

**EVALUATION OF LIBRARIANS AWARENESS AND UPTAKE OF OPEN SOURCE
LIBRARY SOFTWARE IN FEDERAL COLLEGES OF EDUCATION IN
NORTH EASTERN NIGERIA**

By

ABDULMALIK BAPPAH MAHMOOD

E65F/31116/2015

**A RESEARCH PROJECT SUBMITTED IN FULFILLMENT OF THE REQUIREMENTS FOR
THE AWARD OF MASTER DEGREE OF LIBRARY AND INFORMATION SCIENCE IN
THE SCHOOL OF EDUCATION, KENYATTA UNIVERSITY**

JULY, 2018

DECLARATION

I confirm that this research project is my original work and has not been presented in any other university/institution for certification. The project has been complemented by referenced sources duly acknowledged. Where text, data (including spoken words), graphics, pictures or tables have been borrowed from other sources, including the internet, the sources have been specifically accredited through referencing in accordance with anti-plagiarism regulations.

Signature

Date.....

Abdulmalik Bappah Mahmood

E65F/31116/2015

I confirm that this research project was carried out by the candidate under my supervision as a University supervisor.

Signature

Date.....

Dr. Peter Wamae

School of Education
Department of Library and Information Science
Kenyatta University

DEDICATION

This work is dedicated especially to my beloved parents Alhaji Muhammadu Abba Baba Zango and Hajiya Maryam Baba Zango for their immense support, prayers, and encouragement through this academic programme.

ACKNOWLEDGEMENT

In the name of Allah, The Beneficent, The Merciful. May the peace and blessing of Allah be upon His messenger, Prophet Muhammad (P.B.U.H). I want to express my sincere and immeasurable thanks to my parents for their prayers and word of encouragement towards the completion of this study. I also acknowledge the perseverance and giant stride of my lecturer and hardworking supervisor, Dr. Peter Wamae, who patiently read through the project and suggested valuable and constructive inputs and observations that guided me in attaining this stage. Other members of the department including Dr. Charles Kamau Maina, Dr. P.G. Mwathi, Dr. Joshua R. Njuguna, Dr. Rose, Dr. Mukuvi C., Dr. Namande, Mr. Martins G., Mrs. Elizabeth, Dr. Caroline and Dr. M. Wambiri are also appreciated.

My special thanks go to Prof. GidadoTahir, Air vice marshal Abubakar S. Natiti, Justice Abdulmalik B. Mahamud, the college librarian (FCE, Yola) Hajiya Maryam Ribadu, and the entire staff of the college. My special appreciations go to Mallam Ahmed Baba Zango, A.C.P. Ibrahim B. Zango, Alhaji Mohammed B. Zango, Hajiya Hauwa, Haj. Amina, Haj. Aishatu, Haj. Asma'u, Alh. Abubakar B. Zango, ACI Barr. Abdurashed B. Zango and Umar B. Zango.

ABBREVIATIONS

CIM	Common Information Model
FCE	Federal Colleges of Education
ICT	Information and Communication Technology
OLS	Open Library Software
OPAC	Open Public Access Catalogue
OSLS	Open Source Library Software
OSS	Open Source Software
SPSS	Statistical Package for Social Sciences
TEI	Tertiary Education Institutions
WBEM	Web Based Enterprise Management

TABLE OF CONTENTS

DECLARATION	ii
DEDICATION	iii
ACKNOWLEDGEMENT	iv
ABBREVIATIONS	v
TABLE OF CONTENTS	vi
LIST OF TABLES	ix
LIST OF FIGURES	x
ABSTRACT	xi
CHAPTER ONE: INTRODUCTION	1
1.1 Introduction.....	1
1.2 Background to the Study.....	1
1.3 Statement of the Problem.....	5
1.5 Objectives of the Study.....	5
1.6 Research Questions.....	6
1.7. Significance of the Study.....	6
1.8. Scope and Limitation of the Study.....	7
1.9 Assumptions.....	7
1.10 Theoretical Framework and Conceptual Framework.....	8
1.10.1 Theoretical Framework.....	8
1.10.2 Conceptual Framework.....	9
1.11 Operational Definition of Terms.....	13
CHAPTER TWO: REVIEW OF RELATED LITERATURE	14
2.1 Introduction.....	14
2.2 Implementation of open source library.....	14

2.3 Qualities of a Good Library Software.....	21
2.4 Awareness of Open Source Library Software among Librarians	40
2.5 Training, workshop, conferences on free open source library software	45
2.6 Challenges facing Implementation of Free Open Source Library Software.....	47
2.6.1 Finance and Funding.....	47
2.6.2 Poor Infrastructure	48
2.6.3 Intellectual Property Right.....	48
2.6.4 Low Internet Bandwidth	50
2.6.5 Privacy, Security and Income	50
2.7 Summary and Gap Identification	51
CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY	52
3.1 Introduction.....	52
3.2 Research Design.....	52
3.3 Variables	53
3.4 Location of the Study.....	53
3.5 Target Population.....	54
3.6 Research Instruments and Data Collection Techniques.....	55
3.6.1 Research Instruments	55
3.6.2 Data Collection Techniques	55
3.7 Pilot Test Results	57
3.7.1 Data Validity	58
3.7.2 Data Reliability	59
3.8 Data Analysis	60
3.9 Ethical Consideration.....	60
CHAPTER FOUR: RESULTS AND ANALYSIS	61

4.1 Introduction.....	61
4.2 Response Rate.....	61
4.3 General Information.....	62
4.3.1 Gender Distribution	62
4.4.2 Years in Service Distribution.....	63
4.4.3 Official Position of Respondents	64
4.4.4 Highest Qualifications	65
4.5. Knowledge about Open Source Library Software.....	66
4.5.1 Components of Free and Open Library Software	67
4.5.2 Types of Free and Open Library Software	69
4.5.3 Benefits of free and open source library software in the operations of library.....	71
4.5.4 Challenges associated to Free and Open Library Software	72
4.5.5 Possible solutions to the challenges.....	75
CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.....	78
5.1 Introduction.....	78
5.2 Summary.....	78
5.3 Conclusion	80
5.4 Recommendations.....	81
5.5 Suggestions for Further Readings.....	82
REFERENCES.....	83
APPENDICES.....	92
Appendix I: Letter of Introduction.....	92
Appendix II: Questionnaire.....	93
Appendix III.Map of Nigeria Showing North East.....	100

LIST OF TABLES

Table 3.1: Target Population.....	54
Table 4.1: Response rate.....	61
Table 4.2: Reliability Results.....	58
Table 4.3 Knowledge about Open Source Library Software.....	67
Table 4.4 Components of Free and Open Library Software.....	68
Table 4.5 Types of Free and Open Library Software.....	70
Table 4.6 Benefits of free and open source library software.....	72
Table 4.7 Challenges associated to Free and Open Library Software.....	74
Table 4.8 Challenges associated to Free and Open Library Software.....	76

LIST OF FIGURES

Figure 1.1 Conceptual Framework	11
Figure 4.1 Gender Distribution of Librarians	63
Figure 4.2 Years in Service Distribution	64
Figure 4.3 Official Position of Respondents.....	65
Figure 4.4 Highest Qualification.....	66

ABSTRACT

The researcher evaluated librarian's awareness and uptake of open source library software in Federal Colleges of Education in North-East Nigeria. The study discussed on open source software for libraries. The study investigated on the uptake situation, level of awareness, benefits and problems of open source for library service. The purpose is to recommend the best open source software for the Federal Colleges Library for their uptake operations. Literatures was reviewed which includes the concepts and types of open source software, availability and utilization among others. The study adopted descriptive research design in order to describe the current situation on awareness and uptake of OS library software. The target population was the library staff and probability sampling technique were used to enable every member of the population have equal chance of being chosen for the study. Stratified random sampling was applied to the study. The instrument for data collection was questionnaire and data were presented in a descriptive manner using tables, graphs and charts. A pilot study was conducted in advance to test some part of the instruments in order to ensure that ambiguities are removed from the questionnaire so that respondents would not have difficulties in responding to questions. In order to ensure that the researcher obtains qualitative data from the field, the instrument was pretested with a few individuals before the researcher embarks on data collection exercise to check on their validity. Secondary source of data was also used to validate the data provided. Computer based statistical package for social sciences (SPSS) was adopted to analyze the quantitative data.

CHAPTER ONE

INTRODUCTION

1.1 Introduction

This chapter provides an overview of the research problem and the gaps that necessitated this study. It comprises background to the study, statement of the problem, purpose, objectives and research questions, significance of the study, limitations and delimitations of the study, theoretical and conceptual frameworks and operational definition of terms.

1.2 Background to the Study

Free and open access library software is very significant modern source of teaching, learning and research particularly in higher educational institutions around the world especially in the 21st century. According to Fadehan and Ali (2010), the 21st century has seen an extraordinary paradigm change in the execution of library and information services worldwide; and the ripple consequence of the influence of Information and Communication Technology (ICT) on each aspect of human effort remains enormous and its influence on library and information services has not been limited.

According to Blessing (2012), currently, admission and acquisition of Open Source Software are achieved with little or no fund via the Open Source Software Initiative. Blessing (2012) goes on to assert that, the arrival and growth of Open Source Software in the present age, has made the change from “traditional” to “technology based” library services which gives room for more real

service delivery that are very easy and cost effective. Consequently, libraries are now accepting them in their technical services, digitization processes, and overall library content management.

Higher educational institutions libraries in this respect vastly benefits from free and open access library software as source material for the instant community including staff, students, researchers and the community at large. According to Johnson, Trabelsi, and Tin (2013), the development in online education or e-learning, in which learning is carried and strengthened through computer networks such as the Internet, has demonstrated new challenges for library services. New information and communications technologies, as well as fresh educational models, require librarians to re-evaluate the way they progress, attain and deliver resources and services.

In a related suggestion, Nhando (2016) observed that, open educational resources (with free and open access) present a chance for learning institutions in Sub-Saharan Africa to produce information and use a wider range of educational funds. Nhando (2016) further counted the potential of Open Educational Capitals in Sub Saharan Africa in progressing online education includes; access to excellence academic resources; deteriorating cost of education; improving the quality of resources that result from partnership and peer scrutiny; smattering locally developed educational assets that meet local necessities; constructing local contribution communities and rising resources' quality; establishing the culture of sharing in the educational context; cost and effort effective transformation of the native educational resources.

The unrestricted and open library software plays substantial role of most progressive countries of Europe. This is since access and accomplishment of this software are achieved with slight fund

via the Open Source Software Initiative. The introduction and development of Open Source Software in the present age, has made the switch from “traditional” to “technology based” library services which provides room for more effective service provision very easy and cost effective thus, libraries in industrialized countries are now accommodating them in their technical services, digitization processes, and general library content organization. A study conducted by Gance, Kerr and Reid (2004) on the degree of use of OSS by Tertiary Education Institutions TEIs in Australia, New Zealand and UK discovered that all the TEIs who responded to the survey were already using OSS in their services provision. In the same way, Open source software's are extensively being accepted across the globe, particularly in western countries, in developing countries misconceptions about OSS plays a negative role in its awareness and uptake level.

From wide literature search equally conducted, the outcome discovered that no research had been done to test the awareness of librarians, the status, development, prospect and challenges of the use of Open Source Software with exact reference to Nigerian libraries. Library practice in African countries has had a boundless pioneering determination envisioned at achieving progression and effectiveness.

The pursuit to completely please the changing needs of library and information users has unceasingly been delayed primarily by insufficient fund prerequisite for the procurement of resources, lack of awareness of open sources software, as well as facilities needed for real service delivery to the consumers. During the age proceeding the arrival and development of Open Source Software, it was completely recognized that very limited number of libraries were

able to obtain software as a result of their overall high cost in third world countries (Blessing, 2012).

In Nigeria, academic institutions ran into one problem of the other owing to the incorrect choice of library software and this reveal that most librarians in Nigerian Federal colleges of Education Libraries have limited consciousness on the obtainability of the changing unhindered open source library software. In addition, there is no substantial utilization of open source software in their libraries. This feat is until now to be reached in many other developing nations like Africa as exposed from communication with colleagues during five dissimilar conferences and workshops attended in Nigeria between May and November, 2010. These discovered that Librarians know very petite communicating and about obtainability of the changing OSS as well as their uses (Blessing, 2012).

Another factor that affects open source library software uptake is lack of staff training growth, research collaborations and conference presence in the area of free open source library software non- obtainability of required equipment, lack of motivation and funding. Notwithstanding all these benefits of free and open library software attained in developed nations, many librarians in most institutions of higher learning precisely Federal Colleges of Education in Nigeria are still not aware of the value and role of the free and open library software.

1.3 Statement of the Problem

Indications from the background reveals low diffusion; there is low uptake of automated libraries system in North East Nigeria libraries. Notwithstanding the existence of free open source library software, this condition may mean that the said libraries cannot benefit from the amenities of free open source library software. There is incomplete literature and studies on assessment of libraries awareness of free open source library software situation like Federal Colleges of Education. Consequently, this study seeks to find out the uptake level, awareness and challenges faced.

1.4 Purpose of the study

The purpose of this study was to evaluate librarians' awareness and uptake of open source software in federal colleges of education in north eastern Nigeria. The bottom line was to establish the existing unutilized benefits of open source software through establishing scientific findings existing in other parts of the world.

1.5 Objectives of the Study

- i. To establish the level of open sources software usage in the North-Eastern Nigerian Federal Colleges of Education.
- ii. To determine whether librarians are aware of the benefits of free open source library software
- iii. To establish problem that can be solved through the use of free open source library software.
- iv. To find out the benefits of open sources software to librarians in library
- v. To find out whether librarian and have any training on free open source library software.

1.6 Research Questions

- i. What is the level of open sources software uptake in the North East Nigerian Federal Colleges of Education?
- ii. What is the level of awareness by librarians on the benefits of free open source library software?
- iii. What are the problems that can be solved through the use of free open source library software?
- iv. What are the benefits of free open source library software to librarians?
- v. What is the level of librarian involvement in any training, workshop, conferences on free open source library software?

1.7. Significance of the Study

The study provides details on free open source library software, which enable software vendors to understand their positive customer and therefore enable them penetrate and market their product. The study also highlighted some areas where free open source library software will help the librarian in augmenting permanent distribution of knowledge to the target users.

The study may also be beneficial to the librarians to gain access to intellectual knowledge and creative thinking within the academic environment. This would help them solve specific product/service design problems including production of new products and services.

Findings from the study would serve as a guide for planning of on adoption of free and open source software to bridge the gap created by inadequate funding among federal colleges of education in Nigeria. It may also provide new knowledge on priority areas for uptake of open source in Nigeria.

1.8. Scope and Limitation of the Study

The study have evaluated the level of awareness of open source software among library staff of Federal College of Education North-East Nigeria. The study will be a survey of librarians' awareness of open source software three public Federal Colleges of Education which are: Federal College of Education, Yola, Federal College of Education, Potiskum and Federal College of Education, Gombe all in North-Eastern Nigeria. The study will be restricted to the central libraries in the institutions, since branch libraries operate as subsidiaries. The designated three Federal Colleges of Education in the North-East will form a representation of Federal Colleges of Education in Nigeria.

1.9 Assumptions

This study will dwell on the following assumptions:

- i. There is low level of knowledge about open source library software among library staff of Federal Colleges of Education in North-Eastern Nigeria.
- ii. There is low level of awareness among library staff of Federal Colleges of Education in North-Eastern Nigeria about the components of Free and Open Library Software.
- iii. There is low level of awareness among library staff of Federal Colleges of Education in North-Eastern Nigeria about the Types of Free and Open Library Software.
- iv. There is low level of awareness among library staff of Federal Colleges of Education in North-Eastern Nigeria about the benefits of free and open source library software.
- v. There is low level of awareness among library staff of Federal Colleges of Education in North-Eastern Nigeria about the challenges associated to Free and Open Library Software.

- vi. There is low level awareness on the possible solutions to the challenges associated with free and open source library software in Federal Colleges of Education in North-Eastern Nigeria.

1.10 Theoretical Framework and Conceptual Framework

1.10.1 Theoretical Framework

Borgatti (1999) defined theoretical framework as a collection of interconnected concepts, like a theory but not essentially so well worked-out. It is further claimed that, a theoretical framework guides your research, determining what things to be measured, and what statistical relationships to look for. It can also be explained as the guiding and building ground on which researchers based their explanation.

The study was based on one theory, the Situational Awareness theory. According to Gilson (2005), the concept of situational attentiveness was identified during World War I by Oswald Boelke who realized ‘the significance of gaining a consciousness of the enemy before the enemy gained a comparable awareness, and devised methods for accomplishing this.’ This idea of separation between the human operators understanding of system status and actual system status is at the crux of the definition of situational awareness (Woods, 2007).

Woods (2007) points out that in order for people to uphold an adequate awareness of system status, they need to track the development of events (indicated as the broken line steps in figure one) as they progressively unfold (as illustrated in the left-hand side of figure one as the bold line steps). He contends that incidents change by the propagation of disturbances over time. These

problems become worsened if human controllers fail to adapt to new events. This can lead to a disconnection of system state and the human operators understanding of system state (as illustrated in the right-hand side of figure one where the dotted line (human situational awareness) departs from the bold line (actual system state)). The resulting control actions on the basis of mistaken situational awareness could, possibly, make a bad incident even worse. Such as the events hastening the explosion at Chernobyl (Reason, 2001).

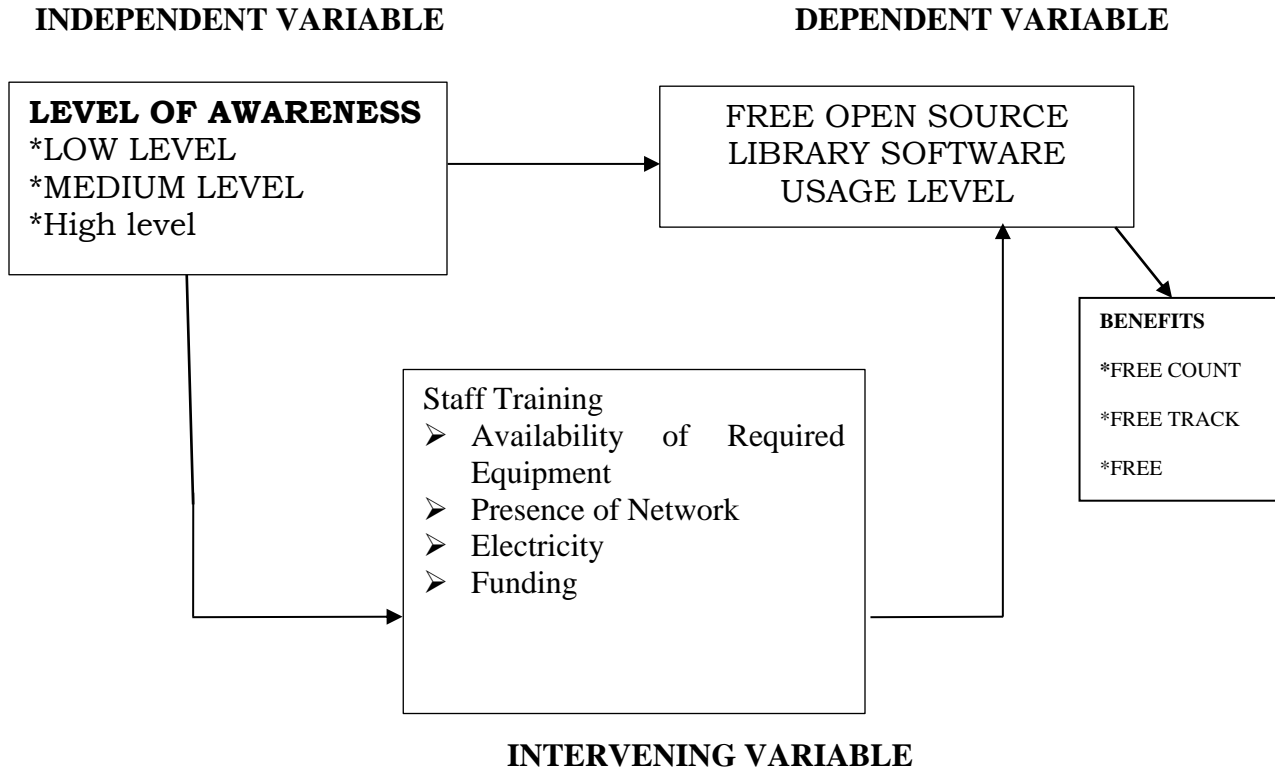
Therefore, situational awareness theory of open source library software among the librarians in Federal Colleges of Education in Northeast, Nigeria can represent the capacity of becoming the object of attention of other librarians in higher educational institutions of learning in Nigeria and beyond. Situational awareness of open source library software allows librarians to understand modern learning and practice, how they can bring change in librarian's attitude and their responses to library management and utilization.

1.10.2 Conceptual Framework

The conceptual framework below evidently explained librarian's awareness of open source library software in Federal Colleges of Education in the northeastern Nigeria was determined by the provision of staff training, obtainability of required equipment (such as computers, etc), content reading, inspiration and funding. Awareness of the free and open library software at low, medium and high levels as independent variable generate a lot of benefits ranging from free count, free track and free monitor with obtainability of staff training, availability of required equipment, presence of network, electricity and funding as overriding variable will lead to free open source library software uptake level as dependent variable. It has been scholarly observed

that open Source “Software offers more flexibility and freedom than software purchased with license restrictions” (Blessing, 2012). The fact also remains that supreme FCE in the North-east Nigeria are financially inadequate to obtain the resources and facilities needed for efficient service provision as a result of their high cost of the computer and information and communication software.

Figure 1.1 Conceptual Framework



Source: Researcher, 2017

From the figure 1.1 conceptual framework, it is clear that librarian’s consciousness of open source library software in Federal Colleges of Education in the northeast Nigeria was determined by the provision of staff training, availability of required equipment (such as computers, etc.), content reading, incentive and funding.

Awareness of the free and open library software among librarians will render progress, efficiency as well as fulfill the changing needs of library and information consumers. It has been scholarly observed that open Source “Software offers more suppleness and freedom than software purchased with license restrictions”(Blessing, 2012:12). The fact also remains that most FCE in the Northeast Nigeria are financially inadequate to procure the resources and facilities needed for

effectual service provision as a significance of their great cost of the computer and information and communication software.

1.11 Operational Definition of Terms

Academic Library: In this study it refers to higher educational libraries.

Free and Open Source Library Software: In this study it refers to a computer software that give free and open access to users to run, copy, distribute, study, change, modify and redistribute without royalty to the developers of the software.

Librarian: In this study it refers professional staff working in the library.

Librarian Awareness: In this study it refers to librarian knowledge about understanding of a situation based on information or experience prior unknown.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter review pertinent literature on the awareness of open source library software it begins with introduction to open sources library software, features of open sources library software, obtainability of open sources library software, benefits of open sources library software and Challenges related to Free and Open Library Software in Higher Academic Institutions of Learning in Nigeria.

2.2 Implementation of open source library

Open source software is defined by Feller and Fitzgerald (2002), as circumstances where the source code of the program is made freely available for anyone to change and distribute provided they abide by the accompanying license. Linux is believed to be one of the most successful OSS whose project begun in 1991 by Linus Torvalds, a Finnish university student (Feller % Fitzgerald, 2000). Computer experts have widely adopted OSS across the globe with the global E-Commerce infrastructure relying heavily on OSS such as Apache, Send mail, Linux among others (Madey, Freeh and Tynan, 2002). Open Source Software is believed to offer significant benefits compared to typical commercial products which often stress on advancement and updating of visible features in order to achieve marketing advantages (Kandar, Mandal and Ray. 2011). Researchers have suggested that OSS offer benefits such as cost savings, security, flexibility of software and hence many international non-government organizations are increasingly supportive of OSS (Dudley-Sponaugle et al. 2007).

Libraries have been around for some time but never to the extent at which they are presently. Peace studies archives from Goshen, Earlham, and Manchester Colleges have taken steps to place all their information in a digital library. They are organized and can be located effortlessly. These projects are principally used to digitize information but also to amass into one source (Next-Gen Libraries). Additionally, there are many different programs that can be used to develop digital libraries. Below are a few examples of systems that are popular when considering open source libraries as an option for storing information.

According to Reijswound and Mulo (2007), many Non-African EDCs have successfully adopted OSS with Brazil taking the lead. In their view, Brazil was the first country in the world to pass a law regarding the use of OSS which paid off with some good levels of adoption notably in the states of Rio Grande do Sul and Pernambuco. According to Laszlo (2007), the decision to switch to OSS was a cost cutting measure because Brazilians spent \$1.1 billion every year on software licensing fees.

In China, which is classified by the IMF (2010) as an emerging and developing economy apart from being an advanced economy has widely adopted OSS. As part of a five-year development plan, China identified software as a strategic sector for development (Dudley Sponaule et al. 2007). Laszlo (2007) also noted that China has been very aggressive in promoting Linux. As a result Linux adoption has been on the increase since the year 2000 with a notable steady growth of over 40% per year (Dudley Sponaule et al., 2007). They observed that the Chinese have benefited through OSS by reducing cases of piracy, cost savings, flexibility among other benefits. In India which is another emerging and developing economy, OSS is supported by the government and businesses (Dudley Sponaule et al., 2007).

In India, it was noted that, OSS groups are distributing free copies of desktop productivity software. The paper concludes that the Indians have enjoyed benefits such as, reduction of cases of piracy which is done due to high costs of software, cost reduction, ability to compete with wealthy countries among others. In a similar manner, Peru passed a law encouraging the procurement of free software by the government in 2005 whose main motivation was to gain free access to public information by the citizen (Laszlo, 2007). An ILS can provide most of a library's operational functions, including acquisitions, cataloging, circulation, and the OPAC (Rubin, 2010; Taylor & Joudrey, 2009). Almost all public libraries in the U.S. use an ILS (Breeding, and Yelton, 2011). An ILS can be either proprietary or open source.

Breeding (2010) noted, "library automation based on open source software has become a major trend". Breeding is also the author of an annual Automation Marketplace survey of over 2,100 libraries about the ILSs in use and satisfaction with them. The 2011 survey, conducted in 2010, found "just over 10% of survey respondents currently operated open source ILS products, with generally moderate to high satisfaction scores" (Breeding and Yelton, 2011).

If Moffitt (as cited in Hadro, 2009) and Breeding were using the same scale, there was an increase from under 2% to over 10% in just a few years. By 2011, functionality of FOSS ILSs had improved as well. In that year another researcher reported, "Increasingly, the quality of FOSS products is easily comparable to that of proprietary ILS products developed by commercial software vendors" (Müller, 2011). The 2012 annual Automation Marketplace survey (from 2011 data) showed an increase in libraries switching to FOSS ILSs, an increase in the software as a service (SaaS) model, and reported that "Evergreen and Koha ILS products have

become mainstream. Both, offer features comparable to proprietary products”(Abba, 2014). In 2013, the same Automation Marketplace annual survey (published in April 2013 and presumably conducted in 2012), reported that: Open source ILS products, including Evergreen and Koha, continue to represent a significant portion of industry activity. Of the 794 contracts reported in the public and academic arena, 113, or 14 percent, were for support services for open source systems. A growing number of projects involve regional or statewide projects based on an open source ILS. These include NCCardinal in North Carolina, the SPARK catalog in Pennsylvania, three regional libraries in Massachusetts, and SCLENDS in South Carolina, (Breeding, 2013).

This survey result indicates another significant increase: from 10% in 2010 to 14% in 2012. For perspective, consider that in the United States alone there are well over 9,000 public libraries (many with multiple branches), most of which use an ILS (American Library Association, 2011c; Breeding, 2011c). FOSS ILSs have now surged to a 14% market share, and have gained comparable features to proprietary systems. FOSS ILS users are no longer a fringe element.

The first open source library automation software system, Koha, was developed in 1999 and released in 2000. Koha began in New Zealand when a library needed to replace its older proprietary automation system with one that could properly handle the year 2000 (Koha Library Software Community, 2011). Until this time library systems were proprietary, but the Koha developers decided upon an open source model. Koha has been in active development since then, and has grown to be one of the leading FOSS ILSs.

Evergreen started in Georgia in 2006 and has quickly grown to become one of the leading contenders in this market (Chepesuik, 1997). Evergreen has experienced a recent burst of

development, which will be detailed shortly. OPALS is one of the leading ILSs in school libraries, besting proprietary systems in user satisfaction (Breeding & Yelton, 2011). Other FOSS ILSs include PMB, Gnuteca, New GenLib, Open Biblio, Emilda and PHP My Library. These have achieved varying degrees of adoption, functionality, and community strength. Some are most appropriate for specific types of libraries (academic, international, etc.). Depending on a library's environment and particular needs, these other systems may be a step behind the leaders, Evergreen and Koha. Kualu OLE was in early development as of December 2011. It is an extensible LMS for academic and research libraries that will be an "enterprise-ready, community source software package to manage and provide access not only to items in their collections but also to licensed and local digital content" (Kualu Foundation, 2011).

African countries have recognized the importance of OSS in development. In February 2003, a foundation called Free Software and Open Source Foundation for Africa (FOSSFA) was launched in Geneva, Switzerland, whose vision is to promote the use of FOSS and the FOSS model in African development (Edward, 2008). The FOSSFA foundation and Linux signed an agreement in December 2009 to work together in the promotion of OSS in Africa (Free Software Foundation, 2016).

Among the African states, South Africa has been on the frontline in the official implementation of OSS as a strategy within the public sector (Laszlo, 2007). The South African government acknowledges that OSS is a viable alternative for proprietary software and this is evident by the approval of the OSS policy by the cabinet (Mtsweni and Biermann, 2008). They further state that one of the salient points in the policy provides that government departments should adopt and implement OSS unless proprietary software is demonstrated to be superior to OSS. In South

Africa, expenditure for proprietary software licenses amounted to R6 billion annually which is channeled to foreign companies such as Microsoft (CATIA, 2005). Several years after the government policy was passed not much had been achieved.

In Botswana, which is one of the leading economies in Africa, OSS is not widely used (Mutula & Kalaote, 2010). A study conducted by Mutula and Kalaote (2010), in the government ministries indicated that the use of OSS is limited to only a few IT managers who had made individual efforts to spearhead its use. They further noted that Botswana did not have an OSS policy and that the government had made a long-term agreement with Microsoft for use of its products. A recent study indicates that majority of the companies in Botswana are not yet ready for OSS adoption and suggests that the Government Ministry of Transport and Communication has a major role to play in promoting OSS by implementing favorable policies for its adoption (Nyakudya, 2012).

Ghana is a country that has widely embraced technology, but in terms of OSS adoption the country is lagging behind with Microsoft windows operating system taking the lead at 84.7% and Linux at 11.9% (Amega Selorm & Awotwi, 2010). According to them some of the reasons given for the lead in the Microsoft operating system are; the Microsoft windows comes pre-installed in the computer, ease of use, availability of applications and availability of technical support. They cited absence of OSS adoption and procurement policy as a major adoption challenge of the software in the Government.

The adoption of OSS in Nigeria has been having the same challenges faced in other parts of the African continent with most computer users over relying on proprietary software (Akintomide,

2016). He notes that the government has a role to play in promoting the use of OSS by assisting with Open source Research and Development, Education and Training.

A report on the status of OSS adoption in 2005 revealed that there was little use of OSS in most African countries both in the government and in the private sector (Bridges, 2013). The Bridges organization also noted that an overwhelming majority of countries did not have policy on OSS. In most countries such as Uganda, Kenya, Benin, Burkina Faso, Cameroon, Ethiopia, Ghana among others there were some initiatives that were supporting the use of OSS, particularly in training institutions and universities (Graham, 2017). The report also indicated that in Nigeria the government was investigating OSS as an alternative to proprietary systems in government departments although sources indicated that the situation was being complicated by a generous Microsoft for software.

In West Africa, specifically Nigeria, experience has shown that very many libraries run into one problem or the other due to the wrong choice of library software. For instance, some of the first generation universities in Nigeria started with TINLIB software but they could not continue due to some technical difficulties, maintenance problem, poor revision policy and the prohibitive cost of processing and maintaining it. Akpojotor (2007) revealed that Kenneth Dike library of University of Ibadan, Nigeria had earlier used TINLIB software and could not continue. Also, University of Ilorin also started with TINLIB and later shifted to Alice software. The University of Lagos was equally affected in the wrong choice of library software. This university started with TINLIB and later shifted to a modified version of TINLIB called Graphical Library Automation System (GLAS). When the latter software could not adequately sustain the library operations, the library then opted for Millennium software in 2012. The purpose of opting for

Millennium software was because it is web-based. The Vice – Chancellor of University of Lagos reported this to Nigerian University Commission. However, this same software is characterized by its own technical difficulties and inadequacies. Therefore, the reports highlighted above coupled with the experiences Nigerian libraries faced in the wrong choice of library software called for this research.

2.3 Qualities of a Good Library Software

Literature Helmreich (2011), Hiong (2005); Bridge (2013) and Randhawa (2012) recognized the qualities of a good Open Source Software as follow:

Open source software is normally obtained at zero cost wanting no licensing fees. Unlike proprietary software open software invite no maintenance fees. The solitary expenditures are for media, training, support and documentation, if requested. Managing the open software is simple, since once the software is obtained it can be install as numerous times and friendly to as many environment and locations needed. It is free count, free track, and free monitor for license compliance. The cost of getting the hardware for open source is less, compared to the other hardware (Mercie, 2015).

To this end, the researcher believed that, open source solutions are stylishly compact and portable and less expensive. Open source applications and services can often scale significantly. Multiple options for load balancing, gathering, and open source applications, such as database and email, give organizations the ability to scale up for new growth or consolidate to do more with less.

Support is available for open source-often superior to proprietary solutions. First, open source support is easily available and accessible through the online community via the Internet. Secondly, many tech companies are now supporting open source with free online and multiple levels of paid support. Using a non-free invention with non-open formats in a tremendously integrated manner is highly annoying, and this is a reality for most of all ICT managers. In addition to ongoing license fees, there is lack of manageability and the inability to customize software to meet specific needs, refers to as the “lock in”(Dole, 2000).Using open source software liberated one from lock in into using a particular vendor’s system. Open source simply is a declaration of freedom of choice and use. According to Randhawa (2011), specific open source technologies such as CIM (Common Information Model) and WBEM (Web Based Enterprise Management) provide the competence to integrate or consolidate server, service, application, and workstation management for influential administration. Through open source software one is capable of integrating, consolidating sever, service and workstation management for powerful administration.

Security and dependability is one of the quality expected of software, open software in this regard is one of the reliable and secured software. The level of this dependability and security attached to it can be captured from Helmreich (2011). According to him, “the time until a security vulnerability in open source software is fixed (36 days) is significantly shorter than the time that elapses until a commercial product gets fixed (82 days)”. Though, report from the same source indicate that open source software is as secure as commercial software, but more secure than internally developed (Helmreich, 2011). According to Hiong(2005):

A technological product can only be as protected and as reliable to the extent that the necessary care was taken to properly install and maintain the product. A poorly maintained product offers little security, irrespective of the software

development model used to create the product, or the rigor to which the software was tested. Instantaneously, the standardization around a platform can simplify and accelerate the security updating processes.

In this regard, one would agree with Helmreich (2011), who stated that, open software can naturally be more secure than proprietary software, but it is no automatism, because as he indicated, security entails an active community that offers and distributes fixes for security vulnerabilities.

In short, open source software can be beneficial to librarians, to users, and to the higher institutions of learning.

2.3.1 Types of Open Source Software

There are different types of open source software, these software's were adopted by libraries in accordance of their needs and aspirations. Below are different types of open source software that can be used for information dissemination, storage and retrieval by the libraries.

Evergreen is an open source library automation software designed to meet the needs of the very smallest to the very largest libraries and consortia. Through its staff interface, it facilitates the management, cataloging, and circulation of library materials, and through its online public access interface, it helps patrons find those materials. The evergreen software is freely licensed under the GNU General Public License, meaning that it is free to download, use, view, modify, and share. It has an active development and user community, as well as several companies offering migration, support, hosting, and development services (Bridge, 2013). Evergreen IT is the perpetual migration of end-user software, hardware and associated services such as mailboxes, telephony, file storage and the infrastructure supporting the technology. It requires a combination of people, process, and technology to deliver optimal results. It involves a budgetary and

executive commitment to ensuring that no end-user technology is ever more than N-x (x to be defined by each organization) behind the currently available version within a pre-determined timeframe (Helmreich, 2011).

For hardware, it means that every piece of physical equipment is kept within warranty or lease and is refreshed on a fixed timeline. The process means that the organizational processes are in place for procurement, licensing, scheduling, communication and deployment are in place and highly repeatable. For this, creating a set of tasks that are repeatable and in constant use will be vital, or as Gartner (2008) puts it, enterprises much have a “production-line model” of dealing with change. With regards to technology, this means that the information required to trigger an evergreen event such as a hardware replacement or software upgrade is continuously available and updated. Additionally, the technology systems to support the process identified earlier exist and are understood by every team that interacts with them. The goal can be achieved in a real-time.

DSpace is the software of choice for academic, non-profit, and commercial organizations building open digital repositories. It is free and easy to install "out of the box" and completely customizable to fit the needs of any organization. DSpace preserves and enables easy and open access to all types of digital content including text, images, moving images, mpegs and data sets. With an ever-growing community of developers, committed to continuously expanding and improving the software, each DSpace installation benefits from the next(Bridge, 2013). DSpace facilitates the building of institutional repositories that capture, distribute and preserve intellectual output at an institutional level. It is produced by HP Labs and designed in partnership with MIT. This is to note that much of the intellectual output of professors and researchers is in

digital form and potentially ephemeral unless the institution has an aggressive policy for collecting and preserving it. DSpace is designed to help capture and organize everything produced by faculty and staff- digitized versions of lecture notes, videos, papers, and datasets - into an "institutional repository" that will make it available to future generations in its original digital form. Of course, it has applications in government organizations and commercial enterprises too. DSpace provides a set of tools for helping institutions keep track of their data, organize it in meaningful ways and migrate that data to new formats as old ones become obsolete, It helps establish a system for the duration of the data in a manner that is as automated as possible, in order to handle the increasing volume and complexity of the data being produced(Helmreich, 2011).

The key points that DSpace makes was to include support as a core business which include:
Repositories at an institutional level
Self-deposit of digital assets by faculty
End-user interface for depositors
Assets made available for searching and browsing
Data retrievable many years in the future
Institutional commitment to ensure the continued availability of certain named formats.

Building Bridges is an obvious way to transfer a digital library collection from DSpace to Greenstone or vice versa and to use the Open Archive Initiative Protocol for Metadata Harvesting (OAI-PMH), which is an application-independent interoperability framework. As item is located in the system, retrieval is accomplished by clicking a link that causes the archived material to be downloaded to the user's web browser. "Web-native" formats (those which will

display directly in a web browser or with a plug-in) can be viewed immediately; others must be saved to the user's local computer and viewed with a separate program that can interpret the file (e.g., a Microsoft Excel spreadsheet, an SAS dataset, or a CAD/CAM file).

According to Bridge (2013), DSpace is the first open source digital repository system to tackle the complex problem of how to accommodate the differing submission workflows needed for a multidisciplinary system. In other words, different DSpace Communities, representing different schools, departments, research labs and centers, have very different ideas of how material should be submitted to DSpace by whom, and with what restrictions, who is allowed to deposit items? What type of items will they deposit? Who else needs to review, enhance, or approve the submission? To what collections can they deposit material? Who can see the items once deposited? All of these issues are addressed by the Community representatives, working together with the Libraries' DSpace user support staff, and are then modeled in a workflow for each collection to enforce their decisions.

The system models "e-people" who have "roles" in the workflow of a particular Community in the context of a given collection. Individuals from the Community are registered with DSpace, then assigned to appropriate roles. For example, a department may choose to have two collections: one for working papers and another for datasets. They may then decide that any member of the faculty can deposit items to either collection directly, and that any member of the general public can have access to these collections. In this example the workflow is very simple, and the only "role" is that of submitter (Berlin Declaration on Open Access, 2003).

In a more complex example, the same department may have a working paper collection that

requires tight editorial control by the head of the department. In this case, they may choose to again designate all faculty as "submitters", but also designate a small group of people as "reviewers", an administrative staff person as a "metadata editor"(Bethesda, 2003), and the head of the department as the final "coordinator". According to Abba (2014),an item deposited by a faculty member would then go through a process of review, cleanup and approval before finally being deposited to the relevant DSpace collection. Each person with a role to play in this process is notified of the new submission, and goes to a personal workspace in the system to perform their assigned task. Items that do not make it through the process are not archived in the system. The importance of software was summarize by (Helmreich, 2011) as follows:

DSpace was developed to be open source, and in such a way that institutions and organizations with minimal resources could run it. The system is designed to run on the UNIX platform, and comprises other open source middleware and tools, and programs written by the DSpace team. All original code is in the Java programming language.

Other pieces technology stack includes a relational database management system (PostgreSQL), a Web server and Java servlet engine (Apache and Tomcat, both from the Apache foundation), Jena (an RDF toolkit from HP Labs), OAIC at from OCLC, and several other useful libraries. All leveraged components and libraries are also open source software. Libraries are bundled where possible (exceptions are described in the installation instructions). The system is available on Source Forge, linked from both the DSpace informational website and the HP Labs site. While DSpace is open source and freely available, neither MIT Libraries nor HP offer formal support for DSpace adopters. It is our assumption that institutions that use DSpace will have resources to use the system, including adequate hardware that runs the UNIX operating system, and a UNIX systems administrator to install and configure the system.

Most institutions using DSpace will also want the services of a java programmer who can localize and customize for them, or enhance it, although this is not absolutely necessary to run the system. Dspace continues to be improved by staff at HP, the MIT Libraries, and other institutions that adopt it during the coming year, MIT will take responsibility for evaluating and reincorporating these improvements into the main open source system available to the public. DSpace is an open source repository application that allows you to capture, store, index, preserve and distribute your digital material including text, video, audio and data.

DSpace provides a way to manage your materials and publications in a professionally maintained repository to give them greater visibility and accessibility over time. There are over 1000 digital repositories worldwide using the DSpace application for a variety of digital archiving needs. DSpace is most often used as an institutional repository – a platform that provides access to research output, scholarly publications, library collections, and more.

DSpace applications have many customizable features and tools for managing digital content, enabling digital preservation and providing accessibility to your materials. As an open source application, there is a very active community of developers, researchers and users worldwide that contribute their expertise to enhance the DSpace application.

Dspace uses a qualified Dublin Core metadata standard for describing items intellectually (specifically, the Libraries Working Group Application Profile). Only three fields are required: title, language, and submission date, all other fields are optional. There are additional fields for

document abstracts, keywords, technical metadata and rights metadata, among others. This metadata is displayed in the item record in DSpace, and is indexed for browsing and searching the system (within a collection, across collections, or across communities). For the Dissemination Information Packages (DIPs) of the OAIS framework, the system currently exports metadata and digital material in custom XML schema while we work with the METS community to develop the necessary extension schemas for the technical and rights metadata about arbitrary digital formats.

Dspace's current user interface is web-based. There are several interfaces: one for submitters and others involved in the submission process, one for end-users looking for information, and one for system administrators. The end-user or public interface supports search and retrieval of items by browsing or searching the metadata (all fields for now, and specific fields in the near future).
Once

Koha is an open-source Integrated Library system. It was created in 1999 by Katip Communications and designed by librarians to achieve their technology goals. Koha includes modules for acquisitions, circulation, cataloging, serials management, authorities, flexible reporting, label printing, multi-format notices, offline circulation for when Internet access is not available, and much more.

Koha is a web-based Integrated Library Management System, with a SQL database backend with cataloguing data stored in MARC accessible via Z39.50. Koha is beneficial to librarians because it manages complex classifications, allowing librarians to work with eleven different publication periods (from daily newspapers to annual publications), with delayed publications, and with

publications out of sequence. Nowadays, the management of libraries and documentation centers is much more than the provision of a catalog on the Web. This library management software will allow libraries to promote their content, know their users and provide services that bring readers to the library by extending it beyond its physical space.

Koha is the first free software library automation package. In use worldwide, its development is steered by a growing community of users collaborating to achieve their technology goals. Koha's feature set continues to evolve and expand to meet the needs of its user base. Koha is currently available for free download and immediate use.

Libraries are becoming more resourceful in their use of Information communication systems, the ability of technology to enhance the quality of life in our society through products and services is commendable. In the present era of digitized databases, libraries are faced with challenges. The challenges range from the collection of books to managing the knowledge bank. In order for libraries to manage their resources, they require high quality integrated software along with retrieval tools. However, the high cost of licensing often prevents libraries from using them. Open source is a major change for libraries to manage all kinds of resources and information and this has helped save cost because it is free, which is a major advantage to Libraries. Open source library management software has made it possible for libraries to manage all kinds of resources. Another major advantage is that the developers distribute the software along with the codes, allowing individual libraries to modify it to meet their specific needs. There are no contractual restrictions on how the software is used(Helmreich, 2011).

Although Koha is free, one disadvantage is inadequate or non-existent technical support. For any issues with the product the library needs support. In this case, open source software, there is no body designated by the developers to solve technical problems. As a result, libraries will require technical expertise to operate and maintain open source, this tends to cost more because the product is typically self-supporting.

A major advantage of Koha is that the interface is very configurable and adaptable and can be translated to different languages. Also, it has most features of an ILS such as customizable search. Union catalog facility. It has a simple clear interface for librarians and members (patrons). Lastly, another advantage of Koha that is enhances software collaboration and resource sharing that is freely available to all libraries worldwide.

Open source incorporated library system built on an Open Public Access Catalog OPAC interface. According to Randhawa (2012), it is a system of keeping track of the operations of a library - payroll, expenses, purchases, and most significantly, keeping track of the various media being checked out by the librarians patrons. It is a vendor-lock out that allows libraries to receive tech support from any party they choose. It is recognized that KOHA is a perfect alternative but not all libraries can afford purchasing, installing and upholding the KOHA system.

To determine the level of awareness and obtainability of OSS in Nigerian libraries, Blessing (2012) in her study on awareness, obtainability and utilization of open source software in Nigerian libraries. The respondents were scrutinized to identify from nineteen (19) OSS listed by the researcher, the ones that they are acquainted of their presence, the purposes for which they are intended for as well as their availability in the library. The result showed that over 90% of the

whole respondents showed that out of the 19 OSS listed, they are totally unaware of the existence of 11 which include; Eprints, Joomla, Drupal, Plone, KOffice, Evergreen, Chrome, PHP, Perl, Python and Jabber whereas CD/ISIS which received the uppermost awareness and availability rate in the libraries got 26.2% and 16.7% correspondingly for awareness and obtainability. A number of 5 (11.9%) libraries recognized that KOHA, which is an Integrated Library System is accessible in their libraries whereas 3 (7.1%) other libraries designated the availability of Greenstone, a digitization software in their individual libraries. DSpace is available in only two libraries whereas Open office and E-prints are available each in a library. The suggestion of the outcome of this finding is that most of the libraries in Nigeria lack adequate knowledge and awareness on the existence of this software.

Drupal was adjusted from the Dutch word “druppel”, or water droplet, and was named accidentally by Dutch creator Dries Buytaert when he misspelled the Dutch word for village ‘dorp’ while checking a domain name. Upon further consideration Buytaert thought his misspelling of Drupal simply sounded better, and kept it—giving us the name Drupal. Since its initial inception as a message board Drupal has come a long way as the accidentalness stopped there.

Drupal has since developed into one of the most complex open-source content management systems (CMS) on the market and is represented by an array of top notch sites, including: The Economist, Examiner.com, The White House, Popular Science. Harvard. MIT. Ubuntu. Sony Music and more. Drupal now displays contents in 182 languages by over 538,813 people in 228 countries.

For those of us new' to CMS tools, Drupal is essentially WordPress—on a three-day speed binge. Drupal uses a very sophisticated programming interface that has a tough learning curve and is considered more of a developing platform than simple CMS tool. The system has in- depth reporting generating tools for advanced administrations. While no programming skills are technically required for basic use. the system is generally used by more advanced developers and administrators. Basic users usually go with the more basic CMS platform WordPress. although they can create basic sites simply using Drupal. Beginners to advanced users gather virtually in Drupal communities increasing their commitment to the system and their knowledge base.

While Drupal is a great CMS, for some it can be too much. Consider the advantages and disadvantages to using Drupal as your CMSDrupal Core is their standard release of features, which includes: user account registration and maintenance. RSS-Feeds. menu management, system administration and page layout customization. These basic features can be used to create simple sites, single or multi user blogs, brochure ware, forums, community websites and more.

Drupal offers you the basic building blocks of websites in a module-styled format where content and rules can be created quickly. Through the use of templates and themes there is no need to start from scratch—no matter if you are building a simple or complex site. Predefined configurations of site features help users build fairly complex sites rapidly, allowing them to use their time to build in extra features.

Drupal's bread and butter in its content creation. Drupal allows its users the flexibility to create and manage different content types including: video, polls, user management, text, blog, podcasts, real-time stats, and revision controls (Graham, 2017).Administrators have the options of setting up new user accounts and user permissions. These permissions can be designated per

role or group and offer fine-tooth comb-style, allowing" users to help create your content for you. Drupal's new release of version 7 allows for easier administration and greater controls.

While Drupal offers themes and templates that are easily recognizable to the public many users like to use its design tools to create their own dynamic designs. The system's presentation layers allow for easily usable and interactive experiences. One of the difficult parts of many CMS tools is the ability organize your content for later use and recall. Drupal allows you to categorize your content through path URLs, create custom lists, associate content and create defaults. This structure helps you to organize, structure, search find and reuse content. Drupal has over 7.000 plugins and extensions available to boost your building capacities. As the program is open source you can both use plugins and create your own. adding to disabilities of the Drupal platform(Chepesuik, 1997).

Drupal is commonly mistaken for a blogging platform due to its incredible ability to publish socially. Drupal-based sites engage users to contribute while giving the administrator the ability to create, view, publish, administer and otherwise control the social content published to the site(Abba, 2014).

The most important part of a site is connecting it to users, other sites, social networks, and search engines— and Drupal makes this simple. Through increased network integration, feeds,

search engine optimization tools, aggregation and other connecting tools. Drupal helps connect you to your viewers.

Drupal is not the most user-friendly platform and it has a high learning curve(Abba, 2014). Platforms like WordPress and Joomla are significantly easier to use. although they don't offer the power and options that Drupal does. The good news though is that the new release of Drupal 7 is addressing some of the usability concerns and should be an easier adaptation for newer administrators.

Drupal is a relatively new system and is not backwards compatible with other software so if you have other content, systems and programs in place that you have become accustomed to, then Drupal might not be the system for you(Mercie, 2015).In terms of loading and scalability Drupal is one stroke behind that of WordPress. The slow loading is simply because of the breadth of tools and capabilities(Cleveland, 1998). If you have a slower computer, or are simply a microwave generation kid and need things to work quickly then consider a zippier platform. Advanced users have however found ways around its problematic performance indicators, but with the big learning curve this takes a significant amount of time.

Evergreen is an open source tool created by librarians for librarians and is designed to serve as an institution's Integrated Library System (ILS). Essentially it helps to managing a collection of materials, including locating those materials, searching for them, cataloging them, holding them, renewing them. etc. The Georgia Public Library created it out of a need for a better alternative to proprietary' ILS's. All of Evergreen's intended uses are all highly relevant to what

libraries must manage on a constant basis, and it therefore can be taken up by any library(Dole, 2000).

As this tool is open source which is free to download, develop, and use. there is no concrete knowledge of the number of users. However, a list of libraries who have contacted Evergreen to inform them that they are using the tool can be found here. Several libraries across the country and across the world are taking advantage of this open source ILS. Below you can see graphics on the coding behind Evergreen and the community of coders that make the software available and current. All images and data were taken from the Project Summary page on Open HUB.

The top advantage for the average consumer of open source software is that it is usually free to use. For those who know coding, it also usually allows for free modification of software to suit a specific purpose or requirement. This is not possible with proprietary systems. You are also free to adapt the tool to use with other systems, which is something that proprietary systems often make impossible. Lastly, it is constantly being updated and reworked by a range of developers so that issues can be worked out rather quickly at times. In terms of Evergreen, despite the dip in its developer community, it still has a dedicated core group of people who meet monthly to discuss developments. It is free and was partially created because the Georgia Public Library was unable to use their proprietary system with other systems and was dissatisfied by these limitations.

Disadvantages of open source tools are that they're not usually as user-friendly as proprietary technologies as they are created mostly from a developer's perspective. These tools can often be made with only the developer's wishes and needs in mind, not the others who may want to use it. Security can also be a concern as anyone, even those with malicious intent, can freely modify- and update software. The disadvantages to Evergreen fortunately has not had security concerns, and it does have a code of conduct. However, there is the issue of needing to have a decent background in coding and developing in order to make the move over to Evergreen. Professionals who handle installing and moving over a ILS may not be able to handle Evergreen simply because they are not familiar with it. Support also comes through a community of volunteers and therefore they are not able to full-time devote themselves to it.

The biggest advantage of Linux, for me is to keep my system tidy and secure. With Windows, everything basically gets a mess. You install Application A which writes all files with some version in the Windows directory, then you install Application B which overwrites these files with newer versions, and Application A doesn't work anymore. So basically, everything affects each other and keeping a tidy system is quite hard. With Ubuntu Linux and Mac OSX, that problem is less severe(Graham, 2017).

Also, with Ubuntu you get an OS update every six months: and its improving on a wide range of fronts. With Windows, you can take multiple years before a new version is released, and not every new version is an improvement. Though I generally feel Windows 7 is a good upgrade to those who still prefer XP over Vista. It appears the biggest innovations don't come from Microsoft.

Eventually, the Operating System will become much more advanced: Abba (2014), affirmed that open source development will yield a better product than a closed source development team would be able to produce. While closed-source/commercial software generally spent more time on analyzing how casual users use their system. The researcher was genuinely impressed by the way the Ubuntu Project deals with user feedback. Just browsing through the Ubuntu Brainstorms is very inspiring, and also means the user has influence in how the OS is developed and make crucial design decisions that affects user experience. You don't have to be a techy to participate in Ubuntu.

According to Abba (2014), seeing how Ubuntu had made it in the world's most popular Linux distro while they started it only in 2004. You can see it's evolving at a much faster rate than Microsoft does with their Windows OS. Many cool things in Windows were killed-off because they couldn't make it work well in time. For example, the WinFS file system would be revolutionary, and Microsoft could have exited the .dll-hell by making .NET more integral. Windows 7, when looking at user interface, is not so different from Windows XP. The biggest visual change in Vista - the Sidebar - have already been removed in Windows 7. In other words - I can see no radical new design or technology that affects user interface. Sure, there are a lot of changes under-the-hood that makes Windows 7 a better choice than XP(Abba, 2014).

These applications might be going like it's going with IE - as soon as there is a good alternative people will switch over and Microsoft will not be absolutely dominant in market share. Linux still has to demonstrate just about any user can use this instead of Windows. If Linux is a viable alternative and matured a bit, things can go pretty fast. A browser is free, but an OS is not. If

people can do everything they can do on Windows, with comparable effort or convenience, they might opt for the cheaper Linux option instead when they choose to buy their new computer.

The most important change here is that you'll have a choice in the future, more so than now. There will be no more one universal system, just as IE as 'universal browser' is no longer.

Greenstone is an open source system for digital libraries that is of greatest importance right now (Sowe, 2008). The advantages that Greenstone provides is that it can sort information on the internet and is able to be searched to find any information a user needs. It was created in Belgium as open source international software. It operates under GNU General public License who has worked hard to influence information technology and create the best approach. It is relatively easy to install and can run on Windows, UNIX, and Max OS-X. It does very well with many different types of servers it may come across.

There are two main interfaces are called the Reader and Librarian. The user of the digital library uses the Reader interface. The Librarian interface is used to design the interface to the way you want the interface to search and find information. Greenstone is being used at American college's from coast to coast and also overseas ("The Greenstone digital library software"). Moreover, Greenstone has many advantages. For instance, it can be enriched by users to satisfy their specific needs and there are no binding contracts. Even with the advantages, Greenstone does have some drawbacks as far as the technical support for the system and unpredictability, (Leski, 2009).

The article “Introducing DSpace” explains what DSpace can do when one uses digital repositories. It was fashioned by MIT Libraries and Hewlett Packard Labs, which cater to digital archiving. The uses of DSpace have an extensive diversity of uses like institutional repositories, learning object repositories, e-Theses, electronic records management, digital protection, and publishing to name a few. There are also digital forms like text, images, video, or audio. To implement DSpace, they have a website that helps you design a repository that will work for you. It has a BSD open source license that helps expedite research institutions by letting the program run as it is or have them adjust it as it is needed. Wiki is used to change this code if needed by being used as a communication tool between programmers. They encourage these changes because it improves and grows their platform. Users can also post questions on a mailing list if there is any further problem (“Introducing DSpace”).

2.4 Awareness of Open Source Library Software among Librarians

Awareness of open source library software among librarians in most higher academic institutions in Nigeria remains a challenge (Abba, 2014). Awareness is supreme for librarians to effective and efficient use of electronic resources comprising open source library software. Nevertheless, there are few studies on librarians’ awareness towards open source library software. In a survey research carried out by Blessing (2012) on “*awareness, availability and utilization of open source software in Nigerian libraries*” with the main objective of finding the level of awareness, degree of use, challenges and forecasts of the use of open source software in Nigerian libraries, it was exposed that most librarians in Nigeria have limited awareness on the obtainability of the changing Open Source Software and do not meaningfully exploit them in their libraries. As Blessing (2012) research indicates, of the 42 libraries involved in the study, only 7 are presently using CD/ISIS whereas 5 others use KOHA. In the survey, it was found that there are certain

inhibitors which contributed to the absence of awareness. These inhibitors include the management which does not see the use of the software in those sections as something important ;other inhibitors include the fear for service support problems, and unavailability of Internet access in the libraries to enable downloading of software.

The knowledge economy depends as much on the knowledge distribution power of the system as on its knowledge production power. This openness to knowledge will provide the impetus for the accelerated growth of knowledge societies Raju (2015). Openness means unhindered access to information and knowledge. The free flow of information is a major component to bridging the knowledge gaps between privileged and under-privileged communities Raju (2015).

Creaser et al. (2010) looked into the awareness of scholarly authors toward open access repositories and the factors that motivate their use of institutional repositories. Their main intention was to establish the extent to which these authors were aware of open access. The research found that there was a good understanding and appreciation of the open access in general by over two thirds of survey respondents but the understanding of scholars from different disciplinary backgrounds differed. However, the authors reported concerns over copyright infringement and unwillingness to place outputs where other content had not been peer reviewed among the respondents.

Dulle (2010) explored the awareness, usage and perspectives of open access repositories among Tanzanian researchers. They also revealed more use of open access outlets in accessing scholarly content than in dissemination of research findings. They were of the opinion that addressing issues relating to researchers' self-efficacy, fears and misconceptions, ICT infrastructure,

researchers' information search and publishing skills, and policies would enhance the adoption of repositories among Tanzanian researchers.

Their study differed from the current one in that these authors only addressed researchers' awareness and use but did not consider researchers' skills and training useful for accessing and disseminating research including skills to self-archive research information. This would definitely require specialized support from the librarians. This was the essence of the study.

Vlachaki and Urquhart (2010) explored the impact of open access initiatives on biomedical research scientific publishing and scholarly communication in Greece. They used a longitudinal approach and employed bibliometrics, questionnaire surveys and interviews. They examined knowledge, awareness and attitudes towards open access. The researchers used a bibliographic survey with the intention of detecting Greek biomedical journals in five world-wide sources. Their sample comprised of 70 biomedical researchers. A response rate 88.5% was achieved. Their finding was that awareness of open access among Greek biomedical scientists low (58 %).

The researchers limited themselves to Greek-language journals indexed in various OAJs. In contrast to the studies of Vlachaki and Urquhart (2010), which used scholars in universities the subjects in this study were biomedical researchers only. Furthermore, this study used a small sample of 70 and only drawn from one field (medical). Another distinct feature was the use of interviews for this study unlike the current that used questionnaires.

Anuradha, Gopakumar, and Baradol (2011) examined the awareness of the availability of free open access resources via the internet. The analysis revealed that the Internet was the most preferred source of information by the academic community. Results also revealed unawareness

of the freely available resources. It was not clear how many students participated in this study or the method used in arriving at the sample for both the students and academic staff. The study pointed out that the librarians ought to play a role in imparting awareness and developing skills through information literacy sessions. As a collaborative support of academic staff, library staff needs to initiate appropriate user education programs to sensitize academic staff researchers on the existence of OA resources. It was necessary to establish the sources of information for academic staff including the library.

Uzomba, Oyebola, and Izuchukwu (2015) studied the awareness of Open Access Scholarly Publication among members of the teaching fraternity drawn from the University of Benin in Edo State, Nigeria. They used a descriptive research design. Seventy (70) academic staff were the subjects of their study. The subjects were randomly selected in the University of Benin Main Library. They used a structured questionnaire, Open Access and Scholarly Publishing Questionnaire (OASPQ) to collect data. They used simple frequency counts and simple percentages for data analysis. Their study found that the respondents were aware of open access scholarly publication. Most of the respondents learnt about OA from their colleagues. The respondents cited increased impact and free online access were some of the advantages of open access while unavailability of internet facilities were some of the constraints reported. The authors suggested that the university library needed to intensify its efforts in the creation of awareness of both open access journals and institutional repository. This study and the current used a similar design and statistics for purposes of data analysis. However, the authors did not come clear on the total population from which they drew their sample nor indicate whether they employed qualitative, quantitative or a combination of both approaches.

Stanton and Liew (2012) examined doctoral students' awareness of and attitudes to open access forms of publication. A sequential exploratory design was used. Mixed-methods approach consisting of qualitative semi-structured interviews and quantitative self-completion questionnaire was adopted. They interviewed eight doctoral students enrolled in a range of disciplines in Massey University, New Zealand who were purposively selected. Data collected formed the basis for the quantitative self-completion web survey which involved 251 students. From 901 doctoral students 251 took part in the survey, a response rate of 28% was obtained. Both qualitative and quantitative data were collected. Qualitative data were analyzed thematically. NVivo 8 was used to sort, store and analyze the interview transcripts by theme while survey responses were analyzed using Survey Monkey's online toolkit and Excel.

These researchers found that awareness of open access and repository 41 archiving was still low but respondents supported the concept of open access. Only two of the eight interview participants could describe the concept of open access. Reported also was the fact that deeper knowledge of IRs was lacking among the respondents. While respondent lacked in-depth knowledge of IRs, they still preferred a voluntary system of self- archiving their work in an institutional repository as opposed to the compulsory system. This involves knowledge about various protocols, file formats, security measures, metadata as well as preservation strategies. In order to improve on academics' self-archiving, there is need for knowledge of the above-mentioned issues. That calls for extra support from specialized librarians. Their study has established the extent to which the librarians were aware of these self-archiving related requirements in order to assist academic staff in self-archiving.

Darvish (2014) investigated faculty members' awareness on open access at Çankaya University, Turkey. They conducted using a survey and quantitative analysis was used. Their population was 115 faculty members out of which 41 members responded. The study found that the University's faculty members were well-informed of the concept of open access. This study, besides being conducted in Turkey only limited itself to awareness of the concept of OA while the current was conducted in Kenya and also extended its scope to awareness of other aspects of OA. This study also used only quantitative current study uses both qualitative and quantitative approaches. The author failed to clearly show how the respondents were selected. These research findings point to the fact of awareness of OA concept amongst the subjects engaged in the research but most of these studies did not look at awareness of specific aspects of OA. Besides, no such studies have been done in Kenya.

2.5 Training, workshop, conferences on free open source library software

Very little is available about on the training, workshop, conferences on free open source library software. In present studies, training can be done in two techniques: either by buying training from a seller, or doing it inside. Lewis (2011) established that having staff work on the system together at first and then try it self-sufficiently was the greatest successful. They had a demonstration system to practice, which also helped. In addition to this self-training, they had onsite teaching done by element, which permitted staff to appear only the training that was relevant and needed for them.

Learning is an ongoing process thus, educating library staff and users to exploit the use of library software are very vital. Tucker (1980) noted that user education is library instruction (educating the library user) and library education (training for the potential librarian) developed

simultaneously. According to Abioye (2013) user education was to advance and reinforce the generous arts and bibliographical research aspects of student. Rahman, hatun and Mezbah-ul-Islam (2011) highlighted that a standard official library education should have passionate faculty members, well-resourced section, and methodically liable curriculum representative clear relationship between theory and practice. Abubakar (2014) pronounces that to ensure correct usage, manpower to grasp installation, alternation and arrangement of system procedures and training of the staff and users of the system must be cautious.

Training librarians who in turn train the users is very vital. Chiware (2007) stated that some university libraries have acknowledged dedicated IT units in order to address the problematic of lack of IT skills among librarians. And where combined library systems have been applied, seller training has always safeguarded that staff is adequately trained to run the turn-key projects.

Taking a look at user education as librarian's responsibility, it entails concentrated effort initially by teaching the learners in the classroom (theoretical) and then, taking time to guide them one-to-one (applied) using the other methods which include location, workshop, seminars among others. According to Adeyemo (2005), the importance of library user education cannot be over highlighted. This is since there cannot be a joining between the user and the tools without traversable education given to the user who might not have any previous knowledge how to use library resources and tools.

According to Olsen & George (2004), as a way of improving skills through training, conference and workshops, Babcock University academic curriculum comprises "usage of library and study skills", a two-unit course to instruct every scholar on how to use the library tools and resources

in their first year at school. The process adopted by the University Library to educate library users to use the software both tutorial, seminar, one-to-one discussion, workshop, and the two-unit course among others. These methods have shown great growth and impact over the years. Most of the library users who went through any of the process presented self-reliance in searching, use of ILS, access and recovering of information.

Osaniyi (2010) stressed that the incorrect package can lead to dissatisfaction to support an important process; supporting a process imprecisely or incompetently; unhappy clients; loss of support; etc. Although on the other hand, the right compendium provides employees with the right tools for the job and can lead to substantial improvement in services. Among the libraries that are presently using Koha worldwide, none has noted any system breakdown. The only experiment to the smooth running of the software has been irregular power supply. This outstanding test is external from the software. This in no doubt was the case in India as documented by Srinivasa (2010).

2.6 Challenges facing Implementation of Free Open Source Library Software

Notwithstanding the advantages of using free and open library source in more particularly in higher institutions of learning, there are numerous challenges facing most institutions and organizations, and these challenges are discussed as follows:

2.6.1 Finance and Funding

One of the major challenges related with use of open library software in higher academic institutions in Nigeria is finance and inadequate funding to procure the resources and facilities

needed for well-organized service provision. This a great challenge according to Oluwasemilore (2009):

Most of the universities in Nigeria receive considerable part of their funding from the government's budgetary allocation. This increase in cost of developing digital sources is even made worse by the fact that the institutions in this region continues to grapple with declining funding from budgetary allocations from the government. A typical cost for developing an institutional repository in Nigeria will cover the cost for a server, subscription for adequate bandwidth, cost for building an alternative energy source, computer staff time for running and maintaining the ICT facilities, costs of purchasing scanning equipment, library staff time in formatting documents etc.

2.6.2 Poor Infrastructure

Related to the above challenge also is the issue of deprived and inadequate availability of supporting infrastructure that comprise roads, electricity in addition to poor regulatory frameworks and affordability. Electricity supply is a major infrastructural problem related with open access to scholarly journals in Nigerian academic institutions. An institutional repository of research, information and knowledge should be openly reachable 24 hours a day. This is solely possible only when there is uninterrupted electricity supply. There is no stable electricity supply in Nigeria that will provide (Keneth, 2012).

2.6.3 Intellectual Property Right

A scholarly property right is another key challenge to open library software in higher academic institutions in Nigeria. According to World Intellectual Property Organization (WIPO) (2014), Property rights like any other property right allows and permit management, creators, or owners, of patents, trademarks or copyrighted works to profit from their own work or investment in a creation as outlined in Article 27 of the Universal Declaration of Human Rights, that warranted

for the right to benefit from the protection of moral and material interests ensuing from authorship of scientific, literary or artistic productions (World Intellectual Property Organization, 2014.). The following agreements: the Paris Convention for the Protection of Industrial Property (1883) and the Berne Convention for the Protection of Literary and Artistic Works (1886) recognized and authorized intellectual property rights to countries.

According to WIPO(2014) Intellectual property refers to makings of the mind: inventions; fictional and artistic works; and symbols, names and images used in commerce. These rights are detached into two categories: 1) Industrial Property and 2) Copyright. This includes patents for inventions, trademarks, industrial designs and geographical indications for Industrial Property right. While, copyright covers literary works (for example novels, poems and plays), films, music, artistic works (e.g., drawings, paintings, photographs and sculptures)and architectural design, and rights allied to copyright include those of performing artists in their performances, producers of phonograms in their recordings, and broadcasters in their radio and television programs. Most libraries in advanced educational institutions in Nigeria are confronted with these challenges. According to Uzuegbu and McAlbert (2012):

Digital librarians are anticipated to work with copyright experts, attorneys, legislators at all levels and other stakeholders in the information industry to address the issues involved here. Managing intellectual property rights thus seems to be the most complex of the challenges facing digital librarians in the country today. This is so since of the huge legal and financial costs that may be involved. The legal obligation of providing access to licensed digital materials can be far bigger than that of similar information in printed format. What it thus means is that digital librarians may need that users of information in their repository pay some fee for access to information they would have acquired free of charge.

2.6.4 Low Internet Bandwidth

Low Internet bandwidth can also be one of the tests to open library software in higher academic institutions in Nigeria. There is low Internet penetration in the developing countries like Nigeria and this affects access to open source library in most academic institutions in Nigeria compared to that of developed ones. This problem was well described by Jensen (2006):

Bandwidth is the life-blood of the world's knowledge economy, but it is rarest where it is most needed – in the developing nations of Africa which necessitate low cost communications to accelerate their socio-economic development. Few schools, libraries, universities and research centre's on the continent have any internet access. For those that can afford it, their costs are typically thousands of times higher than for their counterparts in the developed world, and even Africa's most well-to-do centre's of excellence have less bandwidth than a home broadband user in North America or Europe, and it must be shared between hundreds or even thousands of users. This remains an inordinate challenge to library users in academic institutions in Nigeria.

2.6.5 Privacy, Security and Income

Privacy, security and income all are obstacles to open source library software access in Nigeria. Security is the bedrock of any development of any country in the world. Security thus is a threat to development in every feature of lives comprising education. Academic libraries or libraries in general more particularly digital libraries due to this threat to security defend the secrecy and confidentiality of the people's lawful use of the library, its equipment, and its resources, more particularly after September 11, 2001 attack on America. This security threats across African countries has turned out to be a challenge to most open access libraries to the level that librarians protect digital content in their library collections from illegal access, uncontrolled use, storage, copying and printing. On the other hand, therefore restriction is made for generating income for school when it come management of the internet system in the school.

2.7 Summary and Gap Identification

This chapter alludes to relevant literatures which critically discussed open sources library software. It also deliberated on the literature selected based on software and it features availability, benefits and challenges associate with open source library software in Nigerian Federal Colleges of Education North East. Research gap was identified in the literature review and tend to be link which will be commended for possible application in the libraries under study.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter describe the research methodologies which were used to investigate librarians' awareness and uptake of open source library software in Federal colleges of Education North East Nigeria. The chapter discusses the research design, population of the study, location of the study, sampling procedure and research instruments. The chapter also considered the data collection analysis procedures.

3.2 Research Design

The present study adopted a cross-sectional descriptive survey research design. This is considered suitable since the variables under study were measured as they logically occur without being manipulated or controlled. This is in view of the philosophical orientation adopted for the study since it was concerned with investigations in what, when and how much of a phenomenon at one point in time. In this type of research, either the entire population or part is selected or from this selection, data is collected to help answer research question of interest. In this type of design either the entire population or a subsection thereof is selected and from these individuals, data are collected to help answer research questions of interest .

A cross - sectional descriptive survey offers the opportunity to collect the data across different firms and test their relationship. It gives the researcher the opportunity to capture a population's

characteristics and test the hypotheses quantitatively with respect to time period over which data was collected across various firms. Cross sectional survey is suitable for capturing data at one point in time.

The design is also suitable because of the purpose of the study, scope, nature of data collected and the type of analysis to be performed. Cross-sectional descriptive survey methods are too when information collected represents happenings in a firm is at one point in time which is the case of the current study (Sitko, 2013). The other reason for the design is because the researcher anticipates collecting data that is to be accorded statistical analysis for hypothesis testing to come up with objective conclusion. Cross - sectional survey method is considered appropriate since it adapts to previous studies such as Awino (2007) and Suleiman (2012) in which the same research was investigated.

3.3 Variables

In this research, the independent variables were librarians' awareness and the dependent variable is uptake level while intervening variable comprises of staff training, availability of required equipment and motivation funding.

3.4 Location of the Study

The factors that influenced the choice of the location of the study area include familiarity with the area and limitation of the time for the study. Gay (1976) observes that factors such as familiarity with an area, limitation of time and money may influence the researchers choice of the locale as it has a positive effects on the administration of instrument and the amount of data to collect; Meredith (1996) noted that carrying a research in a setting where you are known as a

friend and colleague makes it easier than if you are regarded as an outsider with known motives. This also improves the ethical, legal and public relations in research.

According to Singleton (2017), “an ideal setting for any study is one that is easily accessible to the researcher and one which permits instant affinity between the researcher and the respondents”. Accessibility to the study area what influenced the choice of the location. The study’s location was Federal Colleges of Education, Yola; Federal Colleges of Education, Potiskum; Federal Colleges of Education, Gombe. The location was chosen to signify Federal Colleges of Education in Nigeria. They served as panacea for evaluation of librarian’s awareness of open source library software in Federal Colleges of Education in Nigeria.

3.5 Target Population

The target population of this study were the entire librarians from the three federal colleges of Education in the north east, Nigeria. The study made use of all the librarians (285) both professional and paraprofessional. The target population was 285 librarians from the three selected Federal Colleges of Education libraries as indicated in table 3.1:

Table 3.1: Target Population

College Name	Head of Library	Professional librarians	Paraprofessionals	Total no. of Library Staff
Yola	1	36	41	78
Potiskum	1	46	52	99
Gombe	1	47	60	108
Total	3	129	153	285

Source: Researcher

3.6 Research Instruments and Data Collection Techniques

3.6.1 Research Instruments

The research instruments for this study comprised questionnaire and interview schedule.

Questionnaire was used as research instrument for the total target population. This include professionals, paraprofessionals and head of libraries, while interview schedule: Interview was used as one of the research instrument to solicit information from the head of libraries.

3.6.2 Data Collection Techniques

Data collection is one of the most vital stages in conducting a research (Universal Basic Education Commission, 2011). It can be defined as the process of gathering and measuring information for fact findings. There are essentially two important sources of information gathering, the primary and secondary. The primary source focuses on information from questionnaire, interview schedules, while the secondary source focuses on information from books, journals conference papers, magazines, Newspapers, periodicals, seminars, workshops and internet etc. For the purpose of this, research both the primary and secondary sources of data collection was embraced with emphasis majorly on questionnaire. The researcher used observation and secondary information.

The researcher reviewed relevant documentary sources regarding the adoption of cloud computing, use and challenges, as well as to bring together background information about the area (cloud computing) under study. The review targeted institutions strategic documents such as annual reports, libraries monthly statistics, library handbook and manuals. The documentary

sources consulted were also helpful in bringing together comments and opinions from different scholars with different backgrounds as pointed out in the literature review.

3.6.1.1 Questionnaire

Questionnaire is one of the greatest popular convenient ways of gathering information from a target population (Wallonick, 1993). It also offers information from an assortment of ways and perspectives. The researcher used it because it is cost effective, easy to analyze, reduce bias and one of the most statistical analysis that software can easily process (Wallonick, 1993), more particularly in case study research. The researchers were physically distributing the questionnaire to the library staff using stratified random sampling techniques.

3.6.1.2 Interview Schedule

The researcher used interview schedule. This is an instrument used in eliciting information from respondent through some verbal interaction between the interviewer and the interviewee. A request letter for the scheduling of the interview was sent to the head of the libraries ahead of time. The nature of the interview guide was unstructured in nature. Rather, it allows the head libraries to give their own opinion without guidance or restriction. The conversation took the form of face to face interview. The research assistant was able to transcribe in long hand not short hand and recorded the conversations as well which were later listened to by the researcher for content analysis. The choice of these methods was based on the geographical location of the institutions under study which is across three states in North eastern Nigeria with the farthest 320 km away.

3.6.1.3 Secondary information Sources

According to Nordquist (2016), secondary source refers to information that has been collected (and often interpreted) by other researchers and recorded in books, articles, and other publications. Secondary sources whether published or not published may widen research by providing background information, analyses, and unique perspectives on one or more steps removed from an original event or work. This method of data collection helped widen the research by providing background information that helped validity and dependability of the data collection. The researcher checked the selected area of study libraries to verify that they deliver and different types of open source library software. This allowed the researcher verify what the respondents responded on the questionnaire.

3.6.2 Pilot Study

A pilot study was conducted in advance to test some part of the instruments in order to ensure that ambiguities are removed from the questionnaire so that respondents would not have difficulties in responding to questions. The pilot test was done at FCE Yola Library since no other FCE existed in the northeast, Nigeria apart from the three selected FCE under study. The pilot study aided the researcher to come up with valid and dependable instrument for data collection (questionnaire).

3.7 Pilot Test Results

To establish validity, the research instrument was given to two experts who were experienced in the awareness and uptake of open source library software in federal colleges of education in north-east Nigeria to assess the relevance of each item in the instrument in relation to the objectives. The same were rated on the scale of 1 (very relevant) to 4 (not very relevant).

Validity was determined by use of content validity index (CVI). CVI was obtained by adding up the items rated 3 and 4 by the experts and dividing this sum by the total number of items in the questionnaire. A CVI of 0.747 was obtained. Zahra and Pearce (2009), state that a validity coefficient of at least 0.70 is acceptable as a valid research hence the adoption of the research instrument as valid for this study.

A higher value shows a more dependable generated scale. It also indicated 0.7 to be an acceptable reliability coefficient. The study involved questionnaires from 7 respondents, who were selected to participate in the pilot study. Since, the alpha coefficients were all greater than 0.7, a conclusion was drawn that the instruments had an acceptable reliability coefficient and were appropriate for the study.

Table 3.2: Reliability Results

Variable	Cronbach's Alpha	Items
Low level	.71	2
Medium level	.73	1
High level	.75	2

Source: Researcher, 2017

3.7.1 Data Validity

According to Universal Basic Education Commission (UBEC) (2011), validity denotes the property of a measuring instrument that is concerned with how well the instrument measures what it was designed to measure. In order to certify that the researcher obtained qualitative data

from the field, the instrument was pretested on a few individuals before the researcher embarked on data collection exercise to check on their validity. Secondary source of data was used to validate the data provided.

According to Mugenda and Mugenda(2003) validity is the degree to which the results obtained from the analysis of the data represents the phenomenon under study. In other words, it is the measure of how well a research instruments measures what it is supposed to measure (Kombo and Tromp 2006).In this study, the research instruments were examined by the researcher to ascertain their validity. This was obtained by consulting experts on the open source software, who looked at the research instruments and made comments on the face validity. The research instruments were piloted after which modifications were made to suit content validity of the instrument.

3.7.2 Data Reliability

According to Universal Basic Education Commission (UBEC) (2011), reliability refers to how consistent or dependable an instrument is in measuring whatever it measures. Reliability is the measure of the degree to which a research instrument yield consistent results or data after repeated trials (Mugenda and Mugend 2003). According to Kombo and Tromb (2006) is a measure of how consistent the results from research instruments are. Bush (2004) observed that a reliable instrument is the one that has a small error or standard deviation.

In this regard, a pilot study was conducted to determine if the relationships between the questions and objectives of the study are reliable with each other.

3.8 Data Analysis

The data for this study was collected and examined using questionnaire according to the objectives of the study. The data was presented in a descriptive manner using tables, graphs and charts. Computer based statistical package for social sciences (SPSS) was adopted to analyze the quantitative data also presented using pie chart and bar chart.

3.9 Ethical Consideration

Ethical considerations are germane in researches as it deals with moral factors that ensure factuality and originality. Ethics according to Resnik (2015) is a strategy, process, or ways of how to clearly decide on how to act and analyze difficult problems or issues (Resnik, 2015). It is a process or actions that researchers adhere to in order to generate data about a social problems or phenomenon. The researcher was directed by all ethical deliberations in undertaking the research. The researcher looked for permission from relevant authority in the institutions designated as well as the consent of individual respondents. The respondents were guaranteed of their confidentiality and their feelings and emotions would be sufficiently taking in to consideration. More so, the researcher embraced all the processes identified in conducting the research, so as to ensure that the research is impartial and a true reflection of the data obtained from the field.

CHAPTER FOUR
FINDINGS, INTERPRETATION AND DISCUSSION OF RESULTS

4.1 Introduction

This chapter presents the analysis, interpretations and discussions of the findings. The chapter was organized in accordance with the specific objectives of the study as well themes derived from the research questions.

4.2 Response Rate

The targeted sample size was 285 from the three selected Federal Colleges of Education libraries. The study utilized all the librarians (285) both professional and paraprofessional. Those who filled and returned questionnaires were 252 respondents making a response rate of 88.89%. According to Mugenda and Mugenda (1999), a response rate of 50% is adequate for analysis and reporting; a rate of 60% is good and a response rate of 70% and over is excellent. This means that the response rate for this study which was recognized to be 88.89% was excellent and therefore enough for data analysis and interpretation.

Table 4.1: Response rate

Questionnaires	Frequency	Percent (%)
Response	252	88.89%
Non-response	33	11.11%
Total	285	100.00%

Source: Researcher, 2017

4.3 General Information

The study pursued to determine the general information of the respondents. The results were recorded in the preceding section.

4.3.1 Gender Distribution

The study set out to determine the gender composition of the respondents. Gender in this study is considered very important. This is because of the disparity between male and female in library profession in Nigerian FCE. The findings in figure 4.1 showed the numbers of male and female respondents involved. The figure below indicates that 46% of the respondents were male while 54% were female. It's obvious from the study that the bulk of the respondents were female as supported by 54% of the respondents. The finding indicates that the study captured both genders. According to Hu, Al-Gahtani and Hu (2008), gender seems to moderate the effects of perceived usefulness of the free open sources software, more so for women than for men. This mean that female staff are likely to consider a technology usefulness and important than the male when shaping their attitudes towards technology as show below (see figure 4.1)

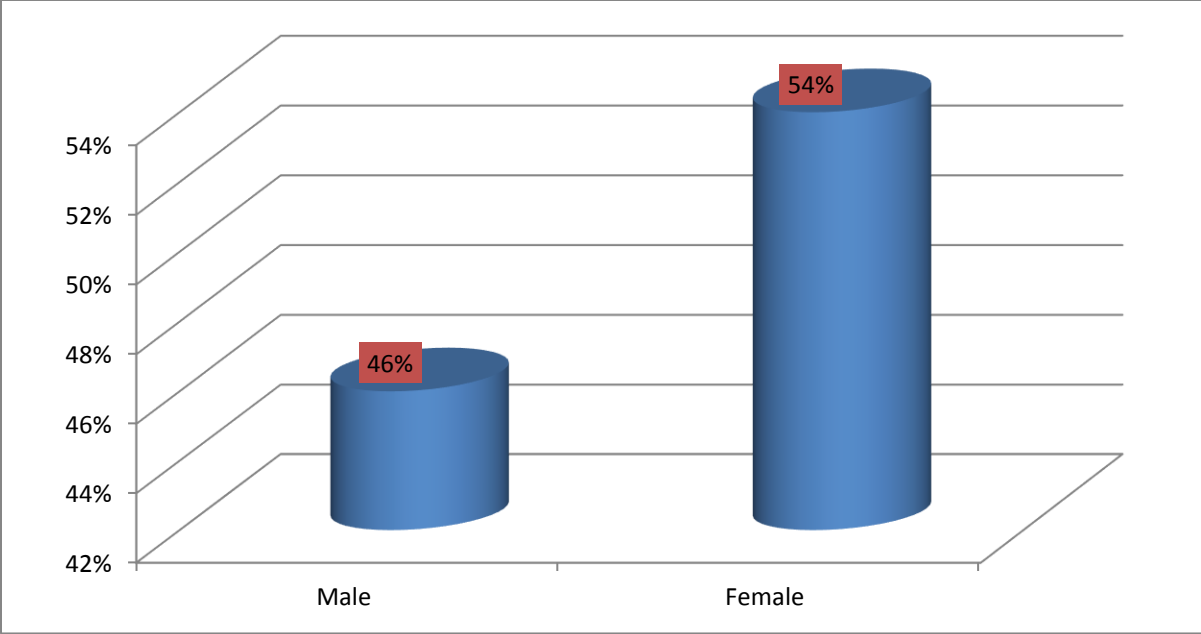


Figure 4.1 Gender Distribution of Librarians

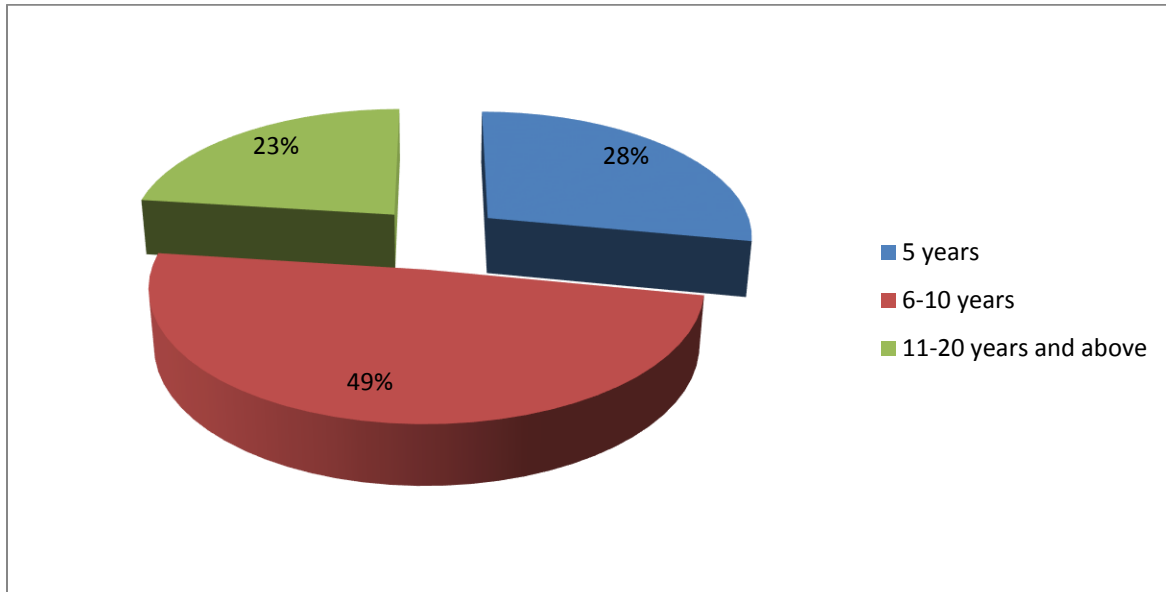
4.4.2 Years in Service Distribution

The study sought to determine the years in service distribution of the respondents. The findings were presented in the figure below. Years and experience of library staff is a key consideration in the present study. The perception of open source software is determined by quality staff with experience and who have worked for years.

The results from figure 4.2 shows that 28% were in service for 5 years, 49% were for 6 to 10 years while 23% had worked for between 11 to 20 years and above. The diagram indicates librarian years in service to provides their knowledge in the profession for those who spent more than 6- 10 years responded more than those spend more than those with 5 years and 11-20 years in the profession have interest of modern technology (ICT). Other staff who spent 11 years in the

service are librarians who are close to their retirement age and have no knowledge of modern technology (see figure 4.2).

Figure 4.2 Years in Service Distribution

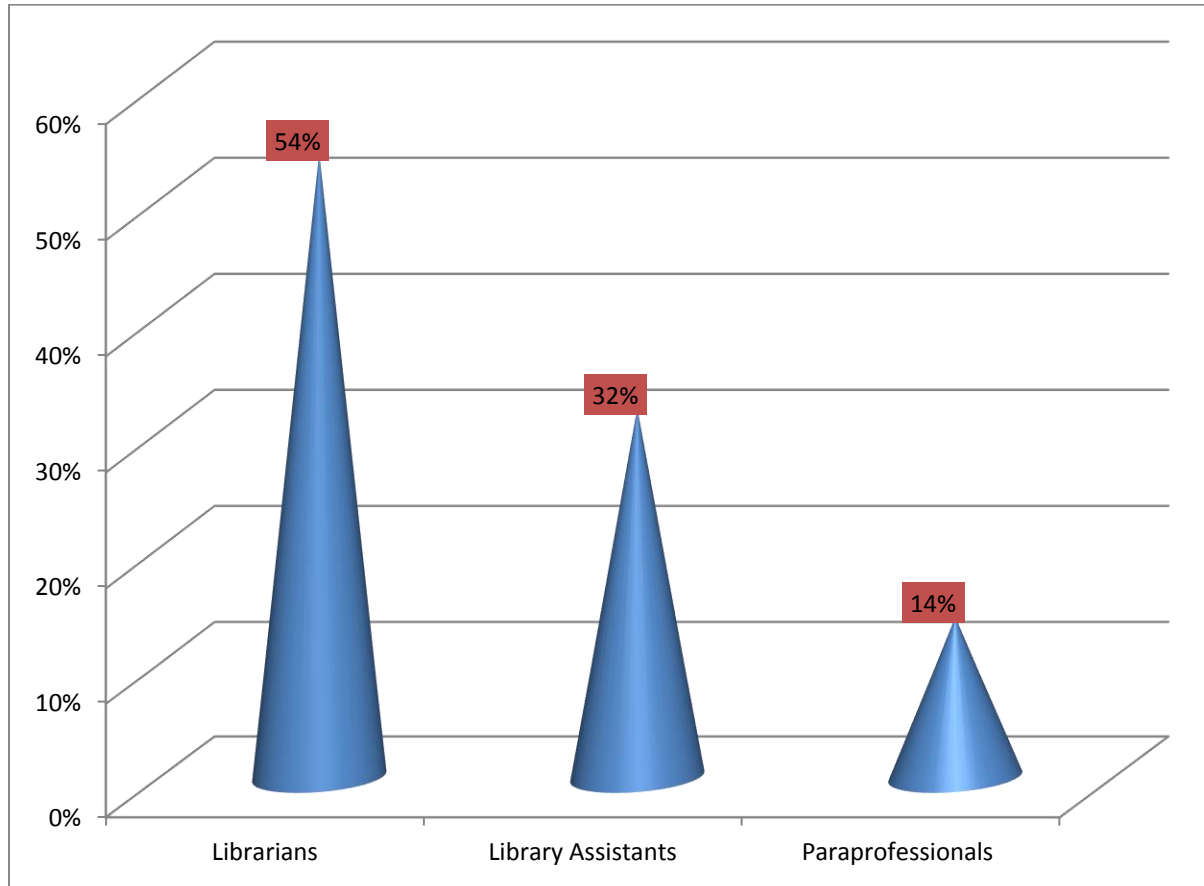


Source: researcher, 2017

4.4.3 Official Position of Respondents

The study also sought to determine the official position of respondents. The findings were presented in the figure below. The study shows that 54% of the respondents were librarians, 32% were library assistants whereas 14% were paraprofessionals. The librarians responded highest based on their position and professionalism in the field, they also held position as department heads of each sections of the library. This makes them more knowledgeable and able to solve existing library problems than the assistant librarians and paraprofessionals. This was shown in figure 4.3.

Figure 4.3 Official Position of Respondents



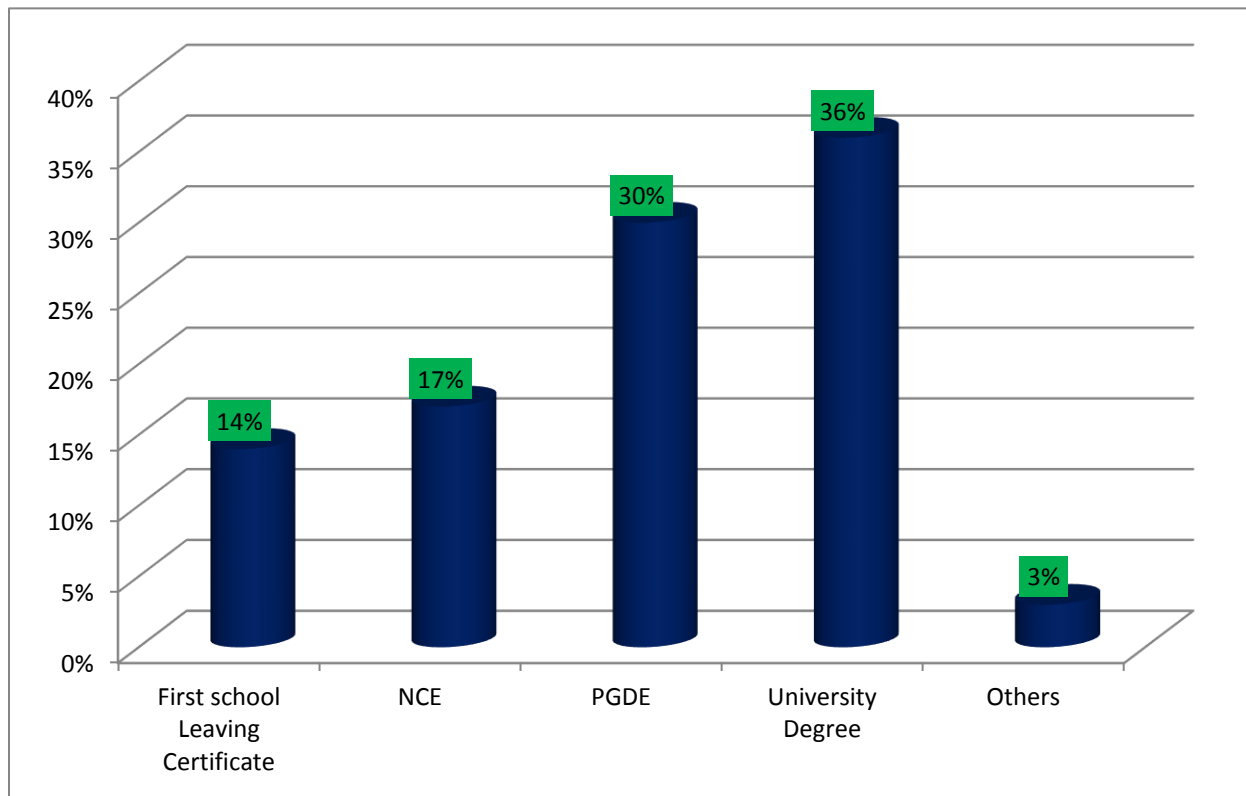
Source: Researcher, 2017

4.4.4 Highest Qualifications

The study also sought to determine the highest qualification of respondents. The findings were presented in the figure below. Qualification of library staff in the study is considered very vital. Librarians with higher qualification provides relevant services than the less qualified librarians. Professional librarians are of high value than the para-professional librarians in the profession. The study from figure 4.4 demonstrates that 14% of the respondents had a first school leaving certificate, 17% had National Certificate of Education (NCE), 30% had reached a Postgraduate Diploma in Education(PGDE), and 36% had a university degree while 3% had other academic

qualifications. It is apparent from the study that the majority (36%) had a university degree. The education level of the respondents was adequate for the study as reflected in figure 4.4.

Figure 4.4 Highest Qualification



Source: Researcher, 2017

4.5. Knowledge about Open Source Library Software

The researcher sought to establish the respondents' knowledge about open source library software. Free and open access library software is very significant modern sources of teaching, learning and research particularly in higher educational institutions around the world especially in the 21st century. According to Fadeham and Ali (2010), the 21st century has seen an extraordinary paradigm change in the library and information services worldwide, and the ripple

consequence of the influence of information and communication technology (ICT) on each aspect of human effort remains enormous and its influence on library and information services has not been limited. The study results were recorded in table 4.3. The study designates that 20% of the respondents knew nothing about open source library software, 34% heard a little about open source library software while 46% were fully aware about open source library software. The study indicates that the majority (46%) were fully aware about open source library software. Nevertheless, as cited by Helmreich (2011), there is low penetration; there is low uptake of automated libraries system in North East Nigeria libraries. Notwithstanding the existence of free open source library software, this state may mean that the said libraries cannot benefit from the facilities of free open source library software. (see table 4.3)

Table 4.3 Knowledge about Open Source Library Software

Knowledge	Frequency	Percentage (%)
Know nothing about it	51	20
Heard a little about it	86	34
Fully aware about it	115	46
Total	252	100

Source: Researcher, 2017

4.5.1 Components of Free and Open Library Software

The researcher sought to establish the respondents' knowledge about the components of free and open library software. The results were recorded in table 4.4.

The study shows that 12% of the respondents knew access to the source code, 19% knew free redistribution, 18% were aware of creation of derived works, 20% knew non exclusion and

Indiscrimination against Persons, Groups and every field of endeavor, 6% were aware of license must not constrain other software, 9% indicated license must be technology-neutral, 13% knew distribution of license right whereas 3% were for others.

The study indicates that the bulk (20%) were aware of Non exclusion and Indiscrimination against Persons, Groups and every field of endeavor. These findings were in line with (Helmreich (2011) that any person or any groups of persons are granted rights to use the license, and no one is constrained from making use of the open source software in exact field of endeavor. It can be used in a business, medical research, and library and for every fields of human endeavor (see table 4.4).

Table 4.4 Components of Free and Open Library Software

Components	Frequency	Percentage (%)
Access to the Source Code	30	12
Free redistribution	48	19
Creation of derived works	45	18
Non exclusion and Indiscrimination against Persons, Groups and every field of endeavor.	51	20
License Must Not Restrict Other Software	14	6
License Must Be Technology-Neutral	23	9
Distribution of License Right	33	13
Others (Specify)	8	3
Total	252	100

Source: Researcher, 2017

4.5.2 Types of Free and Open Library Software

The researcher sought to establish the types of free and open library software the respondents are familiar with. The results were recorded in table 4.5. The study indicates that 4% of the respondents were aware of KOHA, 1% knew Reference portal, 5% were aware of Evergreen, 3% knew VuFind, 5% were for LibKi, 5% were aware of NewGenLib, 2% knew PMB, 4% were for Calibre, 6% knew Greenstone Digital Library Software, 2% were for DSpace, 6% knew EPrints, 4% were for Fedora, 5% knew Web Publishing, 6% were aware of Wordpress, 2% were for Drupal, 1% knew Library Find, 2% knew Firefox, 6% were aware of Open Office, 5% were aware of PDF Creator, 6% knew Thunderbird, 3% knew GIMPshop, NVU were for 8%, on the other hand, 3% were aware of Ubuntu whereas 6% were for others. (see table 4.5)

Table 4.5 Types of Free and Open Library Software

	Frequency	Percentage (%)
Koha	10	4
Reference Portal	3	1
Evergreen	12	5
VuFind	8	3
LibKi	13	5
NewGenLib	14	5
PMB	4	2
Calibre	9	4
Greenstone Digital Library Software	16	6
DSpace	5	2
EPrints	14	6
Fedora	9	4
Web Publishing	12	5
Wordpress	15	6
Drupal	5	2
LibraryFind	3	1
Firefox	4	2
Open Office	14	6
PDF Creator	12	5
Thunderbird	16	6
GIMPshop	8	3
NVU	21	8
Ubuntu	9	3
Others (Specify)	16	6
Total	252	100

Source: Researcher,2017

4.5.3 Benefits of free and open source library software in the operations of library

The researcher sought to establish benefits of free and open source library software in the operations of library. The results were recorded in table 4.6. The study shows that 8% of the respondents showed that free and open source library software was a lower costs software, 5% indicated simplified license management, and 9% were for lower hardware costs, 13% indicated scaling /consolidation potential, 16% were for support, 15% indicated that the software avoided lock-in, 10% were for unified management, 19% indicated security and reliability while 5% were for quality software.

From the results, it is obvious that free and open source library software was secure and reliable as supported by 19%. These findings were in line with Graham (2017), that security and reliability is one of the qualities expected of software, open software in this regard is one of the reliable and secured software. The level of this reliability and security committed to it can be captured from (Abba, 2014). According to him, “the time until security susceptibility in open source software is fixed (36 days) is substantially shorter than the time that elapses until a commercial product gets fixed (82 days)”. Nevertheless, report from the same source indicates “that open source software is as secure as commercial software, but more secure than internally developed” (Helmreich, 2011). (see table 4.6)

Table 4.6 Benefits of free and open source library software

Benefits	Frequency	Percentage (%)
Lower Costs Software	20	8
Simplified License Management	13	5
Lower Hardware Costs	24	9
Scaling/Consolidation Potential	32	13
Support	40	16
Avoid Lock-In	38	15
Unified Management	24	10
Security and Reliability	49	19
Quality Software	12	5
Total	252	100

Source: Researcher, 2017

4.5.4 Challenges associated to Free and Open Library Software

The researcher sought to establish the challenges associated to Free and Open Library Software in Higher Academic Institutions of Learning in Nigeria. The results were recorded in table 4.6.

The study established that poor infrastructure was a challenge associated to Free and Open Library Software as supported by 10%. On the other hand, Intellectual Property Rights had 6%, Low Internet Bandwidth had 8%, Privacy, Security and Income had 4% each. Additionally, lack of awareness of open source library software among Librarians had 10%. Furthermore, inadequate manpower had 5%; lack of supervision had 2%. Nonetheless, inadequate managerial support had 4%, inadequate power supply had 6%. Furthermore, cost of Procurement of the hardware/software had 6%, Maintenance Cost had 6% and vendor's insincerity had 7%. Nonetheless, lack of consortium had 1%, apathy on the part of library staff had 0.3% while inadequate funding had 6%. On the other hand, lack of training and re-training of staff had 6%, compatibility with hardware devices had 4%. Additionally, piracy had 1%, proximity to virus had 4% while crashing problem had 2%. Further, lack of technical knowledge from the staff had 4% while others indicated 0.3%.

It is clear from the above that extra fund should be provided for maintenance of the library as supported by 7%. These findings were in line with Oluwasemilore (2006) that one of the key challenges related with use of open library software in higher academic institutions in Nigeria is finance and inadequate funding to procure the resources and facilities needed for effective service provision owing to among others poor funding on the side of government and for the fact that there is high cost of the computer and information and communication software. This a great challenge.

Poor Infrastructure was a main challenge as supported by 10%. These findings were in line Uzuegbu and McAlbert (2012) that poor and insufficient infrastructure that include roads, electricity in addition to poor regulatory frameworks and affordability. Electric power supply is a major infrastructural problem related with open access to scholarly journals in Nigerian academic institutions. An institutional repository of research, information and knowledge should be openly accessible 24 hours a day. This is exclusively possible only when there is uninterrupted electricity supply. There is no stable electricity supply in Nigeria that will provide adequate utilization of these resources.

Absence of Awareness of Open Source Library Software among librarians was another major challenge as supported by 10%. These findings were in line with Blessing (2012) that Lack of awareness of open source library software among librarians to most higher academic institutions in Nigeria serves as a challenge. Awareness is supreme for librarian to effectively and efficiently use electronic resources including open source library software. Nevertheless, there are few studies on librarians' awareness towards open source library software. In a survey carried out by Blessing (2012) on *“awareness, availability and utilization of open source software in Nigerian*

libraries” with the main objective of finding the level of awareness, degree of use, challenges and forecasts of the use of open source software in Nigerian libraries, it was exposed that most librarians in Nigeria have partial awareness on the obtainability of the changing Open Source Software and do not expressively exploit them in their libraries. As Blessing (2012) research indicates, of the 42 libraries involved in the study, only 7 are presently using CD/ISIS whereas 5 others use KOHA. The survey also identified some inhibitors to the lack of awareness to include the management which does not see the use of the software in those sections as pertinent, fear of service support problems, and unavailability of Internet access in the libraries to enable downloading of software. (see table 4.7)

Table 4.7 Challenges associated to Free and Open Library Software

Challenges	Frequency	Percentage (%)
Poor Infrastructure	20	10
Intellectual Property Right	15	6
Low Internet Bandwidth	26	8
Privacy, Security and Income	10	4
Lack Awareness of Open Source Library Software among Librarians	24	10
Insufficient manpower	13	5
Lack of supervision	5	2
Inadequate managerial support	9	4
Inadequate power supply	15	6
Cost of Procurement of the hardware/software	11	4
Maintenance Cost	14	6
Vendor’s insincerity	17	7
Lack of Consortium	2	1
Apathy on the part of Library Staff	1	0.3
Inadequate Funding	16	6
Lack of training and re-training of staff	15	6
Compatibility with hardware devices	10	4
Piracy	3	1
Proximity to Virus	9	4
Crashing Problem	5	2
Lack of technical knowledge from the Staff	11	4
Others (Please specify)	1	0.3
Total	252	100

Source: Researcher, 2017

4.5.5 Possible solutions to the challenges

The researcher sought to establish the possible solutions to the challenges associated with free and open source library software in the respondents' organization. The results were recorded in table 4.8. The study shows that the library ought to employ capable manpower as indicated by (2%). On the other, there should be appropriate supervision of staff with (7%); there should be sufficient managerial support (8%). The respondents indicated that there should be uninterrupted power supply 10%. Additional funds should be provided for maintenance of the library as supported by 7%. Grants should be provided for teaching and re-training of library staff as supported by 6%. On the other hand, libraries ought to form consortium with each other so as to deliberate possible challenges and solutions encountered in the use of the software as supported by 7%. Library staff and users should be given proper positioning on the benefits and use of open source software as supported by 7%. Software should be made flexible enough was supported by 17%. Further, software ought to be user-friendly was supported by 11%. Moreover, software ought to be made well-matched with hardware devices were supported by 15%. Software should be fortified against virus attack was supported by 3%. Finally, other challenges were supported by 2%. (See table 4.8)

Table 4.8 Possible Solutions to Challenges associated to Free and Open Library Software

Challenges	Frequency	Percentage (%)
The library should employ capable manpower	5	2
There should be proper supervision of staff	18	7
There should be adequate managerial support	20	8
There should be uninterrupted power supply	24	10
More fund should be provided for maintenance of the library	18	7
Grants should be provided for training and re-training of library staff	15	6
Libraries should form consortium with each other so as to discuss possible challenges and solutions encountered in the use of the software	18	7
Library staff and users should be given proper orientation on the benefits and use of open source software	18	7
Software should be made flexible enough	42	17
Software should be user-friendly	28	11
Software should be made more compatible with hardware devices	38	15
Software should be fortified against virus attack	8	3
Others (Specify)	5	2
Total	252	100

Source: Researcher, 2017

The researcher sought to establish the type of library in federal colleges of education in north-east Nigeria. The study indicated that there were majorly school libraries. The researcher further wanted to establish the size of the library. The results indicated that the libraries from federal colleges of education in north-east Nigeria served an average of 2000 people per day, both students and none students. The libraries employed more than 50 librarians with a total of 15000 reading materials. The researcher further sought to find out where the librarians got information

when selecting an open-source ILS. Majority indicated from Vendor/ILS pages. The study recognized the challenges faced during installation of ILS. The respondents showed low capable manpower, lack of proper supervision of staff, frequent power interruption, lack of provision of grants for training and re-training of library staff and poor networking and consortium with each other so as to discuss likely challenges and solutions met in the use of the software.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes fundamental issues as established in the entire study and also makes relevant conclusions and recommendations based on policy, best practice framework and further research. These are derived from the purpose, objectives and research questions of the study. The preceding involves the summary, conclusions and recommendations from the research findings. Summary, conclusion and recommendations are based on the objectives and findings of the study.

5.2 Summary

The study above shows that 46% of the respondents were male whereas 54% were female. It's obvious from the study that the majority of the respondents were female as supported by 54% of the respondents. It's apparent from the study that the majority (36%) had a university degree. The education level of the respondents was adequate for the study.

The study indicates that the majority (46%) were fully aware about open source library software. Nonetheless, as allude to by Helmreich (2011), there is low penetration; there is little uptake of automated libraries system in North East Nigeria libraries. Notwithstanding the existence of free open source library software, this situation might mean that the said libraries cannot benefit from the facilities of free open source library software.

The study indicates that the majority (20%) were conscious of Non exclusion and Indiscrimination against Persons, Groups and every field of endeavor. These findings were in line with (Helmreich (2011) that any person or any groups of persons are allowed rights to use the license, and no one is limited from making use of the open source software in a specific field of endeavor. It can be used in a business, medical research, and library and for all fields of human endeavor.

From the study, it's obvious that free and open source library software was safe and reliable as supported by 19%. These findings were in line with Helmreich (2011) that security and reliability is one of the qualities expected of software, open software in this respect is one of the dependable and tenable software. The level of this reliability and security attached to it can be apprehended from Helmreich (2011). Conferring to him, "the time until security susceptibility in open source software is fixed (36 days) is importantly shorter than the time that passes until a commercial product gets fixed (82 days)". Nonetheless, report from the same source shows "that open source software is as secure as commercial software, but more safe than internally established" (Helmreich, 2011).

It's clear from the study that additional fund ought to be provided for maintenance of the library as supported by 7%. These findings were in line with Oluwasemilore (n.d.) that one of the main challenges related with use of open library software in higher academic institutions in Nigeria is finance and inadequate funding to obtain the resources and facilities required for effective service provision owing to among others is deprived funding on side of government and for the fact that there is high cost of the computer and information and communication software. This a great challenge.

Deprived Infrastructure was a major challenge as supported by 10%. These findings were in line Uzuegbu and McAlbert (2012) that poor and inadequate accessibility of supporting infrastructure that comprise roads, electricity in addition to poor regulatory frameworks and affordability. The problem of electricity power supply is a major infrastructural problem related with open access to scholarly journals in Nigerian academic institutions. An institutional repository of research, information and knowledge ought to be openly accessible 24 hours a day. This is exclusively possible only when there is never-ending electricity supply. There is no stable electricity supply in Nigeria that will offer.

Lack Awareness of Open Source Library Software among Librarians was another key challenge as supported by 10%. These findings were in line with Blessing (2012) that Lack Awareness of open source library software among librarians to most higher academic institutions in Nigeria works as a challenge. Awareness is supreme for librarian to effective and effective use of electronic resources including open source library software. Nonetheless, there are few studies on librarians' awareness towards open source library software.

5.3 Conclusion

In spite of the awareness of free open source library software, there is little penetration; there is little uptake of automated libraries system in North East Nigeria libraries. Notwithstanding the existence of free open source library software, this state of affairs may mean that the said libraries cannot benefit from the facilities of free open source library software.

Any person or any groups of persons are contracted rights to use the license, and no one is restricted from making use of the open source software in a specific field of endeavor. It can be used in a business, medical research, and library and for every fields of human endeavor. Free and open source library software is secure and reliable. Security and reliability is one of the quality anticipated of software, open software in this respect is one of the reliable and secured software.

Poor Infrastructure was a key challenge in the implementation of Open Source Library Software deprived and inadequate availability of secondary infrastructure that comprise roads, electricity in addition to poor regulatory frameworks and affordability. Electricity supply is a key infrastructural problem associated with open access to scholarly journals in Nigerian academic institutions.

Lack of Awareness about Open Source Library Software among librarians was another key challenge, open source library software among librarians to most higher academic institutions in Nigeria serves as a challenge. Awareness is paramount for librarian to effective and efficient use of electronic resources including open source library software.

5.4 Recommendations

- I. The researcher recommends that the library ought to employ skilled manpower for the implementation and use of Open Source Library Software among guarantee appropriate Librarians.
- II. The libraries under study should create awareness about open source library software, there benefits to users, staff and the academic community as a whole.

- III. The identified problems should be addressed by both the library management and the academic authority through joint committees.
- IV. There ought to be uninterrupted power supply to enhance library operations with stand by generators and reliable power inverters and also, funds ought to be provided for maintenance of the library.
- V. The management should make provision for sponsorship for library staff to attend conferences, seminars and workshops on librarianship and ICT.

5.5 Suggestions for Further Readings

It is worth noting that academic libraries only constitute one segment among many types of libraries which includes Public, School, Special or National libraries. A comparative study of open source software in different libraries, as well as different types of open source software in relation to the use and benefits. It would monitor the different sectors and avenues of open source adoption and implementation which may help librarians to make informed choices in terms of the adoption and implementation of open source.

More research work is needed in the area of building a trust between open source service providers and consumers and focus on issues of data security and data privacy which may enhance efficiency and acceptability of open source software.

REFERENCES

- Abioye, A. (2013). Enhancing library and information science education through cross-border collaboration: The experience of university of Ibadan, Nigeria and University of Ghana. Paper presented at the IFLA WLIC 2013. Available online at: <http://library.ifla.org/174/1/199-abioye-en.pdf>
- Abubakar, B. M. (2014). Rethinking e-learning in library and information science (LIS) education in Nigeria: developing a model for the 21st century. *Information and Knowledge Management*, 4(9): 68-76.
- Abba, K. (2014). Automation in Nigerian university libraries: mirage or reality. *Information and Knowledge Management*, 4(4), 1-6 .
- Adeyemo, A. B. (2005). The Open Source Business Model and its Economic Implications for Nigeria and other Third World Economies. *Journal of Information Technology Impact*, 5(3), 121-128.
- Akintomide, O. A. (2016) "A Study of Nigerian Librarians' Attitude to Open Source Software". *Library Philosophy and Practice (e-journal)*. Paper 1356.
- Akpojotor, L. O. (2016) "Awareness and Usage of Electronic Information Resources Among Postgraduate Students Of Library And Information Science In Southern Nigeria" *Library Philosophy And Practice (E-Journal)*. Paper 1408.
- Amega-Selorm, C., & Awotwi, J. (2010). *Free and open source software (FOSS): it's significance or otherwise to the e-governance process in Ghana*. ICEGOV '10: Proceedings of the 4th International Conference on Theory and Practice of Electronic Governance (pp. 91-95). ACM.
- American Library Association. (2011a). Public library funding and technology access study, 2010-2011 [Summer 2011 Digital Supplement]. *American Libraries*, 7-10. Retrieved from <http://americanlibrariesmagazine.org/archives/issue/summer-2011-digital-supplement-0>

- Anuradha, V., Gopakumar, V., & Baradol, A.K. (2011). Awareness and Use of Open Access and Free Resources on the Internet: A Case Study at BITS Pilani K K Birla Goa Campus, Goa. 8th International CALIBE
- Awino, Z.A. (2007): “*Effects of Selected Strategy Variables on Corporate Performance: A Survey of Supply Chain Management in Large Private Manufacturing Firms in Kenya*”, (Unpublished PhD Dissertation) University of Nairobi.
- Berlin Declaration on Open Access. (2003, October 22). *oa.mpg.de*. Retrieved February 10, 2017, from Berlin Declaration on Open Access:
<http://oa.mpg.de/openaccess-berlin/berlindeclaration.html>
- Blessing, U. N. (2012) “Awareness, Availability and Utilization of Open Source Software in Nigerian Libraries: The Way Forward”. *International Research Journal of Library, Information and Archival Studies* Vol. 1(1).January. Pp. 001-009,
- Borgatti, S. P. (1999) Elements of Research.(Accessed Online: from <http://www.analytictech.com/mb313/elements.htm> on 11/2/2017).
- Breeding, M. (2010, January 13). LibLime acquisition by PTFS marks a new era for Koha. *Library Journal*, 135(2). Retrieved from <http://www.libraryjournal.com/article/CA6714841.html>
- Breeding, M., & Yelton, A. (2011). Librarians’ assessments of automation systems: Survey results, 2007–2010. *Library Technology Reports*, 47(4), 5-34. Retrieved from <http://www.alatechsource.org/taxonomy/term/106/librarians-assessments-of-automation-systems-survey-results-2007-2010>
- Bridge, R. (2013) “Open source software – The advantages & disadvantages”. (Accessed Online: from <http://entrepreneurhandbook.co.uk/open-source-software/> 20/2017).
- Bush, R.F. (2004). Hand Book on Research Methods in Public Administration. Oslo, Mchill publication.

- CATIA. (2005) Catalysing Access to ICTs in Africa (CATIA) programme, Free/open source software (FOSS) policy in Africa: A toolkit for policy-makers and practitioners, *bridges.org and the Collaboration on International ICT Policy for East and Southern Africa* (CIPESA).
- Chepesuik, R. (1997). The future is here: America's libraries go digital. *American Libraries*, 2(1), 47-49.
- Chiware, E.R.T. (2007). Training librarians for the digital age in African university libraries. Pre-IFLA Satellite Meeting, Durban, August 2007. <http://www.ifla.org/IV/ifla73/satellite/programme.en.pdf>.
- Cleveland, G. (1998). *Digital Libraries: Definitions, issues and challenges*. New York: IFLA.
- Creaser et al., (2010). Authors' Awareness and attitudes toward open access repositories. 16(S1):145–161. Available at www.tandfonline.com
- Darvish, H., (2014). Open access awareness in scholarly communication: a case of Cankaya University.
- Dole, W. A. (2000). Values for Librarians in the information age. *Library Management*, 21(6), 285-286.
- DSpace Organization (n.d.) About Dspace.(Accessed Online: from <http://www.dspace.org/introducing>).
- Dudley-Sponaule, A., Hong, S., & Wang, Y. (2007). The Social Economical Impact of OSS in Developing Countries. *Handbook of Research on Open Source Software*, 102-113
- Dulle, W. F. (2010, August). *An analysis of open access scholarly communication Tanzanian public universities* (Thesis). Retrieved from <http://uir.unisa.ac.za/handle/10500/3684>
- Edwards, J. (2008). "The Changing Face of Freeware," *Computer*, pp. 11-13.

- Fadehan, O. A. & Ali, H. (2010)“Educational Needs of Librarians in the Digital Environment: Case Studies of Selected Academic Libraries in Lagos State, Nigeria”. *Library Philosophy and Practice (e-journal)*.Paper 476.
- Feller, J. & Fitzgerald, B. (2002). *Understanding Open source Software Development*. Boston. Addison-Wesley Longman Publishing Co.
- Free Software Foundation (2016) “What is Free Software?”.(Accessed Online: from <http://www.gnu.org/philosophy/free-sw.html>).
- Gartner I. (2008) *User Survey Analysis: Open-Source Software, Worldwide, (2008)*. Available at:http://www.gartner.com/DisplayDocument?ref=g_search&id=757916&subref=simplesearch. Last Accessed,14.02.2017
- Gay, L.R. (1976). *Educational research: competencies for analysis and application*. London: Mirrill Publishers.
- Gilson, J. (2005) *Ecosystem-Based Management and Dialogic Stakeholder Theory in Small Protected Areas Management. A THESIS SUBMITTED TO THE FACULTY OF GRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE*
- Glance DG, Kerr J, Reid A (2004). *Factors Affecting the Use of Open Source Software in Tertiary Education Institutions*. www.myresearchspace.grs.uwa.edu.au/files/folders/20/download.aspx
- Graham, P. (2017). *Requirements for the digital research library*. . Retrieved from aultnis: <http://aultnis.rutgers.edu/texts/DRC.html>
- Hadro, J. (2009). *IMLS boosts open source ILS project for large public libraries* [Web page]. Retrieved from <http://www.libraryjournal.com/article/CA6701493.html>

- Hague, M. (2011) Sampling Methods in Social Research. (Accessed Online: From [Www.Grmgrlaranya.Com/Journals/Sampling%20methods%20in%20social%2...](http://www.grmgrlaranya.com/journals/sampling%20methods%20in%20social%20...) on December 29, 2016).
- Helmreich, M. (2011) *Best Practices of Adopting Open Source Software in Closed Source Software Products*. A Thesis submitted to the Institute for Informatik Professurfür Open Source Software Friedrich-Alexander-Universität Erlangen–Nürnberg.
- Hiong, G. O. H. S. (2005) Open Source and Commercial Software: An In-Depth Analysis of the Issues. *Business Software Alliance*.(Accessed Online: from http://www.wipo.int/edocs/mdocs/copyright/en/wipo_ip_cm_07/wipo_ip_cm_07_www_82575.pdf on 21/2/2017).
- Jensen, M. (2006) Open access: Lowering the costs of international bandwidth in Africa. APC Issue Papers.(Accessed Online: from http://www.researchictafrica.net/images/upload/open_access_EN.pdf).
- Johnson, K. Trabelsi, H. and Tin, T. (2013) “Library Support For Online Learners: E-Resources, E-Services And The Human Factors”. Chapter 14.*Theory and Practice of Online Learning*.(Access Online: from http://cde.athabascau.ca/online_book/ch14.html on 21/12/2016).
- Kandar, S., Mandal, S., & Ray, P. (2011). Open Incremental Model A Open Source Software Development Life Cycle Model “OSDLC.” Retrieved from <http://core.kmi.open.ac.uk/display/960627>
- Kenneth A. Merchant, (2012) "Making management accounting research more useful", *Pacific Accounting Review*, Vol. 24 Issue: 3, pp.334-356, <https://doi.org/10.1108/01140581211283904>
- Koha Library Software Community. (2011). History: Koha Library Software Community. In *Koha Library Software Community* . Retrieved from <http://koha-community.org/about/history/>

- Kombo, D. and Tromp, D. (2006). Proposal and thesis writing: an introduction. Nairobi: Paulines Publications.
- Kuali Foundation. (2011). Kuali OLE. Retrieved from <http://kuali.org/OLE>
- Laszlo, G. (2007). Issues and Aspects of Open Source Software Usage and Adoption in the Public Sector. *Handbook of Research on Open Source Software Technological, Economic, and Social Perspectives*, 455-458.
- Lewis, M. W. (2011). Exploring paradox: Toward a more comprehensive guide. *Academy of Management Review*, 25(4): 760-776.
- Madey, G., Freeh, V., Tynan R. (2002). *The Open Source Software Development Phenomenon: An Analysis Based on Social Network Theory*, AMCIS2002, Dallas, TX,.
- Mercie, J. (2015). *Computers and Librarians*. London: University Press.
- Meredith, J.R., (1996). Alternative research paradigms in operations management. *Journal of Operations Management* 8, 297–326
- Müller, T. (2011). How to choose a free and open source integrated library system. *OCLC Systems & Services*, 27(1), 57–78.
- Mugenda, O. M. and Mugenda, A. G. (1999). *Research Methods: Quantitative and Qualitative Approaches*. Nairobi: Acts Press
- Mugenda, O. & Mugenda, A. (2003). *Research methods: Quantitative and Qualitative Approaches*. Nairobi, Kenya: Acts Press
- Mtsweni, J. & Biermann, E. (2008) An investigation into the implementation of open source software within the SA government: an emerging expansion model, In SAICSIT '08: Proceedings of the 2008 annual research conference of the South African Institute of Computer Scientists and Information Technologists on IT research in developing countries, pp: 148-158.

- Mutula, S. & Kalaote, T. (2010). Open source software deployment in the public sector: A review of Botswana and South Africa. Available at https://www.researchgate.net/publication/220364214_Open_source_software_deployment_in_the_public_sector_A_review_of_Botswana_and_South_Africa. Accessed on 02-11-2017
- Nhando, D. (2016) “How Can Open Educational Resources Advance Online Learning In Sub-Saharan Africa?”.(Access Online: from <https://elearningindustry.com/utilizingopeneducationalresources-advance-online-learning-sub-saharan-africa>on 21/12/2016).
- Nordquist, R. (2016) Secondary Source (Research): Glossary of Grammatical and Rhetorical Terms. (Accessed Online: from <http://grammar.about.com/od/rs/g/secsourceterm.htm>).
- Nwakanma, N. (2009). *Linux fund and FOSSFA to join forces to promote open source software in Africa*. Retrieved July 8, 2017, from Free Software and Open Source Foundation for Africa:<http://www.fossfa.net/node/14?q=node/91>
- Nyakudya, M. N. (2012). Open Source Enterprise Applications in Botswana: A Readiness Assessment. *International Journal of Engineering and Management Sciences*, 32-42.
- Oluwasemilore, I. A. (n.d.) Issues and Challenges in the Development of Open Access Publishing and Scholarly Communications in Nigeria.http://digitalscholarship.unlv.edu/cgi/viewcontent.cgi?article=1004&context=aaas_pacific_conf).
- Osaniyi, L. (2010). Evaluating the X-Lib Library Automation System at Babcock University, Nigeria: A case study . Available at <http://journals.sagepub.com/doi/abs/10.1177/0266666909358306>

- Rahman, A.I.M., Khatun, M. & Mezbah-ul-Islam (2011). Education for Information Professionals in Bangladesh: A Case Study of the University of Dhaka. *Library Philosophy and Practice*
- Randhawa, S. (2012). Open source software for creation of digital library: A comparative study of greenstone digital library software and Dspace. *Indian Journal of Library and Information Science*, 6 (30), 45-52
- Raju, R., & Smith, I. (2015). South Africa: The role of open access in promoting local content, increasing its usage and impact and protecting it. In J. Schöpfel (Ed.), *Learning from the BRICS: Open access to scientific information in emerging countries* (pp. 159–189).
- Reijswound, V. V., & Mulo, E. (2007). Evaluating the Potential of Free and Open Source Software in the Developing World. *Handbook of Research on Open Source Software Technological, Economic, and Social Perspectives*, 79-92
- Resnik, D. B. (2015) What Is Ethics In Research & Why Is It Important? (Accessed Online: from <https://www.niehs.nih.gov/research/resources/bioethics/whatis/> on January 18, 2017).
- Singleton, R. (2017). Approaches to Social Research. Sixth Edition. London: Oxford University press.
- Sitko, N. J. (2013) Designing a Qualitative Research Project: Conceptual Framework and Research Questions. Indaba Agricultural Policy Research Institute. June 7. (Accessed Online: http://fsg.afre.msu.edu/zambia/Conceptual_Framework_and_Research_Questions.pdf).
- Sowe, S. K.,. (2008) Understanding Knowledge Sharing Activities in Free/Open Source Software Projects: An Empirical Study, *Journal of Systems and Software*,.

- Stanton, K. & Liew, C. (2012). OA theses in institutional repositories: an exploratory study of the perceptions of doctoral students. *Information Research*, 17(1)
- Suleiman, S. (2012) *Researchers Companion*. 2nd Edition. Kano: Samarib Publishers.
- Universal Basic Education Commission (UBEC) (2011) *Field Research Guide to Research Methods for Administrators*. Abuja: Universal Basic Education Commission.
- Uzomba, Oyebola, & Izuchukwu (2015) “The Use and Application of Open Source Integrated Library System in Academic Libraries in Nigeria: Koha Example”. *Library Philosophy and Practice (e-journal)*. Paper 1250.
- Uzuegbu, C.P. & McAlbert, F.U. (2012) “Digital Librarians and the Challenges of Open Access to Knowledge: The Michael Okpara University of Agriculture (MOUAU) Library Experience”. *Library Philosophy and Practice (e-journal)*. Paper No. 740. (Accessed Online: from digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1814&context=libphilprac)
- Vlachaki, A. & Urquhart, C. (2010). Use of open access journals in biomedicine in Greece. *Journal of library management*, 31 (1).
- Wallonick, D. S. (1993) Everything You Want To Know About Questionnaires. (Accessed Online: from <http://www.statpac.org/research-library/questionnaires.htm>).
- Wood, D. J., (2007). Toward a comprehensive theory of collaboration. *Journal of Applied Behavioral Science* 27, no. 2 (June): 139–62.
- World Intellectual Property Organization, (2012) What is Intellectual Property?. WIPO Publication No.450 (E). Accessed Online: from http://www.wipo.int/edocs/pubdocs/en/intproperty/450/wipo_pub_450.pdf.
- Zahra, S. A. & Pearce, J.A. (1990) Research evidence on the Miles-Snow typology, *Journal of Management*, 16 (4), 751-768

APPENDICES

Appendix I: Letter of Introduction

Department of Library and Information Science,

Kenyatta University,

4th March, 2017

Dear Respondent,

LETTER OF INTRODUCTION

I am a student of the above named institution pursuing a Degree of Masters in Library and Information Science. I am conducting research on the topic “EVALUATION OF LIBRARIANS AWARENESS AND UPTAKE OF OPEN SOURCE LIBRARY SOFTWARE IN FEDERAL COLLEGES OF EDUCATION IN NORTH-EAST NIGERIA”. I wish to solicit your opinion on the subject matter through the questionnaire attached. All the information provided and opinion expressed will be held confidential and used strictly for academic purpose.

Thanks in anticipation of your cooperation.

Yours Sincerely,

Abdulmalik Mahmood Baffa

Reg. No. E65/31116/2015

Appendix II: Questionnaire

INSTRUCTION: KINDLY TICK THE APPLICABLE OPTION

SECTION A: BACKGROUND INFORMATION

(A) GENDER DISTRIBUTION

GENDER	Tick your choice
Male	
Female	

(B) YEARS IN SERVICE DISTRIBUTION

YEARS IN SERVICE	Tick your choice
5years	
6-10 years	
11-20 years and above	

(C) OFFICIAL POSITION OF RESPONDENTS

POSITION	Tick your choice
Librarians	
Library Assistants	
Paraprofessionals	

(D) HIGHEST QUALIFICATION

Qualification	Tick your choice
First school Leaving Certificate	
NCE	
PGDE	
University Degree	
Others	

SECTION B: TOPICAL ISSUES

Instruction: kindly tick the applicable option (√)

Question (1): What is your knowledge about open source library software?

ITEMS	Tick your choice
(E) Know nothing about it	
(F) Heard a little about it	
(C) Fully aware about it	
(G)	

Question (2): What are the components of Free and Open Library Software you know?

ITEMS	Tick your choice
Access to the Source Code	
Free redistribution	
Creation of derived works	
Non exclusion and Indiscrimination against Persons, Groups and every field of endeavor.	
License Must Not Restrict Other Software	
License Must Be Technology-Neutral	
Distribution of License Right	
Others (Specify)	

Question (3): Which Types of Free and Open Library Software you are familiar with?

TEMS	Tick your choice
Koha	
Reference Portal	
Evergreen	
VuFind	
LibKi	
NewGenLib	
PMB	
Calibre	

Greenstone Digital Library Software	
DSpace	
EPrints	
Fedora	
Web Publishing	
Greenstone Digital Library Software	
DSpace	
EPrints	
Fedora	
Web Publishing	
Greenstone Digital Library Software	
DSpace	
Word press	
Drupal	
Library Find	
Firefox	
Open Office	
PDF Creator	
Thunderbird	
GIMPshop	
NVU	
Ubuntu	
Others (Specify)	

Question (4): What are the benefits of free and open source library software in the operations of library?

TEMS	Tick your choice
Lower Costs Software	
Simplified License Management	
Lower Hardware Costs	
Scaling/Consolidation Potential	
Support	
Avoid Lock-In	
Unified Management	
Security and Reliability	
Quality Software	

Question (5): What are the challenges associated to Free and Open Library Software in Higher Academic Institutions of Learning in Nigeria?

TEMS	Tick your choice
Poor Infrastructure	
Intellectual Property Right	
Low Internet Bandwidth	
Privacy, Security and Income	
Lack Awareness of Open Source Library	

Software among Librarians	
Insufficient manpower	
Lack of supervision	
Inadequate managerial support	
Inadequate power supply	
Cost of Procurement of the hardware/software	
Maintenance Cost	
Vendor's insincerity	
Lack of Consortium	
Apathy on the part of Library Staff	
Inadequate Funding	
Lack of training and re-training of staff	
Compatibility with hardware devices	
Piracy	
Proximity to Virus	
Crashing Problem	
Lack of technical knowledge from the Staff	
Others(Please specify)	

INTERVIEW QUESTIONS

What is the type of your library?

- a. School
- b. Academic
- c. Public
- d. Special library

Briefly describe the size of your library

- a. Number of employees
- b. Number of people served
- c. Total number of reading materials

Where do you get information when selecting an open-source ILS?

- a. Vendor/ILS pages
- b. Friends' referrals
- c. Business contacts

What problems/challenges you faced during installation of ILS

Does the organisation offer any kind of specialized training on open-source ILS? Explain

Appendix III. Map of Nigeria Showing North East

