SUSTAINABLE PROVISION OF DIGITAL INFORMATION SYSTEMS AND SERVICES IN ACADEMIC LIBRARIES: A CASE OF THE UNIVERSITY OF NAIROBI LIBRARY SYSTEM

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DECLARATION

I hereby declare that this project is my original work and it has never been submitted to any examination body in Kenya.

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C54/79793/2015

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

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My acknowledgement goes to first and foremost, Almighty God, to whom I owe my life, strength and health. I would also like to express my sincere gratitude to my supervisors Dr. Kingori and Dr. Njiraine for their continued support and guidance.

DEDICATION

I dedicate this work to my daughters Raheel and Juwairiyah, who have always been a source of inspiration to me.

LIST OF ABBREVIATIONS AND ACROYNMS

CAE	College of Architecture and Engineering
CAVS	College of Agriculture and Veterinary sciences
CBPS	College of Biological and Physical Sciences
CD-ROM	Compact Disk-Read Only Memory
CEES	College of Education and External studies
CHS	College of Health Science
CHSS	College of Humanities and Social Sciences
DIR	Digital Information Resources
DIS	Digital Information Services
DRS	Digital Reference Services
GHG	Green House Gas
HEI	Higher Education Institutions
ICT	Information Communication & Technology
IT	Information Technology
OPAC	Online Public Access Catalog
RSS	Really Simple Syndication
SPSS	Statistical Package for Social Sciences
USIU	United States International University
SDI	Selective Dissemination of Information
CAS	Current Awareness Services
CO_2	Carbon dioxide

ABSTRACT

Library services have been a crucial part of libraries since time immemorial. Their significance is progressively becoming a yardstick of the library's involvement to in the development and transformation of the society, community and the nation at large. Developments such as Internet, digital library, electronic journals, and online databases have changed the way libraries function today. The introduction of digital information has added a new dimension in provision of digital information services within academic libraries. The purpose of the study was to investigate sustainable provision of digital information services at the University of Nairobi library system. The study was guided by the following objectives: to identify the digital information services that are offered by the library; to find out whether the digital information services are sustainable; to identify the challenges faced by the libraries in enhancing sustainable provision of digital information services; to find solutions to the challenges faced in provision of sustainable digital information services. The study used descriptive research design. The sampling technique applied to arrive at the target population was census sampling method and purposive sampling technique. Data for the research were collected by use questionnaires and document review. The findings showed that the respondents were aware of the existence of digital information resources and services. The study further established that a majority of respondents were not well versed with matters regarding environmental sustainability. The study further established that both the library staff irrespective of their positions and MLIS students got some training regarding digital information services. The following recommendations were made: in order to ensure that the library staff and post graduate students are prepared to address the issue of social and environmental sustainability, the library management and MLIS department should embark on creating awareness about these issues. Libraries subscribe to information resources that are rarely used by the clientele. The library should formulate strategies to enhance social sustainability of digital information resources and services. The study will be useful to librarians and university administration in policy formulation.

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CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter introduced the title of the study where background information to the study was clearly provided. In addition, the study discussed digital library, digital information resources, digital information services, statement of the research problem and the aim of the study stated. The objectives of the study and research questions were clearly highlighted. Further to that, study assumptions, scope, limitations and significance of the study were discussed.

1.1 Background information

Library services have been a crucial part of libraries since time immemorial. Their significance is progressively becoming a yardstick of the library's involvement in the development and transformation of the society, community and the nation at large. One of the rudimentary roles of libraries and information centers is to readily avail information resources to its users. In this era of information, ICT is playing a fundamental role in enhancing dissemination of information to users in a networked environment. New developments in Internet, digital library, electronic journals, and online databases have changed the way libraries function today (Choughule, 2007:160). The introduction of digital information has added a new dimension in provision of digital information services within academic libraries. The coming together of computer, telecommunication, information and multimedia has facilitated the development of digital

information services (Rajashekhar & Shilpa, 2013: 2). Digital information services offer a variety of services to support members of the library by making the collection more widely available (Choughule, 2007: 160).

Digital information services are increasingly getting amalgamated with systems such as student information services, electronic learning systems, library automation systems as well as financial management systems. Library patrons nowadays require flawless access to a variety of digital information services from the comfort of their desktop computers, laptops, mobile phones, etc. Nowadays, library users fancy using systems that identify them, acknowledge their rights and privileges, as well as providing customized information services (Tonta, 2004: 263).

A large percentage of digital services are accessible via digital library. But first we need to know what digital library is before exploring digital information services. According to Chandra and Dominic (2015: 45), there is much confusion surrounding the phrase digital library. Information scientists have used diverse terms over the years to represent this concept - virtual library, electronic library, library without walls, etc. The term digital library is the most recent and generally acknowledged term and is virtually used everywhere be it in classes/lectures, literatures, conferences, seminars, etc.

Trivedi (2010: 1) defines digital library as:

> "… a library in which collections are stored in digital formats (as opposed to print, microform, or other media) and accessible through computers. The content may be stored locally, or accessed remotely".

The Digital Library Federation (n.d) defines digital library as:

> "An organization that provides the resources, including the specialized staff, to select, structure, offer intellectual access to, interprets, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily available for use by a defined community or set of communities".

Choi (2006: 130) states that the main reason as to why digital library projects were undertaken was in order to create, share, make use as well as preserve information so as to support user's information needs in a digitized environment. In other words, digital library is all about information services in a networked environment.

University of Nairobi is one of the largest universities in East Africa with a student population of over 60,000. The university offers over 4,000 academic programs in full time, part time, distance learning, e-learning modules in its six colleges and several campuses spread all over the major cities and towns in Kenya. These six colleges are: College of Architecture and Engineering (CAE), College of Agriculture and Veterinary sciences (CAVS), College of Biological and Physical Sciences (CBPS), College of Education and External studies (CEES), College of Health Science (CHS), College of Humanities and Social Sciences (CHSS). The University of Nairobi is also ranked position one among all public and private universities in Kenya as per July, 2015 web metric analysis (University of Nairobi, 2016).

The University of Nairobi Library system consists of twelve libraries which are clustered into six college libraries plus a central library which is known as Jomo Kenyatta Memorial Library (JKML). There are also two libraries in Kisumu and Mombasa campuses. JKML houses library administration's offices, central services units such as acquisitions, cataloguing, the union catalogues, the bindery and the archives. The library system has a stock of over 750,000 volumes which includes books, periodicals and electronic materials. The collection is divided into a general lending materials and specialized research collections. The library system uses Library of Congress Classification Scheme to catalog its resources (The University of Nairobi, 2016).

1.1.1 Digital information resources

Digital information resources are those resources which are either born digital or digitized and can be accessed from an information center's database, library portal as well as from the world-wide-web. These resources include electronic journal, electronic books, e-newspaper, e-magazine, thesis, website resources, reports, and are regarded to be important by users, researchers, information professionals as well as the library management (Khan & Raju, 2014: 136). Urhiewhu & Emojorho (2015:83) state that digital information resources (DIRs) denotes information resources that were initially in print form, but were digitized and can be accessed through computers and other Information Communication Technology tools.

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Urhiewhu & Emojorho (2015:83) further noted that digital information resources (DIRs) also includes resources such as published journals, books, encyclopedias, cartographic materials, magazines, etc. Animations, pictures and movies are also considered part of digital information resources.

Digitized materials refer to those materials that have been converted from other format into digital format. Routhier (2014:2) defines digitization as the process of converting analog resources such as books, cartographic materials, printed journals, etc., into an electronic state whereby users will be able to access them via computers and other ICT tools.

1.1.2 Digital information services

A considerable number of digital information services are presented to users by library and information centers today (Tonta, 2004:263). Library services offered by digital libraries differ from institution to institution. These services can be categorized into two categories: traditional services and services that are distinctive to the networked environment (Chu & Krichel, 2003:2). Digital information services in the libraries include all electronic information resources as well as computerized and networked online resources accessed through libraries (Choughule, 2007: 161). These services include: full text journals, online public access catalogues, current awareness services, E-table of content service, electronic document delivery, remote information services, newsletters, reports, etc.

1.2 Statement of the problem

Libraries are service institutions whose main preoccupation is to fulfill the information needs and desires of the users. According to Mayega (2008), libraries have always acted as the bridge between information users and information producers from time immemorial. The development in the information technology (IT) sector and its utilization in libraries and information centers have transformed ways in which knowledge is collected, processed, stored, managed and disseminated. Advancements in field of information technology have altered ways in which the user community ends up consuming information. The adoption of new technologies in libraries and information centers has enabled librarians and information professionals to perform information processes like cataloguing and acquisition of information resources more effectively and efficiently. The adoption of new technology has decreased the time and energy spent by clients looking for information (Okorie, 2010). Furthermore, changes in lifestyle, work practices, and mobility have greatly impacted the use of libraries, with more clients wanting to access information services independently, timely, conveniently and far from the physical location (Buchanan et al, 2012).

In the modern digital environment, libraries and information centers use information communication technology to provide and support access to collections that are in electronic form. Additionally, the technologies provide custom-made set of information resources and services devised to sustain the patron's information requirements (Choi, 2006). This has been brought about by the fact that the knowledge based society is experiencing massive information explosion that has increased publications of digital

books and other information resources. Complete integration of digital technology into the library operations and processes has generated efficient utilization and dissemination of information to the users (Gbadamosi, 2012). These changes have forced the libraries especially academic ones to come up with digital information services so as to cater for the needs of its diverse user community. Nevertheless, there is apprehension about sustainability of digital information services in academic libraries.

The University of Nairobi library has highly advanced digital information systems and services which poses exceptional challenges largely due to varied prerequisites involving them. Technical knowledge is still a serious problem within the library. Library staff lacks skills which are appropriate in provision of digital information services. This can be attributed to the fact that majority of the staff who operate within the library are para professionals. In addition, these systems consume a substantial amount of energy thus leading to usage of millions of shillings on electricity bill as well as increasing the library's carbon footprint. The above challenges impede the sustainability and provision of digital information services in academic libraries. It is in this regard that the study will seek to investigate the sustainability of digital information services at the University of Nairobi.

1.4 Aim of the study

The aim of the study was to investigate the strategies that academic libraries are using in sustaining provision of digital information services with particular reference to the University of Nairobi.

1.5 Objectives of the study

Objectives of the study are to:

i. Examine the digital information services that are offered by the library.

ii. Find out whether the digital information services are economically, socially and environmentally sustainable.

iii. Establish the challenges faced by the library in enhancing economic, social and environmental sustainability in provision of digital information services.

1.6 Research questions

i. What digital information services are offered at the library?

ii. To what extent are the digital information services sustainable?

iii. What are the challenges faced by the library in provision of sustainable digital information services?

iv. What are the solutions to the challenges faced in provision of digital information services?

1.7 Significance of the study

The findings of this study will act as a feedback tool on the state of provision of sustainable digital information services at the University of Nairobi library. Furthermore, it will help the library administration to address the issue of sustainable digital information services. The findings will also contribute to the body of knowledge in regards to the issues of provision of sustainable digital information services as well forming the basis of further research in this area of study.

1.8 Assumptions of the study

The following assumptions of the study were made:

i. Academic libraries provide adequate access and use of digital information services to support research, teaching, learning and community services.

ii. Digital information services require massive financial resources to develop, manage and maintain.

iii. The participants will answer the questionnaires in an honest and candid manner.

1.9 Scope of the study

The study was limited to the University of Nairobi Jomo Kenyatta Memorial library. This can be attributed to the fact that MLIS students are one of the key users of the library. Additionally, this is where all digital information services and resources emanate from.

1.10 Limitation of the study

Limitations are problems or challenges that the researcher knows may adversely affect data collection, reliability and the generalization of results. Often the researcher may not have control over these problems or challenges. First and foremost, there are few resources touching specifically on the issues of sustainability of digital information services. Additionally, the number of participants will be small due to the fact that only library staff will act as respondents in this study.

1.11 Operational terms

Academic libraries

These are libraries/information centers in educational establishments at any level of universities, colleges and research institutions.

Digital information resources

This refers those resources which are either born digital or digitized and can be accessed from an information center's database, library portal as well as from the world-wide-web. They include games, stories, e-magazines, e-journals, e-books, encyclopedias, pamphlets, cartographic materials, etc.

Digital information services

This refers to all electronic resources as well as computerized and networked online resources that can be accessed through libraries.

Digital library

Organization that make available resources, together with trained staff, in order to help choose, arrange, grant intellectual access to, decode, disseminate, maintain the integrity of, and ensure the preservation of digital collections in order to guarantee that they will be promptly available for use by user community.

E-Book

E-book refers to electronic text that is available in an electronic format and can be accessed from any devise that is either handheld or desk-bound and has a screen.

E-Journal

E-Journal refers to peer-reviewed publications that are in electronic format and can be accessed in a digital environment.

Sustainability

This refers to the ability of meeting the current demands without undermining the capability of other generations to fulfill their own needs.

1.12 Chapter Summary

This chapter introduced the title of the study where background information to the study was clearly provided. In addition, the study discussed digital library, digital information resources, digital information services, statement of the research problem and the aim of the study stated. The objectives of the study and research questions are clearly highlighted. Further to that, study assumptions, scope, limitations and significance of the study were discussed.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

Literature review is a significant part of any research process that adds valuable contribution towards research (Kumar, 2011:31). Literature review is established on the principle that knowledge is snowballing and that a researcher must first ascertain what has been written or studied on a given area and then endeavor to build upon it. The main sources of the literature reviewed are journals and other information resources containing authoritative information about digital information resources and services as well as information about their sustainability.

2.1 Digital information services

Digital Information services refer to all information resources that are in electronic format as well as computerized and networked online resources that can be accessed through libraries (Choughule, 2007:161). Libraries offer quite a number of digital information services that includes e-table of content service, digital reference services, SDI, CAS, e-document delivery, full text e-journals, Online Public Access Catalogs (OPAC), remote information services, newsletters, reports, etc.

2.1.1 Digital reference services

Reference services have played a significant role in service delivery in both public and academic cycles. Nevertheless, the growth in information communication technology has

led to the development of digital reference services which quite a number of people thought will make traditional library based customized services redundant (Henley, 2004:30).

Digital reference services (DRS) commonly known as online reference services, is a real-time reference service whereby library patrons make use of computers or social media technology to interact with digital reference staff virtually (Ramos & Abrigo, 2012:8). They further stated that DRS has been necessitated in institutional libraries due to the increasing demand of information by the clients as well as the adoption of different information seeking behaviour by the library clients who no longer frequent the library. A large percentage of library patrons nowadays are people who are techno savvy, multitaskers, influenced by what they see, quite demanding, and expect communication irrespective of the time and place.

DRS are provided through different formats and models such as online chat reference, Ask A librarian services, email, video conferencing, web forms, collaborative digital reference, digital robots, etc (Krishnamurthy, n.d.:7). Web 2.0 tools such as social media platform like Facebook and Twitter are applied in a synchronous reference services whereby library patrons seek round the clock assistance from the digital reference librarian with a delayed time response (Ramos & Abrigo, 2012:9).

2.1.2 Current awareness services

According to Reitz (2004), current awareness services can be defined as:

> "… a service or publication designed to alert scholars, researchers, readers, customers, or employees to recently published literature in their field(s) of specialization, usually available in special libraries serving companies, organizations, and institutions in which access to current information is essential".

Libraries serve clients from different background with diverse information needs. Information professionals need to assist their clienteles in order to access services that sufficiently meet their information needs (Naqvi, 2013: 101). One of the key methods in providing digital information services is through current awareness services. Current awareness services have made serious progress despite information overload being a major concern to the librarians (Naqvi, 2013: 101).

According to Chu & Krichel (2003), current awareness service is not a major item on the traditional library service menu but thanks to the information communication technology, it can achieve its full potential in digital libraries.

Current awareness services notify researchers, scholars, and even library patrons about newly published works in areas of their interest. Information professionals provide these services using several approaches to ensure that they are up to date with academic and professional literature. Before the incorporation of technologies in libraries, current awareness services were conducted through means such as photocopying of journal tables of contents, and browsing of publications in order to identify their contents. Nowadays

current awareness is carried out via means such as sending e-mail alerts to clients with an attachment of table of contents, saving of searches in preferred databases, etc., (Johnson, Osmond, and Holz, 2009:52). The growing accessibility of really simple syndication (RSS) feeds offers additional choice for the current awareness services, a choice that can address many of the traditional current awareness problems (Johnson et al, 2009:52).

2.1.3 Electronic Journals

The advent of the internet and the development of World Wide Web in early 1990s reduced the significance of printed journal which by then was considered quite vital when it came to scholarly communication (Ramalho & Carlos, 2005:351). Nowadays libraries no longer allocate budget for printed journals due to ease with which they can access and subscribe to electronic journals. This development has had a significant impact on collection development policies in information centers and libraries.

Electronic journal can be described as peer-reviewed publications that are in electronic format and can be accessed in a digital environment (Cole 2004:78). Dhingra & Vasishta, (2007:1) stated that the growing needs by information users for easy, affordable and reliable ways of information management that is supplemented by developments in the information and communication technology sector, has given rise to modern ways of information management. Similarly, changes that occurred in the publishing sector in recent years also had irrefutable influence on the information systems and services, which led to production of information resources in different formats. Information resources now are being generated in different digital formats. Documents of this nature are conceived using an appropriate 'authority tool' sorted in computer's memory system and

subsequently displayed using visual display technologies. E-journals are one such sophisticated form of information management employing information technology. E-journals have emerged as a key information resource to researchers and a fundamental tool for scholarly communication.

2.1.4 Electronic Books

Institutional libraries have always played a significant role in enhancing access to information resources as well as disseminating information to various information users within the academic institutions in order to facilitate learning and research. This function has also been extended to facilitate ease of access to information resources such as e-journals and e-books via ingenious technologies (Vassiliou & Rowley, 2008:355). The information community has defined electronic books in several ways. Majority of these definitions comprise of a number of components such as they are in digital format, can be accessed online, monographic in nature and the contents can be seen through optical display (Walters, 2013:188).

E-book can be defined as an electronic format of a monograph usually designed to be accessed through the use of desktop computer, e-book reader, laptop, mobile phone or tablet (Reitz, 2004). Armstrong, Edwards and Lonsdale (2002:217) defined E-book as a digital resource excluding journal publication that is in an electronic format and can be accessed in a networked environment with the help of information communication technologies tools.

Walters (2013:189) notes that collection development of E-books can be a difficult and costly affair. This can be attributed to the fact that majority of academic titles cannot be found in an electronic format. As a result, librarians are very reluctant to commit their time and resources in developing E-book collection. Publishers and e-book vendors concentrate their energies on popular titles that will guarantee them quick returns compared to academic titles. E-book market is dominated by top selling genres such as romance and erotica. Academic titles comprise just one tenth of the e-book market. Walters (2013:189) further identifies licensing restrictions, lack of awareness on the part of patrons on the existence of e-books in library, poor display and presentation of texts, users preference of print books, complex e-book interface, unavailability of majority of academic titles in e-book format, etc., are among the challenges facing e-book resources.

2.2 Sustainable digital information services

The term sustainability has been widely used over the past few years in various policy documents thus having implications on almost every modern day business, institution and activity.

The mainstay of sustainable digital information services is three: economic sustainability, environmental sustainability and social sustainability. The main aim of economic sustainability of digital information services is to facilitate cheap and improved access to information resources; the focus of social sustainability of digital information services is to guarantee unlimited access to information resources so as to build an information society; and lastly the objective of environmental sustainability of digital information

services is to warrant decrease in the environmental impact of digital information (Chowdhury, 2013:605-606).

Initially the issue of sustainability was addressed just before the conclusion of a digital library project whereas it is a core part of any project undertaken. Gone are days when the only interest was how to get initial funds: plans for sustainability once the funding is over are now considered part and parcel of any proposal. Sustainability does not concern digital libraries only. Traditional libraries nowadays are forced to justify their existence in order to ensure that they maintain their budget (Hamilton, 2004:392).

Chowdhury (2013:605) came up with digital information services sustainability model. This model had three pillars of sustainable digital information services which are economic sustainability, social sustainability and environmental sustainability
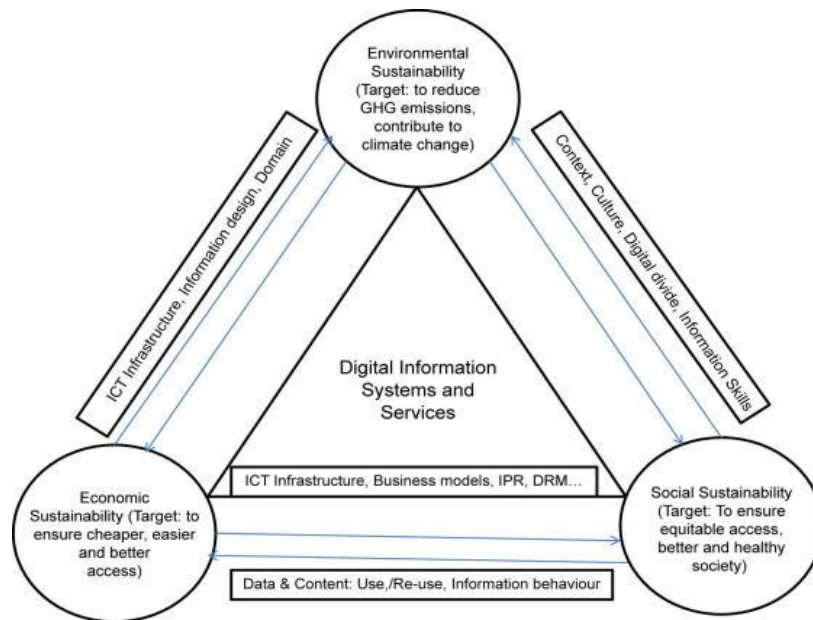
Figure 1.1: Sustainable digital information services model

Source: Chowdhury (2013:605)

2.2.1 Economic sustainability of digital information services

Sustainability denotes the capacity to sustain the requirements of the current generation without undermining the ability of the coming generations to meet their own needs (Dalal-Clayton, 2010). Sustainability creates an environment whereby humans and nature can exist in mutual harmony that allows the fulfilling of the economic, social and environmental requirements of the current as well as future generations (Summers & Smith, 2014:720).

Economic sustainability is a pressing concern for many digital libraries projects. Library buildings consume significant amount of water, electricity, energy, and, over and above ink and paper for printouts. They also produce significant amounts of solid waste. Digital information resources are quite expensive and they demand a substantial amount of human, financial and technical support (Jankowska and Marcum, 2010:160).

The Blue Ribbon Task Force on Sustainable Digital Preservation and Access in their draft report of 2008 page 19 defined economic sustainability as, "A set of business, social, technological, and policy mechanisms that encourage the gathering of important information assets into digital preservation systems, and support the indefinite persistence of digital preservation systems, enabling access to and use of the information assets into the long-term future".

The report further stated that cost-effective digital preservation entails identification of the advantages of preservation of information resources by the policy makers; encouragement of decision-makers to ensure that the interest of the public comes first;

sorting out materials that will be considered for long term preservation; coming up with ways of ensuring continuous and efficient allocation of human, technical and financial resources towards digital preservation; proper management of digital preservation endeavors.

Digital libraries can attain economic sustainability through adoption of a business model that will grant access to high quality digital information resources and services. This achievement that is economic sustainability can be quantified by decreasing direct costs through means such as enhanced production and dissemination of information products and services, as well as indirect costs, such as decreasing time and effort used by a user to access information. The influence of information services on a particular undertaking, venture, society, etc., can be considered a long-term measure of the economic sustainability of information systems and services (Chowdhury, 2015:1).

Financial sustainability is the biggest problem within digital preservation (Chowdhury, 2014). Hedstrom (2001) stated that despite increased concerns regarding digital preservation, there are numerous barriers such as economical, legal, organizational or technical when it comes to preservation of digital assets. Attempts to sustain digital information resources have always been faced with problems such as the relatively short life span of a majority of storage media that is brought about by increased competition and innovation between technology companies.

Information preservation is one of the most critical issues in human culture, economics, history as well as the development of human civilization (Kyong-Ho et al, 2002: 93). The long term access to digital resources cannot be achieved automatically and without

incurring cost. This will occur as an outcome of a thoughtful decision on the part of individuals and organizations to provide resources required towards steering digital information resources safely across time (Blue Ribbon Task Force on Sustainable Digital Preservation and Access 2008:11). The preservation of digital objects involves a wide array of challenges, such as legal issues, policy questions, intellectual property rights, institutional roles and relationships (Thibodeau, 2002:4). It is an ever changing process: the procedures as well as technical requirements keep on changing. It is difficult and the hype surrounding it has made it far more difficult. (Ross, 2012:47). Digital information resources are found in various formats thus prompting people tasked with the responsibility of preserving them to come up with different criteria for preserving each object (Thibodeau, 2002:7).

Economically sustainable preservation is an urgent societal conundrum because information is a fundamental resource of the economy, science, research, education, industries, and cultural heritage sector. It is crucial since digital information is fragile, prone to loss and degradation. It should be noted that preservation is central to digital sustainability and without preservation, there will be no access to these information resources (Blue Ribbon Task Force on Sustainable Digital Preservation and Access 2010:9).

The development and provision of digital services also entails increased costs for libraries which means that decisions have to be made regarding which services should be provided. The subscription of electronic resources is slowly substituting acquisition of print materials. Information centers are no longer able to physically possess information

resources like in the past especially when it comes to electronic resources. Moreover, the substance of these digital information resources, plus the subscription price, might go against the basic collection development policies in libraries. Libraries can no longer acquire information materials independently as well as determine the terms and conditions for resources they acquire. The acquisition of a single information resource in an electronic environment could compel the library to acquire whole database because the single item is not available independently. This will automatically translate into an expensive affair for the library (Koehn and Hawamdeh, 2010:161-162).

2.2.2 Social sustainability of digital information services

Not much has been written about social sustainability of digital information services. Social sustainability is the perception that future generations should have the privilege of accessing social resources as the current generation (Michael & Peacock, 2011:1). Social sustainability of digital information systems and services can be realized by safeguarding equitable access to information by users (Chowdhury, 2015:2380).

Among the key requirements of social sustainability especially when it comes to information services, is impartial access and usage of information in nearly all cycle of life. Access to information incorporates all undertakings related to access, retrieval and usage of information for everyday business, enjoyment, well-being, and so on. (Chowdhury, 2014:185-186).

Article 19 of the Universal Declaration of Human Rights states that,

> "Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers" (United Nation, n.d).

Creating accessibility in a sustainable way not only helps patrons use library's space and services, but it also helps libraries create better community outreach, incorporate change more easily into our culture, and encourages dynamic and creative problem solving. Approaching the problems and challenges of accessibility that arise, especially in times of economic hardship, makes for better buildings, better spaces, and better services for all people, including the functionally diverse (Pionke, 2016:324).

Open access has been fronted as one of the ways of ensuring social sustainability. Open access publishing eases students', researchers' and scientists' access to research literature through the internet free of cost (Sahu & Arya, 2013:6). There is a wide array of explanation in regards to open access. However the one that stands out is the one of Budapest Open Access Initiative (2001) which states:

> Open access to the literature, means its free availability on the public internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers. The only constraint is on reproduction and distribution, and the

only role for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited.

However, it should be noted that Chowdhury (2013:611) stated that social sustainability of open access is still not clear and there are countless issues comprising of the economic sustainability in addition to acknowledgement of open access publishing that requires to be investigated in order to come up with reliable datasets. The challenges of social sustainability have become more intricate when we deliberate how the parameters for social sustainability influence, and are influenced by the parameters that are associated with economic and environmental sustainability of digital information systems and services.

2.2.3 Environmental sustainability of digital information services

Environmental sustainability is expressed as a state in which the pressure placed on the environment can be realized without decreasing its ability to allow the current and future generations to live well. The environmental dimension of sustainable development was covered in what is known as Agenda 21, the Rio Declaration on Environment and Development which was adopted at the United Nations Conference on Environment and Development held in Rio de Janeiro, Brazil, June 3–14, 1992.

The notion of environmental sustainability has attracted lots of attention for the last twenty years. Environmental management is a core segment of sustainability in institutions of higher learning. Literatures on library sustainability and environmental concerns have received much attention since 1990s. Several authors such as Ephraim,

2003; Brown, 2003; Neale, 2008; Rowley, 2006; Antonelli, 2008; etc., have written articles in regards to environmental sustainability in libraries. Karioja (2013:18) states that in this century, information centers have become more aware of the significance of environmental management and have started to align their actions towards environmental sustainability. Chowdhry (2015:2382) states that institutions of higher learning largely use digital libraries and information services virtually in all their activities ranging from management activities, research, teaching and scholarship, which have adverse effect on the energy as well as the environment.

In the United States of America, Green Library Movement (GLM) was started in the early 1990s with the aim of ensuring that libraries are environmental friendly. GLM consisted of librarians, libraries, cities, towns, college and university campuses that are dedicated in ensuring that libraries are environmental friendly. This can be realized through initiatives such as building of green libraries, providing green library services, greening of the existing library facilities, and finally embracing environmentally friendly and sustainable procedures within libraries (Antonelli, 2008:1). According to Chowdhury (2012:635) green information service concept was introduced to denote sustainable information services. A green information service simply refers to a sustainable information system that is devised to oversee data and information, and produces information as an output so as to support research or decision-making activities.

Ephraim (2003:160) is of the opinion that a green approach to the management of libraries is considered as putting library management viewpoints into sustainable development. In his attempt to explain the theory of greening libraries, Ephraim

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(2013:160) stated that sustainable development incorporates guidelines and resolutions that will protect both the internal and external environment of the information centers and libraries through minimum use of energy, reduction of pollution and resource consumption, as well as ensuring that the library is a safe environment to work in.

According to Antonelli (2008:4) there are several reasons as to why libraries should be environmental sustainable. Firstly, the cost of setting up environmental sustainable libraries is affordable. With a conventional budget, it's much easier nowadays to build a green library. Secondly, the most readily available energy resources are finite resources. It is fundamental to the wellbeing of our planet and libraries' budgets that libraries make use of these energy sources wisely. Thirdly, it is quite significant that we reduce the emission of greenhouse gases from our library building.

However environmental sustainability of digital information systems and services that is core in higher education has not been thoroughly researched and investigated in the information science literature (Chowdhury, 2016). Digital information systems and services make use of ICT infrastructure and equipments during the course of information life cycle that is from creation or digitization, access, use, storage, preservation, etc. These equipments produce a significant amount of carbon footprint thus contributing to the environmental costs of digital libraries and information services (Chowdhury, 2015:2380).

The digital information services sector excessively use ICT equipment and infrastructure thus contributing substantial amounts of GHG emissions to the environment. It has been projected that ICT sector greenhouse gas emission which currently stands at 2 percent of

total global emissions will increase twofold by 2020 (The Climate Group, 2008). Glanz (2011) reported in his article in the New York Times in 2011, that Google revealed that it consumes an adequate amount of electricity that can power 200,000 homes. Gombiner (2011:122), stated that additional approximation indicate that over one billion Google search is carried out daily, and thus on a conservative estimation, 1,000 tonnes of CO_2 is released to the environment from these Google search.

Higher education institutions (HEIs) in the US release roughly 121 million tonnes of CO_2 to the atmosphere annually which is equal to almost 2 percent of total annual greenhouse gas (GHG) emissions in the United States of America, or approximately a quarter of the whole State of California's yearly emissions (Sinha et al., 2010:568). These figures postulate an idea of the possible environmental impact of digital information systems and services.

2.3 Challenges in provision of digital information services

2.3.1 Hardware and software

Modern tools of information technology have unequivocally transformed the role and responsibilities of information professionals (Khan and Bhatti, 2012:2). Digital libraries guarantee benefits such as eradication of the time and space restrictions of traditional libraries. Furthermore, digital libraries exist on a network that is accessible by users irrespective of their geographical location (Uzuegbu & McAlbert, 2012:2).

Information now exists under software control and use of hardware. The technological advances and in particular changes in software and hardware pose serious threats to the

continuing accessibility and use of this information. Such concerns seem to imply that digital information, that can be accessed using one software program today, may fail to be accessed in the future because the program may be outdated and no new one available on the market. Examples of some of these softwares include MS WORD, PDF, HTML, XML and JPEG. This is considered among the biggest challenges that need to be looked into in the information management profession (Keakopa, 2008:10).

Digital information services (DlS) is among the highly advanced form of information systems. It poses exceptional challenges and opportunities largely due to varied prerequisites involving rapid access, collaborative support, highly interactive interfaces, distributed database management, digital document imaging, information retrieval, information mining, management of multilingual collection, integration of multimedia information services, electronic document delivery, electronic reference service, selective dissemination of information and enforcement of intellectual property rights. Therefore, it is understood that deployment of DIS will entail incorporation of numerous information technologies (Bhattacharya et al, 2002:1).

In this era, digital information services and systems has brought about numerous transformations to information centers and libraries, some of which took place before the advent of the Internet early 1990s. The end of the 20th century saw lots of debate in libraries and information centers on matters such as print versus electronic; "access versus ownership", "mediated versus unlimited online searching" and professional concerns not gradually widened to include electronic licensing and consortia collection development. The digital age has begotten many features of library services

such as Online Public Access Catalogue which has replaced card catalog. Again, there is increased remote access of information resources by users. Users are now able to download audio/visual lectures as well as e-books; retrieval of full text information resources is normal nowadays and personalization of services (Mayega, 2008:4).

2.3.2 Knowledgeable staff

According to Ongus, Kemparaju, Nyamboga, and Veerabasavaiah (2007:3), any institution that wants to establish a digital library should have knowledgeable and skilled staff. These individuals should be hardworking and dedicated individuals, devoted to the institution, keen to constantly learn activities relating to information technology with specific emphasis on digital libraries and must have the resolve of applying whatever they have learnt in their workplace. Veronica and Ignatius (2011:377) however found out that numerous skills required for the integration of the digital library, comprising of web scripting, web design and relational database management, are possessed by individuals who do not have training in librarianship. Therefore, suggestions have been made to incorporate talents from outside the library profession into the digital library functions.

Technical knowledge is still a serious problem in ICT development. Library staff lack skills and it is important that appropriate knowledge and skills are part of the human development requirements in digital libraries. Issues of ICT training and human capacity development as well as staff retention need to be addressed, so as to ensure sustainability and accessibility by all (Keakopa, 2008:7). He further notes that retaining staff with skills is a frustrating exercise. Furthermore, the cost of training and recruiting technical

expertise are already high and appear to be growing. Unfortunately, those already trained can command jobs in the private sector with higher salaries than what is earned in the public service. As a result of this, libraries/ information centers face the problem of retaining skilled workforce.

The sustainability of the library as a whole, and the sustainability of its various services in turn, depend on the continuous and sustained ability of library staff. Continuous staff development must be actively encouraged and supported (Cmor & Cmor, 2016).

2.3.3 Funds

Ongus, et al, (2007:5) states that digital librarians should establish ways to ensure that digital libraries are financially stable in order to ensure that they are fully operational. One can explicitly state that obtaining means of funding digital libraries is the most challenging hurdle facing librarians nowadays. Digital libraries are sure to alter how information is collected, managed, stored, disseminated and preserved, today as well as in the future. Libraries will most certainly be at the helm of realizing this phenomenon and therefore it is important that they endeavor towards building enough capacity, especially in regards to financial backing. Therefore digital librarians should be smart enough to be able to conduct fundraising to support their libraries as well as have sound financial management skills so that their libraries can survive in the medium and long term.

2.3.4 Energy management

In the context of digital information systems and services, the target for sustainability is to reduce the energy and environmental costs throughout the life cycle of an information system or service (Chowdhury, 2013). While comparing energy consumption between libraries built before mid-1990s and ones that were built after mid-1990s in China, Xuan and Hongyan (2011:4-5) found out that libraries built before mid-1990s that have natural lights and no air-conditioning systems spent less amount of money on energy. However, library constructed after mid-1990s consumed more energy. The increase in energy consumption was attributed to a couple of factors namely: size of the library; poor natural lighting thus leading to increased usage of artificial lights during the operational hours; overreliance on air-conditioning systems; increased usage of lift within the libraries; etc. The research also indicated that high energy cost was as a result of extensive use of air-conditioning systems, computers, elevators, lighting systems, servers, security, and fire monitoring.

2.4 Theoretical framework

2.4.1 Theoretical framework

Theories are devised to expound, contemplate and comprehend phenomena and, in some way, to challenge and broaden existing knowledge. The theoretical framework is the edifice that can hold or corroborate a theory of a research study. The theoretical framework presents and illustrates the theory explaining why the problem is being studied.

The perpetual progression and ever-increasing significance of the notion and practice of sustainability amongst organizations, persons and societies all over the world appears to justify the evolution of conceptual approaches to theories of sustainability for use in education, research and practice. Whilst other theories have been utilized by intellectuals to help elucidate the necessity for and development of sustainability, none of the theories seems to have the exceptional features, benefits, challenges, opportunities or orientations to support individuals, organizations and societies move towards sustainability when the need arises (Starik & Kanashiro, 2013:7).

The study was guided by triple bottom line theory which was coined by John Elkington in the year 1994 to advance his sustainability agenda. John stated that sustainability encompasses synchronized pursuit of economic success, environmental quality, and social parity. Organizations working towards sustainability need to perform not against a single, financial bottom line but against the triple bottom line (Benn et al 2014:163).

Triple bottom line (TBL) sustainability is a framework that expands the sphere of sustainability beyond the environmental to incorporate economic and social aspects. Triple bottom line (TBL) sustainability, or the "3Ps" of people, planet, and profits, grew from the 1970s environmental movement in which John Elkington was heavily involved with. The three TBL domains are economic, environmental, and social. Government regulation, increased awareness, basic public demand have driven many companies and organizations to embrace TBL practices.

TBL could help libraries enlist socially responsible publishers and vendors who will help to assess operational approaches, occasioning in provision of green products, saving of energy, reduction of waste as well as ensuring that library usage fee is low. Libraries strategic plans need to be formed on the basis of the three standard dimensions of sustainable growth i.e. economic, social and environmental sustainability.

2.4.2 Conceptual framework

The conceptual framework shows how the researcher will conceptualize the relationship between the research variables in the study (Mugenda, 2008). In this study, there are independent as well as dependent variables. Independent variables are used in studies that try to establish relationships but may also be used to establish cause and effects. Dependent variable is that variable which is influenced or changed by another variable. In this case Independent variables are economic, environmental and social sustainability. Dependent variable is this case is digital information services whereas ICT infrastructure and information skills are considered as intervening variables in this study. Figure 1.2 therefore aids to visualize the relationship between key concepts and variables that are relevant to this study.

Independent variable   Dependent variable Intervening variable Outcome variable

| Economical sustainability

 Environmental Sustainability

 Social sustainability | → | Digital information services | → | ICT infrastructure

 Information Skills | → | Provision of quality DIS

 Affordability

 Reduction in GHG emission

 Equitable access to information |
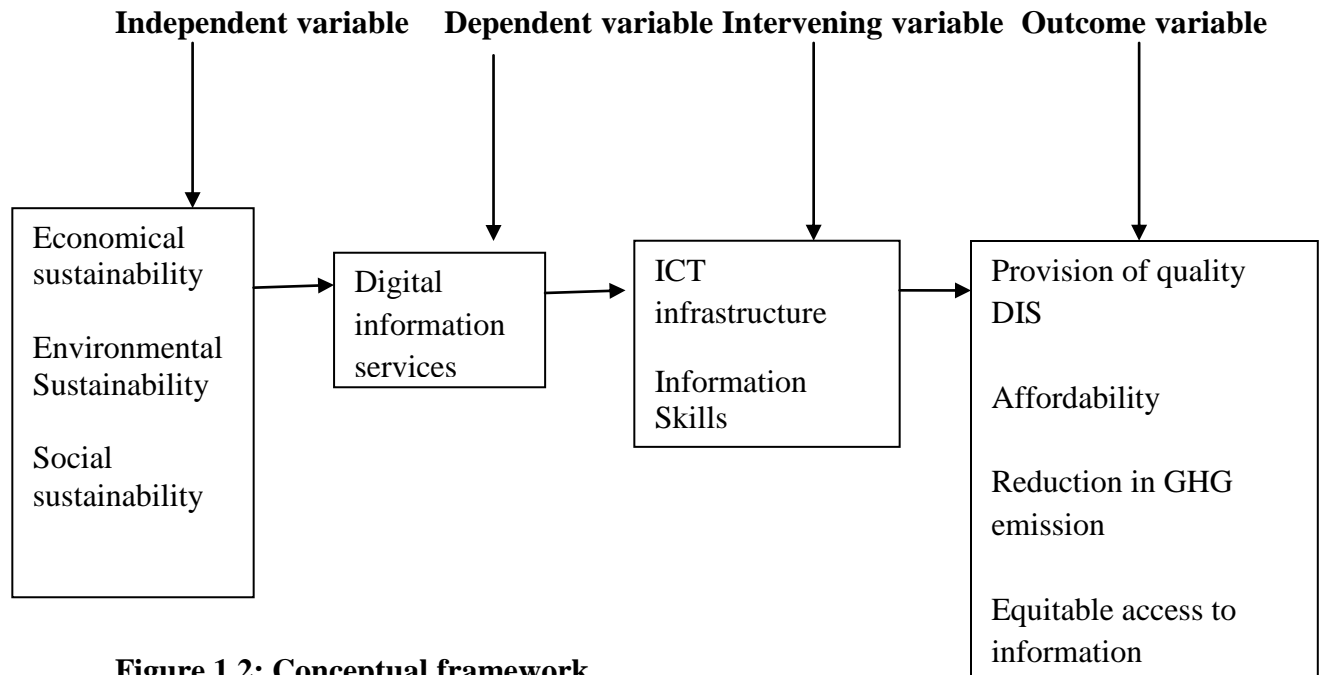
Figure 1.2: Conceptual framework

Source: Researcher, 2016

2.5 Chapter Summary

This chapter reviewed some of the existing literature on digital information services in academic libraries. The researcher also reviewed literature on digital library infrastructure as well as having a look at the challenges faced in provision of digital information services. The researcher concluded with a conceptual framework which showed the independent variable, dependent variables and intervening variables.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discussed the research methodology that was used in the study for data and information collection. Highlights include research design used in the study, area of study, the targeted population, sampling methods and techniques, data collection approaches, data collection tools and procedures, validity and reliability, data analysis and presentation and ethical issues.

3.2 Research Design

The study applied the quantitative and descriptive research methods. This would ensure fuller description of the phenomenon under study by providing more than one perspective from the respondents (Denscombe, 2010:150). Quantitative method involved use of structured questionnaire to collect data on sustainable provision of digital resources and services from the professional and management point of view as well as the client perspective. Descriptive research design was used to collect data regarding provision of digital information services from the respondents using questionnaires. The study also utilized document review in gathering relevant data and information.

3.3 Area of Study

The study was carried out at the JKML – the main library of the University of Nairobi the portal center for provision of digital information resources and services. The main campus library services the Masters of Library and Information Science students who regularly use digital information services.

3.4 Target population

Population research is the total sum of items about which desired information is gathered (Kothari, 2014). The target population for this study involved a survey of university library information staff and postgraduate students. Library information staff are usually engaged in the organization and provision of digital information resources and services, and therefore were the focus of the study. Postgraduate students provided comprehensive information regarding provision of digital information resources.

3.5 Sample and the Sampling Techniques

3.5.1 Sample Size

Sampling process refers to the selection of a portion of an aggregate on the basis of which a judgment about the aggregate is made (Kothari, 2014:147). Process of sampling provides the framework of selecting the required and representative sample from the total population in the study. Respondents for the study population were selected through purposive and census sampling techniques. Purposive sampling method was applied in selecting the postgraduate students in the library. Census sampling technique was adopted for the whole population of the library and information staff. This method was used

because of the small number of the information staff in the library. Postgraduate library and information science students were selected purposively because of their knowledge in digital information resources and services. Questionnaires for data and information gathering were self-administered to the respondents in the university library as indicated in Table 3.1 below.

Table 3.1: Sample Size

NO.	RESPONDENTS	POPULATION SIZE	SAMPLE SIZE
1	Library & Information Staff	25	25
2	ICT Staff	10	10
3	Digital Repository Staff	05	05
4	E-resources Staff	05	05
5.	Postgraduate students	25	25
TOTAL		**70**	**70**

Source: (Researcher, 2016)

3.5.2 Sample Techniques

Purposive and census sampling techniques were used to select the respondents for data and information collection. Target population consisted of information professionals and postgraduate students. The university library has a well-developed digital collection of information resources and services including local content. Census sampling method was adopted in choosing the respondents for the information staff given their small number. Purposive sampling technique was used to select library and information science students because of their knowledge in digital information resources and services. Respondents of the study were carefully selected so as to provide comprehensive information and

knowledge in regard to sustainability of digital information resources and services in the library.

3.6 Data Collection Methods

3.6.1 Questionnaire

Data and information collection tools designed to help in this research were questionnaire and document reviews analysis. Data was collected from the respondents through the use of a structured or close-ended questionnaire provided to the information staff and postgraduate students. Structured questionnaire were provided to the participants so as to provide the required information. In addressing particular themes and sub-themes of the study, the design of the structured questionnaire was guided by the research objectives and questions. The questionnaire sought to get information on: Background Information of the respondents, Digital Information services available within the library, sustainable digital information services and challenges and strategies for sustainable provision of digital information.

Structured questionnaire was devised to collect data from the library and information staff as well as postgraduate students in the field of library and information science. The researcher administered the questionnaire to the respondents in the library with the assistance from the library staff. In order to facilitate the study, the questionnaire was structured with the necessary introduction and background information.

3.6.2 Document Review

Document review analysis involved the process of reviewing literature and related information sources. Process of document review involved use of information resources such as Emerald, Jstor, Wiley and Ebscohost. Information and web portals from the university library provided the needed knowledge. The purpose of the document review was to provide updated information and knowledge in regard to digital resources and services.

3.7 Research Instruments

3.7.1 Pilot Study

Pilot study involving library and information staff and postgraduate students in a different university learning environment was conducted so as to assess the validity and reliability of the data collection tool. The purpose of the pretesting was to gauge the effectiveness of the questionnaire in data collection process and corrective steps were taken before the actual research. The pretesting of data collection tool was conducted at the United States International University – Africa (USIU) where a sample of 5 and 10 library staff and postgraduate students respectively participated in the exercise.

3.7.2 Validity

A structured questionnaire was drawn up and used to gather data and information from the respondents. The structured questionnaire was guided by the objectives and research questions of the study. Detailed document review analysis was done in order to provide current information regarding digital resources and services in the university and library.

To ensure validity of the research instruments for this study, the researcher gave the questionnaire to experts in the area of study. Their observations and suggestions were used to review the draft questionnaire before the final adoption for the study.

3.7.3 Reliability

Pretesting of the questionnaire helped in addressing some of the issues that would have affected the data and information collection process. The purpose was to determine the effectiveness and accuracy of the questionnaire in the process of data and information collection.

3.8 Data Analysis and Presentation

Descriptive statistics gathered and collected was analyzed and represented in tables, graphs, charts and percentages guided by the objectives and research questions. Data collected was processed, coded and analyzed using the Statistical Package for Social Sciences (SPSS) software and organized into themes and subthemes of the study. Process involved coding data in excel sheet while SPSS helped in analyzing and displaying of the information. The analyzed information was edited, checked for relevance and accuracy.

3.9 Ethical Considerations

A letter of introduction and authorization from the university was given to the respondents informing them that information shared will be handled with lots of confidentiality and for the purpose of academic research. Respondents voluntarily participated in the study without any reward either in monetary terms or in kind.

Acknowledgement of all sources of information was done in order to ensure intellectual honesty and avoid any forms of plagiarism.

3.10 Chapter Summary

This chapter has provided information and knowledge on research methodology and related aspects of conducting the research. It highlighted issues regarding research design used in the study, area of study, the targeted population, sampling methods and techniques, data collection approaches, data collection tools and procedures, validity and reliability, ethical issues as well as ways of data analysis and presentation. The chapter also focused on ethical considerations including confidentiality and plagiarism.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter presents the data that was collected in regards to sustainable provision of digital information services at the University of Nairobi library system. The research was conducted on sample size of 70 respondents out of which 60 respondents completed and returned the questionnaires making a response rate of 85%. Likert scale was used in collecting and analyzing quantitative data on multiple response questions, whereby the scale of 5 points was used in computing percentages. The entries from the questionnaires were coded and analyzed using the Statistical Package for Social Sciences (SPSS) version 23. The results were then presented in tables, graphs and charts as appropriate with necessary explanations.

4.2 Background information

The study sought information on various aspects of the respondents ranging from highest level of education, management level, specific responsibilities, etc. This information was intended to validate the suitability of the respondent in answering the questions regarding sustainable provision of digital information services at the University of Nairobi library system.

4.2.1 The respondents

The research was conducted on a sample size of 70 respondents out of which 60 respondents completed and returned the questionnaires making a response rate of 85%. The respondents were divided into 5 different categories namely; 25 Library staff, 25 Masters in Library and Information Science Students, 5 Digital Repository Staff, 5 E-resources staff and 10 Technologists/ICT staff. Out of the 25 questionnaires distributed to the library staff, 22 were dully filled thus representing 88% response rate. The same number of questionnaires was distributed to MLIS students and 23 out of 25 students duly filled the questionnaires thus representing 92% response rate. 5 questionnaires were distributed among the digital repository staff and only 2 were dully filled and returned thus giving a 40% response rate. 5 questionnaires were also distributed among the E-resources staff and 3 were filled and returned thus representing a 60% response rate. All the 10 questionnaires that were distributed to the Technologists/ICT staff were filled and returned therefore representing a 100% response rate. All this are illustrated in Table 4.1 in the page below.

Table 4.1: Response Rate by Respondents

Respondents	Questionnaire distributed	Questionnaires returned	Percentage (%)
Library staff	25	22	88
MLIS Students	25	23	92
Digital repository staff	5	2	40
E-resources staff	5	3	60
Technologists/ ICT staff	10	10	100
Total	70	60	85

4.2.2 Educational level

The study also sought to find out the level of education of the respondents. This would ensure the respondents were familiar to the phenomena under investigation. The findings of the study showed that 78.8% of the respondents were at the postgraduate level, while 3.8% of the population had bachelor's degree and the remaining 17.3% of the respondents were diploma holders. The findings are illustrated in Figure 4.2 pg. 47.

Figure 4.1: Level of education
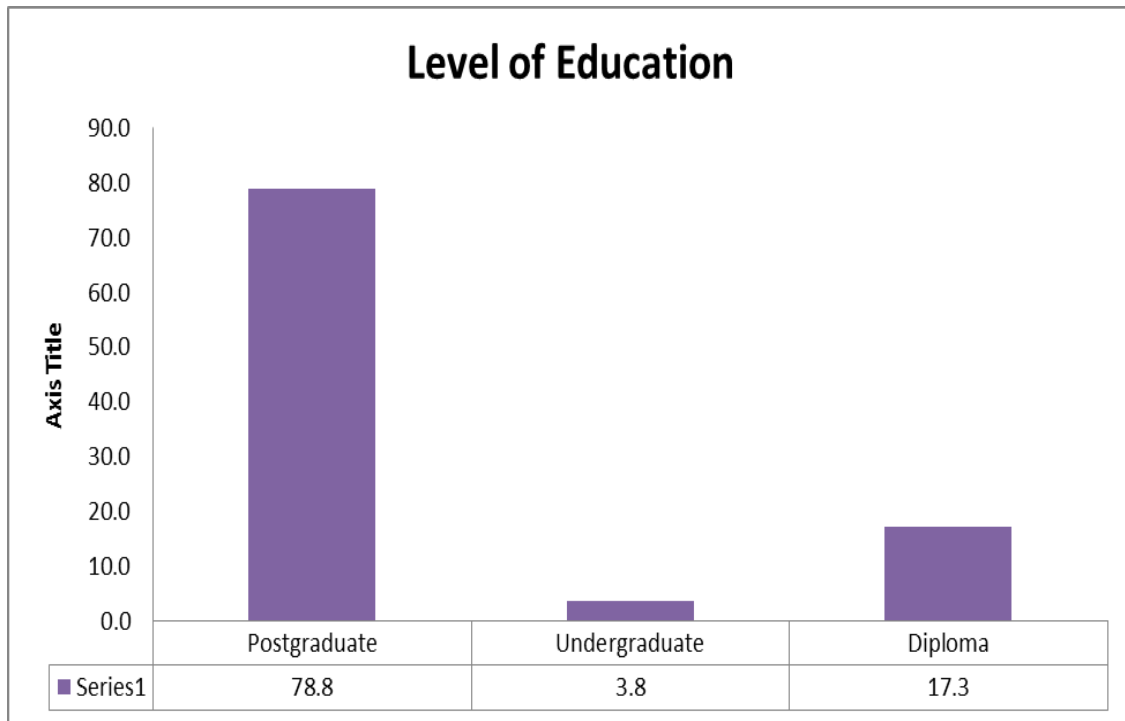
4.2.3 Management level

The study sought to identify the management level of the respondents in their work places. 21% of the respondents cited that they work at the middle level management in their place of work. 56% of the respondents indicated that they work at operational level whereas 23% of the respondents did not indicate their level of management.

Figure 4.3: Management level
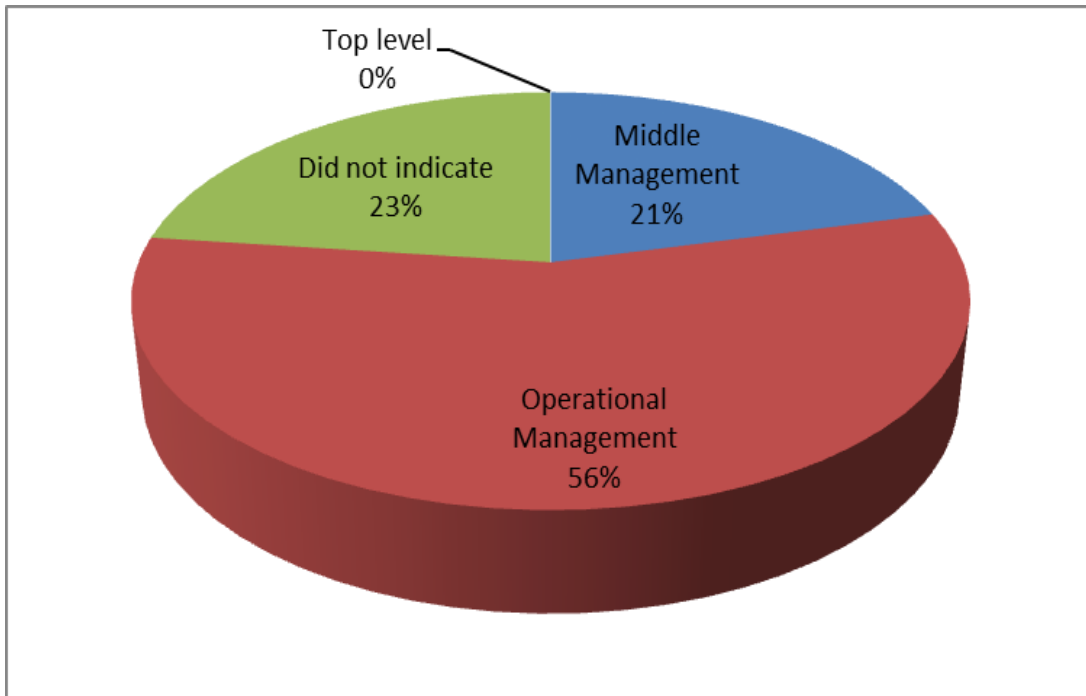
4.3 Digital information services

The respondents were given a list of digital information services and requested to select the resources and services that are accessible via the University of Nairobi library system. The study findings showed that all respondents were aware of the existence of both Online Public Access Catalog as well as the Electronic journals. 93% of the respondents indicated that they were aware of the existence of E-books services within the library system and a further 88%, 82%, 75% and 82% of the respondents indicated that they were aware of the availability of digital repository, web portals, information portals and Wi-Fi services within the library. Their response is illustrated in table 4.2 below.

Table 4.2: Digital information services available within the library

Digital Information Sources & Services	Yes (%)	Not aware (%)	Total (%)
Online Public Access Catalogue	100	0	100
Electronic Journals	100	0	100
Electronic Books	93	7	100
Digital Repository	88	12	100
Web Portals	82	18	100
Information portal	75	25	100
WiFi	82	18	100

4.4 Most preferred Digital Information Sources & Services

The study also sought to establish the most commonly used digital information service within the library. The respondents were asked to identify the most preferred digital information services and resources. From Table 4.3 below, WI-FI is the most preferred digital information service whereas E-books are the least preferred digital information service and resources. The reason as to why Wi-Fi scored highly among the respondents is because it is the gateway to access digital information resources and services. Most of the library users have their own portable devices such as Ipad, laptops, mobile phones, etc, which can be used to access digital information resources and services.

Table 4.3: Most preferred Digital Information Sources & Services

Digital Information Sources & Services	Most Preferred (%)	Preferred (%)	Moderately Preferred (%)	Slightly Preferred (%)	Least Preferred (%)
Online Public Access Catalogue	62	27	8	3	2
Electronic Journals	60	27	10	2	1
Electronic Books	48	26	14	7	5
Digital Repository	52	29	9	7	3
Web Portals	30	42	22	2	4
WiFi	68	18	9	5	0

4.5 Sustainable Digital Information Services

4.5.1 Economic and Environmental Benefits of Digital Information

The study sought to establish environmental and economic benefit of digital information services. 32% (strongly agreed) and 42% (agreed) of the respondents were of the opinion that DIS promotes green environment whereas 12% of the respondents were not sure whether it promotes green environment or not. Another 9% of the respondents disagreed with the notion that DIS promotes green environment and the remaining 5% of the respondents strongly disagreed as indicated in Table 4.4.

24% of the respondents strongly agreed that DIS does not emit greenhouse gases while 40% concurred that it does not produce greenhouse gases while another 21% of the respondents were not sure whether it is free of emission or not. A paltry 7% of the respondents agreed that it does emit greenhouse gases.

Chowdhury (2012:503) believes that the adoption of the appropriate digital information services model as well as embracing Green ICT in libraries where academic and scholarly information resources are accessed and made use of on a regular basis will help to promote a green environment and reduce carbon emission.

According to Table 4.4, 78% and 22% of the respondents established that digital information services and resources can be accessed anywhere at any time. This notion is supported by Alhaji (2008:2-3) who stated that digital libraries differ significantly from the traditional libraries because they allow users to gain an on-line access to and work with the electronic versions of full text documents and their associated images. Furthermore, a digital library can meet simultaneous access requests for a document by easily creating multiple instances or copies of the requested document. It can also meet the requirements of a larger population of users easily. Uzuegbu & McAlbert (2012:2) are also of the opinion that digital libraries guarantee benefits such as eradication of the time and space restrictions of traditional libraries. Furthermore, digital libraries exist on a network that is accessible by users irrespective of their geographical location.

Table 4.4 also indicates that 58% of the respondents strongly agreed that DIS is economically beneficial to the library as it ensures cheap access to information. However Koehn & Hawamdeh (2010:162) are of the opinion that development and provision of digital services and resources entails increased costs for libraries. The acquisition of an item in an electronic environment might require licensing of a whole database because the single item is not available independently which in turn will translate into higher

cost and more restrictive access since licensing terms and conditions are renegotiated from time to time.

Table 4.4: Economic and environmental Benefits of Digital Information

Economic and environmental Benefits of Digital Information	Strongly agree (%)	Agree (%)	Not sure (%)	Disagree (%)	Strongly Disagree (%)
Promotes Green Environment	32	42	12	9	5
Free of Emission	24	40	21	7	8
Provides Digital Resources	76	24	0	0	0
Available Anywhere Anytime	78	22	0	0	0
Cheap Access to Information	58	30	7	3	2

4.6 Digital Information Training

The study also sought to establish whether how often the respondents were trained in the provision of digital information service. 23% of the respondents said that they always got trained in the provision of digital information. A further 46% of the respondents stated that they were quite often trained on digital information services. 24% of the respondents affirmed that they sometimes got trained while another 5% of the respondents declared that they seldom got trained in provision of digital information service. Only 2% of the respondents disclosed that they have never got trained in regards to digital information services. These finding showcases the significance of digital information services in the library. The library administration is cognizant to the fact that digital information services are fundamental in satisfying the user needs at this time and age.

Figure 4.4: Digital information training
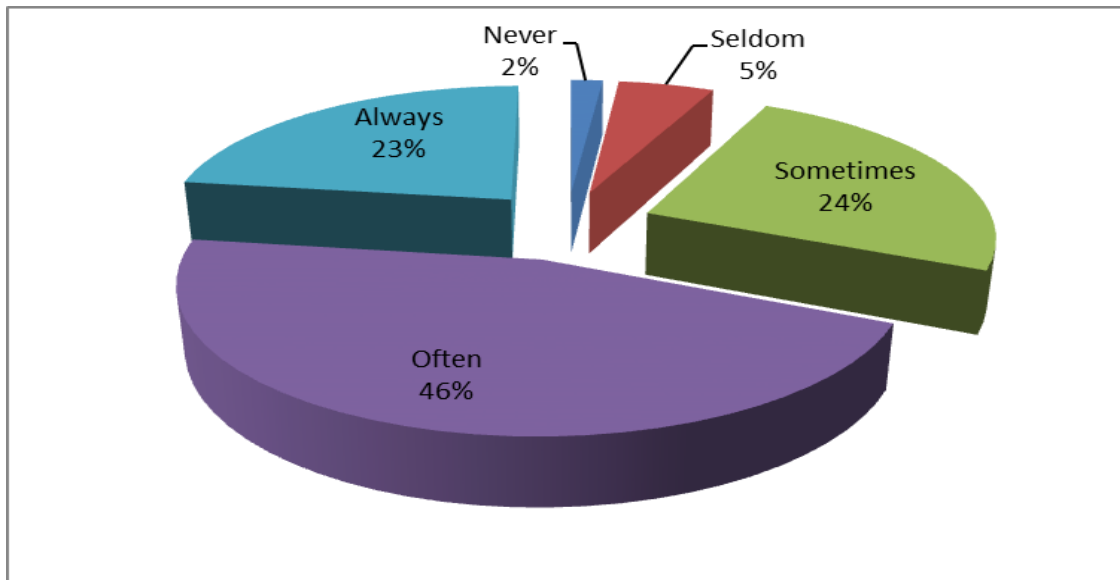
4.7 Strategies for Sustaining Digital Information Resources & Services

The study additionally sought to identify the strategies that will be used ensure that digital information services and resources are sustainable. Majority of the respondents considered adequate allocation of resources, subscription of needed resources, developed digital repository, information literacy skills and marketing and promotion of digital information services and resources as key strategies in ensuring sustainability of digital information services.

Adequate allocation of resources is among the key strategies of sustaining digital information services within libraries. According to Raja & Pandiyan (2011:113) human resource is the most important resource in a digital library not only during the initial creation and set up of digital services but also during operation, maintenance and provision of services.

Subscription of needed information resources is another key strategy for sustainability of digital information services. According to Table 4.5, 39% of the respondents considered subscription of information resources as an excellent step in ensuring that there is sustainable digital information resources and services. Jalal & Vishwamohan (2009:1) stated that collection development is backbone to any library and information center whose main preoccupation is to enable access to resources such as e-resources, e-journals, conferences proceedings, full-text and bibliographic databases to library patrons based on their information needs. Johnson et al (2012:11) while discussing key issues for e-resource collection development affirmed that reliability of e-resource vendors needs to be considered when it comes to subscription of e-resources and the range of technical and user support services they are able to provide. Again, it is important to establish the support services available from the vendor such as trial evaluation and product demonstration, customization, user training and support, data archiving, among others.

Development of digital repository is another significant strategy in enhancing sustainability of DIS. 59% of the respondents consider development of digital repository a significant step in enhancing sustainability of DIS. According to Jain, Bentley & Oladiran, (2009:1), institutions of higher learning have been struggling on how to manage their research output such as journal articles, theses and dissertation, teaching materials, conference papers, reports, research data, and research notes until Massachusetts Institute of Technology (MIT) came up with the DSpace project to build a stable and sustainable long-term digital storage repository. Lynch (2003:327) who is one of the biggest proponents of digital repository/ institutional repository stated that digital/institutional repositories can streamline access to traditional scholarly content by empowering

libraries/information centers to effectively utilize the dissemination capabilities put forward by this wonderful technology. Digital repositories not only make institutions visible but showcase their research output to a worldwide audience.

Information literacy skill is also key when it comes to sustainability of DIS more so social sustainability. 49% of the respondents considered information literacy skills as one of the means of sustaining DIS. In a world experiencing information explosion as a result of developed internet, information literacy skill is of great importance in ensuring access to information. According to Martin (2011) the overflow of information generated and disseminated via contemporary media conceives urgency for the study of information literacy and the strengthening of information literacy practices especially by students. Information literacy skills are considered critical in order for one to successfully navigate the information landscape of the twenty-first century.

Marketing and promotion of digital information services is also considered one of the ways of enhancing sustainability of DIS. 48% of the respondent considered marketing and promotion of digital information services as key strategy in enhancing DIS. 20% of the respondent considered it a very good idea whereas 27% considered it good. A small percent of the respondents i.e 5% considered it a fair move. Marketing and promotion of digital services helps to optimize the use of information resources, generate funds for library, enhance library's image as well as aid library patrons acquire correct and precise information for their research or study. Madhusudhan (2008) is of the opinion that marketing aims to identify the client base determine and fulfill its information needs,

wants, and demands by devising and delivering fitting products and services. The main focus of the marketing concept is the client, and the goal is client satisfaction.

Rani (2007 stated that library resources are so expensive, but often remain underutilized resulting in wastage of money, time, energy and space. Das & Karn (2008) stated that the interest in marketing of library services has greatly increased in libraries in the last decade so as to promote the use of available reading material in the library as well as create awareness of the existences of various services among the users. Xia (2009) while discussing marketing of libraries through Facebook stated that libraries marketing strategies need to respond to various political, social, cultural, as well as technological changes of a given time. Google and other search engines have made it easier for library patrons to discover research materials without necessarily visiting a library therefore the librarians should devise ways in which they will ensure that library patrons frequent the libraries as much as possible.

Mi & Nesta (2006) declared that marketing is the key to the success of the library and listening to customers is the key to marketing. The current generation of library users are graphics oriented therefore libraries should combine visual and interactive elements into their websites as part of their marketing strategy. This will enable them to easily attract the attention of would be library users with much ease. Librarians and digital resources can play a critical role in today's students' life-long learning.

Table 4.5: Strategies for Sustaining Digital Information Resources & Services

Strategies for Sustaining Digital Information Resources & Services	Excellent (%)	Very Good (%)	Good (%)	Fair (%)	Poor (%)
Adequate Allocation of Resources	41	25	32	2	0
Online Subscription of Needed Resources	39	37	21	3	0
Developed Digital Repository	59	17	21	3	0
Information Literacy Skills	49	28	18	5	0
Marketing and Promotion	48	20	27	5	0
WiFi Facilities	51	27	15	7	0
Bring Your Own Device	30	24	30	14	2

4.8 Approaches to enhancing social sustainability of digital information

The study strived to establish social sustainability of digital information systems and services. Social sustainability can be attained by necessitating uncomplicated and equitable access to information associated with the users. The respondents totally concurred that provision of adequate computing facilities, digital information skills, digital creation of local content, interactive website, provision of Wi-Fi facilities and provision of electronic resources will help in ensuring that there is social sustainability of digital information services.

4.8.1 Provision of adequate computing facilities

Provision of adequate computing facilities is considered as one of the approaches of enhancing social sustainability as well as bridging digital divide. 47% of the respondents agreed with the above approach whereas a paltry 2% of the respondents disagreed with this approach. This notion is supported by Chowdhury, (2016:2379) who stated that social sustainability of DIS can be realized by guaranteeing uncomplicated and impartial access to information through the use of information and communication technology (ICT) infrastructure and devices. This opinion has also been reinforced by Islam & Tsuji (2011:507) who stated that ICT accelerates quick and straightforward access to information which grants the socially marginalized community unparalleled opportunity to achieve their own goals in life.

Vahid & Isfandyari (2008:227) consider ICT as an important tool as it has huge potential in empowering communities to surmount obstacles they face, address social problems, strengthen democratic institutions, and empower local economies as well as facilitating information flow that will lead to the realization of an information society.

4.8.2 Digital information skills

The respondents also agreed that digital information skill is also fundamental in enhancing social sustainability of digital information services. 49% of the respondents strongly consider digital information skill as one of the key strategies of enhancing social sustainability of DIS. Social sustainability of digital information services simply refers to impartial access and usage of information in nearly all cycle of life. Mphidi (2004)

acknowledged that information professionals should teach their clients searching and retrieval of information strategies especially in the internet, electronic databases and websites. He further quipped that libraries need to subscribe to good online information databases and other electronic resources. Eshet-Alkalai (2004), declared that digital information skills encompasses more than the ability to operate a digital device or make use of software. It entails a variety of complicated cognitive, emotional and sociological skills, which library patrons require so as to enable them to fully exploit information resources in a digital environment. Vahid & Isfandyari (2008:229) remarked that people who are digital/information literate can effectively and efficiently access and make use of digital resources.

Van Deursen & Van Dijk (2011:894) stated that due to the increasing volume of information on the internet and people's ever-increasing reliance on information, digital information skills is now considered an important resource in modern-day society. People with low levels of digital information skills will increasingly find it hard to access information online that are vital to their day to day life thus becoming more disadvantaged.

4.8.3 Digital creation of local content

Digital creation of local content is also among the strategies that will enhance social sustainability of digital information. 36% (strongly agreed) and 47% (agreed) of the respondents consider creation of local content as one of the approaches of enhancing sustainability of digital information services. According to Khan (2010) local content can be defined as:

"An expression and communication of a community's locally generated, owned and adapted knowledge and experience that is relevant to the community's situation."

Uzuegbu (2012:5) stated that local content available in universities are as a result of scholarly research. They include monographs, thesis and dissertations, project reports, journal articles, evaluation reports, conference papers and proceeding as well as workshop reports. In order to create local content in institutions of higher learning, libraries and information centres should invest in institutional repositories and community virtual network. Shin (2007:2) stated that community networks are formulated in such a way that they will offer communities with free or low-cost electronic access to information content and an array of electronic communication resources. This will enable them not only to create the local contents, but avail them to the community so that they can make use of these resources thus enhancing social sustainability of digital information services and resources.

4.8.4 Interactive website

Interactive website is another strategy for enhancing social sustainability of digital information services. 34% of the respondents strongly agreed with this strategy. 46% agreed with it whereas 2% of the respondents disagreed with setting up of interactive website as a strategy for enhancing social sustainability of DIS. Madhusudhan & Nagabhushanam (2012:569) opined that the web is now a common feature throughout the world. In libraries, the web complements traditional library services as it has enabled libraries to come up with innovative ways of meeting the information needs of its users.

Traditional online services have gradually changed into web-based services through web technologies. Library websites are now the main point of access of the collections housed within a university library as well as web-based library services. Osorio (2001) further stated that the library home page is nowadays the starting point for most library patrons when it comes to searching and exploring the resources available within the university library. Alansari (2013:69) stated that libraries should be in a position to institute and sustain an effective communication channel with their client base so as to maintain their relevance to them. Agyemang et al (2015:685) said that most organizations, more so the libraries, do not fully exploit the interactive ability of the Internet to foster relationships with their client base as well as provide web-based services.

Madhusudhan & Nagabhushanam (2012:570) further stated that the library services that are provided through the web platform are deemed priceless. This is due to the fact that they allow libraries to offer their services beyond the normal library operation hours. Furthermore, these services tend to increase library's visibility as more and more users become aware of what the library can offer. Liu (2008:6; quoted in Agyemang et al (2015:685) depicted libraries websites as the gateway that enables the faculty and students to access to information that will help in their research as well as educational needs.

4.8.5 Wi-Fi services

Wi-Fi services is also one of the ways of enhancing social sustainability of digital information services. Internet is greatly relied upon by a vast majority of the population due to a number of reasons such as communication, job seeking, entertainment, education,

travelling among others. 57% of the respondents strongly agreed that WiFi services is vital in enhancing social sustainability of DIS. Chandel & Saikia (2012:148) stated that usability of digital information services has greatly increased as a result of enhanced internet. Additionally, library patron's attitude and behaviour towards information searching, retrieval and use has greatly changed as they tend to be highly impatient and time conscious. With the provision of Wi-Fi services, library users may be in a position to access information resources much faster by either using their laptops or mobile phones. We should therefore acknowledge that internet has played a great role in ensuring that library patrons access information resources much faster.

4.8.6 Provision of electronic resources

Information technology has had an overwhelming bearing on the availability and accessibility of e-resources (Chandel & Saikia (2012:147). E-resources are resources that are available in electronic format and can be accessed through electronic transmission. E-resources are a vital part of learning nowadays especially in institutions of higher learning. 63% of respondent strongly acknowledged that provision of e-resources as one of the best strategies in ensuring social sustainability of DIS. The advent of e-journal (which is among the e-resources) is considered as the greatest revolution in the capture and dissemination of knowledge (Jotwani, 2014:33). E-resources serve a diverse and dispersed audience and are effectively and efficiently searched, recalled and disseminated with much ease. It is due to this nature that scholars nowadays tend to rely much on e-resource than print resources (Evans, 2008:399). A majority of library users nowadays completely rely on the internet in accessing information resources. It is as a result of the

contribution of ICT and the profounding impact of the internet that information processing, searching, storage, use and dissemination have become much easier. Numerous studies conducted mainly in academic environment focused on people's perceptions and preferences for electronic resources have found their rapidly growing acceptance within the scholarly community. Table 4.6 below summarizes the approach used in enhancing social sustainability of DIS.

Table 4.6: Approaches to enhancing social sustainability of DIS

Approaches to enhancing social sustainability of DIS	Strongly agree (%)	Agree (%)	Not sure (%)	Disagree (%)	Strongly Disagree (%)
Provision of Adequate Computing Facilities	47	32	17	2	2
Digital Information Skills Offered	49	29	15	7	0
Digital Creation of Local Content	36	47	12	5	0
Interactive Website	34	46	18	2	0
Use of Social Media	33	45	16	6	0
Provision of Wi-Fi Facilities	57	28	10	5	0
Provision of Electronic Resources	63	33	2	2	0

4.9 Challenges and solution for provision of sustainable digital information services

The study further sought to identify the challenges faced in provision of digital information services. The respondents' remarks are clearly illustrated in table 4.7.

4.9.1 Lack of adequate information retrieval skills

The findings showed that lack of adequate information retrieval skills on the part of library staff affected delivery of services as follows: 47% of the respondents strongly agreed that it does affect service provision, 32% of the respondents agreed, whereas 17% of the respondents were not sure, 2% of the respondents disagreed and another 2% strongly disagreed. Information retrieval involves appropriate set of skills to select, navigate, evaluate and make use of information effectively. It entails being in a position to know where and how to effectively and efficiently retrieve accurate, current and relevant information. The finding of this study is also supported by Chowdhury et al (2014:575-576) who stated that with a vast range of information sources, it is often quite difficult for users as well as information professionals to determine which of the various channels could provide information in the most effective and efficient manner. They further noted that despite a significant amount of research into the development of sophisticated search tools, the identification of appropriate information sources remains a very challenging task. Fourie & Bothma, (2006:469) also stated that there is a growing need for information literacy skills at all levels of the society as a result of increased used of the internet especially in schools, universities, workplaces among others.

As part of the solution to this challenge, Mohd & Mohd (2016:289) stated in their study that information professionals should strive to guide and teach their patrons on how to find relevant and valid information in order to satisfy their information needs. Information resources cannot be accessed if the patrons are not familiar with how the library system operates.

4.9.2 Poor Connectivity and Networking Systems

49% of the respondents strongly agreed that poor connectivity and networking do affect provision of digital information services, 29% of the respondents agreed, 15% of the respondents were not sure where it affects or not and the remaining 7% of the respondents disagreed. Digital libraries are at the core of relationships between several information service-related disciplines like library management, knowledge management, document management, museum management, archives management, and e- commerce systems. This brings about the need for the different kind of systems to talk to each other through what we call interoperability (Ongus, et al, 2007:4). Interoperability is the ability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units. Interoperability is a principal concern whenever digital libraries are constructed as collections of independently developed components that rely on each other to accomplish a larger task. The ultimate goal for such a system is to have components evolve independently, yet to allow all components to call on each other efficiently and conveniently. For digital libraries to scale to an international level, they need to be constructed from such interoperable pieces. This is the case not only for technical reasons, but also because information repositories and information processing services for digital libraries often need to be operated by independent organizations (Paepcke, Chang, Garcia-Molina, and Winograd, 1998:1).

4.9.3 Inadequate internet

36% of the respondents strongly agreed that inadequate internet is among the challenges that face the library when it comes to provision of digital information services. A further 47% of the respondents agreed that it poses a great challenge to provision of services within the library. The respondents further stated that lack of adequate internet is also another challenge to the provision of digital information services. Digital information services refer to all electronic resources as well as computerized and networked online resources that can be accessed through libraries. Rao & Babu (2001:26) stated that the environment in which librarians work is changing in terms of greater access to a range of information irrespective of where they are, increased speed in acquiring information, greater complexity in locating, analyzing and linking of information. All these have been brought about by internet which is considered a vital part of library environment nowadays. It has added a great value to the library and information services. With the expansion of Internet, a new class of electronic documents has emerged. Internet is playing an important role in transforming the library system and the way in which we view the library resources and the library services. With the help of web based library services, users are attended to round the clock. Internet provides links to various library sites, specializing in almost every topic and they can be accessed directly from any part of the world.

4.9.4 Inadequate financial resources

34% of the respondent strongly agreed that inadequate financial resources affects provision of DIS, 46% of the respondents agreed that it does affect service provision, 18% were not sure whether it does affect service provision or not. A mere 2% of the respondents stated that it does not affect provision of digital information services. Academic libraries are viewed as an integral component of higher education that contributes to the achievement of faculties, students and institutions. Libraries and information centers are under immense pressure to exhibit their values to the stakeholders. A majority of libraries more so academic libraries have experienced budget constraints as a result of budget cuts. These cuts (budget) coupled with an increase in the price of e-resources as well as subscription fees for databases have strongly affected provision of digital information services.

4.9.5 Intellectual property rights

Intellectual Property Rights (IPR) is set of rights associated with creations of the human mind. An output of the human mind may be attributed with intellectual property rights. These are like any other property, and the law allows the owner to use the same to economically profit from the intellectual work (UNESCO, 2015: 4).

Muir (2006) while discussing the issue of preservation, access and intellectual property rights challenges for libraries in the digital environment stated that:

"Intellectual property rights present librarians with challenges at all stages of the information management cycle, from creation of digitized material or selection

and acquisition of externally created material, to the provision of access and long-term management of digital collections".

The whole idea of libraries as information warehouses is contested in a digital environment. A substantial amount of information resources are copyrighted. If the law does not allow preservation copying, a library or information center may be forced to seek permission to copy for preservation purposes. If granted permission, the library may go ahead and copy thus ensuring that its clients have access to the resource. However, it should be noted that the biggest difficulty lingers in the intricate web of rights ownership of digital information or services. The organizations offering the information resource or service may not fully own exclusive rights in that information resource or service, thus not able to grant consent to libraries to preserve.

4.9.6 Lack of skilled staff

The core business of academic library staff is to attend to the needs of their users by granting them access to a diverse range of informational resources in order to support teaching, learning and research within academic institutions. 57% of the respondents strongly agree that lack of skilled library staff is a challenge in provision of digital information services and resources. The environment in which librarians work is changing in terms of greater access to a range of information irrespective of where they are, increased speed in acquiring information, greater complexity in locating, analyzing and linking of information. According to Mathews (1997:84) technological progressions have conceived a range of training needs for librarians such as automated systems management, database mining, information search and retrieval among others. Lack of

skilled staff is therefore among the great impediments to the provision of digital information services within the library.

Table 4.7: Challenges in provision of Digital Information services

Challenges in provision of Digital Information services	Strongly agree (%)	Agree (%)	Not sure (%)	Disagree (%)	Strongly Disagree (%)
Lack of Adequate Information Retrieval Skills	47	32	17	2	2
Poor Connectivity and Networking Systems	49	29	15	7	0
Inadequate Internet	36	47	12	5	0
Inadequate Financial Resources	34	46	18	2	0
Intellectual Property Rights	33	45	16	6	0
Lack of Skilled Staff	57	28	10	5	0
Lack of Information Literacy Skills	63	33	2	2	0

4.10 Solutions to the challenges faced

Furthermore, the study sought to establish solutions to some of the challenges faced in provision of digital information services. Majority of the respondents were in agreement that provision of computing facilities, provision of high technological systems, social media communications, and provision of adequate financial resources, development of information infrastructure, training of information staff and provision of information literacy skills. This is clearly demonstrated in table 4.8 pg. 57.

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According to the findings in Table 4.8, 56% of the respondents strongly agreed that provision of computing facilities as one of the solutions to the challenges faced in provision of sustainable digital information services. Digital information services can only be accessed through the use of computers. Digital library comprises of information in digitized form and are electronically accessible using a computer or other output devices.

4.10.1 Social media communications

Social media communications is also considered as one of the key solution to the challenges faced in provision of sustainable digital information services. 66% of the respondents strongly agreed to it as one of the solutions. Social media channels are quite popular with library users nowadays. Social media is a communication platform whereby people communicate, interact and socialize with the help of internet (Xie & Stevenson, 2014:502). There are quite a number of social media platform and the most widely used platforms within a library setting include Facebook, Twitter, RSS feeds, YouTube, blogs and wikis. According to Zhu & Zhu, (2016:616), Facebook, Twitter and YouTube have features that have endeared them to librarians as they (librarians) are able to engage their users in real-time as well as promote their information resources and library services. Palmer (2014:611) stated that social media systems have given rise to additional ways other than the traditional ways for individuals as well as libraries to convey and transmit information as well as interacting with a wide audience.

4.10.2 Training of information staff

Staff training is considered a crucial and a demanding undertaking which helps in determining the prospect of many businesses, institutions and organizations. 71% of the respondents strongly agreed that training of information staff is one of the best solution to the challenges faced in provision of digital information services. Without applicable and proper training, staff of an institution or an organization could possibly fail to accomplish what is expected of them, therefore resulting in the crumbling of business, institution or organization. Organizations irrespective of their size or nature prefer to have employees who will accomplish tasks as per their expectations, thus realizing their goals and objectives (Ondari-Okemwa, 2000:257). Among the reasons as to why organizations train their staff is to increase efficiency, boost performance as well as improving staff morale with the organization. In order to operate effectively and survive in 21st century, libraries should strive to keep up and respond to technical, social and economic changes. According to Shepherd (2010:507), the 21st century library arena is filled with innovative services and ever-changing technologies thus presenting library management and supervisory staff with the challenge of addressing staff training needs as well as upgrading professional skills of librarians.

The training of information professionals may assist to sustain effective performance as well as optimize their contributions towards the realization of the aims and objectives of the institutions of higher learning. On job training may also aid librarians to improve their professional knowledge and skills as well as developing right attitude regarding their profession (Ondari-Okemwa, 2000:257). The e-library platform offers a serious challenge

to librarians thus the need for training and upgrading of skills. Staff training is considered an essential way of addressing weakness in staff performance (Baro, et al 2013:102).

Librarians and informational professions have a fundamental role to play when it comes to guiding their patrons and users to find and access information resources especially in a networked environment. Therefore training of information staff is central when it comes to provision of sustainable digital information services.

4.10.3 Provision of adequate financial resources

The finding showed that 72% of the respondents strongly agreed that provision of adequate financial resources as a solution to the challenges faced in provision of sustainable digital information services. The finding is in agreement with Ongus, et al, (2007:5) who stated that adequate financial resource is vital when it comes to development of digital libraries. Digital librarians should establish ways to ensure that they are financially stable in order to ensure that it is fully operational. Digital librarians should be smart enough to be able to conduct fundraising to support their libraries as well as have sound financial management skills so that their libraries can survive in the medium and long term.

4.10.4 Development of information infrastructure

The findings further showed that 61% of the respondents strongly agreed that the development of information infrastructure is also among the solutions to the challenges faced in provision of sustainable digital information services. Henshaw, (2011:19) stated that the main objective of a library is to offer seamless experience for its patrons when it

comes to searching and accessing its resources using a single interface. Parida (2004:1) stated that a digital library has specific infrastructural requirements such as database, library system, network connection, adequate personal computers, electronic mail service, well trained manpower, various functions to coordinate and manage the entry and retrieve data, computer hardware with audio-visuals, multimedia kits, video conferencing kit, digital graphic printer and finally software and its accessories all of which play a key role in ensuring access and usage of digital information services/resources.

Henshaw (2011:19) stated that among the key issues in instituting a robust, accessible, and fully integrated digital library systems infrastructure, appropriate for the function of protecting, handling and overseeing dissemination of digital assets to a high standard is through procurement of systems such as Search and discovery system, Digital delivery system (DDS), Digital asset management (DAM), Workflow tracking system (WTS) among others.

Henry (2012:2) further states that, if a library patron cannot easily access the content of a digital library, if an audio/video can be heard/viewed only after it has been downloaded, or if the contents becomes corrupted or lost over time, for example, the library patrons will view the digital library as unreliable source of information.

Table 4.8: Solutions to challenges faced

Solutions to challenges faced	Strongly agree (%)	Agree (%)	Not sure (%)	Disagree (%)	Strongly Disagree (%)
Social Computing Facilities	56	40	4	0	0
Provide High Technological Systems	59	41	0	0	0
Social Media Communications	66	34	0	0	0
Provision of adequate Financial Resources	72	28	0	0	0
Develop Information Infrastructure	61	39	0	0	0
Training of Information Staff	71	29	0	0	0
Provision of Information Literacy Skills	69	31	0	0	0

4.11 Chapter Summary

This chapter highlights the results of the data analyzed based on the objectives of the study. The findings are as a result of the interpretation of the answers from the respondents as well as review of literature and are presented in form of bar graphs, pie charts, tables and texts.

CHAPTER FIVE

SUMMARY OF THE FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter features the summary and discussions of the study findings including conclusion and recommendations. The study further makes suggestions regarding sustainable provision of digital information services at the University of Nairobi library system. Suggested areas for further study are also portrayed in this chapter. The purpose of this study was to examine the strategies that academic libraries are using in sustaining provision of digital information services with particular reference to the University of Nairobi.

Objectives of the study included:

i. Identify the digital information services that are offered by the library.

ii. Find out whether the digital information services are economically, socially and environmentally sustainable.

iii. Identify the challenges faced by the libraries in enhancing economic, social and environmental sustainability in provision of digital information services.

iv. Find solutions to the challenges faced in provision of sustainable digital information services.

5.2 Summary of the Findings

The study's findings are summarized as follows:

5.2.1 Background Information of the Respondents

The research was conducted on sample size of 70 respondents who were divided into 5 diverse groupings namely; Library staff, Masters in Library and Information Science Students, Digital Repository Staff, E-resources staff and Technologists/ICT staff. The study showed that 78.8% of the respondents were of postgraduate level, 17.3% were of diploma level and the remaining 3.8% were at the undergraduate level. Furthermore, 56% of the respondents indicated that they work at operational level followed by 21% who pointed out that they work at the middle level management whereas 23% of the respondents did not specify whether they work at operational, middle or top level management positions. None of the respondents implied that they work at top level management.

5.2.2 Digital information services

The researcher noted that the respondents were aware of the existence of digital information resources and services and that OPAC and E-journals are the most widely used information services and resources followed closely by digital repository and WiFi. This can be attributed to the fact that OPAC is considered as the gateway to the collections that are held in the library. E-journals are also widely used due to the fact that they contain authoritative and current information and can be easily accessed from anywhere within the university. With advances in computing and mobile technology,

WiFi is considered an important service especially in ensuring that there is social sustainability of digital information services. Nowadays, virtually everyone owns a mobile phone, tablet or a laptop and WiFi technology has helped in not only making information accessible but also reduced the operational cost of setting up computer laboratories by the library.

The study also established that a majority of the respondents were able to get training in provision of digital information service. Only 2% of the respondents indicated that they have never been trained in respect to digital information services.

5.2.3 Sustainable Digital Information Services

The study established that a majority of respondents were not well versed with matters regarding environmental sustainability. According to table 4.4, 12% of the respondents acknowledged that they were not sure if digital information services promoted green environment or not. A further 21% of the respondents could not tell whether digital information services helps in curbing emission of greenhouse gases into the atmosphere.

The study further identified that majority of the respondents considered adequate allocation of resources, subscription of needed resources, developed digital repository, information literacy skills and marketing and promotion of digital information services and resources as key strategies in enhancing social sustainability of digital information services.

Additionally, provision of adequate computing facilities, digital information skills, digital creation of local content, interactive website, provision of Wi-Fi facilities and provision of electronic resources were considered significant in enhancing social sustainability of digital information services.

5.2.4 Challenges and strategies for sustainable provision of digital information services

The study further identified the challenges faced in provision of digital information services. The respondents were in agreement that lack of adequate information retrieval skills, poor connectivity and networking systems, inadequate internet, inadequate financial resources, intellectual property rights, lack of skilled staff and lack of information literacy skills were among the key challenges faced in provision of digital information services.

Furthermore, the study established solutions to some of the challenges faced in provision of digital information services included provision of computing facilities, provision of high technological systems, social media communications, provision of adequate financial resources, development of information infrastructure, training of information staff and provision of information literacy skills.

5.3 Conclusion

The study showed that the respondents were aware of the existence of various digital information services in the library. The study further established that both the library staff irrespective of their positions and MLIS students got some training in regards to digital

information services. Additionally the study further found out that a majority of library staff weren't aware of issues regarding environmental sustainability of digital information services. The study also established that the respondents could easily identify the challenges they are facing in provision of digital information services.

5.4 Recommendations

From the study findings and conclusions, the following recommendations are made:

5.4.1 Creation of awareness about social and environmental sustainability of DIS

In order to ensure that the library staff and post graduate students are prepared to address the issue of social and environmental sustainability, the library management and MLIS department should embark on creating awareness about these issues. Based on the results of the study, 21% of the respondents were not sure whether digital information services helps in reducing carbon footprint of the library or not (see table 4.4). A further 7% of the respondents were not sure whether digital information resources help in ensuring cheap access to information.

5.4.2 Formulation of strategies to enhance social sustainability of DIS

Libraries subscribe to information resources that are rarely used by the clientele. The library should formulate strategies to ensure that the clients are aware of the existence of these resources in order for them to make maximum use of them. Use of web 2.0 tools is key in ensuring that digital information resources are utilized. The library management should make extensive use of social media platform in order to ensure clients have access to full time support from the library staff. Use of social media has been least rated by the

respondents as one of the ways of ensuring social sustainability of digital information services (see table 4.6).

5.5 Suggestions for Further Research

Suggestions for further research include:

i. International standards

Studies should be conducted to investigate conformity of academic libraries in Kenya with the internationally accepted environmental sustainability standards.

ii. Social Sustainability

Not much has been written about social sustainability of libraries in Kenya. Studies should be conducted in regards to this issue especially in the following areas:

a) Equity of access to information

b) Access of information by the physically challenged.

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APPENDICES

APPENDIX I: INTRODUCTION LETTER

Abdulahi Abdi Isaac
Department of Library and Information Science
University of Nairobi
P.O. Box 30197 - 00100
Nairobi.

Dear Respondent,

RE: INTRODUCTION LETTER

I am a Master of Library and information Science student in the Department of Library and Information Science, University of Nairobi.

Currently, I am conducting a research titled "**Sustainable provision of digital information systems and services in academic libraries: A case of the University of Nairobi library system**".

The aim of this study is to:

i. Examine the digital information services that are offered by the library.

ii. Find out whether the digital information services are economically, socially and environmentally sustainable.

iii. Establish the challenges faced by the library in enhancing economic, social and environmental sustainability in provision of digital information services.

You have been selected to participate in this study. The information and opinions you provide are purely for academic purposes of the study and shall remain strictly confidential.

Thank you in advance for your cooperation.

Yours faithfully,

Abdulahi Abdi Isaac

C54/79793/2015

APPENDIX II: QUESTIONNAIRE FOR LIBRARY STAFF AND STUDENTS

INSTRUCTIONS

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

Background Information

1. Respondent:

a) Library Staff ☐
b) Technologist/ICT ☐
c) Digital repository staff ☐
d) E-resources staff ☐
e) Postgraduate Student ☐

2. Highest education level:
   …………………………………………………………………………...

3. Management level (staff):

a) Top Management ☐
b) Middle Management ☐
c) Operational Management ☐

4. Specific responsibilities (staff):
   ……………………………………………………………………

Digital Information Services

5. Select the digital information resources and services that are accessed and used in the library.

a) Online Public Access Catalogue ☐
b) Electronic Journals ☐
c) Electronic Books ☐
d) Digital Repository ☐
e) Web Portals ☐
f) Information Portal ☐
g) Hotspot ☐
h) WiFi ☐
i) Digital reference services ☐
j) Current awareness services

k) Any other (please specify)………………………………………………………………………………

6. Rank the digital information services using the provided scale. **5 Most Preferred = 5 Preferred = 4 Moderately Preferred = 3 Slightly Preferred = 2 Least Preferred = 1**.

Digital Information Sources & Services	5	4	3	2	1
Online public access catalogue					
Electronic journals					
Electronic books					
Digital repository					
Web portals					
WiFi					
Digital reference services					
Current awareness services					

7. Rate the digital information services using the following scale. **Excellent = 5 Very Good = 4 Good = 3 Fair = 2 Poor = 1**.

Digital Information Sources & Services	5	4	3	2	1
Online public access catalogue					
Electronic journals					
Electronic books					
Digital repository					
Web portals					
Digital reference services					
Current awareness service					
Wifi					

Sustainable Digital Information Services

8. To what extent do you agree or disagree with these strategies to enhance economic sustainability of digital information services. Use the scale of **Strongly Agree = 5 Agree = 4   Not sure = 3   Disagree = 2   Strongly Disagree = 1.**

Economic and environmental benefits of digital information	5	4	3	2	1
Promotes green movement					
Free of Emission					
Provides digital resources					
Available anywhere anytime					
Cheap access to information					

9. Indicate how often digital information training is offered to the staff using the scale. **Always = 5 Often = 4 Sometimes = 3 Seldom = 2 Never = 1**.

Statement	5	4	3	2	1
Digital Information Training					

10. Rank the following strategies for enhancing sustainability of digital information resources and services in the library. **Excellent = 5 Very good = 4 Good = 3 Fair = 2 Poor = 1**.

Strategies for Sustaining Digital Information Resources & Services	5	4	3	2	1
Adequate Allocation of Resources					
Online Subscription of Needed Resources					
Developed digital repository					
Information literacy skills					
Marketing and Promotion					
Wifi Facilities					
Bring your own device					

11. To what extent do you agree or disagree with the approaches taken by the library to enhance equity in access and use of digital information. Use the scale of **Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, Strongly Disagree =** 1.

Approaches to Enhance Equity of Digital Information	5	4	3	2	1
Adequate computing facilities provided					
Digital information skills offered					
Digital Creation of Local Content					
Interactive website					
Use of Social Media					
Provision Wi-Fi Facilities					
Provides electronic resources					
Computer Labs for Electronic Resource					

Challenges and solution for provision of Sustainable of Digital Information services

12. To what extent do you agree or disagree with the following challenges that hinder provision of digital information services in the library. Use the scale of **Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, Strongly Disagree = 1.**

Challenges of Digital Information	5	4	3	2	1
Lack of adequate information retrieval skills					
Poor connectivity and networking systems					
Inadequate internet					
Inadequate financial resources					
Intellectual property rights					
Lack of skilled Staff					
Lack of information Literacy Skills					

13. To what extent do you agree or disagree with the solution to the challenges faced in provision of digital information services. Use the scale of **Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, Strongly Disagree = 1**.

Solutions to the challenges faced	5	4	3	2	1
Social Computing Facilities					
Provide High Technological Systems					
Social Media Communications					
Provision of adequate Financial Resources					
Develop Information Infrastructure					
Training of Information Staff					
Provision of Information Literacy Skills					