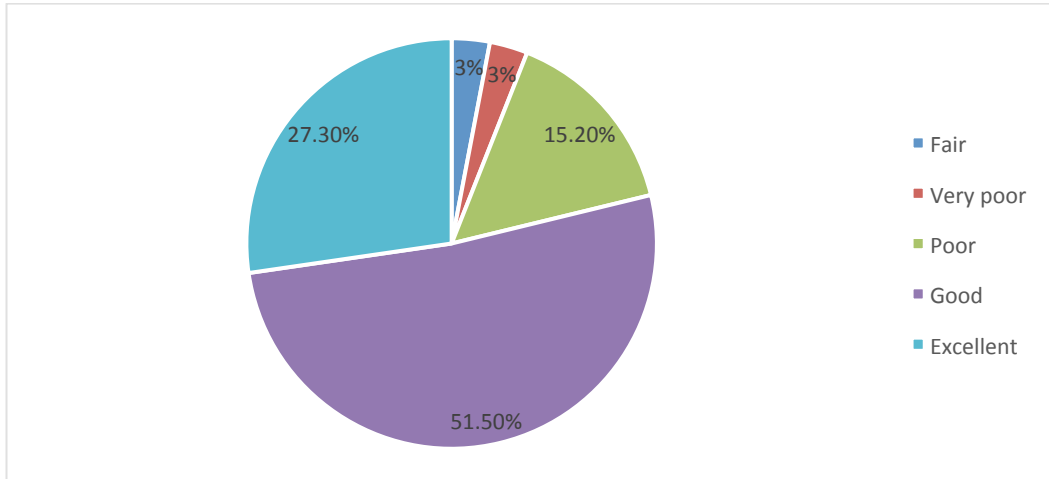
The enabling environment to ICT adoption can be linked to support from management, positive attitude towards ICT adoption, availability of ICT equipment improved ICT skills among staff and increased awareness about the benefits of ICTs. This concurs to findings from a similar study in Kyambogo University by Buwule (2014) which show that indeed the skills of staff, availability of software, positive attitude, management support and demand from students for automated services drive adoption of Koha ILS.

4.3.2. Factors influencing success in the provision and use of ICT-based services in the library

Respondents were asked to list the factors that have led to the success in the use of ICT based services in their libraries. The responses are indicated in Table 17.

Table 17 Factors influencing success in the use of ICT based services

Factors influencing success	Count (*n*=33)	Percentage (%)
Support from management	12	33.36
Positive attitude towards ICT adoption	7	21.21
Skilled library staff	6	18.18
Good ICT infrastructure in place	6	18.18
Sensitization of library users	6	18.18
ICT training programs	3	9.09
Support from funders like SIDA and NORAD	2	6.06
Advocacy from the Uganda professional bodies	2	6.06
Policies that promote use of library systems	2	6.06
Subscription to e-resources	1	3.03
Increase in distance learning students	1	3.03
Global trends spurring the library to keep up to date	1	3.03
Increasing demand for ICT-based services	1	3.03
Availability of technical support	1	3.03

Management support ranks highest in promoting usage of ICTs in the library. Management controls the budget, commits ICT resources, and recruits staff. One of the interviewees reiterated that *"the library has people who are passionate about ICTs and these people should be supported to come up with projects that promote usage of ICTs in the library"*. A positive attitude goes a long way in addressing cultural barriers to ICT adoption (Ani et al., 2005; Fabunmi, 2009; Ondari-Okwema, 1999;)

In one of the responses, the respondent stated that their university makes it mandatory for all students to use the library system in every transaction. Such a policy compels users to explore library services that can be accessed via the system (Adam, 2003: 219). It is also acknowledged that training programs have boosted staff confidence in the use of ICTs. Subscription to e-resources means that institutions need to put in place necessary infrastructure to facilitate access to the e-resources (Ingutia-Oyieke & Dick, 2010). Distance learning students also require access to library resources at their points of reach. With e-resources and systems like Ezy proxy to support off-campus access, distance students are able to access a wide range of electronic databases, journals and books just as the full time students. Awareness is also being made through information literacy programs, library orientation, and library workshops. In Kyambogo University for instance, a respondent stated that at least two workshops are carried out every year to sensitize users about library resources, advocacy and provide accountability to management on the progress that the library is making with, of course, ICT based services at the forefront of discussions. CUUL has carried out vast training programs for librarians in areas of e-resources management, information literacy, network administration, systems librarianship among others. Hirson (1999: 124) explains that the role of the consortia in championing change in the areas of electronic resources should not be under-estimated. Consortia analyse quality of e-resources content, serve as aggregators for member libraries, lobby for funding and more responsive services. Research and Education Network Uganda (RENU) has also boosted internet connectivity across different universities in Uganda. RENU in partnership with SEACOM secured a major reduction of up to 60% of the cost of bandwidth for some of its member institutions (RENU, 2015: online). In fact partnerships should be encouraged to fill skills gaps, capacity building and infrastructure investment (Musoke, 2009; Okello-Obura &

Kigongo-Bukenya, 2011: 13). The expressions in some of the responses imply that there is a fertile ground for ICTs to thrive in academic libraries and the shift to ICTs is just inevitable.

4.3.3. Factors that have impeded the provision and use of ICTs
The high cost of ICT equipment is the major deterrent to the provision of ICT based services at 69.7%. This is followed by low bandwidth 60.6%, inadequate funding 54.54, poor ICT usage skills 48.48% and Power fluctuations 48.48. On a lower scale, factors hindering provision of and use of ICTs are limited management support 33.33%, and poor condition of ICT equipment 18.18%.

Table 18 Challenges faced in the provision of ICT-based services

Challenge	Count (n=33)	Percentage (%)
High cost of ICT equipment	23	69.7
Low bandwidth	20	60.6
Inadequate funding	18.	54.54
Poor ICT usage skills	16	48.48
Power fluctuations	16	48.48
Limited management support	11	33.33
Poor condition of ICT equipment	6	18.18
Other	2	6.7

The above findings are at par with Okojie's (2010, 407) revelation that libraries in Africa have not fully exploited the advantages associated with the use of ICTS. Many libraries lack computers, internet services are poor, automated services are limited and the infrastructure is not maintained. This scenario implies that the services provided to users are not efficient and satisfactory as they should be. In the end, users will be compelled to seek alternative sources of information outside the library system. It remains to be seen that the realization of adequate funding for ICTs is still a nightmare and the issue of low bandwidth remains to feature in barriers to ICT adoption (Minishi-Majanja, 2007; Mutula, 2004; Watts & Ibegbulam, 2006)

4.3.4. Suggestions on how to improve use of ICTs
Respondents were asked to make suggestions on how the use of ICTs can be improved. There were many promising responses as captured in Table 19.

Table 19 Suggestions on how to improve use of ICTs

No.	Suggestion	Count (n=33)	Percentage (%)
1	Increase funds for Library ICT budget	12	36.36
2	Purchasing more ICT equipment	8	24.24
3	Sensitise users	11	33.33
4	Increase bandwidth	7	21.21
5	The library should initiate income-generating projects to raise funds for ICT	5	15.15
7	Improve power supply	3	9.09
8	Training of staff	2	6.06
9	Management support	2	6.06
10	Employing more ICT literate staff	2	6.06
12	Grant proposal writing to get more funds to support ICT	1	3.03
13	Government should supplement the available funds	1	3.03
14	Continuous involvement and commitment of key stakeholders	1	3.03
15	ICTs should be exempted from income tax	1	3.03
16	Continuous maintenance of ICT equipment	1	3.03
17	Coordinated funding	1	3.03

The responses emphasize on the need to address issues of funding, skills, capacity building, costs, infrastructure and policy. According to Adam (2003), government policy is a critical success factor that drives strategic initiatives in universities thorough laws, regulations and allocation of funds. Government intervention is required in tax subsidies, supplementing IT revenue and infrastructural development. Libraries also need to diversify sources of funding, develop local capacity to manage ICTs and promote awareness of ICT among users, and develop appropriate incentives to motivate and retain staff with ICT expertise (Amakuedee, 2005; Choi & Rasmussen, 2009)

4.4. Funding for ICTs in academic libraries

Despite academic libraries in Sub-Saharan Africa embarking on different strategies to ensure sustained funding of library projects, inadequate funding has remained one of the challenges to meeting the needs of library users including the need for ICT services (Musoke, 2008:536). The researcher sought views on how ICTs are funded in order to address the third research sub-problem namely, what is the source of funding for ICTs in academic libraries?

4.4.1. Priority of library ICTs in the budget

40.6% of the respondents agreed that their library ICT budget is given high priority while 31.3% say no. However, 28.1% are not sure of the priority given to ICTs in the budget.

Figure 15: If priority is given to library ICTs in the budget
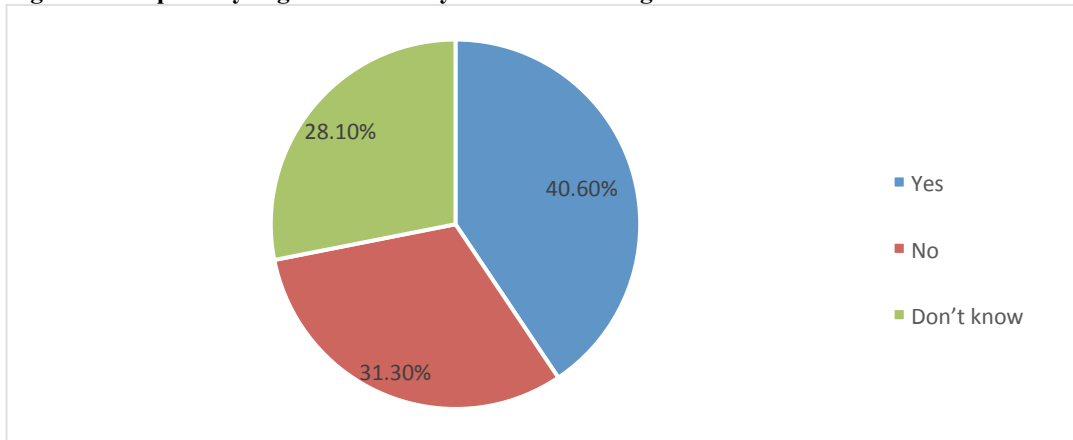
The findings reveal a significant improvement in the funding priority given to libraries as compared to NCHE report on the state of higher education in Uganda 2011. NCHE (2013: 36) revealed that the budget priorities of both private and public universities in Uganda is directed towards staff emoluments which consumes 55.97% and 46.6% in Public and Private Universities respectively. It is therefore very hard to improve on deployment of ICTs with the remaining funds that have to be shared across other university projects. NCHE recommends that priority expenditure be in areas such as library and ICT development that directly impact on teaching, learning and research (NCHE, 2013:36).

4.4.2. Major source of funding for ICTs

Respondents were asked to indicate the major source of funding for ICTs in their libraries. Results shown in Table 20 show that there is heavy dependence on self-paying students to raise funds for ICTs. It should be noted that government supports less than 30% of students in public universities while over 70% of students in public universities are self-paying students. In addition, a majority of the libraries surveyed are attached to private universities. This means that a majority of students at both private and public universities are self-paying students.

Table 20 Major source of funding for ICTs

No.	Source of funding	Count (*n*=17)	Percentage (%)
1	Fees levied on self-paying students	8	47.05
2	Internally Generated funds	3	17.64
3	Government	2	11.76
4	Donations	2	11.76
5	Fundraising activities	1	5.88
6	Other	1	5.88

On top of tuition from students, libraries charge a modest fee for some of its services like printing, photocopying, binding and scanning. Revenue realized from such activities is categorized under internally generated funds and is used to boost the library ICT budget. The nature of funding reflected is detrimental to the growth of ICT services in the library.

Okojie (2010) states that an organization that relies on only one source of revenue stands the risk of collapsing. With a shortfall in funding, libraries will find it even more difficult to meet the expectations of their major funders, parent institutions and users (Nawe in Okojie, 2010: 409). This is not helped by the fact that many librarians have limited or no skills in fundraising and advocacy, most likely because such skills are not taught in schools. There is need for government to complement funding of ICTs at both private and public universities.

4.4.3. Extent to which library requests for the procurement of ICTs are honoured
Respondents were asked to indicate whether or not requests to procure ICTs are honoured. The findings show that 33.33% of the requests are honoured to a greater extent while 39% are honoured to a lesser extent. 27.27% of the respondents were not certain.

Figure 16: Extent to which library requests for procurement are honoured
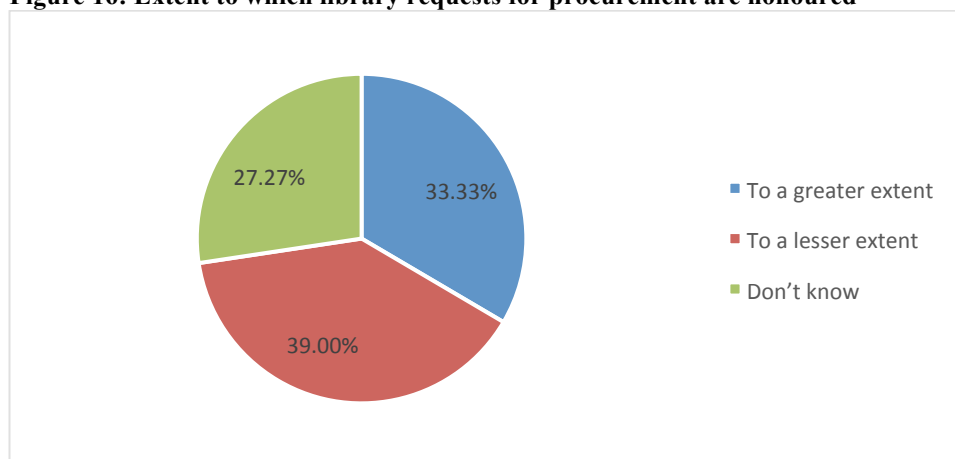
Although library ICTs are given priority in the budget, the requests to procure budgeted ICTs give a different picture. ICTs remain only on paper.

4.4.4. Utilisation of allocated funds in the budget

Mutula (2004) pinpointed that libraries are experiencing budget cuts and this necessitated strategies to ensure that the available funds are optimally utilised. Findings indicate that a higher number of libraries (42.42%) exhaust their ICT funds while 30.3 % do not fully utilise their funds.

Figure 17: Whether or not ICT funds are fully utilised
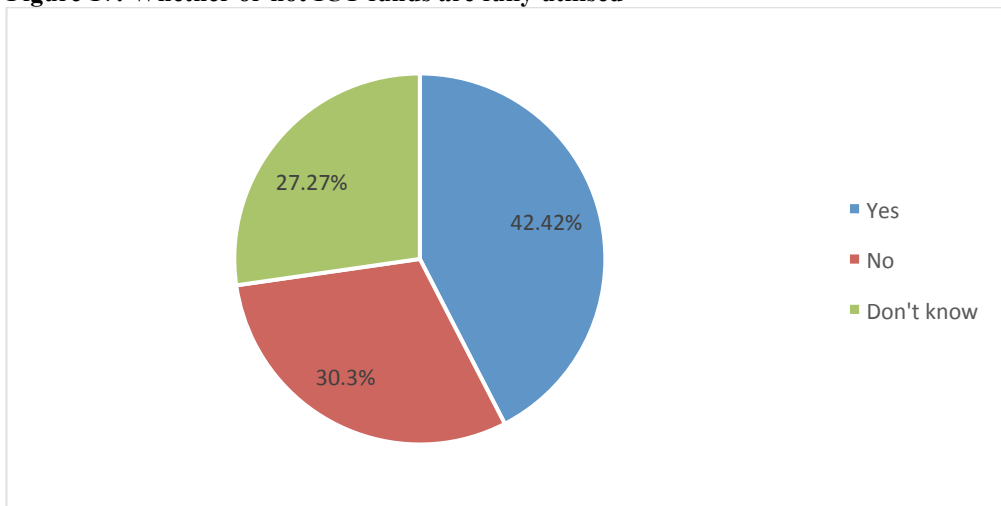
One of the interviewees stated thus:

> *"We budget for ICTs every year and funds are released. However, when we make a request for the funds, finance department tells us that there is no money. They tell us that what we see in the account are just figures. Since the accounts are centralized, we have no control over the utilization of funds deposited in the library account. We later get to know that money was used for other university projects rather than library project".*

Such a statement reflects gross misappropriation of library and is proving to be a chronic problem in academic libraries (Mutula, 2005).

4.4.5. Causes of non-utilization of ICT funds

Public Procurement and Disposal of Public Assets Act 1 of 2003 set up the Public Procurement and Disposal of Public Assets Authority (PPDA) as the principal regulatory body for public procurement and disposal (PPDA, 2015: online). PPDA in its mandate lists the procurement procedures to follow these include: Initiation of procurement; filling the requisition form; approval by authorized officer; registering the procurement requisition; confirmation of availability of funding; and preparation of bidding documents. A procurement planning process on the other hand involves preparation of procurement plans by user departments in line with approved work plan and budgets; consolidation of procurement plans; approval of procurement plan by the contracts committee; approval of procurement plan by board/council management; submission of procurement plans by accounting officer; and display of entire procurement plan on the entity's noticeboard (PPDA, 2014). Such long processes cause delay in execution of contracts. There are mixed reactions on whether ICT funds are fully utilised.

Table 21 Causes of non-utilisation of ICT funds

Cause	Count (*n*=33)	Percentage (%)
Bureaucratic procurement procedures	9	27.27
Other [unspecified]	21	9.09
Non initiation of request for funds	2	6.06
Lack of a procurement plan	1	3.03

In this study, bureaucratic procurement procedures remains big hindrance to access of funds for ICTs in academic libraries especially in public universities. One of the respondents intimated that often times, the library budgets and makes requests for the procurement of ICTs. However, the long procurement processes hinder timely delivery of the required materials. The respondent added that it is hard to tell if the items you are receiving are financed from the current budget or are from the previous budget".

4.4.6. ICT development partners

Findings indicate that 61.3% do not have ICT development partners, 12.9% had ICT development partners while 25.8% do not know if their libraries have ICT development partners.

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Figure 18: Number of libraries with ICT development partners
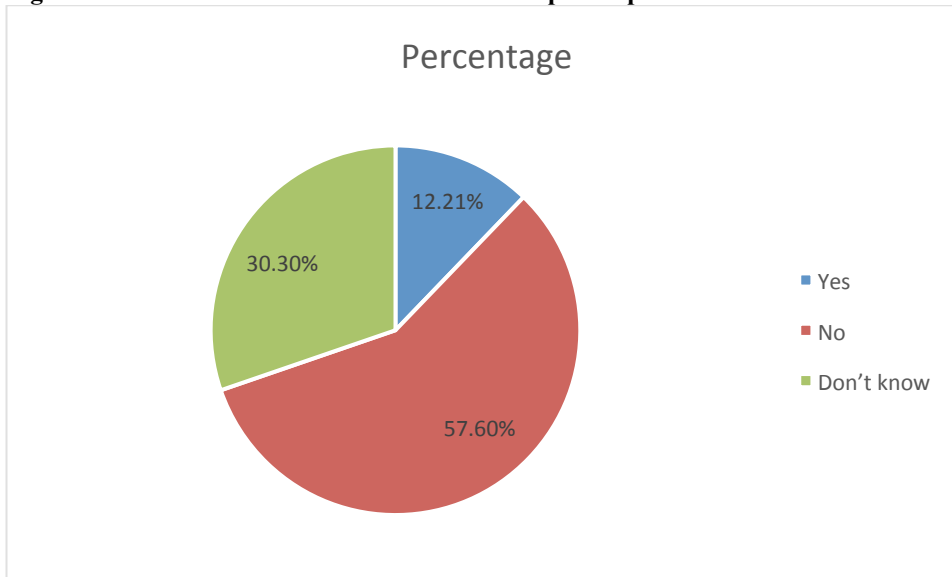
Musoke (2008:537) explains that support from development partners like Sida/SAREC, Carnegie Corporation of New York, NORAD as well as the United Nations Agencies led to significant improvement in the ICT-related projects in academic libraries in the East African Region. Respondents were asked to list the ICT development partners if any. However, findings of this study show that very few libraries in Central Uganda have made good use of the available support The responses include: INASP, SIDA and Carnegie Corporation of New York (CCNY).

Table 22 ICT development partners for academic libraries

Institution	CCNY	INASP	SIDA
Makerere University	X	X	X
Kyambogo University		X	
Kampala International University		X	

Although findings show only a few institutions benefiting from development partners, a quick review on literature reveals that a bigger number of libraries have benefited from the good will of donors and development partners especially in areas of e-resources, infrastructural development and capacity building. Subscription to e-resources is done under consortium arrangement with support from INASP and this benefits all member institutions of CUUL. RENU is also doing a great job in connecting all higher institutions in Uganda to a back bone network. Among the institutions so far connected to RENU network are: Aga

Khan University, Bugema University, Kampala International University, Kyambogo University, Makerere University, Muteesa 1 Royal University, Nkumba University, Uganda Martyrs University, Uganda Technology and Management University and Virtual University of Uganda (RENU, 2014: online). The contribution of INASP, SIDA and CCNY to academic libraries in Uganda in capacity building and technical support to library ICT projects is elaborately documented in the literature (Kakai, 2009; Musoke; 2008; Rosenberg, 2006; Tibenderana & Ogao). It is therefore apparent that either the respondents are not aware of the existing partnerships or academic libraries are not taking full advantage of the existing partnerships to develop and deliver their ICT projects.

4.4.7. Challenges encountered in accessing library ICT funds
Respondents were asked to make mention of any challenges encountered in accessing library ICT funds. Responses were coded as follows:

Table 23 Challenges encountered in accessing library ICT funds

No.	Challenge	Count (n=33)	Percentage (%)
1	Bureaucratic procurement procedures	10	30.3
2	The library is not considered a priority in the university	8	24.24
3	Insufficient funds	8	24.24
4	High cost of equipment	7	21.21
5	Lack of a library procurement plan	3	9.09
6	Centralisation of the university accounts	2	6.06

Respondents complain that centralization of library funds, coupled with the fact that the library does not have the capacity to monitor its own budget has resulted in library funds being diverted to other university projects without the consent of library management. It is apparent that private universities access ICT funds more easily than public universities since they do not have to go through the PPDA rules. It is therefore not surprising that private sector libraries are able to spend more on ICT compared to public libraries (Ramzan and Singh, 2008:582). Lack of alignment of the library budget to the strategic plan was another cause of non-utilisation of the funds. The dis-integrated model of managing ICTs in higher institutions of learning where each department is responsible for its ICT projects could be partly to blame (Adam, 2003). University management will not see the need in prioritising

library ICTs when there are several other ICT projects at faculty level. Suggestions on how to improve funding for ICTs in the library.

4.4.8. Suggestions on how to improve funding for ICTs in the library
Respondents were asked to suggest measures to improve funding and the responses are coded below:

Table 24 Suggestions on how to improve ICT funding

Suggestion	Count (n=33)	Percentage (%)
Prioritise the library	6	18.18
Subsidise on the cost of ICT equipment	5	15.15
Financial support from government	4	12.12
Consultation of all stakeholders in library ICT decisions	3	9.09
Simplify the procurement process	8	24.24
Diversity income generating activities	4	12.12
Proper utilisation of available funds	3	9.09

The above suggestions are shared by Bakabulindi (2006: 49) that the best strategy to reform higher education in public institutions is to reduce reliance on government by diversifying sources of funding through: soliciting for grants and donations, introducing income generating projects and cost sharing.

4.5. Library Staff ICT Skills and training

Musoke (2008:533) explains that the role of an academic librarian is becoming diverse and requires knowledge and skills in providing library programs, services and materials in order to meet the changing needs of students as well as supporting academic staff and researchers. The study sought to investigate if librarians in central Uganda have the right ICT skills and was meant to address the fourth research sub-problem namely: are library staffs in Central Uganda skilled enough to manage ICTs? Findings are presented below:

4.5.1. People directly responsible for ICT based services in the library
82.4.% of the libraries had 1-5 personnel responsible for ICTs. 17.6% had 6-10 people as shown in Table 25 below

Table 25 Number of employees responsible for ICTs

No. of employees	Count (n=17)	Percentage (%)

1-5	14	82.4
6-10	3	17.6
11-15	0	0
16-20	0	0
21-25	0	0

Choi & Rasmussen (2010: 457) pin point that libraries are faced with a problem of allocation and hiring of new skilled personnel. This is because of high costs involved in hiring IT personnel yet libraries are underfunded (Ashcroft & Watts, 2005). It is pertinent for libraries to develop local capacity in ICT technical expertise and promote the culture of knowledge sharing so that libraries don't lose out in the absence of current staff.

4.5.2. Competency levels of library staff in managing ICT based services
No library conceded to have staff with poor ICT skills. 60.6% are moderately skilled, 24.2% are highly skilled and 15.2% have very high skills.

Figure 19:Competency levels of library ICT staff
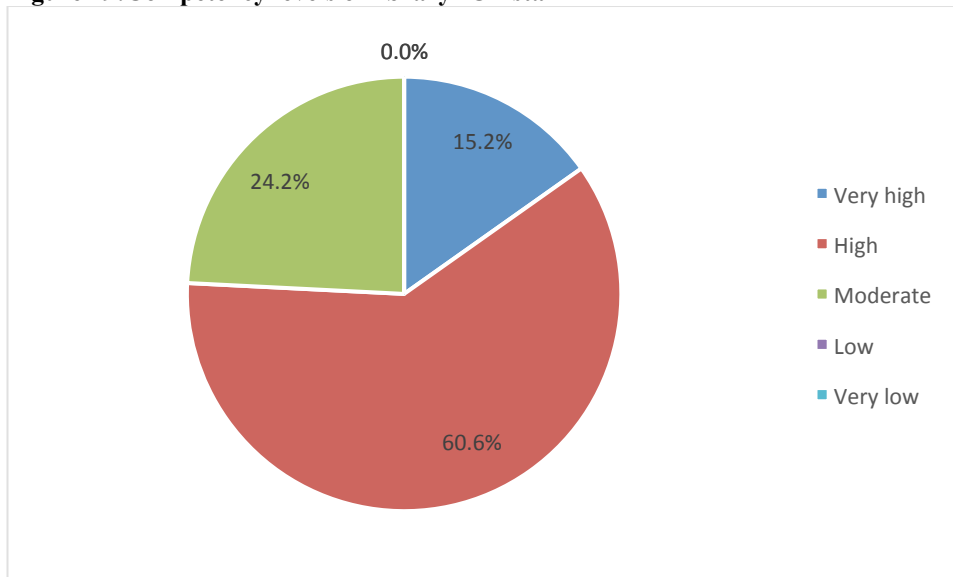
Responses about the competency levels of library staff in managing ICT based services indicate that a majority of library staff have adequate skills to manage ICTs. Ashcroft & Mcivor (2001: 385) assert that although librarians are not supposed to carry out the roles of an IT technician, they need to be equipped with technical competencies to be able to refer ICT problems to IT technicians. Librarians require knowledge and skills on network

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administration, electronic resources management, software customisation among others to be able to cope with the demands for ICT based services.

4.5.3. ICT skills and training that library staff have been exposed to

As a follow up on the competency levels of library ICT based staff, respondents were asked to select training(s) that they have been exposed. The results indicate that a majority of the staff have attended trainings in different aspects of ICT. These are: e-resources management; 93.9%, computer use 90.9%; internet search 84.8%; digitization 66.7%; and database administration 66.7%, integrated library systems 60.6%, hardware and software management 33.35, network and systems administration 33.3%, reprography 30.3%, and other unspecified training 3%. This conforms to the responses in section 4.5.2. which revealed that library staffs are highly competent.

Table 26 Skills and training that library staff have been exposed to

Skills and training	Count (n=33)	Percentage (%)
E-resources management	31	93.9
Internet search	28	84.8
Computer use	30	90.9
Database administration	22	66.7
Digitisation	22	66.7
Integrated library systems	20	60.6
Network and systems administration	11	33.3
Hardware and software management	11	33.3
Reprography	10	30.3
Other	1	3

Despite the skills and knowledge in ICTs, the picture on the ground is very different as the libraries are mostly run manually. Reference services are manual and there are no innovative activities that the librarians are introducing to their libraries.

4.5.4. How library staff acquired their ICT skills

Respondents were asked to indicate how they acquired their ICT skills. 78.78% learnt on job; another 78.78% acquired skills through workshops and Continuous Professional Development Programs (CPD); 69.69% acquired from assistance from colleagues or friends; 51.51% attained skills though personal motivated reading; and 45.45% acquired from a course taught at the university

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Table 27 How library staff acquire their ICT skills

How library staff acquire ICT skills	Count (n=33)	Percentage (%)
Learnt on-job	26	78.78
Continuous Professional Development trainings and workshops	26	78.78
Assistance from colleagues or friends	23	69.69
Reading books, articles	17	51.51
Course taught at the university	15	45.45

A number of staff across different institutions admit to have participated in the Carnegie CPD program tenable at University of Pretoria (University of Pretoria, 2016: Online)s. The purpose of the program is:

- *To empower the next generation of library and information professionals within Sub-Saharan African countries with hands-on skills to apply current and emerging ICTs*
- *Build capacity amongst library and information services professional to support and enable researchers*

Indeed, participants of the Carnegie CPD program are empowered and are the brains behind ICT initiatives at their places of work. Also, the roles played by professional bodies such as IFLA, CUUL and ULIA cannot go unnoticed in skilling librarians. Talemwa (2011: online) explains that the Consortium of Uganda University Libraries (CUUL) is greatly promoting capacity building in ICTs through various workshops organized amongst librarians from member institutions. However, the lower responses tallied for skill learnt at university bring to question the relevance of the LIS curriculum to the needs of modern libraries. Uganda presently has LIS courses taught at different universities from Certificate level to PhD level. However, LIS education and training in Uganda is faced by many challenges and this makes it very hard to produce quality graduates that meet the needs of the modern job market (Okello-Obura & Kigongo-Bukenya, 2011: 4). Challenges include:

- Higher enrollment with unmatched facilities hence compromising on quality
- Inadequate teaching staff especially in the fields of IT and publishing

- Lack of enforcement of standards for teaching LIS programs. ULIA is not doing its part to monitor standards of LIS education in Uganda as mandated by its (ULIA) constitution.

- Lack of funding for those pursuing post-graduate LIS study programs and

- Lack of investment in ICT infrastructure for teaching LIS

There is need for a curriculum review of LIS study programs to align it with the needs of the current and future job market and also ULIA should carry out its mandate in ensuring that LIS study programs meet both local and international standards.

4.5.5. Areas of ICT skills that the libraries have gaps

Respondents were asked to point out the ICT skills gaps in their libraries and the responses include: There are widely pronounced skills gap in the areas of Systems librarianship and emerging technologies; networking, trouble shooting and programming; marketing of ICT services; hardware and software management; repository management; digitisation; web 2.0 technologies; and general shortage of ICT skills which are needed in all aspects of modern library functions. This concurs with Minishi-Majanja (2007) and Shongwe (2014) that LIS graduates need advanced IT skills in networking, software and hardware management, database management, programming, computer engineering among others.

4.5.6. Suggestions on how to fill ICT gaps

Respondents were asked to make suggestions on how to improve on the ICT. The responses place emphasis on continuous training and re-training of staff skills and improving the knowledge sharing culture among librarians. One of the respondents stated:

> *"Staff should be encouraged to attend any sponsored or freely available course. For instance CPD courses offered at the University of Pretoria under the sponsorship of CCNY. I have attended one such training and I can tell you my eyes have been opened up to the world of library technology."*

The responses are not different from Gbaje's (2012:30) suggestion that equipping library staff with the right ICT skills is the single most important step towards having a successful library. Further to that, knowledge sharing should be promoted through informal exchanges

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at professional meetings, benchmarking visits, study tours, professional networks among others (Robertson & Trahn 1997:128) . This can be championed by ULIA and CUUL.

4.6. Emerging trends in the utilization of ICT applications in academic libraries

Musoke (2008:535) explains that library operations remained manual in academic libraries in Sub-Saharan Africa until 1985 when ICTs were introduced. This trend has however shifted with libraries adopting new technologies and re-designing their services. Trends are key to understanding what the future holds and the potential effect of future changes (Figueroa, 2015: online). This section probed for answers to the fifth research sub-question i.e. What are the emerging trends in ICT applications in academic libraries in Central Uganda? Findings are presented as follows:

4.6.1. Deployed trends
The study revealed that at least 88.24% have electronic resources, 70.59% are using open source systems, 47.6% link to open educational resources, supporting digital education is at 35.29%, and reference management is also at 35.29%. Other deployed trends include: research data management and curation 23.23%; cloud computing/Software as a Service 23.53%; use of mobile technologies 17.65%; bibliometrics, infometrics, alt-metrics and citation technologies 17.65%; semantic web 11.76%; 3D printing/maker spaces 5.88%; and cloud computing at 17.65%

Table 28 Emerging trends that have been deployed

Deployed trend	Count (n=17)	Percentage (%)
Electronic resources	15	88.24
Open source systems	12	70.59
Linking to open educational resources	8	47.06
Supporting digital Education	6	35.29
Reference management	6	35.29
Research data management and curation	4	23.53
Use of mobile technologies	3	17.65
Bibliometrics, info-metrics, citation technologies	3	17.65
3D Printing/ makerspaces	1	5.88
Semantic Web	2	11.76
Cloud computing/ Software-as-a-service	3	17.65

Table 28 above shows that academic libraries in Uganda are embracing new trends. Academic libraries are striving to leverage growing interest in active learning, new information and media formats and collaborative spaces in higher education (Figueroa, 2015: online). Academic libraries are transforming to be seen as both place and space.   Libraries are opting for electronic resources so as to cope with the continuing increase in student enrollment (Musoke 2008). By 2011, Makerere University library alone had access to over 25000 full-text e-journal titles and over 271 titles of e-books (Talemwa, 2011: Online).

4.6.2. Emerging trends that library staff would like to be introduced in their libraries
Respondents were asked to select the trends that they would like to be introduced in their libraries and the responses are tabulated in Table 29

Table 29 Emerging trends that library staff would like to be introduced in their libraries

No.	Suggested trend	Count (*n*=33)	Percentage (%)
1	Cloud computing	12	36.36
2	3D printing / maker spaces	9	27.27
3	Use of mobile technologies	9	27.27
4	Research data management	8	24.24
5	Semantic web	8	24.24
6	Library Service Platforms	8	24.24
7	Digital humanities	4	12.12
8	Bibliometrics, informetrics, alt-metrics, citation technologies	3	9.09
9	Digital education	3	9.09
10	Reference Management	2	6.06
11	Linking to open educational resources	2	6.06
12	Open source systems e.g. Koha & Dspace	2	6.06
13	Electronic resources	1	3.03
14	Reference management	1	3.03

Although there is need to adopt emerging and ongoing technologies, academic libraries need to be mindful of the need for robust infrastructural development and address issues of internet bandwidth and security and privacy before implementing such projects. (Abubaker, et al., 2014:2)

4.6.3. ICT-oriented job positions that have been incorporated in the library structure
Respondents were asked to state the ICT related job positions that have been incorporated in their library structure and the responses include: systems librarian, ICT technician, Systems administrator, ICT administrator, ICT librarian, Head ICT section, e-Resources librarian, ICT

director. This implies that academic libraries surveyed are steadily shifting to employ people with ICT skills that are more oriented to computer science, information systems and computer engineering disciplines in the LIS profession (Minishi-Majanja, 2007). The researcher, however did not analyse the job descriptions for the existing positions.

In order to keep with the trends, Respondents also proposed the inclusion of new job positions namely: Emerging technologies librarian, digital librarian, systems analyst and database administrator. Academic libraries in Central Uganda would like to break away from the traditional nomenclature of 'Senior Librarians' and 'Assistant Librarians' and see a change through introducing new posts and re-defining roles. For instance, digital librarians carry out planning and implementation of specific digital projects like setting up institutional repositories; responsible for a content management system; and digitise library collection for online access among others (Monson, 2013: 107). LIS schools in Uganda should take note of the suggestions and review LIS study programs to incorporate ICT courses that are more required in the job market.

4.6.4. Open source systems that the libraries are using
All the libraries that were using open source systems indicated that they were either using Koha 72.43%, Dspace 85.71% or both Koha and Dspace 42.86%. In addition, these systems are installed on Linux operating system which is also open source. According to Balnaves (2008:3) selection of an open source ILS is based on the following criteria: availability of source code; license in which the application is released; development processes and track record of adoption of the ILS in libraries.The fact that Koha is the first open source ILS with the widest customer base makes it endearing to academic libraries in Central Uganda (Balnaves, 2008:3).

4.6.5. How libraries keep up with the latest trends in ICT
When asked how they are keeping up with the latest ICT trends 84.8% stated that they attend workshops and conferences, 75.83% enroll for further training programs, 66.7% benchmark with other academic institutions while 654.5% receive updates from professional bodies.

Figure 20: How libraries keep up with the latest trends in ICT
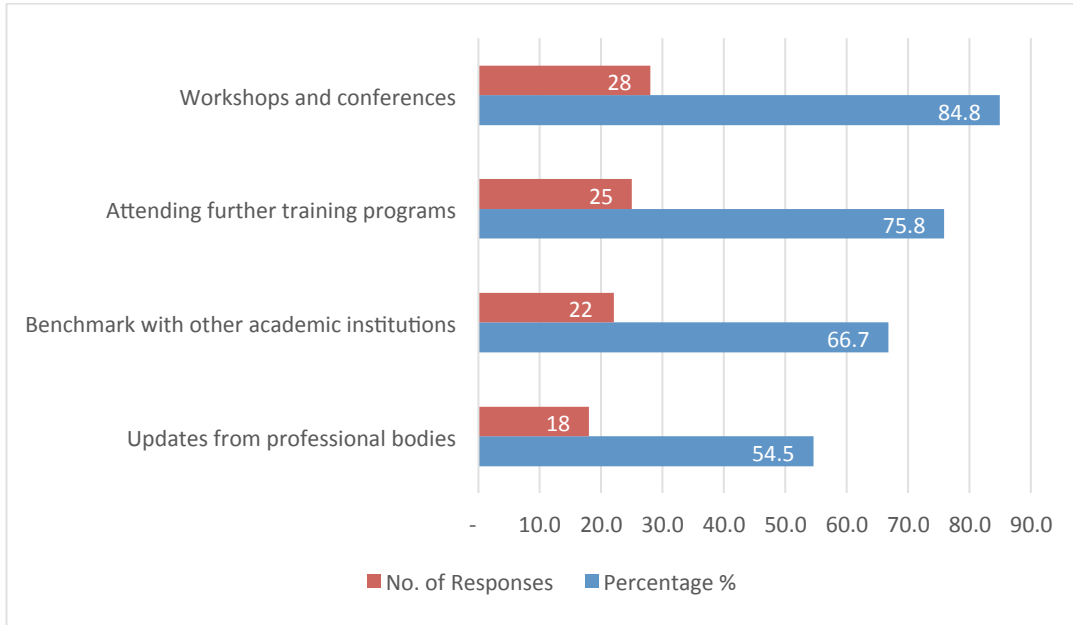
Librarians in this knowledge age are constantly seeking improvement in their ICT knowledge and skills. Some of the professional bodies that are offering professional advice and updates are: *IFLA* 'the global voice of the library and information profession'; *CUUL* aimed "*at facilitating effective and efficient collaboration and resource sharing among university and institutional libraries in Uganda in order to strengthen the library services provided to the students, staff and other patronage of the institutions*" and ULIA 'the professional body representing libraries and librarianship in Uganda'

Figure 21: A section of representatives from CUUL member institutions at the 14th CUUL AGM held on 1st April 2014 at the Grand Global Hotel, Kampala (Photo by Mary Acanit)

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4.6.6. How ICTs will influence the future growth and expansion of library services
Respondents were asked their opinions on how ICTs will impact the future of ICT services in their libraries and the responses show higher expectations and ICT driven libraries. Respondents anticipated that ICTs will spur growth and promote better services through the following:

- Improved communication and access to digital library services
- Improvement, standardisation and expansion of ICT services
- ICTs will drive the library strategy
- Growth in the number of users and increased trust from library users
- Fully automated information management system
- Increased collaboration both locally and internationally
- Better recognition of the library by the university community coupled with library budget prioritization
- Improved funding for library ICTs

4.6.7. Impact of ICT services provision on the image of the library
As shown in Figure 22, there has been a diverse impact of ICT based services in the libraries. 75.8% report growth in library users; another 75.8% indicate improvement in the image of the library; 63.63% agree that ICTs have led to the provision of efficient and effective library service, 57.57% acknowledge increased visibility of the library in the global market; 42.4% indicate that there is more resource allocation for ICTs in the budget and 30.3% show ICTs have increased donor funding.

Williams et al. (2011: 1) observe that ICTs have been a remarkable success in Africa with the availability and quality of service going up and the costs going. ICTs have made delivery of basic library services more efficient and made access to library services even easier.

4.6.8. What the library can do differently in relation to ICTs
Respondents were asked to give their views on what their libraries can do differently in relation to use of ICTs. The responses are shown below:

- Promote capacity building among library staff
- Look out for alternative funding options like donor support, government grants

Figure 22: Impact of ICT services provision on the image of the library
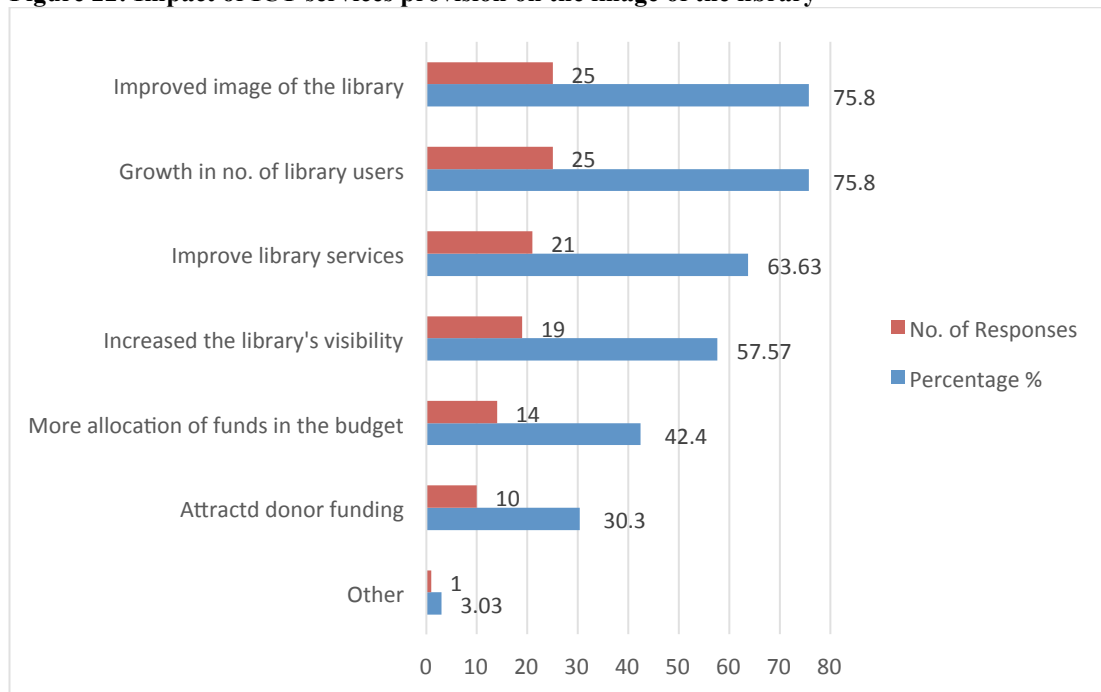
- Purchase more ICT equipment
- The library should carry on with both automated and manual systems until such a time that the automated systems are sustainable.
- Involvement of all key stakeholders in decisions regarding ICT selection and deployment
- There is need for the university community to recognise the autonomy of the library and offer it full support.
- Promote awareness on the available ICT services
- Customization the library systems to accommodate local needs and develop local capacity to manage library systems.
- Find ways of delivering capital intensive projects at minimal costs

The above responses signify that academic libraries in central Uganda are looking beyond the constraints to technology adoption and are embracing opportunities presented by technological innovation. Findings in this study indeed confirm that technology adoption in academic libraries are influenced by the technological factors, Organisational factors and environmental factors (Oliveira & Martins, 2011).

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4.7. Summary

This chapter presents and discusses findings of the study on application of ICTs in Central Uganda. The findings emanate from analysis of data collected using survey questionnaires, interviews, document review and observation. The research subjects included University Librarians, Heads of branch libraries, Systems librarians and Library IT support staff.

Chapter 5 will provide a summary of major findings that have emerged in relation the objectives of this study. Conclusions and recommendations will be drawn based on the findings of the study.

Chapter 5 Summary, conclusion and recommendations

This descriptive study was carried out to determine the status of ICTs in academic libraries in Central Uganda as indicated in the main research question. The objectives of this study are: to find out the ICT infrastructure deployed and services supported by those ICTS; establish factors for and against ICT adoption; investigate sources of funding for ICTs; identify staffing and ICT skills levels; and assess emerging trends in ICTs in academic libraries in Central Uganda. A survey-research methodology was used as described in Chapter 3 to answers the main research question and sub-questions and a detailed discussion of the findings is presented in Chapter 4. This chapter provides a summary of findings, final conclusion and recommendations based on the study and also identifies areas for future research based on the study gaps.

5.1. Summary of findings

A summary of research findings is presented below according to the research sub-questions.

5.1.1. Extent to which ICTs have been deployed in academic libraries in Central Uganda

Academic libraries in Central Uganda have put in place basic ICT infrastructure to facilitate access to ICT based services. These include LANs, library networking, library websites and internet access. In addition, there is deployment of at least the basic equipment to be used in the day to day administrative and technical operations of the libraries. These include desktop computers, laptops, servers, scanners, photocopiers and printers. With continuous maintenance, the ICT equipment is stated to be in good condition. The maintenance is mainly carried out by library IT support staff and university ICT directorate. However, a question remains on whether these ICT equipment are effectively utilised to match the teaching, research and learning needs of users or they are just decoration for the libraries.

Concerning library automation, a majority of the libraries are automated. While commercial systems like Virtua and Sirsidynix Symphony are evident in the earlier automation efforts, open source software have provided an opportunity for the later automation initiatives with Koha ILS proving the best option for academic libraries in Central Uganda. Makerere

University was the first to automate its library services in 2003 using Virtua followed by Aga Khan in 2009 using Sirsidynix Symphony. Koha is used ILS in most of the academic libraries. Full automation has however not been attained in all libraries. Applications used to host IRs are Dspace DuraSpace and Digital Commons.

5.1.2. Factors that have influenced adoption of ICT in academic libraries in Central Uganda

Management support plays a leading role in influencing adoption of ICTs in academic libraries. Other factors include: positive attitude towards ICT adoption; sensitization of library users; good ICT infrastructure are in place; availability of skilled library personnel; availability of ICT training programs; availability of donor funding and design of institutional policies that promote the use of ICTs.

On the other hand, the barriers to ICT adoption include: High cost of ICT equipment which is not helped by the fact the ICT budget is not well funded. Even the available equipment is not adequate enough to serve the ever growing number of users. Low bandwidth and perennial power fluctuations still remain a problem in Central Uganda just like the rest of Sub-Saharan Africa. The ICT usage skills are reportedly poor among both staff and users.

5.1.3. Funding for ICT in academic libraries in Central Uganda

Internally generated funds constitute a major source of funding for academic libraries in central Uganda. This means that libraries have to identify income generating projects and services which they provide at a modest fee to users. This may be detrimental to the core role of the library since libraries will be more focused on obtaining funds to sustain their services rather than striving towards improving the existing services. In addition, a majority of libraries in Central Uganda are attached to private universities who rely heavily on the fees that are paid by students to sustain their activities. The fewer the number of students in a university means that business is slow yet profits have to be posted for the shareholders or owners. This leads to lower prioritization of ICTs in the library.

5.1.4. Library Staff ICT skills and training

There are at least 1-5 persons deployed to oversee ICT services in the libraries. The lowest academic qualification represented in the study is Diploma while Doctor of Philosophy (PhD) is the highest qualification. At least 56.7% of the staff have moderate ICT skills. Over 60% of the staff surveyed indicate that they have undertaken training in e-resources management,

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computer use, internet search, digitization, database administration, integrated library systems and hardware and software management. What remains wanting is the practicality of the ICTs acquired and willingness of staff to share the knowledge and skills acquired. Library staff tend to use their ICT skills and knowledge as a tool to access power and retain authority over certain aspects of library systems. The study further reveals that there is an array of ICT skills that are lacking and these include: networks and systems administration; software customization; digitisation and marketing.

5.1.5. Emerging trends in ICT applications in academic libraries in Central Uganda

Electronic resources and open source systems are popular trends in academic libraries in central Uganda Koha is the most popular ILS for library automation while DSpace is the most popular system for running IRs.

Other emerging trends are linking to open educational resources, supporting digital education and reference management. Libraries also wish to have a shift to cloud computing, popularize mobile technologies, carry out research data management, introduce maker spaces, shift to the semantic web and Library Service platforms (LSPs) and bibliometrics, alt-metrics and citation technologies.

ICT-oriented job position integrated in the library structure are systems librarian, ICT technician, Systems administrator, ICT administrator, ICT librarian, Head ICT section, E-resources librarian, ICT director and webmail administrator. Respondents want the following positions to be introduced in their library structures: digital librarian, emerging technologies librarian, e-resources librarian, ICT librarian, systems administrators and systems analysts. Final conclusion

Findings of the study indicate a remarkable improvement in the level of deployment of ICTs and growth in ICT infrastructure precipitated by the shift to electronic resources which require appropriate ICT infrastructure for access and open source systems which have proved cost effective measures for keeping with the fast changing ICT trends. However, the use of available technologies and infrastructure to deliver vibrant library services is still minimal. Disparities in ICT deployment are still evident amongst academic libraries in Central Uganda just like the rest of Africa. Most of the libraries have been automated using either proprietary

applications including Virtua Integrated Library system, SyrsiDynix Symphony Workflows and Educational Resource management systems or Open Source Software like Dura Space and Koha. Automation initiatives started in 2003 and heightened in 2010 when many libraries started adopting Koha. However, no library has yet attained full automation. Dspace remains a popular application for setting up and running institutional repositories. There is an enabling environment for ICT adoption given management support and positive attitude towards ICT by the users. But even with the improvement in infrastructure; the high cost of ICT equipment, inadequate funds, low bandwidth, unreliable power supply and inadequate ICT skills still pose challenges to adoption of ICTs in academic libraries in central Uganda. Academic libraries in Central Uganda also rely heavily on internally generated funds which are not adequate enough to sustain capital intensive library ICT projects. Moreover, the available limited funds are hard to get due to poor budgeting strategies, bureaucratic procurement processes and misappropriation. Popular emerging trends in academic libraries in Central Uganda are use of open source systems and e-resources although a majority would like to adopt cloud computing, library service platforms (LSPs), mobile technologies and research data management (RDM). It is anticipated that ICTs will change and improve the mode of service delivery in academic libraries in the near future. It can be concluded that academic libraries in Central Uganda have not yet attained their full potential respect to the use of ICTs.

5.2. Recommendations

Based on the study findings, the researcher proposes the recommendation below to relevant authorities to promote application of ICTs in academic libraries in Central Uganda.

a) Libraries:
- More ICT equipment should be purchased to match the growing number of staff and students.
- There is need to develop local capacity to maintain and customise the ILS software in order to promote usage of all ILS modules and automate all library functions**Error! Reference source not found.**.

- There is need for continuous training and re-training of staff in order to fill the ICT skills gaps as well as introduce reward programs to encourage staff to share their ICT knowledge.

- Given the financial constraints, academic libraries should seek alternatives to sustain ICT-based services. Although most respondents suggested introduction of innovative income generating activities, it is imperative to review the performance of some of the existing income generating activities and their impact on delivering vibrant ICT-based services.

- Open source systems like Koha and Dspace have been embraced with much success by many academic libraries and can still be efficiently used to resolve the issues of inadequate funding to promote library automation and setting up of IRs.

- There is need to re-structure libraries to accommodate ongoing and emerging technologies in the LIS field.

- Promote use of e-books and go virtual in order to promote dissemination of knowledge

- support initiatives from International and local library associations such as IFLA, AFLIA, ULIA and CUUL in order to promote and benefit from knowledge sharing (IFLA, 2015)

b) LIS Schools

- A curriculum review for Library and Information Science study programs is critical to incorporate practical ICT courses that meet the demands of modern and future libraries

c) Professional bodies and associations

- Promote partnerships amongst institutions in order to pool resources for infrastructural development; benchmark and share knowledge and experiences (IFLA, 2015)

- Champion the cause for standardization of LIS programs

- Advocate for the establishment of a Pan-African library association that will provide a platform for networking and resource mobilization. This will help bridge the digital inequalities among institutions.

- Take part in articulating national e-strategies and participate in monitoring, evaluating and mentoring roles to shape ICT laws and regulations (Adam, 2003:219)

d) Policy makers and management

- There is also need to break the barriers towards access to ICTs funds especially procurement processes. The process should be simplified and explained to the user departments so that requests do not bounce. There is need to follow up with the budget work plan and implementation plan to ensure that items that are budgeted for are actually procured in that fiscal year. (4.4.7.
- Libraries should be prioritized in the budget and given authority to manage and control their own budgets.

e) Government

- The Ugandan government should support both private and public universities to supplement the locally generated revenue (4.4.2.
- Library ICTs should be considered under capital development funding from government rather than for libraries to fund their ICTs with the limited funds raised from internally generated revenue.
- There is need for tax subsidies on ICT equipment and subsequently lower the costs of ICT equipment which have been a big hindrance to ICT adoption (4.3.3. .
- Strengthen the national ICT policy to address infrastructure in higher institutions of learning Government policy is a critical success factor that will drive strategic initiatives through laws, regulations and allocation of funds (Adam, 2003:219)
- Engage in Public-private partnerships to boost infrastructural growth as seen with the initiatives from RENU.
- Adopt and implement continental innovative strategies to improve ICT penetration and knowledge management such as infrastructural development increased broadband penetration so as to boost the digital economy (African Union, 2014).

5.3. Recommendations for future research

There is need to investigate further how ICTs can be effectively utilised to improve library services. Based on the research findings presented the following areas bear consideration in future research endeavours:

- Sustainable financing solutions for academic libraries in Uganda;

- Challenges of full automation in academic libraries Uganda and prospects of a uniform library automation system for academic libraries in Uganda; and

- Repositioning LIS curricula at Ugandan universities to prepare LIS professionals who are able to meet the demands of modern libraries.

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Appendix A: Survey questionnaire

Dear Respondent,

My name is Mary Acanit. I am a student at the University of Pretoria Pursuing a degree of Master of Information Technology. I am carrying out a study entitled ***"Status of Information and Communication Technologies (ICTs) in academic libraries in Central Uganda"***.

You have been identified to participate in this study and information collected will be treated with confidentiality and shall be used for academic purposes only. Please sign below to indicate that you give informed consent

…………………………………………………….

Demographic data

1. Name of institution …………………………………………………………………..
2. What is your gender?

   Male ☐   Female ☐
3. What is your job title?

   University Librarian   ☐

   Head of branch library   ☐

   Head of Departmental Library ☐

   Systems librarian   ☐

   IT technical support   ☐

   Other   specify   ……………………………………………………
4. Highest educational qualification?

   PhD   ☐

   Masters Degree   ☐

   Bachelors Degree   ☐

   Diploma   ☐

   Certificate   ☐
5. For how long have you worked in this institution?

0 – 5 Years ☐

6 - 10 Years ☐

11 – 15 Years ☐

15+ Years ☐

Section A: Status of ICT infrastructure and ICT-based services

6. What ICT infrastructure has been put in place to facilitate use of ICTs in the Library?

Local area network ☐

Library networking ☐

Library Website ☐

Internet ☐

Other (Please Specify)

7. What ICT based services do you offer in your library?

E-resources ☐
Internet ☐
Computer usage ☐
Institutional Repository ☐
Digital archiving ☐
OPAC ☐
Printing ☐
Photocopying ☐
Binding ☐
Scanning ☐
Other (Please specify)……………………………………….

8. What ICT equipment do you use in the daily operations of your library?

Desktop computers ☐
Laptops ☐
Servers ☐
Tablets ☐

Scanners ☐

Photocopiers ☐

Printers ☐

Other (Please specify)…………………………………………………………………

9. Tick the corresponding number of ICT equipment available at your library

ICT equipment	Quantity						
	None						
Desktop computers							
Laptops							
Server							
Tablets							
Scanners							
Photocopiers							
Printers							

10. What is the condition of the library ICT equipment?

Excellent ☐

Good ☐

Fair ☐

Poor ☐

Very poor ☐

11. What ICT equipment do you lend to your users?

Laptops ☐

Tablets ☐

iPad ☐

DVDs ☐

CD-ROMs ☐

Flash disks ☐

Telephone accessories ☐

Digital Cameras ☐

Others (please specify)……………………………………………………….

12. Who is responsible for maintaining ICT equipment in your library?

Library IT support staff ☐

University ICT office/Directorate ☐

Outsourced company ☐

Other specify ☐

13. How often do you carry out maintenance of ICT equipment at your library?

Never ☐

One to two times a year ☐

After Every two years

14. Is your library automated?

Yes ☐   No ☐   Don't know ☐

15. If yes to 14 above, what system do you use for automation?

……………………………………………………………………………………….

16. In which year was library automation initiated in your library?

……………………………………………………………………………………….

17. Which of the following library functions have been fully automated in your library?

Acquisitions ☐

Cataloguing ☐

Serials management ☐

Patron management ☐

Circulation ☐

Open Access Public Cataogue (OPAC) ☐

18. Does your library have an institutional repository?

Yes ☐   No ☐   Don't know ☐

19. If yes to 18 above, on which platform/software is the institutional repository running?
……………………………………………………………………………………….

20. What challenges do you face in the provision of ICT based services at your library?

…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………
………………………………………………………………………………………….

Section B: Factors for and against ICT adoption in academic libraries

21. From your observation, what has been the experience in adopting ICTs in your library?

Excellent ☐

Good   ☐

Fair   ☐

Poor   ☐

Very poor   ☐

22. What factors have influenced the success in the provision and use of ICT based services in your library?

……………………………………………………………………………………..

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

23. What factors have impeded the provision and use of ICTs in your library?

Limited management support   ☐

Poor condition of ICT equipment   ☐

Inadequate funding   ☐

Poor ICT usage skills   ☐

Low bandwidth   ☐

Power fluctuations   ☐

Limited ICT skills among staff   ☐

High cost of ICT equipment   ☐

Other (please Specify)………………………………………………………………….

24. What factors have impeded the use of ICTs in your library?

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………

25. Suggest ways in which the use of ICTs can be improved in your library?

………
………
………
…….

Section C: Funding of ICTs in academic libraries

26. Are library ICTs included among the high priority items in the budget

Yes ☐   No ☐   Don't know ☐

27. What is the major source of funding for library ICTs?

Government ☐

Donations ☐

Gifts ☐

Internally Generated Funds ☐

Fees levied on self-paying students ☐

Fundraising activities ☐

28. To what extent are library requests for the procurement of ICTs honored?

To a greater extent ☐   To a lesser extent ☐   don't know ☐

29. Does your library use all the allocated funds for ICTs in a given financial year?

Yes ☐   No ☐   Don't know ☐

30. If no to 29 above, what could be the cause of non-utilisation of ICT funds?

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Non-initiation of request for funds ☐

Lack of a procurement plan ☐

Bureaucratic procurement procedures ☐

Other (please specify) …………………………………………………………………………

31. Does your library have ICT development partners?

Yes ☐ No ☐ Don't know ☐

32. If yes to 31 above, name the ICT development partners for your library

……………………………………………………………………………………………………

……………………………………………………………………………………………………

33. What challenges does the library encounter in accessing ICT funds?

……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………

34. Suggest ways of improving funding for ICTs in the library

……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………

Section D: Library staff ICT skills and training

35. How many people are directly responsible for ICT based services in the library?

1-5 ☐

6-10　　　　☐

11-15　　　　☐

16-20　　　　☐

25-30　　　　☐

36. How do you rate the competency levels of library staff in managing ICT based services?

Very High　　☐gh　　　☐ Moderate　　☐Low　　　☐y low　　☐

37. What ICT skills and training have you been exposed to?

Network and systems administration　　☐

Hardware and software management

E-resources management　　☐

Database administration　　☐

Integrated library systems　　☐

Internet search　　☐

Digitisation　　☐

Reprography　　☐

Computer use　　☐

Other (please specify)……………………………………………………………

38. How did you acquire the ICTs skills in 25 above?

Learnt on-job　　　　　　☐

Assistance from colleagues or friends　　☐

Online instruction 4 Course taught at the University ☐

By reading books, articles on the internet ☐

Formal training programs like CPDs, workshops, etc. ☐

Other (Please specify) ………………………………………………………………………………

39. In your opinion, in what areas of ICTs does your library have gaps?

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……
………………………………………………………………………………………………………

40. Suggest ways of filling ICT skills gaps mentioned in 39 above

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………………………………………………………………………………………………………

Section E: Emerging trends in usage of ICT applications in academic libraries

41. Which of the following ongoing and emerging trends are in your library? Please tick all that apply

Open source systems e.g. KohaDSpace ☐

Linking to open education resources ☐

Electronic Resources ☐

Library Service Platforms (LSP) ☐

Supporting digital education ☐

Research data management and curation ☐

Semantic web ☐

Cloud computing / software-as-a-service (SaaS) ☐

3D printing / makerspaces ☐

Bibliometrics, informetrics, alt-metrics, citation technologies ☐

Supporting digital humanities (DH) ☐

Use of mobile technologies ☐

Reference management ☐

42. Which of the ongoing and emerging trends in 41 above would you like to be introduced in your library?

……………………………………………………………………………………………………
………………………………………………………………………………………………
……………………………………………………………………………………………………
………………………………………………………………………………………………

43. What ICT oriented job positions have been incorporated in your library structure?

……………………………………………………………………………………………………
……………………………………………………………………………………………………
…………………………………………………………………………………………..

44. What ICT oriented job positions would you like to be introduced in your library?

……………………………………………………………………………………………………
……………………………………………………………………………………………………

45. What Open Source systems are your library using?

……………………………………………………………………………………………………
……………………………………………………………………………………………………

46. How does your library keep up with the latest ICT trends?

Benchmark with other academic institutions ☐

Workshops and conferences ☐

Attending further training programs ☐

Updates from professional bodies ☐

Other (please specify)………………………………………………………………….

47. How do you envisage ICTs in the future growth and expansion of your library services?

…………………………………………………………………………………………

…………………………………………………………………………………………

…………………………………………………………………………………………

………………

48. How has ICT service provision impacted on the image of the library?

Growth in library users

Improved the image of the library

More resource allocation for ICTs in the budget

Attracted donor funding

Increased the library's visibility

Provision of efficient and effective library service

Other Please (specify)

49. If anything, what can the library do differently in the provision of ICT based services?

…………………………………………………………………………………………

…………………………………………………………………………………………

…………………………………………………………………………………………

The End.

Thank you for your time!

Appendix B: Interview guide

Interview guide for Library Management of Kyambogo University Library Service (KyULS)

Title of the study: Status of Information and communication technologies in Academic libraries in Central Uganda

Name of Researcher: Mary Acanit

Personal background

1. What is your job title?
2. What is your highest educational qualification?
3. For how long have you worked in Kyambogo University

ICT Infrastructure and ICT based services

4. What ICT based Services does KyULS offer?
5. What ICT infrastructure has been deployed to promote ICT use in the University Library?
6. What ICT equipment are used in the daily operations of KyULS?
7. Do you think the current state of deployment of ICTs in Kyambogo University is satisfactory? If not, what gaps are there in ICT deployment in KyULS?
8. What is the condition of the library ICT equipment?
9. How often is ICT maintenance carried out in Kyambogo Unversity Library
10. Who carries out maintenance of ICT equipment?
11. Is Kyambogo University Library Automated?
12. What system does KyULS use for automation?
13. When did KyULS initiate library automation?
14. What activities in KyULS have been fully automated?
15. Does KyULS have an Institutional Repository?

Factors influencing adoption of ICTs in KyuULS

16. What has been the experience of adopting ICTs in KyULS?

17. If yes to question 13 above, what system is KyULS using for automation?

18. What factors have influenced ICT adoption in KyULS

19. What challenges does Kyambogo University library face in the use of ICTs

20. What initiatives have been put in place to address the challenges in 11 above?

Funding for ICTs in the library

21. Are ICTs given priority in the library budget? Are there any plans to improve funding?

22. What is the source of funding for the library ICTs?

23. To what extent are the requests to procure library ICTs honoured

24. Are all budgeted ICT funds utilised?

25. Does KyULS have ICT development partners?

26. How can funding for ICTs be improved in the library?

ICT Skills and training of library staff

27. How many library staff are directly responsible for ICT-based Services

28. Do you think that the deployed staff are competent enough to manage ICTs?

29. What challenges is the library facing in relation to ICT skills and training amongst its staff

30. What is the way forward to harmonizing ICT skills gap in the library?

Emerging trends in ICT usage in academic libraries

31. What emerging technologies has KyULS adopted?

32. What emerging technologies would KyULS like to adopt in the near future?

33. What ICT oriented job positions have been incorporated in KyULS library structure

34. What ICT related job positions would you like to be introduced to KyULS library structure?

35. What is the impact of ICTs on service delivery in KyULS?

36. What are the future plans of KyULS in relation to application of ICTs?

Thank you for sparing time to participate in this interview.