EFFECTS OF TECHNOLOGICAL CHANGES ON LIBRARY OPERATIONS AND SERVICES AT EGERTON UNIVERSITY LIBRARY

BY

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DECLARATION

DECLARATION BY THE CANDIDATE

I certify that this thesis is my original work and any information in it which is not my work has been acknowledged. I further certify that no such material has been submitted for the award of any degree by Moi University or any other institution of higher learning.

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DEDICATION

To Vincent and Victor. They are the inspiration for my studying and my life.

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LIST OF ABRREVIATIONS

AACR2	Anglo-American Cataloguing Rules edition.2
ABCD	Automation of Libraries and Centres of Documentation
AGRICOLA	Agricultural OnLine Access
AGORA	Access to Global Online Research in Agriculture
AJOL	African Journals Online
AMLIB	Amstrong and Murphy Libraries
ASCII	American Standard Code for Information Interchange
CAB	Centre for Agriculture and Bioscience
CAS	Current Awareness Services
CDROM	Compact Disc Read Only Memory
CDS/ISIS	Computerized Documentation System /Integrated Set of Information Systems
DOI	Diffusion of Innovation
DVD	Digital Versatile Disk
ENIAC	Electronic Numerical Integrator and Computer
GoK	Government of Kenya HTML Hypertext Markup Language
IBM	International Business Machines

IBNT	Internet Business Network Technology
ICT	Information and Communication Technology
ILMS	Integrated Library Management System
INDEST	Indian Digital Library of Engineering, Science and Technology
INFLIBNET	Information and Library Network
IT	Information Technology
ITIL	Information Technology Infrastructure Library
JISC	Joint Information Systems Committee
JSTOR	Journal Storage
KLISC	Kenya Library Information Services Consortium
LAN	Local Area Network
LC	Library of Congress
LCSH	Library of Congress Subject Headings
MARC	Machine-Readable Cataloging
MEDLINE	Medical Literature Analysis and Retrieval System Online
OCLC	Online Computer Library Centre
OPAC	Online Public Access Catalogue

PDF	Portable Document Format
PPDA	Public Procurement and Disposal Act
SCIS	School Catalogue Information Service
SDI	Selective Dissemination of Information
TAM	Technology Adoption Model
TEEAL	The Essential Electronic Agricultural Library
UNESCO	United Nations Educational, Scientific and Cultural Organization
VTLS	Virtual Technology in Library Solutions
WINISIS	CDS/ISIS for windows

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ABSTRACT

The operations and services of libraries have experienced significant changes due to introduction of information and communication technologies (ICTs). This has introduced an array of both technical and managerial issues that can have adverse impact on information management if not checked. The aim of this study was to assess the effect of technological changes on library operations and services with a view of proposing a framework to guide the management of technological changes as they affect library information management practices at Egerton University. The objectives of the study were to: trace the history and drivers of technology application at Egerton University Library between 1999 and 2013; establish the technological changes and their implications on library operations, services and staff skills and knowledge; assess the adequacy of the existing ICT policy; examine the technological benefits and challenges associated with introduction of ICTs affecting library operations and services and propose a framework to guide adoption of new ICTs in the management of library operations and services. The study adopted Information Technology Infrastructure Library (ITIL) as its theoretical framework. A qualitative paradigm using case study as the research method was employed. Purposive sampling technique was used to select fifty (50) respondents comprising of both professional and para-professional staff from the library, and four (4) staff drawn from ICT and Procurement Departments. Data was collected using face-to-face interviews and analyzed thematically. The study established that the benefits accrued from technology adoption far outweighed the negative effects. Amongst the notable benefits were: greater level of efficiency in operations and productivity; achievement of excellent services; cost reduction in acquisition of information resources through consortia and increased access to wider range of resources and remote access. The negative effects were: cost of IT equipment, installation and maintenance; staff/user training and retraining; problems of data conversion/transfer and security; absence of permanent physical collection and generation of electronic-waste. Technological changes and technology adoption are inevitable and libraries and information centres must find a suitable framework that will enable them keep up to date and be at par with the rest of the world. The study proposed ITIL framework for managing the challenges by guiding the library in the development, adoption and implementation of information technologies. ITIL framework has aspects such as financial management for determining the cost of implementing a change, capacity management, software asset management, lifecycle configuration management and license management.

CHAPTER ONE

INTRODUCTION AND BACKGROUND INFORMATION

1.1 Introduction

This chapter presents the background to the study and the study area, the statement of the problem, the aim and objectives, research questions, assumptions, limitations and significance of the study as well as definition of terms.

1.1.1 Background of the Study

Academic libraries play a vital role in society as well as in a university. Krubu and Osawaru (2011) citing Oyedun (2007) define academic libraries as those libraries that are found mainly in and serving tertiary institutions. They are established to support learning, teaching and research processes. They ensure that their collections meet the needs of their actual and potential clients. They also organize, process and analyze the information contained in the collection and they facilitate storage and dissemination of information to users.

Academic libraries provide information services to clients including reference services, circulation, information retrieval services, periodical services, online database services, World Wide Web and Internet access services, Online Public Access (OPAC) services, user services, bibliographic services, current awareness services, document delivery, interlibrary loan, audio visual services and customer relations services. These services can be provided more efficiently and effectively using ICT, as they offer convenient time, place, cost effectiveness, faster and most-up-to-date dissemination and end-user involvement in the library and information services process (Krubu and Osawaru, 2011).

Information technology(computing and communication technologies) in turn enhances the functions of the academic library, particularly with respect to collection development strategies, storage, organization, processing and analysis of information. Krubu and Osawaru (2011) concur and state that libraries now use various types of technologies to aid the services they render and further explain that everyday new technological advances affect the way information is managed in libraries and information centers. The effect of these new technologies is felt by libraries in every aspect. IT presents an opportunity to provide value-added information services and access to a wide variety of digital based information resources to their clients. Furthermore, academic libraries are also using ICTs to automate their core functions, implement efficient and effective library cooperation and resource sharing networks, implement management information systems, develop institutional repositories of digital contents, and digital libraries and to initiate ICT based capacity building programmes for library users. Smith (2005) citing Cheng (2001) concurs and states: "every sphere of the academic library is being affected by ICT quite radically. No longer is the library the untouchable custodian of information. It is being shaken to its very foundation; in fact, its existence is being threatened. The academic libraries' traditional role of information custodian has been reduced to that of being one of many information providers". Of all the information technologies the Internet and particularly the World Wide Web with its graphical user interface, has had the greatest effect on the information revolution. Krubu and Osawaru (2011)further state that computing technologies, communication technologies and mass storage technologies have continuously reshaped the way libraries access, retrieve, store, manipulate and disseminate information to users.

The goals of using technologies in libraries have over the last four decades shifted from an emphasis on local concerns to an emphasis on global concerns (Borgman, 1997). These goals evolved through three incremental phases: efficiency of internal operations, access to local resources, and access to resources outside the library before reaching the present stage of addressing interoperability among systems and services. Borgman (1997) further explains that the American and British libraries began experimenting with modern computers in the 1950s and in the 1960s began automating internal processes. Automation spread to other English-speaking countries and to other countries around the world. Raman (1998) citing Rasul & Sahu (2011) reported that since 1960s, libraries worldwide have been using technologies in general and computers in particular to automate the administrative and technical tasks of libraries. In India, for instance, computerization of libraries started in the year 1955 at the Indian Statistical Institute, Calcutta (Rasul & Sahu, 2011). Information technology not only affects the technical operations of libraries but also shapes library services. Worldwide, libraries have been exploring new technologies for providing better and faster access to vast information resources and efficient information services to their users. Information technology has therefore offered better solutions to achieve greater level of efficiency, productivity and excellent services in libraries (Cholin, 2005).

Changes in information technology, especially digital initiative has had the most significant effect on library operations and services. Darga & Hu (2012) observed that during the preceding five years, digital initiatives in information management had developed rapidly along with high speed network facilities for information retrieval, developed huge capacities for resource storage, developed portable devices with mobile

technology and wireless access for convenience of information usage. Other important changes in IT are the image-oriented visual search engines and various social network applications, which are replacing the text oriented search engines for web interfaces.

1.1.1.1 Technological Changes and their Effect on Library Operations and Services

Continuous technological advances have affected the way information is managed in libraries and information centers. The effects of these new technologies are felt by libraries in every aspect, including but not limited to organization, access, retrieval, storage, manipulation and dissemination of information to users. According to Krubu and Osawaru (2011), computing technology, communication technology and mass storage technology are some of the areas of continuous development that reshape the way libraries undertake their information management practices.

Information management practices in libraries and information centres refer to the skillful exercise of control over the acquisition, organization, storage, security, retrieval and dissemination of the information resources essential to the successful operation of a business, agency, organization, or institution, including documentation, records management and technical infrastructure (Reitz, 2004). Over the past years, libraries have been affected by technological changes. The rate of these changes is still accelerating in the area of information management. These changes have led to reorganization in work patterns, and demand for new skills, job retraining and reclassification of positions. For instance, in today's libraries and information centres, the position of a systems librarian has been introduced. Technological advancement of the past years, such as the electronic database, online services, optical technologies (CD-ROMs) and introduction of internet has radically transformed discovery and access to information.

Technological changes have affected every sphere of library activity especially in library collection development strategies and consortia presenting an opportunity to provide value-added information services and access to a wide variety of digital based information resources to clients. Libraries are also using modern technologies to automate their core functions, implement efficient and effective library cooperation and resource sharing networks, implement management information systems and develop institutional repositories of digital local contents and initiate technology based capacity building programmes for library users.

Developments in storage media have thus evolved from the traditional data storage media like magnetic tapes, floppy disks, to CD-ROM, DVD rewritable CDs and DVDs, to hybrid formats of CD and DVD known as Dual disc, Blue ray disc and USB flash drive. While communication has evolved from machine codes and punched cards to keyboard, mouse, scanner, barcode readers, graphic tablets, joysticks, screen and output devices like monitor and printer. All these technologies of information management practices provide levels of evolutionary changes in technology. As a result, the effect of technological changes on information management practices brings with it both opportunities and challenges. Information technology revolutions have not only affected technical operations, but also library services offered to the public. Information technology has enhanced levels of efficiency, productivity and excellent services in libraries (Cholin, 2005). On the other hand, it has brought challenges such as managing change and high growth of electronic wastes.

IT on the other hand also has challenges. There are costs in terms of training of service providers and users. It calls for continuous teaching of information literacy to library

patrons for them to be able to use all the technologies effectively, especially to access and manage information. There is also the cost of purchasing equipment that keep changing from time to time due to obsolescence and the cost of transferring/converting data from outdated storage devices to new upcoming storage technologies. The Integrated library management systems (ILMS) such as KOHA, ABCD, AMLIB as part of IT revolutions are also in use in libraries. As time goes by they are either upgraded (revised editions) or replaced altogether due to technological changes. This also positively or negatively affects library services and operations. There is also the challenge of managing change due to high growth of electronic wastes and their effects on health and environment. In the process of all these changes, services to clients may also be disrupted in one way or another.

1.1.1.2 Library Operations

Library management practices constitute the control of library operations that encompass activities such as administration, acquisition, organization (processing) and storage of information resources. Improving information management practices is one of the key focal points for any library or information centre worldwide. The driving factors include the need to improve efficiency of the business processes, standardization and the desire to provide new services to clients. Darga& Hu (2012) assert that there is an opportunity through use of IBNT to continue reshaping operations to satisfy academic needs and trends. The application of new practices based on new technologieswould enhance and update some operations and workflows. Use of IT in libraries would enhanceefficiency in performance of operations and services. Since the implementation of the integrated library management system (ILMS), AMLIB, at Egerton University Library, operations

have been greatly enhanced with staff able to share data for different purposes. For instance, the ILMS has been used to automate acquisitions and enable sections like processing (cataloguing and classification) to share information with circulation. This technological change has also seen an increase in the ordering of electronic journals and e-books and a corresponding reduction in the ordering of printed periodicals and books.

Kanamadi and Kumbar (2007) opine that information technology has introduced many changes in the way information is identified, procured, processed and disseminated to library clientele. Libraries and information centers are witnessing new paradigm shifts that include transition of information sources and systems from paper to electronic media, complexity in information needs of highly demanding clientele and increase in the cost and quality of information. Ramesha and Kumbar (2004) concur and point out that it is an accepted fact that the information technology has influenced all the components of a library system from information sources, services, human resources to users. The ordering and acquisition operations, for instance, which involve the stocking of the library with required relevant information resources have changed from the traditional print resources towards the more sophisticated electronic resources. Darga & Hu (2012) opine that information technology applications and digital resources have increased rapidly during the past few years, for example, e-books and streaming videos.

1.1.1.3 Library Services

Osinulu and Amusa (2010) opine that computer and information technology applications have remarkable benefits to academic libraries. The benefits include provision of fast, effective and efficient services; possibility of new services and functions; ease of generation of vital statistical records; cost reduction; possibility of networking and

greater cooperation among libraries and improved services through access to resources of other libraries. Nwalo (2000) also observes that the application of information technology to library services has brought about tremendous improvement and makes possible more services. Mosuro (2000) reiterates the relevance of information technology to library functions and services:

"Over the years, advances in the area of information technology have offered Library and Information Centres more efficient ways of acquiring, organizing, storing and disseminating information. New information technologies are becoming integral components and have the potential of changing the status quo of libraries and librarianship".

1.1.2 Background Information of the Study Area

1.1.2.1 Egerton University

Egerton University lies on a 320 hectare piece of land that was donated to the Department of Agriculture, Government of Kenya by a white settler, Lord Egerton of Tatton, England for the establishment of an Agricultural School in 1939. The institution is situated some 40km west of Nakuru town, approximately 180km northwest of the Kenyan capital city, Nairobi. It played a very integral role in providing short courses in general agriculture between 1939 and 1951. Through this institution, the training of extension workers in the Ministry of Agriculture was eventually realized. The Government of Kenya handed over the management of the college to a Board of Governors in 1955. Lord Egerton left a further 1,125 hectares of land to the college when he died in 1958. In 1960, due to the impending Kenya's independence, the Act had to be amended and the Board of Directors

re-organized to allow the Agricultural School which was upto then an exclusive European preserve, to admit non-European students beginning 1961. The Agricultural School was upgraded to offer both certificate and diploma level courses. In 1986, the college was granted university college status and in the following year, 1987, it was granted full university status by an Act of Parliament. There has been a continued growth in student numbers, staff and physical facilities as well as in the number and type of training programmes offered.

1.1.2.2 Egerton University Library

The Egerton University Library was inherited from Egerton College in 1987 with a collection of about 30,000 volumes of books and bound periodicals. The library has since grown and currently has a collection of over 90,000 volumes of print-based information resources. This is further complemented by approximately 10,000 titles of books and journals in electronic format that have increased and diversified the library information resources. The university library serves a client population of approximately 18,000 comprising of students (postgraduate and undergraduate) and staff. These clients receive services that include and not limited to reference and information desk services (current awareness, selective dissemination of information, OPAC, literature searches and customer relations services). Other services include circulation services (issuing and receiving as well as reservation), periodical services (daily newspapers, magazines and journals), Internet services, archival services as well as reprographic services (photocopying and scanning).

The university library has embraced information technology in its information management practices where the library has adopted and applied various technologies in its operations and services. Among these technologies are electronic equipment such as computers, printers, electronic information storage devices, and CD-ROM technologies, for instance CDISIS and TEEAL databases as well as the integrated library management system, AMLIB. The AMLIB system is being used in the management of the library's operations and services. Library operations utilizing AMLIB include Acquisition, Cataloguing and Classification. Library services such as circulation (issuing, receiving and reservation) and OPAC are managed with the help of AMLIB. Before the introduction of AMLIB, the University Library was carrying out its operations and services using the manual system with the help of Browne's Circulation System for circulation services and the use of AACR2 and LCSH lists for cataloguing and classification operations.

The Internet technology which is in use in the library has since replaced the CD-ROM technology. Users currently access electronic journals and books through the Internet. TEEAL CD ROMs have been put in a database to facilitate access through LAN hence replacing the previous mode of access through CD-ROM technology. CAB abstracts that were being accessed using the CDISIS program are currently available online through CABI databases.

The University Library system has staff most of whom have basic computer skills, while a number have average and advanced computer skills. All staff therefore are capable of running the integrated library management system (AMLIB) though some need help at one point or another. Other technologies available in the library such as Internet

technology, on-line cataloguing and classification and scanning services are used by staff with advanced computer technology skills.

1.2 Statement of the Problem

Libraries use various technologies to enhance quality and efficiency of the services they render. New technologies affect the way information is managed in libraries and information centers. Currently, there is a major shift from manual library management systems to automated systems. The effect of these new technologies is felt by libraries in every aspect. For example, Egerton University Library has taken a shift from Browne's Manual Circulation System to the Integrated Library Management System known as AMLIB for the enhancement of library operations and services. AMLIB has seen users accessing the library catalogue within the library through OPAC and even remotely through the NetOPAC. Circulation services have also improved greatly with significant improvements in speed during service delivery even with a small number of staff. The technical operations like cataloguing and classification have attained universal standards and staff are able to do copy cataloguing using the integrated library system. Access to all modules of the integrated system at any section of the library also allows staff to easily share data.

The storage devices have also experienced tremendous changes from floppy disks through CD-ROMs, audio tapes to the current flash disks, digitization and cloud computing technologies. The optical technologies (CD-ROMs) may also soon be superseded by digitization as in the case of, for example, TEEAL CD-ROM and CABI Abstracts databases that are currently being accessed online and no-longer accessed through CD-ROM technology. Changes in storage devices have also resulted in changes

in hardware, for instance, the current computer hardware have no port for floppy disks. The information stored in the obsolete devices also requires salvaging for future use, thus calling for transfer of the same to the current storage devices.

However, technological changes have resulted in the need for continuous staff training on the use of the new technologies in the management of information. The new technologies also call for the purchase of new equipment and software which together with the continuous training of staff results in added costs in the running of the library. Another negative effect of technological changes is the generation of e-waste causing space and health problems in libraries. In 1998,the World Bank's Kenya Universities Investment Project donated to Egerton University various ICT equipment that included computers, printers, plotters, scanners and typewriters, most of which have reached their end-of-life and are still lying in the library store un-disposed. Electronic equipment have a high obsolescence rate due to fast changing technologies.

The University has no clear policy and regulatory framework on the management of technological changes and their consequent challenges on library and even the University business operations including information management.

1.3 Aim of the Study

The aim of the study was to assess the effects of technological changes on library operations and services at Egerton University Library with a view to proposing a framework to guide the management of technological changes as they affect library information management practices.

1.4 Objectives of the Study

The study sought to fulfill the following objectives:

1. To trace the history and drivers of technology application in library operations and services at Egerton University Library between 1999 and 2013.
2. To establish implications of technological changes on library operations, services and staff skills and knowledge.
3. To assess the existing ICT policy in addressing the effect of technological changes on library operations and services.
4. To examine the technological benefits and challenges associated with the introduction of ICTs affecting library operations and services at Egerton University Library.
5. To propose a framework to guide adoption of new information and communication technologies in the management of library operations and services.

1.5 Research Questions

1. (a) What information technologies have been adopted over the years?

   (b) What influenced the adoption of these information technologies?
2. a) How have changes in ICT application affected library operations and services?

   b) What arrangements are in place for staff training and retraining to equip them with the knowledge, skills and competencies required in using ICT resources considering the rapid changes affecting technologies at the University Library?
3. Does the existing ICT policy comprehensively address the effect of technological changes and their subsequent effects on library operations and services?

4. What benefits and challenges are associated with the introduction of ICTs on library operations and services?
5. What framework can the library adopt for effective management of technological changes in library information management practices?

1.6 Assumptions of the Study

The study assumes that:

1. There is need to develop a framework to guide the adoption of information technologies by libraries.
2. The rapid technological changes have negative and positive effects in information management.

1.7 Significance of the Study

It is hoped that the findings of the study will:

1. Expose the implications of technological changes on library operations, services and staff skills and knowledge.
2. Contribute towards better management of technological changes in academic libraries and particularly Egerton University Library.
3. Provide a framework to guide Egerton University Library and other academic libraries in the development, adoption and implementation of information technologies.
4. Generate knowledge that will trigger further research and also benefit other researchers, staff and students undertaking research in the same field as well as policy makers as a documentary source.

1.8 Scope and Limitation of the Study

1.8.1 Scope

The study employed descriptive case study research design at Egerton University Library, Njoro Campus.

The research was limited to Egerton University Library, ICT and Procurement staff, both professional and paraprofessional staff.

1.8.2 Limitation

The busy schedule of respondents, especially the professionals that included the University Librarian, ICT and Procurement staff, made data collection difficult.

1.9 Definition of Terms

1.9.1 Information Management

The skillful exercise of control over the administrative, technical and user services of a library or information centre. It includes the management and organization of human resource for the achievement of the technical operations like acquisition, organization, storage, security, retrieval and dissemination of the information resources essential to the successful operation of a business, agency, organization, or institution, including documentation, records management and technical infrastructure (Reitz, 2004). It is basically concerned with managing the storage, accessibility, and utilization of a collection.

1.9.2 Library Automation

The design and implementation of evermore sophisticated computer systems to accomplish tasks originally done manually in libraries.

1.9.3 Library Operations

A management term encompassing all the activities and details involved in running a library or library system on a day-to-day basis, as opposed to functions requiring a long-range view of the institution's direction and priorities, such as planning and budgeting, policymaking, fund-raising, and public relations (www.abc-clio.com/ODLIS/odlis_o.aspx). They generally refer to the planned activities of a library for the achievement of its set goal and objectives. They basically include acquisition, cataloguing and classification.

1.9.4 Library Services

They refer to the help and advice given to library patrons/users by staff especially by using their skills, ability or knowledge. They are services offered to the library user and they include mainly reference and circulation services (www.google.com/#q=define+library+services).

1.9.5 ICT

Early definitions of ICT were narrow due to the scope of technologies that were available then. Current definitions refer to methods and tools of recording knowledge like computer storage media such as magnetic devices that include floppy disk, hard disk, tapes and optical storage devices like CD-ROM, DVD (Digital Versatile Disk) Rewritable CDs and DVDs). ICTs also include methods of keeping records (Computer

hardware, software, creating databases as well as methods of indexing documents and information that result in creation of computerized indexes and machine readable catalogues. ICTs also cover methods of communicating knowledge such as electronic mail, facsimile transmission, electronic journals, teleconferencing and data communication networks (Rowley, 1996). ICTs and IT are occasionally interchangeably used and they basically refer to tools used for collection, processing, storage, transmission, and dissemination of information. Alternatively, they also refer to technologies that process or communicate digital data.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature on technological changes as they affect library operations and services. Theoretical frameworks and their application to technological changes are discussed as well as the conceptual framework on the effect of technological changes on library operations and services. The literature reviewed includes the challenges of the effect of technological changes on library management practices.

2.2 Theoretical Frameworks

According to Mugenda and Mugenda (2003), a theory refers to a system of explaining phenomena by stating constructs and the laws that inter-relate these constructs to each other. A construct is a concept, abstraction or idea drawn from the specific. Scientific theory shows commonalities of concepts that may seem isolated at a glance but can be applied through experiences. A theory can help in making predictions and controlling events. Through theoretical concepts, a researcher is able to organize isolated findings from different research studies into an explanatory framework resulting in consistency in any field of study. Any scientific theory is a potential source of further information and discoveries. The study reviewed three frameworks for their applicability to the study namely; Technology Adoption Model (TAM),the Diffusion of Innovation (DOI) and the Information Technology Infrastructure Library (ITIL)as well as a conceptual framework.

The Technology Adoption Model (TAM) was proposed by Fred Davis in 1985 where he proposed that system use is a response that can be explained or predicted by user

motivation, which in turn, is directly influenced by an external stimulus consisting of actual system's features and capabilities. User's motivation can be explained by three factors namely; perceived ease of use, perceived usefulness and attitude toward using it. All the three factors point to the user behaviour and not the effect (positive and/or negative) of a new technology on the operations and services of an organization, therefore not suitable for this study.

The Diffusion of Innovation theory is concerned with the manner in which a new technological idea, artifact or technique, or a new use of an old one, migrates from creation to use. The important characteristics of an innovation include its relative advantage, its compatibility, past experiences and needs, complexity, trialability and finally observe ability which refers to the visibility of its results (Clarke, 1999). This model does not fully bring out the strategies for managing technological changes because it mainly focuses on how a technology gradually permeates and that it does not occur at once. It does not however show whether there are any challenges when a new technology is introduced and how such changes could be handled.

The above two models (TAM & DOI) reflect application of new technologies but they were found not quite suitable for this study while ITIL framework was found to be more suitable as explained below.

2.2.1 Information Technology Infrastructure Library (ITIL) Framework

The Information Technology Infrastructure Library (ITIL) framework was developed by the British government's Central Computer and Telecommunications Agency (CCTA) during the 1980s. ITIL is a framework of best practices for delivering IT services and it

regulates best practices in information technology (Greiner, 2007). The framework is based on British standard BS15000. Greiner (2007) explains that implementing ITIL framework requires significant change management and it basically focuses on service support which involves the identification and recording of IT configuration items, and processes for handling changes, problems and incidents. The aspects for consideration include:

- *Incident Management:* After something has gone wrong, how to restore normal operations as quickly as possible. Cases of data or information loss due to introduction of a new technology or update of an existing one often occur. Such incidents can be managed successfully by maintaining a back-up or running a parallel manual information management system as a security measure.
- *Problem Management*: First, the identification of root causes of incidents reported by the service desk; then, the arrangement of changes in the IT infrastructure to prevent their recurrence. A user survey report on the services offered by the library often reveals problems experienced by users. Such incidents can be analyzed and recommendations presented for changes in the IT infrastructure to be made during the production of a new update or a release of the information management system.
- *Change Management:* Discusses processes and procedures to ensure prompt, efficient and controlled handling of changes. Formulation of a committee to handle change management is essential. This will ensure regular discussions of library processes and procedures that facilitate prompt, efficient and controlled handling of changes.

- *Release Management:* Planning of new releases so that both IT and non-IT requirements are considered. Planning is essential when taking up any new technology. IT requirements such as infrastructure and relevant configurations and non-IT requirements e.g. staff with required knowledge and skills should be considered to ensure all library operations and services run smoothly whenever a new release is implemented.
- *Configuration Management:* How to identify, control, and maintain records of the configurations of items and services. It is important to maintain through documentation all records of the configurations of items and services of every technology acquired for purposes of pre- and post-problem solving. This ensures the presence of a fallback whenever a configuration problem occurs.
- *Service Delivery:* ITIL framework covers aspects of service transition and looks at how the design delivers the intended strategy, and whether it can be effectively executed. ITIL framework emphasizes on change management as an important component. Any acquired technology is intended to serve a purpose, for example, an integrated library management system is intended to deliver a myriad of services that include and not limited to circulation, OPAC, reservation, reminders and fines management services among others.Any new technology should therefore deliver the intended service even in times of transition.

In the actual delivery of the services ITIL framework covers the following aspects:

- *Availability Management:* How do you maintain the availability of services to allow a business to function effectively? The framework advocates for a binding contract between the supplier of a new technology and user. Issues of

maintenance, updates and/or releases are successfully managed through a binding contract.

- *Capacity Management*: Best practices in predicting future needs. The framework requires that the staff capacity requirements are regularly checked to meet present and future needs of the organization as this will also ensure efficient and continuous running of services and operations. This calls for regular training and retraining of staff on new developments in technology.
- *IT Service Continuity Management*: After a disaster or other business interruption, how to manage service continuity to agreed-upon levels. The framework recommends strategies for maintaining service continuity and therefore calls for maintenance of back-ups or in some instances running of parallel systems (automated and manual) especially during the initial stages of implementing a new system.
- *Service Level Management*: Establishing, monitoring, and reporting IT achievements and establishing ways to eliminate poor service. The framework recommends conducting user surveys that give feedback on the performance of available services. This ensures upholding of IT achievements and putting in place corrective measures for poor services.
- *Financial Management for IT Services*: Budgeting, accounting and charging for IT services. It is important to consider financial requirements for IT services for procurement of required IT facilities like software and hardware as well as maintenance of up-to-date antivirus that ensures security of data and/or information.

ITIL framework helps create a consistent level of process across the organization by creating a standard methodology to apply within IT. ITIL framework has aspects such as financial management for determining the cost of implementing a change, capacity management, software asset management, lifecycle configuration management and license change management which any organization including libraries and information centres can adopt in their information management practices. This framework can best help libraries and information centres manage effects of IT changes on information management practices as it provides strategies for change management.

2.2.2 Conceptual Framework

A conceptual framework of a study is a system of concepts, assumptions, expectations, beliefs, and theories that supports and informs a researcher's work. Miles and Huberman (1994) defined a conceptual framework as a visual or written product that "explains, either graphically or in narrative form, the main things to be studied, that is, the key factors, concepts, or variables and the presumed relationships among them". In a broader sense, it refers to the actual ideas and beliefs that a researcher holds about the phenomena being studied, whether these are written down or not. Basing on ITIL framework, a library or an information centre can develop a conceptual framework that best suits its operations and services (Figure 1). The technological changes refer to implementation of a new technology and its effects (opportunities/benefits) and challenges) on information management practices. ITIL framework provides strategies for managing effects of these technologies.

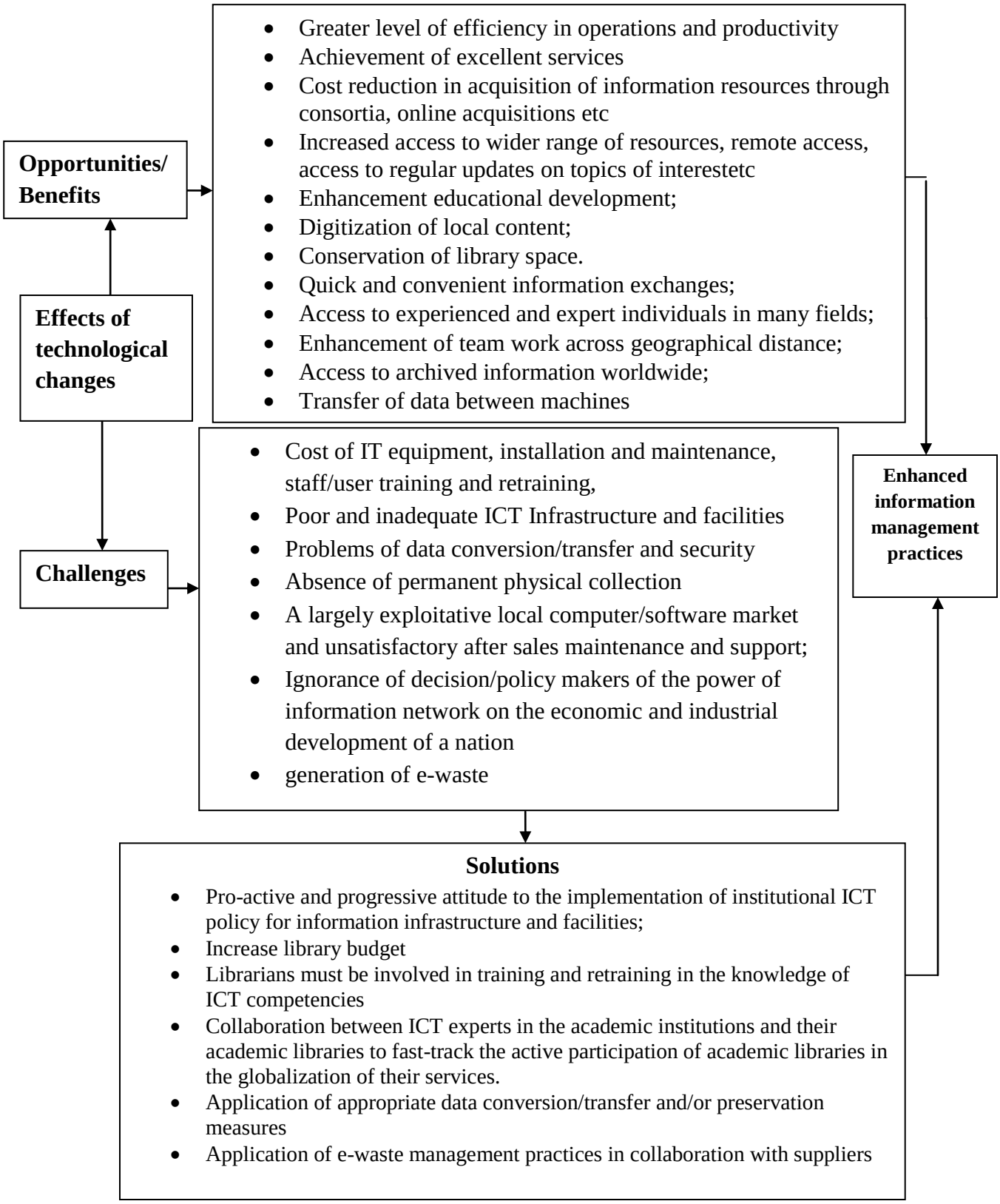

Figure 1: Conceptual Framework

Technological changes in libraries and information centres affect information management practices both positively and negatively. The opportunities and challenges need to be addressed for the purposes of sustaining and even enhancing library operations and services. Through the framework, libraries and information centres will identify the challenges and find ways and means of addressing them to ensure that there is continuity and security of information through proper security and preservation of data for the realization of the overall goal of achieving effective and efficient information management practices.

2.3 Trends in Information Technology use in Libraries

The concept of technology refers to the purposeful application of information technology in the design, production, and utilization of goods and services, and in the organization of human activities (www.businessdictionary.com). It includes information and communication technologies (ICTs) that are used in the management of information with regard to processing, storing, disseminating and utilizing of information. ICTs include computers, monitors, modems, keyboard, mice, scanner and printers. ICT includes the technology used in handling, acquiring, processing, storing and disseminating information (Aina, 2004).

Rowley (1996) states that ICTs include areas such as methods and tools of recording knowledge like computer storage media such as magnetic devices that include floppy disk, hard disk, tapes and optical storage devices like CD-ROM, DVD (Digital Versatile Disk) Rewritable CDs and DVDs. It also includes methods of keeping records (Computer hardware, software, creating databases as well as methods of indexing documents and information that result in creation of computerized indexes and machine readable

catalogues. ICT also includes methods of communicating knowledge such as electronic mail, facsimile transmission, electronic journals, teleconferencing and data communication networks.

In the late 1950s to early 1960s, libraries applied a growing range of information technologies to manage collection of primarily print information. This period was mainly characterized by studies on cost benefit analysis of the introduction of technology to modernize library operations. According to Lynch (2000), academic libraries were confronted by environmental changes driven by information technology from late 1980s to early 1990s, which quickly moved the focus away from automation toward a series of much more fundamental questions about library roles and missions in the digital age. The emergence of the Internet and the World Wide Web (WWW) in the mid-1990sis perhaps the greatest symbol of this shift, with all of its implications for scholarly communication as well as the new role of databases in all areas of scholarship. Smith (2005) who cites Duff (2003) concurs and states: "Of all the information and communication technologies, the Internet and particularly the WWW with its graphical user interface, has had the greatest effect on the information revolution". The WWW originated in the 1990s as a simple application based on the existing infrastructure of the Internet's applications and protocols (Haigh, 2011). The Internet is currently providing universal access to information. Quadri (2012) concurs and states that ICTs, Internet included, facilitate quick and easy access to a wide range of information and/or information resources worldwide. Quadri (2012) further explains that it is now difficult to imagine a world without information technology.

There are major factors and challenges that forced libraries to adopt information technology such as information explosion, technological developments, need to provide efficient and effective services, increased number of users, increased expectations of users, online information retrieval, increased commercial information providers, and changes in nature of information resources such as Electronic-Journals, CD-ROMs, and online databases (Davarpanah, 2001). The provision and use of ICTs in academic institutions is part and parcel of the entire system, to both the students, information professionals and the institution.

Other major trends in information technology include the computerization of library operations, the introduction of public access, development of electronic content and introduction of cloud computing as elaborated below.

2.3.1 Computerization of Library Operations

According to Brady and Elkner (2011), trends in information technology show that we now live in the electronic age, the time between 1940 and now. The first high-speed, digital computer, known as ENIAC (Electronic Numerical Integrator and Computer), which was capable of being reprogrammed to solve a full range of computing problems was designed during this electronic age. This was followed by the first automation age of 1950s and early 1960s, as part of the post-Sputnik revolution in science and technology (Lynch, 2000). Lynch further explains that for most academic libraries, this technology was mainly applied in force in the late 1960s or early 1970sin developing commercial products for automating library processes. Similarly, Groenewegen (2010) notes that, the period 1960 to 1965 was characterized by a growing awareness of the possibilities of

library automation. This was the period when most university libraries in the USA started exploring library automation options using punched cards.

In Africa and particularly Nigeria, the earliest use of any technology in libraries was the introduction of microform technology at the University of Ibadan with the purchase of three microform readers in 1948.Likewise at Egerton University Library, microform technology was used to automate library operations and services. The first instances of the usage of computers in Nigeria were when IBM set up the African Education Centre at the University of Ibadan (UI Computing Center) in 1963 and when computing services were brought to Nigeria for analyzing the 1962/63national census. By 1977 the total number of computer installations in Nigeria had grown to 70 and interestingly this technology had increased, and by the late 1970s computer science courses had been established at the Universities including Nigeria, Lagos, Ibadan and Ife.

Other technologies introduced included minicomputers that were used to automate circulation, and books were bar coded. Computer-based ordering systems were also introduced to pass orders to book publishers and serials jobbers. These changes simply made existing manual processes more efficient and helped to control costs (Lynch, 2000).During this period, libraries experienced significant management challenges such as small companies offering products; some used custom hardware and software, and a number of these companies failed. Some libraries developed their own systems rather than purchasing commercial products; and few libraries had the expertise to manage large, operationally critical software projects. Learning about system life-cycle management was also a problem to most libraries. For example, the conversion from a manual circulation system to the first automated system was far easier than the

conversion from the first automated circulation system to the second one, when some libraries discovered that there was no way to get information out of the old system and into the new one and often had to run the two systems in parallel for a year or a longer period.

The greatest achievement of this period, which continued until the early 1980s, was the development of shared copy-cataloging systems. These systems established very important precedents in the use of computers and computer networking for collaboration and cooperation within the library community. Groups of libraries used large, centralized databases operated by external organizations. Shared cataloging was pioneered by a number of library consortia in the 1960s and 1970s. Today, OCLC in Columbus, Ohio is one example of shared cataloging systems (Lynch, 2000).

2.3.2 The Introduction of Public Access

Lynch (2000) observes that the second automation age was in the 1980s, when the shared cataloging databases had become quite large as a result of retrospective conversion programs for older books and some years of use in cataloging new acquisitions. The central databases began to reflect the collective holdings of the major research libraries. In addition, individual libraries developed machine-readable bibliographic records for significant percentages of their holdings. Also, by this time the cost of information technology and in particular, interactive systems had dropped to the point that it was possible to consider application of much larger scale applications of information technology. These developments laid the foundation for a second round of automation activities, which would start to radically change the library services. The result included development of online public access library catalog as a replacement for the traditional

card catalog. The physical card-catalog drawers were replaced by computer terminals. The online catalog opened up the massive collections of research libraries to users who could conduct searches that had been difficult or impossible to conduct previously. Through the online catalog, users could search the library's holdings at any time, and could do so remotely, rather than having to go to the library.

Lynch (2000) adds that library consortia developed union catalogs that merged materials from multiple libraries, promoting resource sharing and the growth of library consortia. With the growth of Internet, library catalogs were connected to the Net (NetOPACs) so that they could be consulted remotely from anywhere in the world. The online catalogs and electronic mail ushered in a new era of access and communication particularly for journal articles given that journals, rather than monographs, are the key literature in many disciplines, particularly in the sciences, and that by the mid-1980s atypical research library was spending more than half of its acquisitions budget on journals. Abstracting and indexing services, such as Index Medicus (now MEDLINE) for the health sciences literature, abstracted articles in journals and supplemented the local library catalog. This replaced voluminous series of printed volumes, which libraries had been purchasing since the 1940s (or earlier) and were very hard to use. During the 1960s and1970s these abstracting and indexing services began to create databases that were made available through commercial online services.

The 1980s and early 1990s also saw major investments in resource sharing. Union catalogs were one example; another was the development of computer-assisted interlibrary loan systems that built on the shared national union catalog databases. Fax technology was applied for the delivery of journal articles on an expedited basis. Perhaps

the greatest financial success that has been achieved is the creation of collective purchasing consortia that can negotiate prices for all members of the consortium, rather than the sharing of already purchased resources. Many publishers of electronic journals offer their journals through consortia of libraries at much lower rates. For instance, INDEST (Indian Digital Library of Engineering, Science and Technology), and INFLIBNET are two such consortia operating in India (Chauhan, 2004). Access to articles in electronic journals can also be made through aggregator(company that obtains material from multiple publishers and repackages it into a one-stop database) services which offer searchable databases of contents of e-journals from several publishers, and links to journal sites for full text (Chauhan, 2004). Emerald, OCLC and J-Gate are some of the examples of e-journal aggregator services. According to Were (2010) consortium building has become a way out of the financial constraints in libraries in many countries. The concept is being embraced in Africa and Kenyan academic libraries are already practicing consortium building through Kenya Library and Information Services Consortium (KLISC) that was established in 2003. KLISC was established with the main objective of collective subscription to electronic resources to cope with the increasing cost of information resources.

Trends in information technology have resulted in greater access to information by users. Academic librarians find themselves in an era of unparalleled access to information. The latest revelations indicate that there is a great increase in the number of electronic journal titles available on-line. Although this appears to be a most ideal situation, it is not because the financial resources available in acquisitions departments have not necessarily

increased. The sheer volume of information available also makes selection of the most suitable information a complex task (Fisher, 2003) as cited by Smith (2005).

2.3.3 Development of Electronic Content

The third automation age saw the development of electronic content forming the current and probably the final epoch of automation (Lynch, 2000). Modernization has largely run its course, and new issues related to innovation and transformation are becoming dominant. The Online catalogs, though widely popular, rapidly created demand for actual content in digital form. Once library users had begun to enjoy the freedom of remote, twenty-four-hour-a-day access, they quickly grew frustrated with searches that ended with the identification of print material that they had to wait to get or that they could not get easily especially if they were searching a catalog across the world or at another institution.

By the late 1980s and early1990s, the costs of storage and bitmapped display technology had come down considerably, and networks had gotten faster. It was possible to deliver content, either as page images and later formats such as Adobe PDF (Portable Document Format) or as ASCII (American Standard Code for Information Interchange) text for materials that did not need charts, graphics, equations, or special characters. The emergence of the Web, HTML (hypertext markup language) offered another alternative. Publishers and aggregators began to offer this material to libraries. The convenience of electronic content was so compelling that many users particularly students in a hurry, rapidly began to ignore materials available only in print in favor of this convenience. Clearly, the shift to electronic content has now gone beyond the automation of existing library services and activities. Quadri (2012) emphasizes that many types of library

materials such as journals, books, patents, newspapers, standards, photographs, pictures, motion pictures or music are now available in electronic or digital form. These digital resources, from the user's point of view, hold many advantages such as time and place convenience, timeliness, ability to search directly on text (as against the catalogue records), ability to link to further reading material and ability to disseminate and share information. From the library's point of view, digital format offers convenience of storage and maintenance, cost advantage, and ability to target global users.

Another problem is integration. Libraries want to provide a coherent service for their users; they want their users to be able to move smoothly from abstracting and indexing databases to full text and from citation of a work to the full text of that work. Library users want to move seamlessly across a range of products and services offered by different suppliers. Print content that has moved electronic has been journals rather than books with the exception of works like encyclopedias or dictionaries, which are read randomly, in small units. This is perhaps because most computer screens are not an attractive reading environment for long texts such as monographs. It is reasonable to skim a journal article online or to print it on an inexpensive printer. Digitized versions of books are much more cumbersome and so far have seen limited use. Chauhan (2004) concurs and observes that digital resources pose human, social and technological problems, such as discomfiture in reading on the screen, problems in internet access and speed, poor infrastructure, lack of sufficient skills to use the digital resources, and perceptional change resulting from right to use rather than physical possession.

Special collections such as manuscripts, photographs, maps and other unique works that are often owned as intellectual property and are old enough to be in the public domain

and thus unconstrained by copyright are being digitized by libraries and museums to make them available to the public. These specialized materials that are the treasures of the library have been historically nearly invisible to the public except for a few privileged scholars and occasional exhibits. They are now among the most visible contents offered by research libraries through the Web. These materials are a tremendous resource not only for scholars but also for teaching, since students have access to source materials on a very broad basis.

2.3.4 Cloud Computing

The libraries have been automated, networked and now moving towards paper less or virtual libraries. Librarians are also applying different platforms in Library science field to attain economy in information handling. The emergence of e-publications, digital libraries, internet usage, web tools applications for libraries, consortium practices has led to further developments in library profession. The latest technology trend in library science is use of cloud computing for various purposes and for achieving economy in library functions. Gosavi, Shinde & Dhakulkar (2012) define cloud computing as an emerging computer paradigm where data and services reside in massively scalable data centers in the cloud and can be accessed from any connected devices over the internet. Cloud computing is a way of providing various services on virtual machines allocated on top of a large physical machine pool which resides in the cloud.

Cloud computing harnesses the computing power and storage capabilities residing in the distributed environment of the cloud and makes available these resources as a single entity which can be changed to meet the current needs of the user. The basis of cloud computing is to create a set of virtual servers on the available vast resource pool and give

it to the clients. Any web enabled device can be used to access the resources through the virtual servers. Based on the computing needs of the client, the infrastructure selected for the client can be scaled up or down (Gosavi, Shinde & Dhakulkar, 2012).

Application of cloud computing may be a leap of faith for some library professionals. It is a new technology that could improve storage for libraries. Cloud computing or IT infrastructure that exists remotely, often gives users increased capacity and less need for updates and maintenance, and has gained wider acceptance among librarians(Gosavi, Shinde & Dhakulkar, 2012).

Cloud computing is based on many years of research in virtualization, distributed computing, utility computing, more recently networking, and web software services. It implies a service oriented architecture, reduced information technology overhead for the end-user, great flexibility, reduced total cost of ownership, on demand services and many other things. In today's global competitive market, companies must innovate and get the most from its resources to succeed. Cloud computing infrastructurecan provide remarkable value to companies including libraries and information centres of any size. They can help them achieve more efficient use of their IT hardware and software investments and provide a means to accelerate the adoption of innovations (Gosavi, Shinde & Dhakulkar, 2012). In agreement, Romero (2012) states that computing technology relies on technologies such as virtualization, programming techniques such as multi-tenancy and/or scalability, load balancing and optimal performance, to ensure that resources are offered quickly and easily.

Romero(2012),Gosavi, Shinde & Dhakulkar (2012) explain that cloud computing has certain advantages in libraries that include cost saving/reduction; flexibility and innovation; user centered; openness and transparency; interoperability; lower investment and reduced risk; scalability; greater security and accessibility; availability anytime anywhere; connect and converse as well as create and collaborate. Gosavi, Shinde & Dhakulkar (2012) further give some examples of cloud libraries that are in use in most libraries as OCLC; Library of Congress (LC); and Google Scholar and Worldcat.

2.4 Overview of Technological Changes and their Effect on library Operations and Services

Technological changes have brought unique changes and transformation to services in libraries and information centres that include but not limited to OPAC, reference services, current awareness services, document delivery, interlibrary loan, Audio visual services and customer relations (Krubu and Osawaru, 2011). These can be provided more efficiently and effectively using new technologies as they offer convenient time, place, cost effectiveness, faster and most-up-to-date dissemination and end users involvement in the library and information services process. The effect of technological changes on library operations and information services is characterized by changes in format, contents and method of production and delivery of information products. The emergence of internet as the largest repository of information and knowledge has changed the role of library and information science professionals from intermediary to facilitator, new tools for dissemination of information and shift from physical to virtual services environment and extinction of some conventional information services and emergence of new and innovational web based services and resources. All these technological changes come

with unanticipated costs to the libraries and information centres. Such costs range from expenses on acquisition of hardware and software, training of staff, data conversion and transfer of data to the new formats. Fyffe (2001) observes that the increasing use of market mechanisms and digital technologies to rationalize the production and distribution of scholarly information poses significant risk to business cycles and the obsolescence of hardware and software will lead to the unplanned loss of significant portions of our intellectual heritage.

2.5 Effect of Technological Changes on Library Information Management Practices

Libraries now use various types of technologies to aid the services they render. Everyday new technological advances affect the way information is managed in libraries and information centers. The effect of these new technologies is felt by libraries in every aspect. According to Krubu and Osawru (2011), computing technology, communication technology and mass storage technology are some of the areas of continuous development that reshape the way that libraries access, retrieve, store, manipulate and disseminate information to users. The effect has been felt in library administrative and technical operations as well as in library services in many ways.

2.5.1 Library Operations

Successful library operations depend upon quality library collections and resources. Darga & Hu (2012) lament that there are various changes in library allocation of acquisitions budget. These changes include increased electronic and digital resources (e-books and e-journal ordering) and reduced budget on non-electronic/digital resources (printed periodicals and books). There is also an increased access to online resources replacing optical devices (CD-ROMs, DVDs). The changes are aimed at saving printed

resources' space for information and learning areas to serve students, and expansion of multimedia facilities in the libraries. Egerton University Library has adopted the sophisticated and preferred online e-resources and replaced among others, The Essential Electronic Agricultural (TEEAL) CD collection and other CD based resources such as AGORA, AGRICOLA, HINARI, MEDLINE and CAB abstracts that used early versions of the early library systems such as CDS/ISIS or WINISIS provided by UNESCO. These early versions were not very sophisticated, not always based on MARC records, had few modules and were not web-accessible. The newer generations of library systems are all web-accessible and are based on MARC records and inter-operability. Examples of these systems are Millennium from III, Virtual from VTLS, Liberty/Alice from Softlink and Koha, an open-source system developed by Katipo in New Zealand (Abdulkadir, 2009). AMLIB integrated library management system that Egerton University Library is currently using is also one of the newer generations of library management systems.

According to Osinulu & Amusa (2010) library collections are the foundation of library services. Collections represent the strength of services. Collections of academic libraries should be large, comprehensive, current, and of good quality. The collections should support the curricula of the parent institutions and meet the needs of their clientele. ALA (2006) judges the quality of an academic library's collections on usability, comprehensiveness, diversity, and size, stipulating that the library should provide varied, authoritative, and up-to-date resources that support its mission and the needs of undergraduates, post graduates and faculty staff. The collections should also conform to the standards set out by regulating bodies locally and internationally and this can only be made possible through the application of new technologies.

Technological changes have also affected processing operations in libraries. New information technology applications have reduced the need for traditional manual processing in libraries. Digital and electronic resources change library operations, processes, and workflows, including skills and competencies required for librarians and support staff. All these changes cause library organization and management to change. For instance, Egerton University Library has applied the AMLIB ILMS to automate its processing operations and replace the manual processes of cataloguing and classification. This technology has saved staff work time and workflow processing has changed and resulted in more accuracy, more efficiency and increased productivity. The new technology brought about by the ILMS, AMLIB has enabled the technical processing operations to attain international standards of cataloguing and classification. AMLIB features online Z39.50 searching of other libraries and databases simultaneously. For example, search Libraries Australia, Library of Congress, SCIS (School Catalogue Information Service), Suppliers and Universities in a single search; facilitate the immediate importation of search results into AMLIB database. The AMLIB Catalogue and Authority modules utilize MARC21 standards with an easy to use interface.

Digitization of some of the local holdings is also one of the operations that many libraries feel is important. This practice though not yet widespread requires infrastructure that is not common in many libraries. However, several libraries have managed to start these projects. An examination of the digitization initiative of the University of Nigeria, Nsukka, shows that the challenges included legal aspects, training, infrastructure, and stakeholders. According to Okiy (2008), in 2008, the University of Nigeria, Nsukka embarked on the process of digitizing all of its legacy and scholarly works such as thesis,

dissertations, and publications of scholars in journals, books, and inaugural lectures. The aim was to protect the original documents and improve remote access and visibility for scholars. Egerton University Library is currently digitizing its theses and dissertations using DSpace software with the aim of protecting the original documents and at the same time enhancing remote access and visibility of the documents through electronic databases. The library is equally experiencing problems such as inadequate staff with capacity, infrastructure and complains from stakeholders.

Okiy (2008) elucidates that electronic databases offer thousands of digitized journals and e-books and libraries need to offer pathways to guide users to the best ones. African Journals Online (AJOL) is an important effort at freely offering digital copies of African journal articles. This online resource along with JSTOR offers a wealth of digitized peer-reviewed journal articles for researchers in Africa. Other electronic databases such as AGORA and HINARI are available through open access to libraries in low GDP countries in Africa with registration by an educational institution (Okiy, 2008).

2.5.2 Library Services

Through the application of ILMS like AMLIB at Egerton University, library services can be greatly enhanced. Reference services such as selective dissemination of information (SDI) and current awareness services (CAS) as well as document delivery services to clients can be more efficient, effective and fast in automated environments. ILMS also facilitate the use of Net OPACs which enhance ease of search and access to information resources by clients without the limitations of distance from the library building (www.reference.md/files/D007/mD007999.htm).

Mohammed (2004) also states that electronic and computer technologies have come in to remove most of the limitations of access and use of information resources and services. Instead of "written word", we now have "electronic word" existing as bits and bytes of computer memory. Ramesh (2006) observe that new information technology is changing the face of libraries because of the advent of the Internet. Virtual libraries can be a threat to the existence of the traditional libraries. He further acknowledged such media as; multimedia services, e-mail, voice mail, discussion groups, bulletin board, chat sessions, online reference and web pages that are gaining great effect on libraries and information management. Omekwu (2004) summarizes the extraordinary developments, saying that, the "hi-tech information systems have invaded the traditional domain of the printed media."

2.6 Challenges Presented by Technological Changes

Libraries and information centres are confronted with many challenges as they find ways and means of integrating the ever changing technologies in their profession. The challenges include staff capacities, cost of automation, e-waste generation, information security, connectivity and bandwidth as well as power supply.

2.6.1 Staff Technological Capacities

New and old employees are required to develop new competencies for managing libraries and information centres. The job descriptions need to be updated to be in line with the new requirements along with new technologies. Staff training for professional development needs to be frequently and necessarily arranged by library management to meet the operations needed and the required leadership and training for capacity building.

Some resistance to change from some library staff also exists across academic institutions due to the fear of the unknown and issues of technophobia (Darga & Hu, 2012). Cheng (2001) and Darga & Hu (2012) identify the following core competencies needed by the future librarian:

a) Good communication skills.
b) Have good knowledge and skills of ICT and its relation to information resources.
c) Should have an in-depth knowledge of organizational and user needs that are research-based and should organize library resources to satisfy those needs. This also includes skills in identifying and analyzing the information needs of various faculties served and how the information need would be met through the complex information agencies;
d) Competent in Web publishing techniques.
e) Skilled in manipulating metadata to organize digital information.
f) Skilled in training users in the use of e-resources.
g) Skilled in filtering, evaluating and appraising Internet information.
h) Good knowledge and skills required in selecting and using information technologies to solve information problems, database design, and organizing information;
i) Knowledge of the characteristics of information transfer, including users' information seeking behaviour, and information generation activities within the various disciplines and

j) Knowledge of the generation, production and distribution of information and of the changing paradigm from print-based information production to other modes of production and distribution.

All the above staff requirements call for continuous training of staff to keep pace with the changing technologies. Training in turn calls for increased budget allocation for libraries which has always been a challenge since libraries are not income generating organizations. Last but not least, there is need to build on a framework of a well-trained information technology workforce. It is not enough to have trainers visit and give superficial training at great cost and then leave without leaving some back-up capacity on the ground. Personnel problems can result from the sudden departure of a university computing expert handling a project on behalf of the university library. This may cause a lack of continuity in the project; and lack of library personnel to understudy and follow the automation project to its conclusion. Lack of trained staff is a very important and often overlooked constraint. An absence of discipline and alertness required for the manipulation of computer systems often is obvious (Alabi, 1986).

2.6.2 Cost of Automation

Print-based libraries require funding but digital or virtual libraries require even much more funds for the purchase and replacement of software, electronic databases and equipment as well as generators and fuel, VSATs and ISP fees in order to operate (Amkpa and Tukur, 2009). Currently, information acquisition, storage, handling, and dissemination have been tremendously and positively affected by computer technology. All routine activities involved in collection development, readers services (circulation and reference services), serials management, and technical services are being

accomplished by computer and related technology, mainly the integrated library management system (ILMS).These technological changes come with a cost. The automated operations and services therefore require the allocation of substantial amounts of funds. ICT soften become obsolete fast calling for regular upgrading of the hardware and software used to run the system so as to conform to the ever shifting trends and standards of technology. Further, the budgetary allocation will ensure that the initial cost of purchase and installation as well as the license and maintenance fees for the system are paid in time while ensuring regular training on emerging technologies.

Academic libraries generally require both recurring and non-recurring budgets. The funds available to an academic library determine the extent and quality of its operations and services. Amusa and Odunewu (2006) argue that funding is an issue that cannot be toyed with in order to ensure the success of any organization, academic libraries included. Libraries require good funding in order to provide better facilities and services to users. Hence, library budgets should be more elastic and generous. Osinulu & Amusa (2010) cite Moran (1984), Fabunmi (2004) and Nnadozie (2005) who state that academic libraries require adequate funding.

Nnadozie (2005) recommends adequate funding and prudent management of available funds. He emphasizes that, increased funding would enable libraries' management to implement motivational schemes for staff, purchase current publications, acquire multimedia materials, procure adequate infrastructure, and working tools for qualitative library services, especially with regard to the demands of the ever changing technologies.

2.6.3 E-waste Generation

According to Aina (2004), information and communication technology (ICT) is concerned with handling, acquiring, processing, storing and disseminating information. There is high rate of innovation in these ICTs that make older versions obsolete at a very fast pace. This results in generation of electronic waste (e-waste). Libraries and information centres generate e-waste every time any older electronic equipment is replaced. Disposal of this e-waste is becoming a global environmental and public health issue, as this waste has become the most rapidly growing segment of the formal municipal waste stream in the world as argued by Mittal, Goel and Rani (2012). The estimated e-waste generated annually in Kenya is 2,500 tonnes from personal computers and 500 tonnes from printers among other electronic appliances (Press release UNEP, 2010). A more recent report by Safaricom in conjunction with Waste Electrical and Electronic Equipment Centre (WEEEC) and NEMA notes that Kenya produces an estimated 17, 350 tonnes of e-waste annually (Chacha, 2013). The report further indicates that mobile phones, personal computers and printers contribute over 3,150 tonnes to the pile of rubbish. These numbers are expected to rise in the coming years given the increasing reliance on electronic devices by Kenyans to accomplish daily tasks (Chacha, 2013).

2.6.4 Information Security

As libraries and information centres increase their dependence on information technologies, security risks also increase. Anday (2012) confirms this by citing Zimerman (2009) who assert “library computers are not safe, they are physically vulnerable to theft, damage and destruction, but, most of all, they are vulnerable to

attacks by a host of malware agents which include Trojans, viruses, worms, adware, spyware, porn ware, keystroke loggers and password stealers". External extrusions such as hackers, viruses, worms, and Trojan horses are security risks which libraries should be able to handle (Al-Suqri and Afzal, 2007). Anday (2012) further cites (Zimerman, 2009) who claims that most academic libraries experience the aforementioned risks because their computers have the most popular antivirus software that make them believe they are safe but there are criminals who specialize in targeted attacks, making it more difficult to handle the risk with the traditional antivirus systems. All computing environments experience danger that is a multifaceted threat. Although there are protection systems that have to be applied, some are too expensive for a library and they only help to minimize but are never perfect. At the same time, in a library environment, it is even harder to manage the threats since it is difficult to control the behavior of many users.

In the digital age, availability of secure, efficient and cost effective networks of access would be the core competency of the libraries. It would be vital for libraries to secure networks so that the integrity of data can be maintained (Al-Suqri and Afzal, 2007). Network equipment include hubs, routers switches and cabling. For the hardware that supports the network it is necessary to implement security measures that correspond to all other sensitive hardware equipment (National Forum on Education Statistic, 2003). Computer networks now exist as wired and/or wireless networks and security measures in these environments are different. Libraries tend to use wired networks for machines which are fixed in their premises. Wireless networks are used for connecting users who might be having their own mobile gadgets to connect to the network. The National Forum on Education Statistic (2003) proposes the importance of not allowing users to install

unauthorized network equipment, the use of secure passwords for root access, ensuring proper cabling and cable protection to ensure security of physical networks. There is also need to consider investment in wireless network security if the integrity of information resources is to be maintained because there is a great increase on the use of mobile gadgets using wireless networks to access digital content in libraries.

There are also risks of format obsolescence. Format obsolescence according to Pearson and Webb(2008) refers to the development of new format encodings that take the place of already existing formats in the marketplace, and the changes in the availability of presentation tools, generally (although not exclusively) in the direction of decreasing availability, for any particular file format. According to Rosenthal (2010a), obsolescence has proved to be a minor risk: format obsolescence is a rare problem that happens infrequently to a minority of unpopular formats. Nevertheless, two solutions are proposed: a standard solution and an alternative one. The standard solution consists of migration: it is based upon public registries of format specifications and the creation of software which converts files in obsolete formats to usable files. A format registry is a repository for format representation of information or, in other words, descriptive, administrative, and technical metadata about digital formats, including the definition of the syntactic and semantic characteristics of the registered formats. This metadata defines the significant properties of digital formats with regard to the long-term preservation of digital objects (Abrams, 2005).

Rosenthal (2010b) shows how data storage has become easier and easier in the last years due to the development of technology and the lowering of related costs. Since storage in digital formats is cheap, whenever there is a chance the data could possibly be useful, it

should be kept. However, storage in digital formats is not completely reliable, so backup copies should be kept as well. Data backups, just like all the security measures must be part of what is known as disaster recovery plan (Fox, 2006).Kuzma (2010) and Balas (2005) explain that backup practice is nothing if not supported by a clear preservation policy, which involves security and information literacy as well as staff training and education. Anday (2012) confirms the claims reported by Whitman (2003) and Parkin (2009) who also stress on the importance of policies for an efficient digital preservation plan. Policies on digital preservation have been developed and include "OCLC Digital Archive Preservation Policy and Supporting Documentation" (OCLC, 2006) and "Digital Preservation Policies" in a report prepared for JISC in 2008 (Beagrie, Semple, Williams and Wright, 2008).OCLC (2006) cites Kuzma (2010) who asserts that a preservation strategy must include more than just what can be achieved by good system back-up procedures and that a strategy is needed also to ensure the long-term accessibility of digital content objects deemed to have enduring value. Beagrie et.al, (2008) through the JISC report reiterate that production of a practical guide for developing an institutional digital preservation policy is necessary.

A major challenge posed by digital technologies for long-term preservation of data and cultural objects is the fragility of digital information or literature. According to Castells's theory of the network society and Giddens's account of disembedding of expert systems point towards amore candid recognition that the fragility of digital systems and the resulting possibility of significant cultural loss are inherent features of the new landscape of scholarly communications. Waters (1999) states that digital information and the technologies on which they depend on are extremely fragile. Their fragility makes it

highly uncertain that digital libraries can endure over time and it causes one to wonder about the durability of their supposed benefits. Rapid cycles of change and obsolescence infect the hardware and software products now in use to create new knowledge. Further, Ameen (2005) anticipates the future of digital collections and states that subscriptions to online resources often provide only access rather than ownership. Due to financial problems and poor infrastructure, it is a concern that digital libraries may lack their current resources in the future. The library may be empty handed after the subscription ends.

Further to the problems of information security, retrospective conversion from the less sophisticated non-MARC systems to the next generation of MARC based catalogs has shown that libraries should be encouraged to begin with a system which offers standard international formats which can easily be upgraded and converted and which are compatible with other integrated library systems (Abdulkadir, 2009).Anday et al. (2012) also observes that information sharing has been made easier and less expensive by Internet technologies and global networking infrastructures, but availability of such information systems comes at the expense of higher risks. In the long run, information is not preserved, websites tend to disappear frequently and digital media become obsolete easily and there can be an abuse in the privacy of information. At the same time, libraries are not in a position to physically possess the digital media. Brophy and Wynne (1997) opine that the electronic environment introduces new levels of complexity, not least because so many of the information resources are not ‘owned’ by the library in any real sense and issues such as cataloguing of networked resources are far more complex than

their traditional library equivalents. Moreover, the integrity of the systems could be compromised.

Gosavi, Shinde & Dhakulkar(2012) suggest that cloud computing offers a better solution for information security which libraries and information centres can utilize. It is an emerging computer paradigm where data and services reside in massively scalable data centers in the cloud and can be accessed from any connected devices over the internet. Cloud computing is a way of providing various services on virtual machines allocated on top of a large physical machine pool which resides in the cloud. Cloud computing comes into focus only when we think about what information technology has always wanted as a way to increase capacity or add different capabilities to the current setting in computing without investing in new infrastructure, training new personnel or licensing new software.

Cloud computing has lots of computing power and storage capabilities residing in the distributed environment of the cloud. What cloud computing does is to harness the capabilities of these resources and make available these resources as a single entity which can be changed to meet the current needs of the user. The basis of cloud computing is to create a set of virtual servers on the available vast resource pool and give it to the clients. Any web enabled device can be used to access the resources through the virtual servers. Based on the computing needs of the client, the infrastructure selected for the client can be scaled up or down (Gosavi, Shinde & Dhakulkar, 2012).

2.6.5 Unstable Internet Connectivity and Low Bandwidth

Developing countries have limited bandwidth available and universities are faced with the challenge of purchasing dedicated bandwidth. Poor connectivity has been a big challenge for accessing and downloading information especially large files (Warraich and Tahira, 2009). To effectively access and download the online electronic resources, strong internet connectivity and a reliable wide bandwidth are a prerequisite. The bandwidth in most African countries is often narrow and the internet connections generally slow. In support of this, Mortenson Center…(2004) lament that even the premier universities of the African countries are challenged by an insufficiency of bandwidth capacity that interferes with any networking. The provision of Internet capability needs to be strengthened in order for ICTs to work effectively in libraries (Amkpa and Tukur, 2009). Egerton University Library utilizes wireless and cable connectivity. Both internet connections are generally slow and unstable.

2.6.6 Erratic Power Supply

The consequences of inconsistent power supply cannot be overemphasized. Computers and their associated accessories cannot run without electricity. Kenya has erratic power supply which is a difficult problem to address, as any solution depends on governmental action, but in order to move ahead, libraries and institutions need to make arrangements for generators and back-up power so that servers can be run on a continual basis. Consistent power supply is the only way that information and communication technologies can be fully utilized. Erratic power supply can also damage some electronic components which cannot easily be replaced. Gbadamosi (2012) critically explains that the erratic power supply remains a source of concern in sustaining automation/e-library

facilities. According to computer experts, Internet facilities are better placed on continuous power supply as this ensures steady current supply to the equipment and equipment damage through power surge will be minimized. Libraries and information centres need to address this problem with the installation of alternative source of power.

2.7 Chapter Summary

The chapter reviewed literature on theoretical frameworks and information technology adoption in libraries and information centres. Most of the literature reviewed emphasized the benefits/opportunities of information technology without much emphasis on their challenges on information management practices. Libraries and information centres need to be wary of the challenges of information technology in order to ensure sustainable information management practices. Electronic resources are significantly fragile and without proper preservation practices, libraries may find themselves without any coherent stock development as technological changes continue to affect them.

CHAPTER THREE

RESEARCH METHODOLGY

3.1 Introduction

This chapter presents the methodological procedures that were used in conducting the research including the study area, research design, study population, sampling techniques, research instruments, data collection methods, data analysis, presentation and interpretation, data validity and reliability as well as ethical issues relating to the study. Research is the application of various methods and techniques to obtain knowledge by using objective methods and procedures (Welman and Kruger, 2001). According to Kothari (2004), research is a scientific and systematic search for pertinent information on a specific topic. Kothari (2004) explains research methodology as a way of systematically solving research problems. Creswell (2009) explains that research methodology entails forms of data collection, analysis and interpretation that a researcher proposes for a study.

3.2 Research Design

Kothari (2004) states that a research design is the arrangement of conditions for collection and analysis of data in a manner that combines relevance to the research purpose with economy in procedure. Kumar (2005) also explains that a research design is a structure that holds together the research and enables a researcher to address research questions in ways that are appropriate, efficient and effective. The study used descriptive case study design to collect data from Egerton University Library. The case study design permits the collection of detailed descriptive data, which are usually qualitative in nature (Baxter & Jack, 2008).Case study design is an in-depth investigation of an individual, group or phenomena (Mugenda and Mugenda, 2003). As a single case study, the

investigation made a detailed examination of library operations and services and related issues at Egerton University. O'leary (2005) points out that case studies are not always representative and generalizable when compared to large scale surveys. A case study research design is appropriate since it is a research strategy and an empirical inquiry that investigates a phenomenon within its real-life context. This study in real-life context helps the readers of this research understand easily as it brings out the situation exactly as it is in its current form.

3.2.1 The Qualitative Approach

Qualitative data was collected to establish the strategies of information management in relation to the effect of frequent technological changes. The various library operations and services were examined so as to establish how technological changes are affecting them. Qualitative inquiry typically focuses on collection of in-depth information in form of text, images and verbal phrases. Brink (1993) explains that the term qualitative research is an umbrella term representing a variety of research approaches which share certain common elements. Qualitative research is not interested in causal laws but in people's belief, experience and meaning systems from the perspective of the people. Methods used are more subjective than in quantitative research. Phenomena are viewed holistically and in their social context. The researcher collected data and information from respondents with experience on issues or problems under study in a natural setting. The natural settings in this study were the libraries themselves and the respondents were the librarians in charge of acquisition and use of electronic equipment. Walsh (2003) explains that a qualitative approach describes an event in its natural setting. It is a subjective way that allows the researcher to look at the effects of technological changes

as they are and tries to explain them. Qualitative research seeks to explain a current situation as per specific members of a group instead of providing a broad view of a phenomenon that can be generalized to the population. The qualitative information included responses gathered through face-to-face interviews from the respondents. The open-ended questions allowed the respondents to provide answers in their own words.

3.3 Study Area

The study was conducted at Egerton University in Nakuru County, Kenya. It is a public university with eight faculties. There has been an increase in the usage of electronic equipment and facilities in the University. All the departments, Library department included, apply various technologies in their day to day activities including information and communication technologies.

3.4 Target Population

According to Mugenda and Mugenda (1999), the target population is that population to which a researcher wants to generalize the results of a study. The target population was Egerton University staff. The population for the study consisted of staff from Egerton University Library, ICT and Procurement departments. The library with three branches and a records centre at the Main Campus, Njoro, has a total of eighty three (83) staff. The total population of staff from ICT and Procurement departments was fifty four (54) and thirty eight (38) respectively. The total target population was therefore one hundred and seventy five (175) staff.

Table3.1: Target Population

Department	**Target Population**
Library	83
ICT	54
Procurement	38
Total	**175**

3.5 Sample Size

The sample size consisted of fifty (50) professional and para-professional staff from the library and four staff, two (2) from ICT and two (2) from Procurement departments. Therefore, the sample size was 54 respondents.

3.6 Sampling Techniques

The sampling technique used in the study was purposive sampling. Purposive sampling was used to select staff from the University Library, ICT and Procurement departments. Purposive sampling is a mode of sampling typical of qualitative research and it involves selecting respondents or data on the basis that they will have certain characteristics or experience (Braun and Clarke, 2013). Purposive sampling technique was used because it allows the researcher to select a sample that serves the purpose of the study; a sample that is a representative of the population in terms of its characteristics and attributes, that is, it has the required information and knowledge in the field. The purposively selected staff were interviewed.

The purposively selected staff from ICT and Procurement Departments were those involved in policy making in the University. The library wholly depends on these two departments in their selection and acquisition of ICT equipment because the library has

no ICT or Procurement policies of its own. The library places its ICT requests through the ICT Department which uses its policy and the Government of Kenya ICT Standards and Guidelines to guide the library with regard to specifications before acquisition of any ICT equipment. The Procurement department on the other hand plays the role of purchasing and disposal of University items including ICT equipment. The department is mandated by the University and guided by the Public Procurement and Disposal Act (PPDA) in purchasing and disposal of equipment.

The purposively selected library staff were those directly involved in technology application and use of technology in the library. Purposive sampling technique allowed the researcher to use cases that have the required information with respect to the objectives of the study.

3.7 Research Instruments

There are a number of research instruments used in data collection including questionnaires, interviews and observation. This study mainly utilized qualitative inquiry where data was collected using face to face interview and observation methods. The study collected detailed descriptive information, which is qualitative in nature. Qualitative inquiry typically focuses on collection of in-depth information and face-to-face interviews were used for this purpose.

3.7.1 Interview Method

Interview method was used to collect data from the respondents. Data collection was done using face-to-face interviews. The interview method was flexible and facilitated collection of in-depth descriptive information from the respondents. Interviewing is the

best method for collecting data about respondents themselves, their experiences, their opinions or attitudes, their knowledge and their reactions (Bush and Harter, 1980). In support of this method, Odini (1993) says that interviews give the researchers the opportunity to establish rapport and great flexibility in collecting information since the interviewee and the interviewer are both present. Verbal responses of respondents are often valuable, original evidence of research data. The main task of interviewing was to understand the meaning of what the interviewee said. The data collection tool that was used is semi-structured as it was flexible. The face-to-face interview method was quite useful in soliciting information from respondents and was suitable for this study as it facilitated gathering of in-depth information.

3.7.2 Observation Method

Observation method is used to gather information about things that can be observed including information on the physical surroundings. In this study, information on the available technological equipment in use and those that had been discarded (but still within the library) due to technological changes such as obsolescence were collected with the help of an observation checklist (appendix IV). The collected data was also used to supplement and enrich the information collected through interviews.

3.7.3 Factors/Characteristics Studied

The factors considered in data collection were the history and extent of technology application, the available policies/regulations governing information management, types of automated library operations and services, staff technological skills and knowledge and the impediments experienced by the University Library on the application of fast changing technologies. The interview schedules specifically targeted the selected staff

from the library, ICT and Procurement departments for data collection. The observation method was used to observe the number and state of information technologies in the library including the technologies in use and the discarded (but within the library building).

3.8 Data Validity and Reliability

Validity and reliability are used as criteria for evaluating the scientific merit of any research whether qualitative or quantitative (Brink, 1993).

3.8.1 Data Validity

Validity in research is concerned with the accuracy and truthfulness of scientific findings (Le Comple and Goetz 1982). A valid study should demonstrate what actually exists and a valid instrument or measure should actually measure what it is supposed to measure. In the context of qualitative studies, validity is therefore the extent to which one can draw accurate and meaningful deductions based on the results obtained from a data collection instrument (Mugenda & Mugenda, 2003).The researcher consulted the two supervisors and sought opinions from the professional library staff on the validity of the research instruments. The instruments were also scrutinized to ensure that they were in line with the objectives of the study.

3.8.2 Data Reliability

Reliability is a measure of the degree to which a research instrument yields consistent results or data after repeated trials. It is concerned with consistency, stability and repeatability of the informant's accounts as well as the investigators' ability to collect and record information accurately (Seltiz et. al., 1976). It refers to the ability of a research

instrument to yield consistently the same results over repeated testing periods. In other words, it requires that a researcher using the same or comparable methods obtains the same or comparable results every time he/she uses the methods on the same or comparable subjects. It further requires that the researcher obtains consistent responses or habits(Mugenda & Mugenda, 2003). To test the reliability of the data collection instrument (interview schedules), the research conducted a pilot study using a selected random sample of library staff from Egerton Unversity Nakuru Town Campus library, which was not included in the sample size (Radhakrishna, 2007). The data from the pilot study was analyzed and used to determine the reliability of the instruments.

3.9 Data Analysis, Presentation and Interpretation

Data analysis is the process of bringing order, structure and meaning to the mass of information collected (Mugenda and Mugenda, 1999). Data that was gathered in the study using face-to-face interviews and observation were analyzed, presented and interpreted in an attempt to give answers to the research questions.

3.9.1 Data Analysis

Data analysis is the examining of what has been collected in the study and it involves uncovering underlying structures, extracting important variables, detecting any inconsistencies and testing any underlying assumptions. There are two angles that can be used to approach data analysis: qualitative and quantitative data analysis methods. This study employed mainly qualitative data analysis method. Qualitative data analysis varies from simple descriptive analysis to more elaborate reduction and multivariate associate techniques. It involves analytical techniques which include quick impressionist summary which involves summarizing of key terms, emanations, interpretation and conclusion;

thematic analysis which basically categorizes related topics where major concepts or themes are identified; and content analysis which examines the intensity with which words have been used (Kombo & Tromp, 2006). Data analysis entails making sense of text, images and verbal phrases provided by the respondents. The researcher analyzed the collected data thematically and it basically involved categorizing related topics where major concepts or themes were identified. The researcher collated the collected data before analysis through use of tables. Using the results of this exercise, the data was put into categories according to emerging themes. Each was then labeled with a distinctive term based on the actual language of the respondents. Each category was then coded. Tabulation was then used to present data and analysis done to draw deductions from the data.

In some cases, the researcher integrated qualitative with quantitative methods of data analysis by relying strictly on the qualitative data, but quantifying the analyses. That is, the qualitative data was examined for impressions and trends, methods of coding were developed to capture those impressions, and the codings were analyzed quantitatively (Chi, 1997). The aim of this was to control subjectivity by coding the verbal evidences for each impression and comparing the frequencies of the codes quantitatively.

3.9.2 Data Presentation and Interpretation

The collected data was presented using tables and texts. Tables are important since they were used to list down variables in a more simplified manner for easy interpretation and making the work more organized. Tabulation is the process of summarizing raw data and displaying the same in compact form for further analysis and it is also an orderly arrangement of data in rows and columns. This reduces time taken for analysis. Texts are

important as they give in-depth description of the findings. It is through data presentation that the researcher shows the results of the study to other people.

3.10 Ethical Considerations

The respondents were informed of the purpose of the research and the intended purpose of the data. The respondents were provided with needed explanations or clarification with regard to the interviews and the purpose of the study. Privacy, confidentiality and anonymity were also taken into consideration as it was the researcher's responsibility to respect the beliefs and values of the respondents. The identities of the respondents were kept secret and efforts were made so that no respondent learnt of the responses of other respondents.

3.11 Chapter Summary

This chapter described the research design, study population, sampling techniques, research instruments, validity and reliability, data collection methods, data analysis, presentation and interpretation as well as ethical issues. The research design chosen was case study where qualitative data was collected to establish the strategies of information management in relation to the effect of frequent technological changes on Egerton University Library. Purposive sampling technique was used to select the university and the study sample from the University Library, ICT and Procurement departments. Face-to-face interview and observation methods were used to collect the data. The collected data was analyzed using thematic qualitative data analysis method and presented using tables and texts.

CHAPTER FOUR

DATA PRESENTATION,ANALYSIS AND INTERPRETATION

4.1 Introduction

The study examined the effect of technological changes on library operations and services at Egerton University. This chapter presents the collected data as well as analysis and interpretation of the findings. The respondents comprised of both professional and para-professional staff from the library, and four (4) staff drawn from ICT and Procurement Departments. Face-face interviews were used to collect the data from the respondents. Tables and texts were used to present the data and consequently thematic qualitative data analysis method was used to analyze the data. Descriptive analysis was used to support some quantitative data.

This chapter is divided into the following two parts; the first part presents the background information while the second part presents descriptive analysis of the themes of the objectives of the study under the following headings:

a) History and drivers of technology application at the University Library.
b) Effect of technological changes on library operations, services and ICT competencies of staff in the library.
c) ICT policy in addressing effect of technological changes in the University Library.
d) The benefits and challenges experienced by the Library in the application of fast changing ICT technologies.

e) Proposed framework to guide adoption of new ICTs in the management of library operations and services.

4.2 Background Information

The information collected included the target population, designation, workstation/section, work experience and computer literacy levels of the respondents.

4.2.1 The Study Respondents/Population

The study population comprised staff of the University Library, ICT Department and Procurement Department.

Table 4.1: Respondents Rate by Sample Category

Department	**Target Sample**	**Respondents (n)**	**Percentage (%)**
University Library	50	47	87
ICT Dept	2	2	3.7
Procurement Dept	2	2	3.7
Total	**54**	**51**	**94.4**

Table 4.1 shows a total response rate of(94.4%; n=51), Forty seven (47) staff from the University Library out of the targeted fifty (50) staff were interviewed while two(2) staff from each of the other two departments (ICT and Procurement) were interviewed.

4.2.2 Designation of the Respondents

Forty seven (47) staff out of the intended fifty (50) library staff comprising of professional and paraprofessional staff and four(4) staff comprising of two (2)staff from ICT Department and two (2)from Procurement Department were interviewed (Table 4.2).

Table 4.2 Designation of the Respondents

Designation	**No. of the Respondents**
University Librarian	1
Senior Assistant Librarian	1
Senior Library Assistants	33
Library assistants	12
ICT Manager	1
Assistant ICT Manager	1
Senior Procurement Officer	1
Assistant Senior Procurement Officer	1
Total	**51**

The respondents from the University Library were library assistants as the para-professionals, senior library assistants, assistant librarian and the University Librarian as the professionals. These staff are responsible for the management of library services and operations and are therefore involved in ICT application in the library.

The ICT Department staff were the ICT Manager and the assistant ICT Manager. The Procurement Department staff were the Senior Procurement Officer and the assistant Senior Procurement Officer. This cadre of staff are involved in policy making issues of the University among them ICT and Procurement policies.

Most library staff who were interviewed were senior library assistants and the library assistants both of whom are directly involved in the usage of ICT equipment and are therefore able to give first-hand information on the effect of technological changes on library operations and services. The rest of the respondents, the University Librarian, Senior Assistant Librarian, ICT Manager, Assistant ICT Manager, Senior Procurement Officer and the Assistant Senior Procurement Officer were the staff who provided information on the policies regarding ICT application in the University.

4.2.3 Staff Workstation/Section

Table 4.3 presents data on staff workstation/section as part of the background information of the study.

Table 4.3: Staff Distribution by Division/Section

Section/Division	**No**	**%**
Circulation	15	32
Cataloguing & Classification	8	17
Acquisition	6	13
Africana/Special Collection Section	4	9
Resource Centre	4	9
Reference	3	6
Archives	3	6
Library Store	2	4
Readers' Services	1	2
Librarian's Office	1	2
Total	**47**	**100**

The workstation/section analysis was carried out for the library staff only. One of the criterions for inclusion was the requirement of staff application of ICT equipment in their routine duties. Ten (10) sections use ICT equipment in their routine duties. The majority of the library staff respondents worked at the Circulation and Cataloguing/Classification sections with a total of twenty three (23) staff. Staff in other sections ranged between six (6) and two (2) with the University Librarian's and the Readers' Services offices having the least number of staff, one (1) each as shown in Table 4.3.

The staff working at Circulation and Cataloguing/Classification sections were the majority. Their work is to carry out the major library services and operations with the help of ICT equipment. The functions of the staff working at the Circulation section include charging and discharging, book reservations, sending over-due reminders; while staff in the Cataloguing/Classification section catalogue and classify information resources. Other library service providers include the Resource Centre and Reference section. They, however, have few staff but they also provide major library services. The Resource Centre, for instance, provides online access to electronic information resources and other IT related services to library users. The Reference section on the other hand utilizes ICT equipment to provide services that include, user-education, current awareness services, SDI and OPAC services.

All the Cataloguing/Classification and Acquisition Sections staff utilize ICT related equipment in their operations. The rest of the library sections have few staff due to the nature of the work they perform. Nevertheless, all library sections utilize ICT equipment in one way or another, hence significant in the analysis of the effect of technological changes in library operations and services.

4.2.4 Experience of the Respondents

The experience of the respondents was varied ranging from 1 to 30 years as shown in Table 4.4.

Table 4.4: Experience of the Respondents in Years

Category of Respondents	**Years of Service**			
	0-10	**10-20**	**20-30**	**Total**
University Librarian	1			**1**
Assistant Librarian		1		**1**
Senior Library Assistant	1	12	20	**33**
Library Assistant	3	5	4	**12**
ICT Manager	1			**1**
Assistant ICT Manager		1		**1**
Senior Procurement Officer	1			**1**
Assistant Senior Procurement Officer			1	**1**
Total No. of Respondents (n)	**7**	**19**	**25**	**51**
Percentage (%)	**14**	**37**	**49**	**100**

A minority seven (14%; n=7) of the respondents had worked for less than ten (10) years while the majority who ranged between nineteen (37%; n=19) and twenty five (49%; n=25) said they had worked for 10-20 years and 20-30 years respectively as illustrated in Table 4.4 .

4.2.5 Computer Competency Level

Table 4.5 presents findings on computer competency levels of respondents working in the library. The respondents were required to provide a self-assessment of their computer competency levels on a 3 Likert scale ranging from basic to advanced levels as shown in Table 4.5.

Table 4.5: Computer Competency Levels

Level	**Respondents No(n)**	**%**
Basic	24	51
Average	18	38
Advanced	5	11
Total	**47**	**100**

Most(51%; n=24) library staff respondents had basic computer knowledge, (38%; n=18) had average computer skills and knowledge, while only (11%; n=5) had advanced skills and knowledge. The respondents (library staff) were probed further and they were affirmative that they had knowledge and skills in ICTs that enable them to offer library services to clients and to carry out other library operations like cataloguing and classification. Majority of them had training from certificate to degree level and this has been boosted by in-house trainings and seminars. Although most of the respondents have basic IT knowledge and skills that enable them to run operations and services of the library, very few, however, have advanced IT knowledge for effective managerial decision-making with regard to ICT related issues in the University Library.

Houghton-Jan (2007) emphasizing on the importance of competency levels of staff states: "Competencies are the abilities, qualities, strengths, and skills required for the success of the employee and the organization." Such competencies also go a long way in ensuring that the effect of technological changes on library operations and services is put under control for the purposes of having effective information management practices in libraries in the era of information technology. Krubu and Osawaru (2011) opine that in-house training of staff should be organized from time to time to assist librarians or library staff who do not have funds to update their knowledge and IT skills. This will also aid awareness of IT potentials and capacities from the library staff.

4.3 History and Drivers of Technology Application at the University Library

The first objective of the study, which was posed to library staff only, was to trace the history and drivers of technology in library operations and services at Egerton University Library between 1999 and 2013. The study collected data on library management systems used, usage of ICTs, automated operations and services of the University library, the different types of ICT facilities and equipment and the motivating factors for technology application in the university library.

4.3.1 Library Information Management Systems

Egerton University Library has used a number of Library Management Systems ever since its application of ICTs in library operations and services including CDISIS, Ms Office Access (locally created database for newspaper indexes) and AMLIB (the integrated library management system)as shown in Table 4.6.

Table 4.6: Library Information Management Systems

Library management system	Operation/Services	Period
CDISIS	Access to CAB abstracts in CD-ROM format and Indexed newspaper articles	1999 – 2008
Ms Office Access	Access to indexed newspaper articles	1999 -2010
AMLIB	Integrated system used to manage most operations and services	2009 to date

Libraries and information centres need basic computing technologies to support their operations and services and are therefore compelled to keep pace with changing technologies. Like other libraries worldwide, Egerton University Library started experiencing the effect of technological changes as the spread of technological innovations increased. Rasul and Sahu (2011) stated that since 1960s, libraries worldwide have been using technologies in general and computers in particular to automate the administrative and technical tasks of the library. Libraries like other business organizations cannot afford to remain behind and must therefore adopt the new technologies. They require these new technologies to improve and advance their operations and services. Rasul and Sahu (2011)observed that every facet of library work, in academic, school, public, and special libraries, is being transformed as a result of technological advances.

The major observable changes in technology application include increased database access through CD-ROMs, local mainframes, or dial-up services; a shift in the focus of library instruction toward skills for using computer-based information systems; and the provision of access to local collections for remote users, and to remote collections for

local users. Other significant changes and advancements in technology include the World Wide Web that has become a significant vehicle for distributing information (Rasul and Sahu, 2011). It has also been noted that information technology has emerged as the most potent tool to collect, organize, and disseminate information through communication network. Internet brought the biggest change in libraries as 1990s saw the rapidly increasing availability of access to computers generally. Information and Communication Technologies (ICTs) have brought revolutionary changes in the handling, delivering and storage of information. Rasul and Sahu, (2011) concur and explain that the transition of traditional library collections to digitalor virtual collections presented the librarian with new opportunities and challenges.

4.3.2 Utilization of ICT Equipment

The first objective is on history and drivers of technology application. Egerton University Library has been progressively utilizing ICTs from as early as 1999 when the University received a consignment of a variety of ICT equipment from the World Bank. These equipment included computers (Pentium II computers), printers (Dot Matrix, Line, Inkjet, HP-Laser Jet), Scan Jet, Plotter (750HP), Fax machine, bar code reader, Projection panel, file servers, DTP workstation and multimedia PC (Appendix VI). All these World Bank donations are no longer in use due to technological changes and are either lost or have been retired or disposed in the library store. Respondents reported that obsolescence of technologies was the main cause for technological changes. The World Bank donations had ports for diskettes and some information had been stored in the floppy disks. With their replacement, all the information in floppy disks, for instance, were either lost or discarded as the new type of computers had no ports for the diskettes. Some information

on newspaper indexes that had been stored in floppy disks was discarded in 2010 when the Library opted to use AMLIB, the integrated library management system. AMLIB has been used to create and manage the library's database of newspaper articles. The CAB Abstract CDs are no longer in use due to the available online CAB Abstracts which currently come with CABI full text journal articles, conference papers and reports.

ICT equipment have been used by the University Library since its inception in late 1980s as exemplified by the aforementioned consignment of a variety of ICT equipment from World Bank (Appendix VI).The technological changes have taken place progressively in the University Library giving staff different levels of experience. Utilization of ICTs in the library was unavoidable due to the need for the University Library to keep pace with the changing needs of users and emerging developments in the management of information worldwide that include and not limited to information sharing, cost sharing through consortiums and ease of access without limitations such as space and time. According to Ogunsola (2004), all technological devices are regarded as central to the concept of globalization where the Internet has continued to have profound effects on the promotion of information sharing, especially in the academic world, making possible rapid transactions among businesses and supporting global collaboration among individuals and organizations. ICTs have contributed to development of virtual campuses and virtual libraries therefore, increasing students' access and participation.

4.3.3 Library Automated Operations and Services

Data on automation of library operations and services at Egerton University Library, as a sub theme of the first objective on history and drivers of technology application at the University Library, is presented in Table 4.7.

Table 4.7: Automated Operations and Services

S/No.	Operations	Services
1.	Cataloguing/Classification	Circulation
2.	Acquisition,	OPAC
3.	Reports and Statistics	Electronic book and journal access
4.	Administrative tasks /operations	WWW & Internet services, NetOPACs, CAS, SDI, Customer relations services ,etc

The University Library has automated most of its operations and services using an Integrated Library Management System known as AMLIB as reported by all (100%) library respondents. The automated operations include Cataloguing/Classification, Acquisition, Reports and Statistics, Circulation and OPAC services. Automated services that are not accessed through AMLIB include electronic book and journal access and NetOPACs for off-campus access.

4.3.4 Motivating Factors for Technology Application

To further enhance information on the first objective on the history and drivers of technology application, data on the motivating factors for technology application are presented in Table 4.8.

Table 4.8: Motivating Factors for Technology Application

S/No	Sample Direct Quotations from Respondents (Excerpts)	Motivating Factors (Implication)	Respondents (n)	%
1.	"...there is need to keep pace with changing technologies…"	Keep pace with technology	32	63
2.	"…the world trend of change from analog to digital services and operations is apparent…."	Adherence to current world trends	9	17
3.	"…the need for new electronic equipment to meet user needs and improve operations…"	Up to date technologies	7	14
4.	"…we have to co-exist with other University libraries…."	Consortia and cooperative services and operations	3	6
	Total		**51**	**100**

Thirty two(63%; n=32) respondents said that the overriding driver was to keep pace with changing technologies. Other motivating factors for technology application include world trend of change from analog to digital (17%; n= 9), the need to improve operations (14%; n=7) and the need to co-exist with other University libraries (6%; n=3) as presented in Table 4.8.

The University Library has been motivated to apply new technologies to meet the changing needs of clients. The need to access electronic books and journals has necessitated Egerton University Library to acquire current ICT equipment and software. One of the respondents reported that, as a member of KLISC, Egerton University has been a beneficiary of the consortium where it receives scientific information required by

its clients. The Library users are also currently able to access the library collection through the Online Public Access Catalogue (OPAC) where they are able to know what books are available for loan and/or make reservations for those that are on loan. The NetOPAC is still on trial and once fully operational; library users will be able to access the collection away from the University precincts greatly improving the library's access services.

Egerton University Library has also been motivated to apply new technologies for ease of management of its operations that include cataloguing and classification as well as acquisition. The use of the AMLIB has seen the University Library manage crucial operations as well as lessen the work of the Cataloguing/Classification section. Communication between the University library and book suppliers has been made relatively easier and cheaper with the help of technology application. The Local Purchase Orders (LPOs), for example, are nowadays scanned and emailed to the suppliers unlike previously where they were sent through the Postal Corporation or one had to take to the supplier in person and this was costly and time-consuming.

The need to co-exist with other University libraries also motivated Egerton University Library to apply new technologies for both library operations and services. Qutab, Bhatti and Ullah (2014) assert that technology application aims at ensuring quick and easy access by most library users to relevant, accurate and current information from both remote and local databases. Access facilitates learning, teaching and research in the universities. The respondents also explained that "libraries must take a more proactive response to ICT to function effectively in the present age as the manual processes or

methods will have to give way to information and communication technologies (ICTs) and a computer driven environment".

Libraries in the present age are using information and communication technologies for book and serial acquisitions, classification and cataloguing, reference service, user orientation service, circulation service, inter library loan, document delivery service, electronic contents, e-mail and chat assistance, web 2.0 interactive sharing, bibliographic service and photocopying services. These opportunities not only enable libraries to provide quick information to users but also provide opportunities for remote access to information globally without geographical barrier and time limitations (Qutab, Bhatti and Ullah, 2014).

Chinwe…et.al. (2011) state that there is seemingly no option to the integration of ICTs in library services, especially in the academic libraries. This has been necessitated by forces of competition, advent of information in electronic form and the changes in users' expectations. The use of information resources in electronic form and application of internet became a way of life in the 1980s and the 1990s, respectively. The focus of academic libraries has consistently moved from statistics of users visiting the libraries to providing the desired services without the barriers of space and time.

4.4Implications of Technological Changes on Information Management Practices

The second objective of the study was to establish implications of the technological changes on library operations, services and staff skills and knowledge. Table 4.9 presents the findings on implications of technological changes on information management practices.

Table 4.9: Implications of Technological Changes on Information Management Practices

Sample Direct Quotations from Respondents (Excerpts)	Implications of technological changes on information management practices
	Positive Implications
"…staff are able to work efficiently& fast e.g in classification / cataloguing section with use of technologies like copy cataloguing"	Greater level of efficiency in operations and productivity.
"…issuing & receiving is faster with use of computer…"	Achievement of timely services
"…University libraries acquire information resources jointly through KLISC…"	Cost reduction in acquisition of information resources through consortia, online acquisitions etc
"…internet technology allows users access to a wide range of information resources…"	Increased access to wider range of resources, remote access, access to regular updates on topics of interest etc
"…automated sections transfer information easily and fast from one section to another through LAN…"	Easy and faster transfer of data between machines
"…we are trained any time a new technology is acquired…"	Enhancement of educational development
"…digitization of theses/dissertations is on-going..."	Digitization of local content
"…available e-journals & e-books are so many and they only occupy space of a desk top computer…"	Conservation of library space
"…exchange of information between the library and book suppliers is convenient with use of email technology…"	Quick and convenient information exchanges
"…group discussions technology and teleconferencing allow professionals to exchange ideas…"	Access to experienced and expert individuals in many fields;
"… ICTs have enabled University libraries in Kenya to jointly acquire electronic resources…"	Enhancement of team work across geographical distance
"…internet has all sorts of information including archived/retrospective	Access to archived information worldwide;

information…"	
	Negative Implications
"…for every new technology acquired, there is increase in our library budget…."	Increase in fiscal budgets - cost of IT equipment, installation and maintenance, staff/user training and retraining, hiring of new staff/ consultants/short-term project staff needed to implement the new technologies
"…the whole institution still lacks adequate ICT infrastructure and internet is irregular..."	Poor and inadequate ICT Infrastructure and facilities
"…some data was lost during change from manual to automated library management system..."	Problems of data conversion/ transfer and security leading to loss of data or information
".... supplier for the library management system gives piecemeal trainings and each means additional funds …some modules to date have not been fully utilized…."	A largely exploitative local computer/software market and unsatisfactory after sales maintenance and support;
"…access to electronic resources depends on stability of internet…unlike print resources which are a permanent physical stock…"	Absence of permanent physical collection
"…updates for AMLIB(library management system) take so long due to delays in disbursement of funds…"	Ignorance of decision/policy makers of the power of information network on the economic and industrial development of a nation
"…we have many obsolete ICT equipment in our library store…"	Generation of e-waste

The users were asked to give their opinion on the implications of technological changes on library operations and services. The analysis indicated that there are a number of positive implications and a few negative implications as presented in Table 4.9. The positive implications outweighed the negative implications indicating that adoption of new technologies is a worthy course for any library or information centre. Classification/Cataloguing operations and Circulation services have received the greatest impact of ICT application as reported by respondents who explained that the library has

achieved greater level of efficiency in operations and productivity as well as timely services as presented in Table 4.9.

Krubu and Osawaru (2011) summarize the positive implications of technology applications by stating that libraries now use various types of technologies to aid the services they render and further explain that everyday new technological advances affect the way information is managed in libraries and information centers. The effect of these new technologies is felt by libraries in every aspect. IT presents an opportunity to provide value-added information services and access to a wide variety of digital based information resources to their clients.

The few negative implications are manageable and include increase in fiscal budgets, potential loss of data or information, and upgrading of staff skills and knowledge to enable them manage the technological changes. Hayes & Becker (1974) concur and reiterate that the bottom line with respect to staffing, automation and effective utilization of new information technology has been a major focus of strategic management for academic libraries. It has required the attention of library management in order to obtain the required funds, hire the staff needed to implement, control the processes in acquisition of hardware and software, allocate the space and operating resources needed to house them, participate in cooperative efforts to minimize costs by sharing bibliographic data, deal with the needs of staff in adapting to the changes in operations, inform the academic community of users and work with them to ensure their needs are met. There is also the need for additional staff like the systems staff and operating staff required to make the necessary technical decisions and to implement and manage the results. Sometimes technological changes require hiring consultants and short-term

project staff to support the internal staff. It is evident that new information technologies will continue to require at least comparable levels of commitment at the highest levels of library management. Technological changes increase fiscal budgets as the new technologies are expensive, especially where old equipment require replacement due to incompatibility. The study found out that all the Pentium II computers that were donated by the World Bank in 1999 have since been replaced and new technology computers bought at high cost. Hayes & Becker (1974) concur and reiterate that there will be increasing costs for equipment and related software as well as for the information itself. The manufacturers of new technology equipment and software are there to make profits and the publishers are not about to reduce the costs for the information they distribute.

4.5 Guiding Policy for Technological Changes

The third objective of the study was to assess the adequacy of the existing ICT policy in addressing the effect of technological changes. The respondents from the Library, ICT and Procurement departments were asked to state the policies guiding technology application. The results showed that there are three guiding policies that the University applies in ICT acquisition, use and disposal as indicated in Table 4.10.

Table 4.10: Guiding Policies for Technological Changes

S/N	Guiding Policies	Departments		
		Library Dept	ICT Dept	Procurement Dept
1.	Egerton University ICT Policy		✓	
2.	ICT Standards and Guidelines		✓	
3.	Public Procurement and Disposal Act			✓

The findings revealed that the technological changes at Egerton University are guided by the Egerton University ICT Policy (Egerton University, 2010) alongside that of the Government of Kenya, ICT Standards and Guidelines and the Public Procurement and Disposal Act (GoK, 2012). The ICT Standards and Guidelines basically provide detailed desirable specifications, standards and features of the ICT product(s). The PPDA on the other hand is an Act of Parliament that establishes procedures for efficient public procurement and for the disposal of unserviceable, obsolete or surplus stores, assets and equipment by public entities and to provide for other related matters (Laws of Kenya, 2005).

The Information and Communications Technology (ICT) Department is guided by the first two guidelines, while the Procurement Department is guided by PPDA. The University Library is guided by the two departments (who use their respective policies) in its acquisition of ICT equipment as its guiding policy. Library ICT Policy has not been approved.

Egerton University ICT Policy alongside the Government of Kenya ICT Standards and Guidelines guides the University Library and the Procurement Department through the provision of the specific policy statement 'ICT Procurement Policy', which states that procurement of ICT systems will comply with the following:

1. Establishment of detailed desirable specifications, standards and features of the product(s) as a means of technical evaluation.
2. Inclusion of a comprehensive maintenance policy for the equipment.

3. Negotiation of a replacement policy that should preferably include a buy-back arrangement.
4. Inclusion of arrangements for any necessary upgrade in the technology.
5. Complying with University ICT standards.
6. Use of a Certificate of Completion (successful installation and commissioning) as a prerequisite for final payment.

The study established that the library has no ICT policy or guidelines of its own. It was further established that lack of a policy was as a result of centralization of ICT procurement, policy and budget within the University under the Department of ICT. The Department hence coordinates all the ICT issues in the University including those touching on the Library department operations/activities. The ICT policy on procurement of ICT equipment applies to all University departments. In this regard, the University provides pooled ICT services with a view to reducing costs and increasing access. Odongo (2011) observes that issues of poor or lack of ICT policy greatly affect effective implementation of any business operation and service of which integration of ICTs that also touches on technological changes in the library functions is not an exception. Ineffective policies have been cited by Boateng, Agyemang and Dzandu (2014) as one of the major challenges that academic libraries face. Kamba (2011) also noted that ICT is not very well spread and utilized in African institutions of higher learning, mainly because of poor communication network, limited access to ICT hardware and software. This results from issues such as low internet connectivity, inadequate supply of electricity, inadequate number of PCs (Minishi-Majanja, 2007). The presence of an ICT policy would look into such challenges and provide a framework for streamlining them.

4.5.1Generation of Obsolete ICTs

The study considered the adequacy of the existing ICT policy in addressing the effect of technological changes. The study established, through observation, that various ICT equipment had been replaced or discarded due to obsolescence or breakdown (Appendix VI) and Table 4.11.

Table 4.11: Obsolete/Discarded ICTs from 1999-2013

S/No	ICT Equipment (Obsolete/broken down)	Quantity	Estimated Current Value (Kshs)
1.	Photocopiers	4	300,000.00
2.	Printers	12	485,000.00
3.	Typewriters	5	72,500.00
4.	Ups	24	288,000.00
5.	Computers (Pentium II)	24	1,680,000.00
6.	Plotter	1	100,000.00
7.	Server	1	600,000.00
	Total	**71**	**3,525,500.00**

The large amount of discarded equipment is due to technological changes. The obsolete ICT equipment are mainly those donated by the World Bank, most of which are still lying in the library's store because there is no library guiding policy for their disposal. Their estimated current value is Kshs.3,525,500.00. This implies that their replacement could be very costly for Libraries. The space occupied by these obsolete/discarded ICTs could also be utilized by the library to add more user services or technical operations so as to enhance its library management practices.

The application of PPDA in the University should be supported by departmental policies on matters such as disposal of assets. The library, for instance, should have its policy on disposal of its obsolete assets among them ICT equipment. Troll (2001) candidly explains that operating expenditures have increased significantly to meet automation and electronic resource needs and that current library budgets are insufficient to keep pace with the skyrocketing cost of materials, the increasing burden of capital expenditures for technologies that rapidly become obsolete, and the need for retraining or recruiting and retaining staff with the skills required to use and maintain the technologies.

4.5.2Disposal Methods for Obsolete ICT Equipment

As a further probe on the ICT policy, a question on the ICT disposal methods was posed to the respondents. The study established that there was no approved disposal method for obsolete ICT equipment in the library. The obsolete or discarded ICT equipment have been kept in the Library's store. This also applies to almost all other University departments. Few departments return their obsolete or discarded ICT equipment to Procurement Department who, with advice from the ICT Department, dispose such equipment through resale though some equipment are too old/written-off to be resold and have been left outside as waste in Procurement Department. Egerton University through the ICT Department has a policy on maintenance and repair services as well as electronic waste disposal but most departments, library among them, still prefer keeping all their obsolete and out-of-use electronic equipment in their stores. The ICT department should fully implement the ICT policy to include effective disposal methods with timelines for usage and disposal of ICT equipment such as negotiation of a replacement policy that should preferably include a buy-back arrangement with the suppliers. In concurrence,

Ogbomo, Obuh & Ibolo (2012) opine that large companies should purchase the used equipment back from the customers and ensure proper treatment and disposal of ICT waste by authorized processes.

4.5.3 Data Conversion/Transfer

The effect of technological changes results in data conversion/transfer or migration due to upgrading of technologies. To further enhance the findings on the ICT guiding policy for technological changes, the respondents were asked how data conversion/transfer or migration is managed. The study established that data conversion/transfer was carried out during the installation of the Integrated Library Management System (AMLIB). The manual catalogue entries of the library collection was converted into Microsoft Excel application and transferred into the Library Management System (AMLIB).

Other data in CD-ROM like CAB Abstracts and TEEAL CD-ROMs have been discarded due to the advent of new technologies of access to the same data. The database of indexed newspaper articles using CDISIS system was also discarded alongside the system. The CAB Abstracts are currently being accessed through the CABI online database system, while the TEEAL CD-ROMs are being accessed through the online TEEAL database system. CABI Online database for instance, unlike the previous CAB abstracts in CD-ROM format, has complete access to over 10 million abstracts on the CAB Direct platform with some containing onward links to full text articles (CABI, 2011).

Lawrence (2000) defines data conversion/transfer/migration as“the periodic transfer of digital materials from one hardware/software configuration to another, or from one

generation of computer technology to a subsequent generation."Migration is essentially translation and as with all translations, some information is lost, no matter how skillfully it is carried out. It is therefore prone to generating obvious and subtle errors. An obvious error occurs when the set of structural elements in the source format do not fully match the structural elements of the target format while a subtle error occurs if the data themselves do not convert properly. During conversion/ transfer of data, a comparable element may miss from the format specifications of the target format resulting in data loss (Lawrence, 2000).

Given how much information already exists in digital form and the brevity of its projected life span, institutions must prepare a guide for assessing the risks associated with the migration of data and for making sound preservation decisions on the basis of that assessment. This may result in the formulation of a policy relating to digital information conversion/transfer. The University Library together with the ICT Department, for instance, could apply the aspects of the available ICT policy which states that there should be inclusion for arrangements for any necessary upgrade in the technology. Technology upgrading always involves data conversion/transfer/migration among other configuration issues.

4.6 Technological Benefits and Challenges Associated with Use of ICTs in Library Operations and Services

The questions on benefits and challenges associated with use of ICTs were posed to library staff only. The findings on both benefits /positives changes and challenges associated with use of ICTs showed that benefits outweigh the challenges as shown in Tables 4.12 and 4.14.

4.6.1 Benefits/Positive Changes Accrued from Application of ICTs

The application of ICTs in libraries and information centres elicits a number of benefits or positive changes as exemplified in Table 4.12.

Table 4.12: Benefits of ICT Application

S/No.	Benefits	Respondents (n)	Percentage (%)
1.	Use of new technologies improved management of operations and provision of services	18	38
2.	Increased utilization of information resources	9	19
3.	Sharing of data through use of LAN	7	15
4.	Improved achievement of performance targets	5	10
5.	Enhanced staff capacity building	4	9
6.	Enhanced security of data	4	9
	Total	**47**	**100**

The study found various benefits of ICT application; (38%; n=18) of the respondents said the use of new technologies improved operations and provision of services, (19%; n=9) said there was increased utilization of information resources, (15%; n=7) reported sharing of data through use of LAN, (10%; n=5) said there was improved achievement of performance targets, (9%; n=4) reported enhanced staff capacity building, and (9%;n=4) saw the possibility of enhanced security of data.

The study shows that the greatest benefit of ICT application is in the improved library operations and provision of services followed by increase in the utilization of information

resources by the library clients. In agreement, Hayes & Becker (1974) explains that the new technologies imply the shift of staff from internal operations into readers' services and into information systems support.

Other benefits include enhanced staff capacity building that has been realized through continuous training, improved achievement of performance targets, especially in the cataloguing and classification section where staff are able to work on many information resources within a very short time. Communication with library clients has also been made easier through the use of Internet and other communication channels like telephones and short message services (SMS). A notable benefit is the enhanced security of data facilitated by use of passwords and installation of servers in the University. The server, for example, safeguards all University data including library's data where any lost data in any department can be recovered from the server.

4.6.2 Effects of Technological Changes on Users' Information Needs

The technological changes have impacted on users' information needs. The results from library staff showed a number of effects as presented in Table 4.13.

Table 4.13: Effects of Technological Changes on User Information Needs

Types of effects of technological changes on users	**Respondents (n)**	**%**
Users would require training on how to use the new ICTs	19	40
Achievement of user satisfaction	16	35
Users experience information overload	6	12
Diversified information gathering methods	4	9
Change in information seeking behavior	2	4
Total	**47**	**100**

Table 4.13shows that respondents gave the following effects: (40%, n=19) said recommend training on how to use the new ICTs for accessing information, (16%; n=35) said there was user satisfaction in accessing and using information,(12%; n=6) said users experienced information overload, (9%, n=4) said users develop diversified information gathering methods and (4%; n=2) users' information seeking behavior has changed.

Most respondents (40%; n=19) stated that the effect of technological changes calls for user training on how to use the new technologies. Training motivates the users to use the available technologies to access any needed information because knowledge would give them independence in information seeking. It was also established that there was user satisfaction through use of ICTs as users were able to accomplish their tasks and assignments.

The use of ICTs, especially the Internet and online databases, made users experience information overload. Information overload is being experienced due to high rate of information growth as observed by Behuria (2009) who explains that knowledge base doubled between 1980 and1988 and within fifteen years will be doubling every eleven hours and the amount of materials published is increasing at 2.5 percent each year. Other studies also indicate that the size of research library collections currently tend to double every 16 to 20 years. But with help of staff and the continuous training sessions on how to use electronic resources, users have been able to relatively manage information overload. With the advent of ICTs, users have also managed to have diversified information gathering methods. For instance, one search can be carried out using different search engines as well as different databases enabling users to have diverse information sources.

The study also noted that there was change in information seeking behavior by a number of users. Some users, for example, no longer use print information resources and have instead opted for electronic resources. Others, though, consider blending the two sources (print and electronic). Other findings also show that technological changes significantly alter the way library users find, absorb, even read information because of advanced metadata tagging, advanced search algorithms and networked books (ALA, 2011).

4.6.3 Challenges of Technology Application

The fourth objective of the study was to examine the technological challenges affecting library operations and services at Egerton University. The University Library has experienced various challenges as presented in Table 4.14.

Table 4.14: Challenges of Technology Application

S/N	Challenge	Respondents (n)	Percentage (%)
1.	Increased budget allocation (cost of training and retraining of staff for the purposes of upgrading their skills and knowledge, ever changing technology calling for continuous purchase of newer technologies)	14	30
2.	Inadequate library staff with required knowledge & skills as well as inadequate ICT knowledge by top management	14	30
3.	Management of obsolete or discarded electronic equipment.	12	26
4.	Loss of data/information during transferring of data from old formats to new formats	4	8
5.	Lack of planning of new releases or updates	3	6
	Total	**47**	**100**

The study revealed that the most serious challenge is increased budget allocation (30%; n=14)due to the cost of training and retraining of staff and the ever changing technologies that call for continuous purchase of newer technologies. Another equally serious challenge reported by (30%; n=14) of the respondents is inadequate staff with required knowledge and skills as well as inadequate ICT knowledge by top management. The management of obsolete or discarded electronic equipment was another challenge reported by (26%; n=12) of the respondents. Other challenges are loss of data/information during transfer of data from old formats to new formats as reported by (8%; n=4) of the respondents and planning of new releases or updates as reported by (6%; n= 3) of the respondents as presented in Table 4.14.

4.6.3.1 Obsolete/Discarded Equipment

The study revealed that management of obsolete or discarded electronic equipment was the greatest challenge since there was no library policy guiding their disposal. Various obsolete or discarded electronic equipment since the inception of the library, are still kept in the library store (see Appendix VI).

4.6.3.2 Inadequate Staff

Egerton University Library also faces the challenge of inadequate staff with required knowledge and skills. The ICTs resources are currently overseen by a Senior Library Assistant who has a diploma in IT. There is need for a Systems Librarian who has higher IT skills. Other staff have basic computer knowledge and skills that enable them to run the library operations and services.

4.6.3.3 Training and Retraining of Staff

The Library also experiences the challenge of meeting the cost of training and retraining of staff for the purposes of upgrading their skills and knowledge. A small number of staff underwent a Training of Trainers (ToT) in the use and management of AMLIB, the integrated library management system. These few trained staff in turn trained the rest of the staff. This was to avert the high cost of training all staff.

4.6.3.4 Budget for New Equipment

The ever changing technology calls for continuous purchase of newer technologies to meet the current world standards for purposes of collaboration and information sharing and this is a challenge to libraries, Egerton University Library included. This challenge in turn calls for an increase in budget allocation which is also a challenge to most libraries who rely on their parent organizations as they are not income generating.

4.6.3.5 Inadequate ICT Knowledge by Top Management

Inadequate ICT knowledge by top management is also a challenge to libraries because it affects budget allocation. Managers who do not have adequate ICT knowledge tend to find no adequate reason for allocating the library adequate budget. This makes libraries to lag behind in acquisition and maintenance of ICT equipment and services. The AMLIB library management system, for instance, requires annual support and maintenance fee that should always be included in the University Library budget. This has not always been the case and has resulted in yet another challenge where the library has no adequate plan for new releases or updates. The last AMLIB update came without the Library contributing any of their suggestions of the changes to be included as required.

4.6.3.6 Loss of Data/Information

The challenge of loss of data/information during transferring of data from old formats to new formats was experienced by Egerton University Library, especially through the newspaper index articles. The start of a new database of indexed newspaper articles using the library management software, AMLIB, has seen the continuation of the service. The CAB Abstracts and the TEEAL CD-ROMS were not lost per se as they are accessible through online databases of CABI Abstracts with full texts, an improved access method where many users can have access at the same time from different locations.

In summary, there are numerous challenges that are experienced by academic libraries. Boateng, Agyemang, and Dzandu (2014) recognize this position with the assertion that the low-pace status of sub Saharan African universities in library automation is attributed to among other factors; prolonged adverse economic conditions, budgetary constraints, high cost of ICT facilities, inadequate ICT skills, inefficient electricity/telecommunication infrastructure, and lack of ICT strategies/policies.

4.7 Possible Solutions to Challenges of Technology Application

The fifth objective of the study was to recommend a framework to guide adoption of new information and communication technologies in the management of library operations and services. This objective aims to give possible solutions to the challenges experienced by the University library. The respondents were asked to suggest possible solutions to the challenges of technology application and they made the following proposals for addressing identified challenges.

4.7.1 Emphasis on Change Management

Most respondents, both from the ICT department and the Library department, said that the University Library should emphasize change management with regard to processes and procedures that ensure prompt, efficient and controlled handling of changes. Change management will also ensure that challenges such as staff capacities, loss of data/information and planning of new releases or updates should be well taken care of (Greiner, 2007). According to Doherty (2009), change management is the gatekeeper of a controlled environment and that the underlying goal of Change Management is to protect the business, because any time the controlled environment is touched, the business is put at risk. It is not sufficient to just have a good change management process; compliance with agreed-upon policies and procedures is also required to make sure things are done accordingly, and a full audit trail of everything that has been done is easily accessible.

ITIL framework which has change management as one of its interdependent IT Service Management (ITSM) processes helps any business organization, libraries included, with program planning and implementation. University libraries can therefore find ITIL framework helpful in the management of effects of technological changes on their operations and services. Doherty (2009) explains that ITIL framework recognizes the potential impact of any change which needs assessment and gives an outline of ITIL's seven Rs of change management, namely:

1. Who RAISED it?
2. What is the REASON?
3. What is the RETURN required?
4. What are the RISKS?

5. What RESOURCES are needed?
6. Who is RESPONSIBLE for the various activities?
7. What is the RELATIONSHIP between the change and other changes?

These seven(7) Rs can comprehensively provide a starting point for management of effects of technological changes in any university library where demand for application of new technologies to keep pace with world trends in information management standards are common.

4.7.2 Need for ICT Qualified Staff

The respondents views on the challenge of inadequate knowledge and skills requires urgent staff training or hiring of qualified staff. There is also need for continuous training of staff through workshops and seminars to update them on new technological changes or as refresher courses. Based on Doherty (2009), the ITIL framework with three of its Seven Rs, 'Who RAISED it?', 'What RESOURCES are needed?' and 'Who is RESPONSIBLE for the various activities?' suggests an element of staff qualifications. It is only IT savvy staff who can authoritatively raise issues on IT related changes, qualified human resources be required to manage any IT related change and that implementation of any IT change will be the responsibility of mainly IT qualified staff. The qualifications of any human resources give them the authority to raise any issue, recommend any needed resource and the responsibility to carry out any activity. It is therefore paramount for information professionals to keep abreast of the changing technologies, for them to manage the different types of information resources and cope with the ever growing information needs of the users in this electronic age. Information professionals must be

involved in training and retraining. They must retool in order for them to be able to successfully manage electronic library services (Okorie and Ekere, 2008).

4.7.3 Importance of ICT Application in Academic Libraries

The University management should be sensitized on the importance of ICT application in the University Library. This will enable them find reasons to allocate adequate funds to the library that will in turn facilitate effective change management with regard to technological changes. All library staff should also be sensitized on the importance of ICT application for better service delivery and management of library operations. The need to reduce technophobia challenges experienced by some of the library staff, call for training and re-tooling of librarians in the necessary ICT skills as a necessity in facilitating library services to be impacted on academic libraries (Okiy, 2010).

Covi and Cragin, (2004) as cited by Okiy (2010) observe that ICT application is a necessity because students and lecturers in tertiary institutions have increasingly demanded and preferred access to electronic sources from their libraries. Internet access is one of the greatest technological advancements being experienced currently. It revolves around advancements in ICT which has gone a long way to influence the mode of information gathering, storage, retrieval and dissemination. Internet access is used for electronic mailing services, electronic on-line chats and group activities (Akintunde, 2006). It has resulted in increased access to timely, accurate, relevant and current information in most ICT compliant libraries all over the world (Okiy, 2010).

It is equally important for academic libraries to apply ICTs in their operations and services. This is because academic institutions play major roles in the manpower

development of any nation since they provide all levels of manpower needed for social, economic and political advancement of a nation. This is done through their programmes of teaching, learning, research and community services. The central place of academic libraries is called into play because it is the duty of these libraries to provide the necessary information to the lecturers and students to achieve their teaching, learning and research needs in the easiest, fastest and most comprehensive way. This central place of the library in academics has resulted, over the years, in meeting the needs of their clientele. The current trend in many libraries is to deploy ICT facilities to render services to their patrons thereby providing speedily and on time for their use (Okiy, 2010).

Teaching and research in academic institutions now is facilitated by quality ICT infrastructure. Information growth has been immense and the concept of information explosion is no longer new to information professionals (Omekwu, 2006). In this regard, an information professional needs to work with growth with the aid of ICTs.

Akintunde (2006) is of the opinion that ICT and globalization are irreversible trends that have great benefits to academic activities. Consequently, all efforts must be made to embrace information technology for the purpose of enabling students and faculty staff to be a partof the global information community. Apart from tapping from the global information supply, academic libraries should contribute local content to the pool of global information through the digitization of local content from sources such as theses/dissertations, rare books, newspapers and special manuscripts. Most libraries in Kenya, Egerton University Library included, are currently digitizing their local content with the aim of developing institutional repositories for inclusion in the pool of global information.

4.7.4 Adoption of New Technologies

Technological changes should be fully embraced as they bring with them more benefits than challenges. New technologies improve service delivery and reduce costs of operation. Adoption of new technologies is necessary as it would be in keeping with current world trend when no library can survive without.

The academic environment is in a state of transition in terms of resources and users; many information sources were once available only in print but are now available in print, CD-ROM, and online forms (Abels et al., 1996). This transition has apparently been necessitated by the emergence of the modern ICT and its exceptional impacts on the provision of library services and management of library operations. The use of ICTs (computers, telecommunication, reprography, etc.) has a special role in the modernization of library management practices. Hence, with ICT, such things as electronic cataloguing, electronic online public access catalogues (OPACs), electronic acquisition and serials control, electronic circulation functions, electronic distribution of commercial publications, electronic availability of raw data, multimedia information delivery systems, digitized collections and online textbooks are all now practicable with a higher degree of user satisfaction (Ajayi, 2002; Abels et al., 1996).

CD-ROM is a medium that facilitates provision of information to researchers and scholars. The availability of e-mail and internet facilities in academic libraries offers a wide range of access to timely information globally without geographical barrier. Due to this, academic institutions have begun to develop information technology management system strategies to deal with the need to respond to rapid changes in technology which affect content of nearly every course (Gallimore, 1996). The solution to this problem lies

in effective adoption of ICT in academic libraries. Through ICT, library users can have access to a variety of information available on computer networks and online services across the globe. Due to this, Omoniwa (2001) has hypothesized that in the twenty-first century, globalization of information and the adoption of information technology will be the characteristic of great libraries in this information age.

4.8 Chapter Summary

The chapter presented the findings based on the study objectives on the effect of technological changes on library operations and services. The chapter presents the data, analysis and interpretation of the findings. The study findings indicate that the effect of technological changes on library operations and services has both benefits and challenges. The benefits are enormous and include improved management of operations and provision of services through use of new technologies for excellent services and greater level of efficiency in operations and productivity, increased utilization of information resources, quick and convenient information exchanges/sharing of data through use of LAN and other forms of networks, enhanced staff capacity building, digitization of local content, access to archived information worldwide and possibility of enhanced security of data through use of passwords and off-site digital back-ups of information resources.

The challenges include inadequate staff with required knowledge and skills, increased budget allocation, cost of training and retraining of staff for the purposes of upgrading their skills and knowledge, fast changing technology calling for continuous purchase of newer technologies resulting in challenges in the management of obsolete or discarded electronic equipment, potential loss of data/information during transfer of data from old

formats to new formats, inadequate ICT knowledge by top management and lack of planning of new releases or updates.

The possible solutions to these challenges include giving emphasis to change management, hiring qualified ICT staff, sensitizing all staff including top management on the importance of ICT application and embracing new technologies so as to be in tandem with world trends with respect to information management practices.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter presents a summary of the study, conclusion and recommendations based on main findings of the study and in accordance with the aim, objectives, research questions and assumptions of the study.

5.2 Summary of Findings

The summary of the findings is based on the objectives of the study on the effect of technological changes on library operations and services and are as follows:

5.2.1 History and Drivers of Technology Application at the University Library

The first objective set to trace the history and drivers of technology application at Egerton University Library. The study established that Egerton University Library has, for close to 20 years, been actively using ICTs (Table 4.3). In 1999, the University Library received a donation of various ICT equipment from the World Bank and before then there were other ICT equipment like type writers, duplicating machines and landline telephone devices. Since 1999, the Library has continued to use ICT equipment and has continually phased out obsolete equipment due. The ICT equipment donated by the World Bank have since been replaced. Currently, the library is making great efforts to run its services and operations using state of the art ICT equipment and software in order to efficiently meet user needs.

5.2.2 Implications of Technological Changes on Library Operations and Services

The second objective of the study was to establish implications of the technological changes on library operations, services and staff skills and knowledge. The findings indicated positive and negative implications. The positive implications outweighed the negative implications and they include; greater level of efficiency in operations and productivity as well as service delivery, cost reduction in acquisition of information resources through consortia and online acquisitions, increased access to wider range of resources, remote access, regular updates on topics of interest, easy and faster transfer of data between machines, enhancement of educational development, digitization of local content, conservation of library space, quick and convenient information exchanges, access to experienced and expert individuals in many fields, enhancement of team work across geographical distance and access to archived information worldwide.

The negative implications include; increase in fiscal budgets to meet costs of IT equipment and their installation and maintenance, staff/user training and retraining, hiring of new staff/ consultants/short-term project staff needed to implement the new technologies, problems of data conversion/ transfer and security leading to loss of data or information, poor and inadequate ICT Infrastructure and facilities, absence of permanent physical library collective, exploitative local computer/software market and unsatisfactory after sales maintenance and support service, ignorance of decision/policy makers of the power of information network on the economic and industrial development of a nation as well as generation of e-waste.

The changes on ICT application at the University Library have seen a progressive improvement of library services and operations. Automation of the services and

operations actively started when the World Bank donated the ICT equipment in 1999 where the CDISIS software was used to provide CD-ROM services and to run operations such as indexing of newspapers. The library is currently running an updated software, the Integrated Library Management System known as AMLIB which has been used to automate most of its operations and services. The automated operations include Cataloguing/Classification, Acquisition, Reports and Statistics, whilethe automated services include Circulation and OPAC services. Other automated services that are not accessed through AMLIB include electronic book and journal access.

To further complement the study findings on the second objective, ICT competencies of staff indicate that most of them have basic IT knowledge that enable them to run operations and services of the library. On the other hand, very few staff have advanced IT knowledge for effective managerial decision making with regard to ICT related issues in the University Library. This therefore calls for an urgent need to hire qualified IT staff to take, for example, the position of Systems Librarian which is currently held by a Senior Library Assistant who has just a diploma in IT.

5.2.3 ICT Policy

The third objective was to assess the existing ICT policy in addressing the effects of technological changes. The guiding ICT policy for the technological changes at Egerton University Library is based on the Egerton University ICT Policy under the leadership of the ICT Department. The ICT Department is also guided by the Government of Kenya ICT Standards and Guidelines. For procurement and disposal of ICT equipment, Public Procurement and Disposal Act (PPDA) guide the Procurement Department. The

University Library is therefore guided by the two departments in its acquisition and disposal of ICT equipment as it has no guiding policy of its own.

5.2.4 Technological Benefits and Challenges Affecting Library Operations and Services

The fourth objective was to examine the technological benefits and challenges associated with the introduction of ICTs affecting library operations and services at Egerton University Library. Egerton University Library has achieved benefits and also experienced technological challenges in the management of its operations and services. The benefits outweigh the challenges and are as follows:

1. Greater level of efficiency in operations and productivity resulting in improved information management;
2. Increased utilization of information resources
3. Enhanced security of data
4. Achievement of excellent services leading to achievement of performance targets
5. Cost reduction in acquisition of information resources through consortia and online acquisitions
6. Increased access to wider range of resources, remote access, regular updates on topics of interest
7. Enhanced educational development and staff capacity building
8. Digitization of local content;
9. Conservation of library space.
10. Quick and convenient information exchanges;
11. Access to experienced and expert individuals in many fields;

12. Enhancement of team work across geographical distance;
13. Access to archived information worldwide;
14. Transfer of data between machines

The challenges include:

1. Inadequate staff with required knowledge and skills,
2. Cost of training and retraining of staff,
3. The ever changing technologies call for continuous purchase of newer technologies leading to increase in library budget,
4. Inadequate ICT knowledge by top management,
5. Failure to plan for new releases or updates,
6. Potential loss of data/information during transfer of data from old formats to new formats
7. Challenges related to management of obsolete or discarded electronic equipment.

5.2.5 Proposed Adoption of New ICTs in the Management of Library Operations and Services

The fifth objective was to recommend a framework to guide adoption of new information and communication technologies in the management of library operations and services. Egerton University Library can adopt the following applications for its operations and services;

1. There is need for establishment of a change management committee to ensure prompt, efficient and controlled handling of change in the library. The change management committee will also ensure that challenges such as staff capacities,

loss of data/information and planning of new releases or updates are well taken care of. The ITIL framework is expected to guide the committee in making decisions and implementing them.

2. The University Library should hire qualified ICT staff to offer efficient and effective services using ICT application. There is also need to continuously train and retrain staff through workshops and seminars to update them on technological changes.
3. The University management should continuously be sensitized on ICT applications in the University Library including trends in technological changes. This will ensure that top management support in terms of adequate budget allocation to facilitate effective change management with regard to technological changes. All other library staff should also be sensitized on the importance of ICT application for better service delivery and management of library operations. This will reduce technophobia challenges experienced by some of the staff.
4. The University Library should formulate and adopt procedures for adoption of new technologies taking into consideration challenges and benefits/opportunities. New technologies improve service delivery and cut down the cost of operations.

5.3 Conclusion

The study established that technological changes are unavoidable and therefore should be embraced taking into consideration the benefits/opportunities associated with technology application far outweigh the challenges experienced. The study proposed ITIL framework for application in the adoption of any new technology as it provides a consistent process for changing technologies. ITIL framework has aspects such as financial management

for determining the cost of implementing a change, capacity management, software asset management, lifecycle configuration management and license change management which any organization including libraries and information centres can adopt in their information management practices.

This framework provides strategies for change management. The proposed framework should include policy guidelines where in the occasion that an issue may not be adequately addressed at the problem management level, an institutional policy should be available for the purpose of assessing challenges and proposing guidelines and/or solutions. The policy would facilitate change with regard to incident management, problem management, change management, release management and configuration management, service delivery management, availability management, capacity management, IT service continuity management, service level management, financial management as well as periodic review of policies.

5.4 Recommendations

The study recommends that all the benefits/positive effects should be upheld by the University library with support from the University Management. The negative effects of technological changes on the library operations and services on the other hand, can be overcome using the following recommendations.

5.4.1 Library ICT Policy

Egerton University Library should formulate an appropriate ICT policy odeal with changes in ICT application and their related effects such as financial management, cost of implementing a change, staff capacity management, software asset management, lifecycle

configuration management and license change management. The proposed policy should ensure smooth management of technological changes.

5.4.2 ICT Budget

It is important that the library should have an ICT budget with adequate funds to facilitate efficient and effective automation and change in library operations and service provision. Technological innovations and their implementation should conform to the ever changing trends and standards. With the availability of an ICT budget, the licensing and maintenance of the library system and regular training of the staff on new emerging technologies will be carried out on time.

5.4.3 Staff Training

The University Library should ensure that there is regular training of staff on emerging technologies. Trainings would ensure that staff have the confidence to use new technologies thereby eradicating any signs of technophobia among the staff. Refresher courses on the existing ICTs including the library management system should be carried out on given schedules, especially targeting periods of new releases or updates of the library management system.

5.4.4 Qualified ICT Staff

The presence of a qualified ICT staff, the level of a Systems Librarian, is very imperative. Such a staff would oversee all ICT related issues of the library on day-to-day basis hence ensuring that there is no time lapse in sorting out any ICT technicality that occurs. The library will also avoid over reliance on ICT Department or Vendor support in the

maintenance of its ICT facilities. The University Library can train one of its own staff or hire a systems librarian with some background knowledge in librarianship.

5.4.5 Adoption of Theoretical Framework

The University Library should adopt a suitable theoretical framework to guide the management of technological changes affecting library operations and services. Consequently, the study proposed ITIL theoretical framework with modifications as recommended under the last paragraph of section 5.3for adoption by the University to enable the Library have a smooth running of its operations and services.

5.5 Areas for Further Research

Technological changes in the world today are due to continuous innovations. It was noted in the literature review that there is inadequate data and limited research on ICTs. This study has established that technological changes have effects on library operations and services and that frameworks for managing these changes are not adequate. The study therefore suggests the following areas for further research:

1. To allow for generalization of the findings on effect of technological changes on library operations and services, there is need for a comparative study in other libraries in academic institutions in Kenya.
2. This study has established that there are many emerging technologies such as internet, email, social media, Integrated Library Management Systems (ILMS), library security systems, telephony and short message services (SMS) that can be adopted by libraries and information centres in running their operations and

services. It is therefore essential to carry out an evaluation of these emerging technologies for application in library operations and services.

3. Application of ICTs in the library is inevitable due to the current world trends. Consequently, further studies on the impact of these technologies on library operations and services are necessary.
4. There is need for further study on the effectiveness of current Library and Information Studies (LIS) curriculum in training personnel to manage ICT resources in the library. This came as a realization in the study that though there are library staff in charge of ICT, they are unable to execute their mandate effectively. Inclusion of a detailed IT-related course in the curriculum will enhance personnel performance in management of technological changes.
5. The users also will require adequate skills in an IT environment. In view of this, a research in user training on computerized library services for the users to derive maximum benefits in academic libraries needs to be carried out.
6. Usage of ICTs (resources and equipment) in the library can be assessed for cost-effectiveness. This can be carried out through a study on evaluation of ICT usage in academic libraries.

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APPENDIX I

INTERVIEW SCHEDULE FOR EGERTON UNIVERSITY LIBRARY STAFF

SECTION A: Respondent's details

1. Designation

a) Librarian [ ]

b) Assistant Librarian [ ]

c) Senior Library Assistant [ ]

d) Library Assistant [ ]

e) Other staff [ ]

2. Work Experience (in years)

a) 0-10 [ ]

b) 10 -20 [ ]

c) 20 and above [ ]

d) Other ……

3. Work station/section

a) Circulation [ ]

b) Special Collection [ ]

c) Acquisition [ ]

d) Technical Section [ ]

e) Other (specify):……

4. Computer competency level

a) Basic [ ]

b) Average [ ]

c) Advanced [ ]

SECTION B: Effect of technological changes on library information management practices

1. For how long has the University Library utilized information technology equipment?
   …….(in years)
2. Which operations/services(s) were among the first ones to be automated?.....
   .....
   .....
   .....
   .....
3. What information management systems (technologies) have been in place since the University Library started using ICTs?
   ……
   ……
   ……
   ……
4. What ICT equipment have been in use since the inception of the University Library?
   ……
   ……
   ……
   ……
5. What are the implications of technological changes on the library operations and services?
   ……
   ……
   ……
6. What obsolete ICTs are available in the University Library?
   ……
   ……
   ……
   ……
   ……
7. How does the University Library dispose of these obsolete ICT equipment?
   ……
   ……
   ……
   ……
   ……

8. When the University Library acquired the library management system, was the existing data compatible with the newly acquired systems? If not, how was it converted?

   ……
   ……
   ……
   ……
   ……

9. What benefits has the library accrued from the application of ICTs in its operations and services?

   ……
   ……
   ……
   ……

10. What challenges has the University Library experienced in the application of technology in library management practices?

    ……
    ……
    ……
    ……
    ……

11. What effects do technological changes have on users' information needs?

    ……
    ……
    ……
    ……
    ……

12. From your experience of using the various ICTs in the library, what suggestions would you recommend to the library with regard to challenges of effect of technological changes in information management practices?

    ……
    ……
    ……
    ……
    ……

APPENDIX II

INTERVIEW GUIDE FOR THE DEPARTMENT OF ICT

1. Designation
   a) ICT Manager
   b) Assistant IC T Manager
   c) Senior Technician
   d) Technician
   e) Other ……..
2. Work Experience (in years)
   a) 0-10 [ ]
   b) 10 -20 [ ]
   c) 20 and above [ ]
   d) Other ……
3. What ICT equipment have been in use since the inception of the University Library?
   .....
   .....
   .....
   .....
   .....
4. What are the motivating factors for adoption of new technologies at Egerton University?
   ……
   ……
   ……
   ……
   ……
   ……....
5. What ICT policy is in place at Egerton University that guides technological changes?……
   ……
   ……
   ……
   ……
6. How adequate is the policy in guiding technological changes in the university?……
   ……
   ……
   ……

7. What are the implications of technological changes in the university?
   ……
   ……
   ……
   ……
   ……
8. What are the changes in the University operations and services resulting from technological changes?
   ……
   ……
   ……
   ……
   ……
9. What challenges are associated with technological changes?
   ……
   ……
   ……
   ……
   ……
10. How best can the university manage the challenges of technological changes?
    ……
    ……
    ……
    ……
    ……
11. How does the university manage the obsolete or discarded electronic equipment?
    ……
    ……
    ……
    ……
    ……
12. Suggest any recommendations that you think Egerton University Library should adopt in the management of technological changes……
    ……
    ……
    ……
    ……

APPENDIX III

INTERVIEW GUIDE FOR THE DEPARTMENT OF

PURCHASING/PROCUREMENT

1. Designation
   a) Senior Procurement Officer [ ]
   b) Assistant Procurement Officer [ ]
   c) Other ……..
2. Work Experience (in years)
   a) 0-10 [ ]
   b) 10 -20 [ ]
   c) 20 and above [ ]
   d) Other ……
3. What are the motivating factors for technology application in Egerton University?……
   ……
   ……
4. What challenges do you experience in managing technology application in the University?……
   ……
   ……
5. What policy or guidelines govern the purchase of electronic equipment in Egerton University?……
   ……
   ……
6. What are the implications of technological changes?
   ……
   ……
   ……
7. How do you monitor or control the usage of ICTs in the University?
   ……
   ……
8. What measures are in place for the disposal of discarded or obsolete electronic equipment?……
   ……
   ……

APPENDIX IV

OBSERVATION CHECKLIST

ITEM	NEW ELECTRONIC EQUIPMENT (CURRENTLY IN USE) 2013	OBSOLETE/DISCARDED ELECTRONIC EQUIPMENT (1999-2013)
	Quantity (No.)	Quantity (No.)
Computers		
Printers		
Photocopiers		
Typewriters		
Scanners		
Projectors		
Servers		
Plotters		
Worldspace Satellite Radio		
Fax Machine		
Telephone headsets		
Television set		
Others		

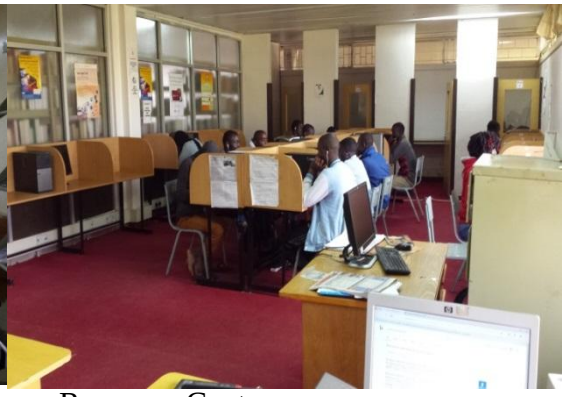
APPENDIX V

NEW ELECTRONIC EQUIPMENT (CURRENTLY IN USE) AT EGERTON UNIVERSITY LIBRARY

Circulation Section

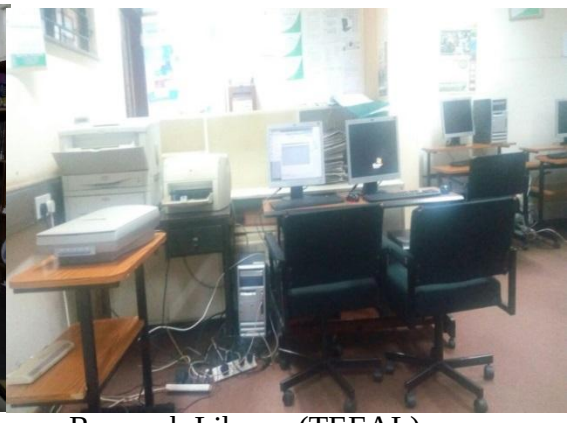
Reprographics Section

Reference Section



Resource Centre

Technical Division



Research Library (TEEAL)

APPENDIX VI

OBSOLETE/DISCARDED (MAINLY DUE TO TECHNOLOGICAL CHANGES) ELECTRONIC EQUIPMENT AT EGERTON UNIVERSITY LIBRARY STORE

Plotter

Pentium II CPUs

Printers and Keyboards


Monitors, Worldspace Satellite Radio, Fax Machine, telephone headsets, CPU, HP Printer etc


Projector


Typewriter Server