

UNIVERSITY OF GHANA

COLLEGE OF EDUCATION

SCHOOL OF INFORMATION AND COMMUNICATION STUDIES

DEPARTMENT OF INFORMATION STUDIES

**USE OF OPEN SOURCE SOFTWARE IN ACADEMIC LIBRARIES IN GHANA: A
CASE STUDY OF SAM JONAH LIBRARY, UNIVERSITY OF CAPE COAST.**

BY

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**THIS DISSERTATION IS SUBMITTED TO THE DEPARTMENT OF INFORMATION
STUDIES, UNIVERSITY OF GHANA, LEGON, IN PARTIAL FULFILMENT OF THE
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INFORMATION STUDIES.**

JULY, 2019

DECLARATION

I hereby declare that, except for references and quotations from the works of other researchers which have been dully acknowledged, this study is the result of my own work and that it has not been submitted elsewhere either in part or whole in any institution for any award.

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DATE

DEDICATION

This research work is dedicated to my Father, Coach, Confidant and Best friend, Mr. Ebenezer Dzabaku Akplehe, who painstakingly taught me two values on this journey; integrity and life-long learning.

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Glory and Honour be unto the Most High God, Whose I am and from Whom I draw inspiration. While I thank the many Authors and Editors whose intellectual outputs played a significant role in the successful completion of this dissertation. I also seize this opportunity to sincerely express my heartfelt appreciation to persons who assisted me in the writing of this dissertation.

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Abstract

The advent of Open Source Software has provided low cost opportunities for libraries to transit from traditional to technology-based library services, which also gives room for more efficient service provision. This study investigated the use of Open Source Software in the Sam Jonah library, University of Cape Coast. The study adopted the Unified Theory of Acceptance and Use of Technology (UTAUT). The study was based on survey research methodology and questionnaire was used to gather data from 113 respondents.

The study revealed that the use of Koha and Dspace, as adopted by the library were considered advantageous due to their flexibility, ease of modification, ease of accessibility and reliability. The study also discovered that the library staff do not really utilize the adopted open software as envisioned by the library management, as staff possessed only average computer literacy skills and knowledge in the use of open source software.

Again, the library's main source of funding for use of the OSS was Digital Humanities Start-Up Grants. On the flipside, the study found out that some limitations, such as inadequate training, lack of expertise to train for and manage the software, breakdowns which require special expertise, vulnerability to malicious users, and inadequate user-friendliness of the software as compared to proprietary software. Therefore, the management of the library should put measures and policies in place to address the challenges being faced in the use of the Open Source Software, such as constant orientation and training of staff, provision of infrastructural support, provision of technical support and installation of robust antivirus software.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The library is a growing organism, has over the years proved to be accurate (Barner, 2011). According to Barner (2011), Ranganathan sees the library as an institution that is active in a constantly changing environment, and accordingly, the institution should transform and adapt itself with the spirit of time so it can serve best those who need it. Consequently, libraries have moved from traditional circulation services to present information services. As such, the introduction of Information and Communication Technology (ICT) into library services has transformed to a great extent, the nature of library operations in the 21st century. Today, information services are strengthened due to advancement in internet, e-resources and computer software (Agrawal, 2015). Hence, almost all library functions, i.e., acquisition, processing, maintenance, and dissemination have been affected by these technological changes. This has placed a growing demand on academic libraries in particular to adapt to change, so as to effectively and efficiently serve the information needs of the scholarly community.

The invention of paper in 105 AD in China by Cai Lun, and printing machine in the 15th Century in Europe, were the initial factors that changed the status and fate of libraries worldwide (Nakakoji, 2002). It has been observed that, since then, libraries have witnessed technology growth in all aspects, i.e., collection, process, and services. Agrawal (2015) suggests that collection-wise, it has grown over time from clay tablets to papyrus rolls, to paper, and now to electronic documents. Even the process of preparation of library records has changed from handwritten records using an ink pen to typewriters and now to computers. Additionally, services of librarians have changed from guardians of documents to circulators of documents, to information providers and now he or

she is regarded as knowledge manager (Agrawal, 2015). The technological changes have been affecting almost every type of library including public, academic and special libraries.

Gbaje (2007) in his contribution to library software stated that, the use of library application software in university libraries has evolved from managing internal library operations to providing access to information and information resources in various formats and in many locations through a combination of Information and Communication Technologies (ICT's). Following this development, there is a paradigm shift from local collections to global information access, thus, making it possible for the removal of geographical constraints to the access of library services.

Libraries as organizations are involved in information creation, processing, organizing, storage, disseminating and utilization. It has therefore become necessary for libraries to produce tools and systematic procedures for all activities so as to provide effective information management. The idea of computerization of libraries gave birth to the development of library application software packages (Ayodele, 2016). Though the open source library management systems (OSLMS) have come to the limelight at the beginning of the 21st century, and library professionals are well aware of their advanced features, they are still in their infancy stage in many parts of the world, particularly, Africa. The Open Source Software has an edge over Commercial Software (CO) as they have got continuous development and regularly updated because of community involvement. Although some external agencies are extending technical support for OSS, Commercial Software still holds in the market (Gangadhar, Nagaraja & Vasanthakumar, 2017).

This study adopted the Unified Theory of Acceptance and Use of Technology (UTAUT) propounded by Venkatesh et. al., (2003). One key feature of the above theory that supports this study is Social Influence. Social influence can be referred to as the change in behavior that one person causes in another, deliberately or undeliberately, as a result of the way the changed person

perceives themselves in relationship to the influencer, other people and society in general. In doing so, one complies and accepts the introduction of a new system. Compliance refers to the state where a person does something that he or she is asked to do by another, with the aim of improving an existing situation. Such a person may choose to comply or not to comply, although the thoughts of social reward and punishment may compel them to comply, when in actual fact they really do not want to. Similarly, in accepting a new technology like Open-Source Software in most cases, academic library staff are likely to find themselves in instances where they have no choice but to comply with instructions about the introduction and/or use of new technology that a superior may instruct them to use.

According to Reddy and Kumar (2013), Open-Source Software is a computer software whose source code is available under a license for users to look at and modify freely, and permits users study, change, and improve the software, and to redistribute it in modified or unmodified form. Many developers around the world are involved in the development and modifications of these programs with licenses that conform to the Open Source Definition (OSD). From the last one decade, the OSS has been spread rapidly in the whole software world (Gangadhar, Nagaraja & Vasanthakumar, 2017).

Open source emerged as an alternative model of software development. It has transformed the development of software and offers a number of attractions for libraries, especially for developing countries. Open source software (OSS) is computer software whose source code is available under a license that permits users to use, change, and improve the software, and to redistribute it in a modified or unmodified form (Singh, 2012). Thus, it presents an existing opportunity for libraries and a major shift in software design. Open Source permits a library to participate directly in the development of its systems and services in a manner consistent with the value of librarianship.

Today, there is great demand as well as challenges, and opportunities for librarians to develop a library database for worldwide access not only bibliographic but also full text.

Open Source Software enables academic libraries to automate their services. The International Encyclopedia of Information Technology and Library Science defines automation as "the technology concerned with the design and development of process and system that minimize the necessity of human intervention in their operation". The fundamental unit of the requirement for automation is the technological infrastructure. The infrastructure mainly consists of 'Computers'. The computers are the essential components for the automation. It is that super product of electronics that is capable of performing the functions as desired by the user with maximum accuracy and quickness. (Sonker, 2000).

Due to the vast explosion of information, librarians are facing difficulties to meet the user demand and are forced to take up the task of systematic organization of the recorded knowledge. On the other hand, computer programmes are being very much advanced day by day in each and every activity. Librarians are also moving with this fast development of computers using various kinds of databases, software and library automation software packages and automating their diverse activities in the libraries, as a solution for this matter (Wright, 1996 as cited in Sonker, 2000).

Today, Open Source Software is being widely used in the library domain. Technology has advanced, and the library faces many challenges of integrating traditional and emerging formats (Sonker, 2000). The rapid growth of the Open Source Software and explosion of web technology has provided huge opportunities for library professionals at the same time. Open Source Software is now easily available for download with their source code free of cost which provides an opportunity to save money as well as removing the dependency on proprietary software. In this setting, it is necessary to study the major types of Open Source Software used in academic libraries

in Ghana, along with a discussion on their advantages and limitations Ray and Ramesh (2017) postulates that the value of any Open Source Software is measured in terms of its simplicity and connectivity. Some examples of Open Source Software include Kalamazoo Optimist Hockey Association (Koha) Greenstone Digital Library (GSDL), Open Journal System (OJS) and DuraSpace (Dspace). There is, therefore, the need to conduct a study into the use of Open Source Software in academic libraries, explore the advantages and limitations of OSS within the library domain and the types of OSS used and other constructs that deem importance for further research. This study explores the use of open source software at the Sam Jonah library, University of Cape Coast which happens to be an academic library that has adopted Open source software for the management of its library resources and services.

1.2 Statement of the Problem

A study conducted by Seneadza (2014) revealed that inadequate funding, low IT knowledge of library staff and erratic power supply contributed to the under usage of library software at the Kwame Nkrumah University of Science and Technology (KNUST), Kumasi. In effect, it rendered the Software being underutilized.

Bruggink (2003) as cited in Sonker (2000) suggests that Open Source Software is not widely used in many academic institutions in Africa and this includes those in Ghana. One can suggest that institutions budgetary constraints due to the lack of funds and economic hardships being experienced in developing countries.

From to the researcher's own observation, it was found that, despite the phenomenal advantages of adopting open source software in the management of the academic library, the extent of its use

is considerably low. Also, it was observed that a sizeable number of staff at the Sam Jonah Library were not using open source software for the management of their library activities.

Numerous studies have been done on the adoption of other software for academic libraries; however, very few studies have been undertaken on the use of Open Source Software in academic libraries in Ghana. It is against this background that the researcher found it imperative to conduct this study and order to fill this knowledge gap.

1.3 Purpose of the Study

The purpose of this study is to examine the use of Open Source Software at the Sam Jonah Library, University of Cape Coast and to make suggestions based on the findings of the study.

1.4 Objectives of the Study

The objectives of this study are as follows:

1. To find out the advantages of Open Source Software at the Sam Jonah Library.
2. To determine the extent of use of Open Source Services provided at the Sam Jonah Library.
3. To evaluate the level of IT skills of library staff in the use of Open Source Software at the Sam Jonah Library.
4. To explore the sources of funding towards the deployment and maintenance of Open Source Software at the Sam Jonah Library.
5. To find out the limitations of Open Source Software at the Sam Jonah Library.
6. To make recommendations based on the findings of the study.

1.5 Scope of the Study

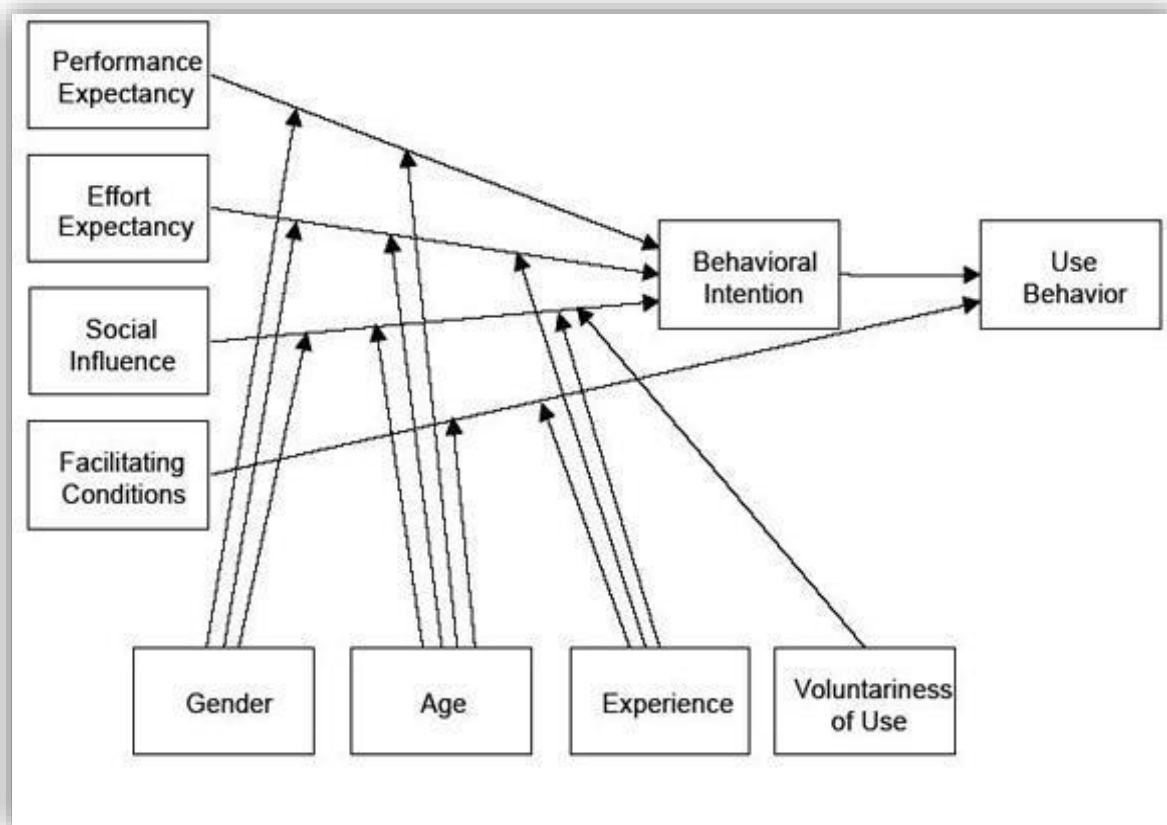
The study was conducted in an academic library setting. It evaluated the use of Open-Source Software at the Sam Jonah Library of the University of Cape Coast. The study focused on the staff of the Sam Jonah Library

1.6 Theoretical Framework

A theory according to Akintoye (2017) is “a set of interrelated constructs, definitions, and propositions that present a systematic view of phenomena by specifying relations among variables with the purpose of explaining and predicting phenomena”. According to Kerlinger (1986), theory can be used to successfully make predictions and this predictive power of the theory can help guide researchers to ask appropriate research questions.

Although a number of theories exist in the field of IT, that seeks to explain IT infrastructure uses and user behaviour, the unified Theory of Acceptance and Use of Technology (UTAUT) as propounded by Venkatesh et. al., (2003) best suits this study, hence, UTAUT was adopted in an attempt to achieve the objectives of this study. The reason being that UTAUT aims to explain users intentions to use an information system and subsequent behavior of the same. According to this theory, there are four key paradigms that affect the acceptance and use of any technology. These paradigms are; performance expectancy, effort expectancy, social influence and facilitating conditions.

Figure 3.1: Unified Theory of Acceptance and Use of Technology (UTAUT)



Source: Venkatesh et al. (2003)

According to Venkatesh et al., (2003) Performance Expectancy (PE) is the degree to which an individual believes that using a particular system or technology will improve work performance. PE is defined as the degree to which an individual believes the system or new technology would be beneficial to his/her job performance. Hence, being a new technology, Open Source Software is expected by the user to offer superior performance. However, there is no such guarantee after all. As it may be, it is worth stating here that, ‘Performance Expectancy’ is similar to other acceptance models such as Perceived Usefulness in Technology Acceptance Model (TAM).

Effort Expectancy is the degree of ease (Easiness) of using a particular system or a technology, and it is similar to Perceived Ease of Use in the TAM model. This construct for behavioral intention is strongly influenced by moderating factors such as 'Age', 'Gender, and 'Experience', a plausible reason is that younger women, for instance, are more concerned with the usage of newer technologies.

Furthermore, Social Influence can be defined as the degree to which an individual perceives that important others believe she or he should use the new system. Social influence is equivalent to Subjective Norm in the Theory of Reasoned Action (TRA) and Theory of Planned Behaviour (TPB) model.

Lastly, Facilitating Conditions are defined as the degree to which an individual perceives that technical infrastructures can support the user to use the technology or a system. This construct is similar to perceived behavioral control in the Theory of Planned Behavioural (TBP).

From the above, it is very clear that the Unified Theory of Acceptance and Use of Technology (UTAUT), in spite of its complexities, remains highly relevant today, especially in the assessment of the acceptance and use of any technology. It is for this reason that, the study adopted the Unified Theory of Acceptance and Use of Technology (UTAUT) as its grounded theory. It is recognized that the Unified Theory of Acceptance and Use of Technology (UTAUT) plays a pivotal role in many organizations today regarding the use of new technologies like Open-Source Software. Technology acceptance theories or models like Unified Theory of Acceptance and Use of Technology (UTAUT) aims to convey the concept of how users may understand and accept new technology and how they may use it. Meanwhile, it is critical to put the role of the entire organization in facilitating technology acceptance and use by the employee into perspective.

In relating the above theory to this study, it is worth mentioning that, the use of Open-Source Software in academic libraries has to do with the holistic use of such software. That is to say that, the study seeks to examine user responsiveness and reaction in the use of the technology. Therefore, the choice of UTAUT as the grounded theory for this study is appropriate, as it also aims at studying holistically, human behavior in the use of technology.

1.7 Research Environment

1.7.1 Sam Jonah Library, University of Cape Coast

The University of Cape Coast was established in October 1962 as a University College to train graduate teachers for first and second cycle institutions. Initially, it was affiliated to the University of Ghana, Legon. On October 1, 1971, the College attained the status of a full and independent university. <http://www.ucc.edu.gh>

The University of Cape Coast library began in 1962 with a collection of about 650 books mainly on English Literature, Economics, History, and Geography. Since its inception, the library's growth has been at a slow pace with a projected average of between 4000 and 5000 volumes. The total numbers of books including the bound volumes of periodicals stand at 249,564 as at 25th March 2015.

The Mission of the Library is to add value to the University's teaching, learning, research, publication, and dissemination activities by providing excellent information service which makes available and accessible information materials both in print and electronic formats to clients (University of Cape Coast Library Strategic Plan 2013-2017).

1.8 Ethical consideration

According to Fraenkel and Wallen (2003), ethical issues in research are defined as behavior that conforms to standards of conducting research. They further stress that research should protect the subjects of the research study from any risk, be it emotional, psychological or physical. With this principle in mind, an introductory letter was obtained from the Head of Department and sent to the Librarians of the respective institutions to formally introduce the researcher. The researcher endeavors to make it clear that the intention of the study will be used for academic purposes and under no circumstance would the information given be used otherwise. All participants were assured of their safety and confidentiality. Apart from that, the researcher did seek their consent and made them aware that no participant was made to provide information under duress. The researcher also conducted the research in line with the Code of Conduct of the institutions involved. In addition, all sources used or referred to in the course of the study were duly cited and acknowledged.

Ethical consideration in research is critical. Ethics are the norms or standards for conduct that distinguish between right and wrong. They help to determine the difference between acceptable and unacceptable behaviors. In respect of ethical consideration, the researcher intends to do the following;

- ensure the quality and integrity of the study
- seek the informed consent of participants, if need be
- respect the confidentiality and anonymity of research respondents
- ensure that all participants participate in the study voluntarily
- avoid harm to any participant and show that this study is impartial

1.9 Organization of the Study

Primarily, this study was grouped into five (5) main chapters. They are;

Chapter One. This comprises, the background of the study, statement of the problem, the purpose of the study, objectives of the study, scope of the study, theoretical framework, significance of the study, organization of the study.

Chapter Two. Literature Review. This chapter reviewed the existing literature relevant to the study. The topics were discussed from a world point of view, African and Ghanaian point of view under the subheading: The advantages of Open Source Software in Sam Jonah Library, the of Open Source Software in Sam Jonah Library, the sources of funding towards the deployment and maintenance of Open Source Software in Sam Jonah Library, the level of IT skills of library staff in the use of Open Source Software in Sam Jonah Library and extent of use of Open Source Services provided in Sam Jonah Library.

Chapter Three elucidates the methodology that was followed for the study which includes: Research design, the population of the study, sample size, data collection instrument, data collection procedure, analysis and presentation of data.

Chapter Four deals with the presentation of data and discussion of the findings of the study.

Chapter Five provides a summary of the findings, conclusion, and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The literature review offers a researcher the opportunity to explore the results of other studies that are largely related to the study being undertaken. According to Creswell (2012), the literature relates a current study to the larger ongoing dialogue in the literature about a topic, filling in gaps and extending prior studies.

According to Neuman (2006) “a literature review is based on the assumption that knowledge accumulates and that people learn from and build on what others have done. A literature review can, therefore, be defined as a description of the literature relevant to a particular field or topic”.

Greene, et al., (1989 as cited in Acheampong, 2016) states that “the literature in a research study accomplishes several purposes” (p. 255). These purposes include:

1. It shares with the reader the results of other studies that are closely related to the study being reported.
2. It relates a study to the larger ongoing dialogue in the literature about a topic filling in gaps and extending prior studies.
3. It provides a framework for establishing the importance of the study as well as a benchmark for comparing the results of a study with other findings

Research is supposed to add to existing knowledge. It would, therefore, be difficult, if not impossible to do research without reference to other scholars. The literature on the world, African,

and Ghanaian views of the Use of Open-Source Software in Academic Libraries was reviewed.

The literature was reviewed along with the following subheadings:

- i. Concept of Open-Source Software
- ii. Advantages of open source software in academic libraries
- iii. The extent of the use of open source software in academic libraries
- iv. ICT skills and competencies of library staff
- v. Sources of funding for open-source software in academic libraries
- vi. Limitations of Open Source Software for library work

2.2 Concept of Open-Source Software (OSS)

The proliferation of the internet has vastly changed the way of service delivery and it is greatly evidenced in the area of the library. This has led to the provision of digital libraries where users, patrons or clientele can get access to library resources irrespective of the geographical location or period of time. Over “the last few decades, libraries have evolved from traditional, paper-based institutions primarily serving needs of “digital fugitive” patrons into a web-accessible, multiformat repositories that hold a wide variety of physical (books, periodicals, magazines) and virtual/digital collections” (e-books, audio, videos, music) catering to the needs of their growing “digital immigrant” and “digital native” customers.” (Upasani, 2016).

According to Omeluzor et al., (2012) Koha is the first open-source integrated library software (ILS) in use worldwide by public, schools and special libraries which its development was steered by a growing community of libraries and users collaborating to achieve their technological goal. The developers of KOHA and other Open Source software released their source codes so they

could become publicly owned and thus stimulate innovation and capacity development. (Breeding, 2008).

2.3 Open Source Software Concept and Technologies

Open source software is a software that users have the ability to run, copy, distribute, study, change, share and improve for any purpose. Open source library software's does not need the initial cost of commercial software and enables libraries to have greater control over their working environment

Open source software is a software that users have the ability to run, copy, distribute, study, change, share and improve for any purpose. Open source library software's does not need the initial cost of commercial software and enables libraries to have greater control over their working environment (Randhawa, 2018).

According to Randhawa (2017), Open source software is computer software whose source code is available under a license (or arrangement such as the public domain) that permits users to study, change, and improve the software, and to redistribute it in the modified or unmodified form. It is often developed in a public, collaborative manner. It is the most prominent example of open source development and often compared to user-generated content.

Open source library software's does not need the initial cost of commercial software and enables libraries to have greater control over their working environment. Lochhaas (2017) explained that "Open source software is software that provides access to the source code, meaning that users are free to see how the product is made. Additionally, users have the right to modify the product (change the code) to their liking, experiment with different versions, and give away or resell the

new product with the guarantee that they must also provide their source code, and so on. Modifying the product and redistribution are the two main components of open source software.”

Open Source Initiative (OSI)

The Open Source Initiative (OSI) is a non-profit corporation formed to educate about open source and advocate for the benefits of open source and to build bridges among different constituencies in the open-source community

Open Source Licenses

Open source license doesn't just mean access to the source code - it has to meet other criteria as well. The important issue is that the source code should be available; there should be permitted to modify the source code and further distribute it

Types of Open Source Licenses

GNU GPL (General Public License)

GNU Lesser GPL

BSD License

Mozilla Public License

IU Open Source License and

Categories of Open Source Software

- Operating Systems: Fedora Linux, Free/OpenBSD, OpenSolaris
- Programming Languages: Perl, PHP, Python

- Applications; Apache, Tomcat, emacs' EreP
- MySQL' send email' ssh (Satheesh, 2012)

Categories of Open Source Library Software (General)

- Library-Oriented search engine: Cheshire, Pears, dbwiz
- Z39.50 toolkits: Zetaperl (Perl), JAFER (Java), YAZ (C/C++)
- MARC parsers: MARC.pm (Perl), MARC (Java)
- MarcEdit
- Image processing: Image magick, tiffinfo/tiffdump (Satheesh, 2012).

2.4 Application of Open Source Software in contemporary libraries

Open Source Software used in libraries are as follows: Integrated Library Management Systems, Content Management System, Digital Library, Learning Management System, E-publishing and so on in the Libraries.

1. Application of Open Source Integrated Library Software in Libraries.

Shrinking budget is a great crisis in the Library to fulfill the need the Open source software came into existence. Library Automation and Management is indeed for the library to maintain the records, Commercial automation software is too expensive and not bearable within the budget. Koha is the first open source integrated library system in the world.

2. Application of Open source Content Management Software in libraries:

The library is one of the main center points to develop a content management system to do it in a perfect manner OSS are very helpful such as DRUPAL and JOOMLA. Joomla is an award-

winning content management system which enables the library to build their own website with a powerful online application.

3. Application of Open source Digital Library Software:

Implementation of Digital library Software helps the user mainly in the retrieval of needed information such as faculty publication, Question papers, Newspaper clippings, Video Lecture and so on, this all together called an Institutional Repository (Satheesh, 2012)

Open Source Software for Libraries

NewGenLib

NewGenLib (New Generation Library) is an Integrated Library Automation and Networking Solution Developed by Verus Solutions Pvt Ltd and The Kesavan Institute of Information and Knowledge Management, India. In March 2005, NewGenLib version 1.0 was released and versions 2.0 and 2.1 have come up later. On 9th January 2008, NewGenLib has been declared Open Source Software under GNU GPL Licence by the Verus Solutions Pvt Ltd, Hyderabad, India

Evergreen

Evergreen ILS is another option when researching open source ILS options. Developed by Equinox Software, Evergreen is a robust, enterprise-level ILS solution developed to be capable of support in the workload of large libraries in a fault-tolerant system. It too is standards compliant and uses the OPAC interface, and offers many features including flexible administration, workflow customization, adaptable

programming interfaces, and because its open source, cannot be locked away and can benefit from any community contributions (Satheesh, 2012)

Greenstone Digital Library Software

The Greenstone digital library software is an open-source system for the construction and presentation of information collections. It builds collections with effective full-text searching and metadata-based browsing facilities that are attractive and easy to use. Moreover, they are easily maintained and can be augmented and rebuilt entirely automatically. The system is extensible: software “plugins” accommodate different document and metadata types. The aim of the Greenstone software is to empower users, particularly in universities, libraries, and other public service institutions, to build their own digital libraries (Satheesh, 2012)

DSpace

DuraSpace (DSpace) is a groundbreaking digital institutional repository software package that captures, stores, indexes, preserves, and redistributes the intellectual output of a university’s research faculty in digital formats. It manages and distributes digital items, made up of digital files and allows for the creation, indexing, and searching of associated metadata to locate and retrieve the items. DSpace design and developed by Massachusetts Institute of Technology (MIT) Libraries and Hewlett-Packard (HP). DSpace was designed as an open source application that institutions and organizations could run with relatively few resources. It is to support the long-term preservation of the digital material stored in the repository. It is also designed to make submission easy. DSpace supports submission, management, and access to digital content (Satheesh, 2012)

Koha

Koha is the world's first free and open source Integrated Library System (ILS). It has features suitable for the library management system of various types and sizes. Koha is a browser-based using an Online public access catalog interface. There is no cost for the license, and users have the freedom to modify the product to adapt it to your library needs. Development is sponsored by libraries of varying types and sizes, volunteers, and support companies from around the world. The strength of Koha lies with its strong community of users, libraries, and businesses that contribute to its development. Koha runs on Linux, Web, and Server (Njoku, 2017).

Fedora

Fedora open source software gives organizations a flexible service-oriented architecture for managing and delivering their digital content. At its core is a powerful digital object model that supports multiple views of each digital object and the relationships among digital objects. Digital objects can encapsulate locally managed content or make reference to remote content. Dynamic views are possible by associating web services with objects. Digital objects exist within a repository architecture that supports a variety of management functions. All functions of Fedora, both at the object and repository level, are exposed as web services. These functions can be protected with fine-grained access control policies. This unique combination of features makes Fedora an attractive solution in a variety of domains. Some examples of applications that are built upon Fedora include library collections management, multimedia authoring systems, archival repositories, institutional repositories, and digital libraries for education (Randhawa, 2018)

EPrints

Eprints is an open source software package for building open access repositories that are compliant with the Open Archives Initiative Protocol for Metadata Harvesting. It shares many of the features commonly seen in Document Management systems but is primarily used for institutional repositories and scientific journals. EPrints has been developed at the University of Southampton School of Electronics and Computer Science and released under a GPL license (Randhawa, 2018)

Wordpress

Wordpress started out as a quick, free, open-source solution blogging solution just a few years ago; today it is a perfect alternative to building a web site from scratch. In addition to being free to use (and easy to install), the Wordpress community has exploded, with thousands of users and programmers creating custom themes and plug-ins to completely change the way the software looks and operates. The most important aspect of the software is its easy-to-use interface and content management system. With its visual rich editor, anyone can publish text and photos to the web site. Other options include multiple authors (with separate log-ins), built in RSS (Real Simple Syndication) technology to keep subscribers updated, and a comment system that allows readers to interact with the content of the site. A fantastic way to communicate with patrons, staff, etc. (Randhawa, 2018)

Drupal

Drupal is another open source web publishing option that allows an individual or a community of users to easily publish, manage and organize a wide variety of content on a website. Tens of thousands of people and organizations have used Drupal to power scores of different web sites,

including Community web portals, Discussion sites, Corporate web sites, Intranet applications, Personal web sites or blogs, E-commerce applications, Resource directories, Social Networking sites (Njoku, 2017).

Others are

- **EPrints**
- **Drupal etc.**

2.5 The use and advantages of Open Source Software in Academic Libraries.

The “cooperative community environment allows the users to use, change, improve, and redistribute the modified or unmodified form of software to the wider community. In many open source projects, copyright is retained by the original author(s). In the initial stages, the product may be free or discounted, but over a period of time, may end up being a costly affair entailing overhead expenses, resources, or expertise for customization and add-ons to incorporate the new programming. This section captures the use and advantage of open source software in academic libraries.

2.5.1 The use of Open Source Software in Academic Libraries.

Open source software such as Koha is a promising full-featured open source ILS (integrated library system) currently being used by libraries all over the world. For those of you out there unfamiliar of what an ILS is, well, it is a system of keeping track of the operations of a library - payroll, expenses, purchases, and most importantly, keeping track of the various media being checked out by the librarians' patrons. Many smaller libraries cannot afford to purchase, install, and maintain an ILS, and Koha is a perfect alternative. Koha is built using library ILS standards

and uses the OPAC (open public access catalog) interface. In addition, Koha has no vendor-lock in, so libraries can receive tech support from any party they choose (Randhawa, 2018).

RajKumar & Krishnan (2011) explored the effectiveness of open source software in which flexibility and freedom were emphasized as a critical advantage of the open source software for libraries: This software is flexible as it gives users opportunity to be able to choose solutions suitable for their needs. Open Source software offers its users greater freedom to purchase other products, avoiding lock-in to particular manufacturers. Freedom from a single vendor and the freedom to modify your software. These findings support the works of (Morgan, 2015, Upasani, 2016). Quality software as an advantage was revealed in the study of Randhawa (2007). Evidence and research indicate that open source software is good stuff. The peer review process and community standards, plus the fact that source code is out there for the world to see, tend to drive excellence in design and efficiency in coding.

Also, in the work of Randhawa (2018) who investigated the open source software and libraries, the study found that the integrated sources such as Koha can handle almost every function of the library and no wonder majority of libraries have adopted it.

2.5.2 Advantages of Open Source Software

Hanumappa et al., (2014) explore the OSS that used in the libraries of India and review the existing library automation i.e. Integrated Library Management System (ILMS) and Digital Library (DL) software. The authors brought to bear that, the use of open source software is coupled with several advantages and one of the topmost is the ease of availability and access. The OSS system can be installed in libraries as live media without extensive installation barriers. It democratizes the use of software applications irrespective of the type, size, or area of the library.

The OSS LMS is ubiquitously available and can be implemented irrespective of type or size of the library, with complete open documentation and source code. Similar findings were found in the works Oyelude et. al., (2016). In the same vein, Ray (2017) postulated that the implementation of OSS provides many advantages and opportunities to all sectors including libraries. OSS can be the right solution for long term use with several significant benefits but still, there are some possible limitations. Researchers and software experts have identified several advantages and disadvantages of OSS. Cost effective: The base product on which OSS LMS is developed is free or without major.

Randhawa (2017) also brought to bear that, simplified license management is one of the cardinal advantages of the use of open source software for libraries management. The Author added to obtain the software once and install it as many times and in as many locations as you need. There's no need to count, track, or monitor for license compliance.

Also, Upasani (2016) investigated the advantages and Limitations of Open Source Software for Library Management System Functions of Libraries in India and revealed the use of open source software is cost effective. The author further added that the base product on which OSS LMS is developed is free or without major licensing costs. However, the enhancements and customizations of the OSS system are reflected in the consulting cost of tailoring the product to the library's need. Similar findings were found in the works of Hanumappa et al., (2014) and Ray (2017) was cost-effective emerged as the most advantage of the open source software and Satheesh (2012) who investigated Open Source Software in Libraries in Hindustan University. In confirmation to the above findings, Randhawa (2017) explore Open Source Software and Libraries and discovered that there are lower software costs: Open source solutions generally require no licensing fees. The logical extension is no maintenance fees. The only expenditures are for media, documentation, and

support if required. Randhawa (2018) investigated open source software and libraries and revealed that one of the critical advantages of open software is there is an escape of vendor lock-in: Frustration with vendor lock-in is a reality for all IT managers. In addition to ongoing license fees, there is a lack of portability and the inability to customize the software to meet specific needs. Open source exists as a declaration of freedom of choice. Further, Reddy and Kumar (2013) undertook a study on the open source software's and their impact on library and information center. It was found that two cardinal benefits of open source software it is easy to maintain. The author elucidated that the OSS LMS are often web-based software with free desktop clients or thin client access, thus freeing up the libraries from server maintenance requirements. Outside vendors or information technology (IT) experts can manage all the upgrades, backups, and general system maintenance while local library IT staff focus on other projects in the library.

In the same study, it was revealed that the open source software is characterized as “ease of operations for both staff and users”. It was further explained that the community of support in the form of wikis, forums, and listservs helps address user issues more economically. OSS development is based on open standards around communication and therefore is more adaptive and interoperable. This provides for ease in operations and management, intuitive navigation, and extensive permissions for both users and staff accounts. Similar findings were evidenced in the works of Morgan (2015; Asay, 2007).

Addition, Morgan (2015) explored the Open Source Software in Libraries, and it was found that the use of open source software leads to give and take. Libraries with an OSS system can develop an effective set of interacting applications and share their enhancements with the open source community. Libraries are able to collaborate and share code for the functionality and fixes they commonly require. In sharing, both parties' benefit. These solutions can be available free of cost

or with marginal cost compared to proprietary systems. The analogous study was found in the study of (Upasani, 2016).

Raj and Sangeeta (2012) also found networking and internet support as one of the advantages of open sources software for libraries. Libraries in consortia or libraries with sister concerns sharing the same network can benefit by sharing library materials and services as well as systems. This not only benefits the library but also the patrons who now have access to a wider variety of resources.

Satheesh (20012) investigated the Open Source Software in Libraries focusing on its pro and cons. The author revealed the following advantages; Easy Evaluation, thusly, it is easier to evaluate open source software than proprietary software. Since open source software is typically freely available to download, Libraries and systems Administrator can install complete production-ready versions of software and can evaluate the competing packages. Also, the Platform Independent, thusly, Open source software usually has its versions for all popular operating systems - Linux, Windows or Mac. Again, it ensures Flexibility in Choosing Support. Open Source Software is backed by online forums and support groups. Established open source software is even backed by paid support services and training programs. Similar findings were found in the works of Ukachi, (2014) in which Library Automation and Use of Open Source Software to Maximize Library.

2.6 Extent of use of open source software in academic libraries.

Upasani (2016) states that modern libraries need to stay technologically active to provide different value-added services to their research community. Libraries need to hold library management systems and digital technologies as a smart tool for providing advanced services to their users. According to the author, libraries should collaborate with computer experts to become

technologically sounder in using OSS. Here the author also provides an overview of the benefits, limitations, and availability of different open source library management systems in the Indian context.

Vijayakumar et. al., (2016) state that now libraries are completely dependent on ICT (Information and Communications Technology) for providing various services to the users. The extent of the use of Open source software was encouraging due to its perceived benefits. In support of what Vijayakumar et. al., (2016) revealed, Baeza-Yates and Ribeiro (2011) mentioned that Asian governments are considered “open source as a boost for their economies and a way to increase technological innovation in the region. The findings brought to bear that; majority of the library staff were found using the open source software.

However, Amekuedee (2005) sought to find out which library processes have been automated in Ghana's three older public university libraries namely; the Balme Library, University of Ghana, Kwame Nkrumah University of Science and Technology Library and the Sam Jonah Library, University of Cape Coast. The author found that the extent of use of the open source software for library activities was below average.

2.7 ICT skills and competencies of library staff

Wijaya and Sunrendro (2017) described that the literacy comprises of two different terms i.e. ICT and literacy. ICT is considered as the fusion of computer technology and telecommunication technology, while literacy is considered an ability to learn and improve an individual's capability. In broad-spectrum ICT literacy is considered as the necessary skill are required to use the ICT to perform the day-to-day professional work. ICT literacy enables library professionals to use digital information resources effectively in their place of work. This includes the use of ICT to perform

routine professional tasks most efficiently and effectively including word processing, using spreadsheets, creating databases and presentations, manage networks, using the Internet, performing automated activities, providing ICT based services, managing social and ethical issues in the library (Abdullahi, 2011).

A comparative study of strategic management of IT applications in some selected university libraries of Ghana and United Kingdom found that the status of IT applications was very low in all the university libraries in Ghana with slightly varying degrees in individual institutions (Mirza, 2014). In the United Kingdom, a very significant level of IT applications was found in the university libraries (Badu, 2004).

In reflection to that Singh (2004) posited that acquisition, processing, organization, storage, preservation, and dissemination of information in the library will continue to revolve around ICT tools. This is because physical location and collection of a library are not as important as the accessibility of the information resources in the library's repository (Faboyinde, 2006; Devchoudhary, 2007; Ezeani, 2010; Adelokun, 2011). In congruence to that, Igun and Adogbeji (2007) rightly observed that librarian competency is very crucial to the successful implementation and application of ICT to library operations. Even where there is a fund for acquiring ICT tools for the library, library staff competency is still very important to the success of ICT incorporation for information handling and management. However, a significance ICT competency gap was identified among LIS professional in Nigeria as observed by Aschroft.

Csapo (2002) notes some basic IT competencies required for success in the workplace. These include using the computer and managing file, word processing, spreadsheet, databases, presentation, internet, and E-mail. The knowledge of them is described as computer competency

Salaam (2000) maintain that such knowledge is needed by librarians to enhance their performance in the variety of library functions such as, maintaining and providing access to catalogue of items in the collection; the acquisition of new items for collection; controlling of serial publication, retrieving of information from local files, searching external online information (database), sourcing literature and accessing full-text document for reference. Oni (2004) summarizes these competencies as house-keeping functions and advice that library staff should be competent in the use of basic computer tools for efficiency and relevance in the library profession.

Bansode and Viswe (2017) investigated ICT Literacy among Library Professionals Working in the University Libraries in Maharashtra, India. The study revealed that majority of library professionals have acquired the basic ICT literacy skills which are required to handle day to day library operations, but still few library professionals need to enhance their literacy level in the area of open source library automation software, digital library software and institutional repository software, etc.

Ekoja (2007) asserts that ICT competency library staff in Nigerian universities are still below average. According to him, many librarians and library staff working in the Nigerian university libraries are unable to use ICTs even when they are available. Only very few library staff who have made effort to acquire competencies in the use of ICTs have put them into practice. Library professionals work in the midst of knowledge repositories which give them abundant opportunities to learn and develop themselves.

On the contrary, Chisenga (1995 as cited in Ojiegbe, 2010) acknowledges that ICT applications improve service delivery in libraries and allied institutions responsible for information provision. Most library functions such as Acquisition, Cataloguing, and Classification, Reference services, previously handled manually are now performed electronically using ICTs. This has helped to

reduce the time spent on doing the jobs and with fewer mistakes. It was further elucidated that, their level of ICT competency was high.

2.8 Sources of funding for open-source software in academic libraries.

Reddy and Kumar (2013) postulates that Open source software products require technical expertise to operate and maintain open source costs more to support because the software is typically self-supporting. This is quite true in the sense that, for any upgrade /or change in the OSS, the library needs support. Again, in the case of OSS, there is nobody to solve such a problem, either one has to hire some expert to solve the problem or the library should make an arrangement with a company (Reddy, 2013).

Tracey (2014) indicated one of the main sources of funding for open source software for libraries is the state funds. State funding commonly addresses specific efforts such as long-range planning, resource sharing, and state-wide cooperative information systems. similarly, Twene (2008) investigated Sources of Funding for Higher Education in Ghana and brought to bear that the government is considered to play a central role in the funding for libraries to help maintain open source software which has been adopted. It is particularly useful when regional solutions are needed for multi-jurisdictional activities. Libraries may also qualify for state funds in support of other programs, such as those in the arts. Other sources of funding were Finding Community Support and Digital Humanities Start-Up Grants

Natarajan (2010) explained that one of the sources of funding for libraries can be obtained from the funding agencies across to augment in its activities. Also, other sources of funding were Fees for Services Corporate Sponsorships. Also indicated in the works of (Reddy, 2013).

Lifer (2000) mention another source of funding which is the “Technology funding”. The author further indicated that, although funding woes are not unique to demands for technology, libraries of all types share the need to finance the escalating costs of technology, particularly those associated with the Internet. These costs include access, hardware, upgrades/maintenance, staffing, software, and web design/management

2.9 Limitations of open source software for library work

Taking a comprehensive and critical view of open source should raise some questions as well, regarding drawbacks. There have been several criticisms of open source software.

Satheesh (20012) indicated three critical limitations of open source software and they are as follows. No or less personal support, thusly, less customer-friendly i.e. All the features expected by the user may not be available. Similar findings were found in the works of Maltikarjun (2011) who explored Open Source software. Also, lack of training, due to lack of training and expertise on Open Source software may lead to ineffective utilization of the software and Maintenance and troubleshooting of a particular OSS needs specialized skills and knowledge about that software. It supports the research by Aswath and (2015) in which it was indicated that adequate training is a prerequisite for the success of open source software movement among working professionals. It is also one of the risk factors that how to train the library staff on operational modules of open source software. It includes updating of new versions too. Continuous training support is required to cope-up with the new versions and technology. This finding was in congruence with the works of RajKumar and Krishnan (2011). Need for technological sophistication such as higher labor costs, Lack of scalability fewer advanced features, nobody is really responsible (by contract) also in agreement with RajKumar and Krishnan (2011).

Further, Anjaneya and Aswath (2014) researched on the Open Source Software in Libraries where Threats and Challenges were the focus. The study revealed insecure data security as a major limitation of the open source software for libraries. In further elucidation, the author postulated that, protecting data from unauthorized access or manipulation of data in the database. The open source software is available free to all those who want to use. It is highly difficult to have control over the data and unauthorized persons may hack the data easily in the open source software scenario. The code of open source software is created and uploaded on the internet by the program developers and chances are open to modify or corrupt the code by unauthorized persons. For instance, many libraries are using 'Koha', library automation software for its routine operations and the same is being hosted on cloud computing'. The cloud computing might have helped to take away the problem of setting up their own hardware and managing it, but it could also take away your data, with so many free online office suites and online storage service providers out on the cloud, it's very easy to take out data under the guise of accessing it from anywhere (RajKumar & Krishnan, 2011).

Muller (2011) investigated how to choose a free and open source integrated library system, it was found that lack of skills on the part of the user was indicated. Skilled persons are required to execute and implement open source software in a proper manner. Lack of software technology skills among library professionals is another major risk to implement open source software in the library environment. Dependence on IT experts or skilled persons enhances the library expenditure and defeats the purpose of OSS movements.

Anjaneya and Aswath (2014) also brought to bear some critical limitations to open source software such as Up-gradation issue. The author further explained that to upgrade to the new version with the existing source is quite difficult. The risk of data migration and compatibility are matter in this

level. Example; 'Koha' improved new versions are being released frequently and it is difficult to replace with the existing version provided librarian is proficient in it.

Asay (2007) explained that installation and customization is a big challenge to Library professionals who may not have IT skills sufficient for installation and customization of software which makes implementation more a complex process. The basic knowledge of IT may not help in customizing open source software and it requires programming and IT expert involvement in the process.

Satheesh (20012) indicated another major risk in open source software environment is, support from the developers or vendors for solving problems at the installation level, implementation level and thereafter. Some of the commercial developers and vendor are there to support but the charges are too high. For instance, commercial vendors the Nucsoft OSS labs, Bangalore, Informatics India Pvt. Ltd., Bangalore and DELNET, New Delhi, are providing support service across India for KOHA. For installation of KOHA and basic customization including hosting on the cloud by Informatics India Pvt. Ltd. Company charges rupees fifty thousand per year as a service charge. The cost for customization of the software will differ based on the client requirements. This finding is in support of the works of Ayres (2015) where it was revealed that the open source software does not come with extensive support.

Further, inadequate technological infrastructure to support the integration of ICTs in the curricula (Manda, 2006). This refers to issues as poor or lack of national ICT policy, low internet connectivity, inadequate supply of electricity, inadequate number of PCs, etc. The author posits that there is a need for policies that deregulate satellite communication and other telecommunication links, regulate ISPs, regulate government and cross-border data flow, etc. ICT policies can help address stringent tax regimes that still treat computers, communication

equipment, and other peripherals as luxury items, thus imposing heavy import duties on them and subsequently rendering these items very expensive. Internet access is now widely available, but the efficiency is poor as many LIS schools experience downtime, several times a week. The telecommunication services are the root cause of these downtimes in terms of either low bandwidth, technical faults or other network configuration problems. As Jensen (2005) puts it, there are also “many external system factors such as electricity, transport networks, import duties” etc, which impact on internet service delivery on the Indian sub-continent. In some institutions, access is limited, not only by the number of internet service point but also by the time that access is available or permitted, leave alone the difficulty of bandwidth. Yet for research purposes, access to the internet is no longer a luxury or privilege for only a few people because, in academic circles, access to the internet and hence to the world’s stores of knowledge is a necessity. LIS departments still need to lobby to gain greater access to internet resources for academic staff and/or research. Thus, there is an urgent need for improved ICT policies and infrastructure in institutions and countries. In the same vein, Kamila (2008) revealed that lack of infrastructure has been a big hindrance to use of open source software.

Further, Funding/sustainability of the technology is the major non-technical constraint in most libraries (Minishi-Majanja, 2004). Most universities libraries decry the issue of under-funding in most of its functions. Besides, the unprecedented, phenomenal and multifaceted growth and development of the ICTs themselves pose another challenge. This rapid pace and transient nature of technological development require sustained funding. While the centralization of ICT services, hence funding, has been found to be the most affordable system for institution-wide development and use of ICTs, it only works well where there exists a policy that has explicitly incorporated the goals and needs of all sectors. Similar findings were found in the works of (Kamila, 2008).

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The research methodology outlines the approach (techniques and the procedures) used to conduct the study. It is a set of tools, techniques, and procedures that are used to collect, analyze and present data (Acheampong, 2016).

Methodology according to Clough and Nutbrown (2012), details how research questions are articulated with questions asked in the field. It provides the rationale behind why a particular research ‘recipe’ is used. The methodology is based on values and assumptions that influence a study. The concept of methodology determines how a study should be conducted in an attempt to answer a set of research questions in a study, to prove or otherwise disprove a set of hypotheses. It actually contains a set of coherent plan and procedures to achieve the goal of a study.

3.2 Research Design

A research design provides comprehensive and complete guidance or guidelines for collecting data. It entails the general approach to the study, the sampling plan and the design of the questionnaire (Panneerselvam, 2011).

This study adopted the survey research methodology. Although there are other research designs employed by researchers such as; action research design, grounded theory, case study, ethnographic study, experiment, archival research and survey research (Cooper & Schindler, 2008). Surveys are the most widely used data-gathering techniques in the social sciences and in related applied fields according to Neuman (2006). A survey methodology is a procedure whereby information is gathered from the population that responds to questions. Bernacle (2001) states that

survey research involves a problem definition, data collection, careful analysis and reporting of findings. McMillan and Schumacher (2001) described a survey research method as a descriptive research methodology that interprets what exists, the conditions and relationships of that which exists. This implies that survey research concerns itself with present events but also considers past events and influences in relation to current conditions. The survey research method is mainly concerned with the discovery of the relative incidence distribution and interrelations of variables using either large and small population or items (Renkly, 2004). Tronchim (2002) opines that survey research is a research method in which a group of people or items are considered to be representative of the entire group.

Surveys elicit information from a defined population about their knowledge, feelings, opinions, attitudes and self-reported behavior. In the view of Creswell (2014) survey research provides a quantitative or numerical data of descriptions of trends, attitudes, opinions of a population by studying a sample of that population from which the researcher can generalize and make inferences from results of a sample to a population by using questionnaires or structured interviews for data collection. Questionnaires are seen to be the most common and standard data collection instruments in survey research (Acheampong, 2016).

The choice of this research method was based on the nature of the research problem to be investigated. In line with the factors mentioned, a survey research method was deemed an appropriate type of inquiry in the assessment of the use of open source software in academic libraries in Ghana.

3.3 Selection of Case

This study was conducted at the Sam Jonah Library, University of Cape Coast, Cape Coast. It is one of the few libraries that has adopted the open source software for its activities. The library has adopted Koha as an Open Source Software. It is considered as one of the large libraries in Ghana with numerous users.

3.3.1 Population

A research population can be described generally as a large collection of individuals or objects that form the main focus of a study. According to (Creswell, 2014) a research population is a well-defined collection of individuals who share similar characteristics based on what a researcher is interested in and therefore qualify to be included in the study. It is for the benefit of the population that researches are mostly done. However, due to the large sizes of populations, researchers often cannot test every individual in the population because it is too expensive and time-consuming. This is the reason why researchers rely on sampling techniques. It is also known as a well-defined collection of individuals or objects known to have similar characteristics. All individuals or objects within a certain population usually have a common, binding characteristic or trait.

Usually, the description of the population and the common binding characteristic of its members are the same. For instance, "Government officials" is a well-defined group of individuals which can be considered as a population and all the members of this population are indeed officials of the government.

The target Population for this study was the academic library staff of Sam Jonah Library of the University of Cape Coast. The rationale for choosing such a population is the fact that it is one of the academic libraries that has adopted open source software for managing its resources.

The library staff consists of a population of 120. The professional and para-professionals forms the population for this study.

Table 3.1: Study Population

Staff	Number of Staff
Professional	45
Para-professional	75
Total	120

Source: Research Survey

Sampling is the process of selecting a subset of a population for a study of which inferences will be drawn about the population. Obtaining a sample size is a daunting task as there are different views held by various scholars. According to Creswell (2014) researchers often choose a sample size based on selecting a fraction of the population (10% or more), or the sample size should be based on the margin of error the researcher is willing to accept.

However, the researcher used all the elements in the population for the study hence there was no sample size. Therefore, no sampling technique was used as well.

3.4 Instrumentation

According to Burns and Grove (1999 as cited by Acheampong, 2016), “data collection is the precise systematic gathering of information relevant to the research purpose or specific objectives, questions, or hypotheses of a study”. (p. 660).

The researcher used the questionnaire as an instrument for the collection of data for the study because they enabled the researcher to gather the responses in a standardized way. Besides, questionnaires are certainly more objective than interviews, and relatively quicker in collecting (Acheampong, 2016).

According to Panneerselvam (2011), the questionnaire consists of a set of well-formulated questions to probe and obtain responses from respondents. Questionnaires for the study consists of closed-ended questions and open-ended questions. In closed-ended questions, responses are structured and sometimes coding is provided beside responses to ease the interpretation of data. Survey questionnaires, apart from addressing numerous issues at the same time, are administered to a large group with the same set of questions (Fraenkel & Wallen, 2003).

The questionnaire for this study was partly structured and partly unstructured. A categorical scale (“yes” or “no”) was used to measure some items of the questionnaire. The questionnaire was divided into six separate sections. Section one consists of “Socio-demographic characteristics and professional background”, the second section, the third section, fourth section, the fifth section, the sixth section, were captioned as follows; “Advantages of open source software in academic libraries”, “Limitations Of Open Source Software for library work”, “Sources of funding for open-source software in academic libraries”, “ICT skills and competencies of library staff” “The extent of the use of open source software in academic libraries” and “recommendation” respectively.

Each section indicated the purpose and had instructions which aided the respondents to respond to each question without or fewer difficulties and provided spaces where necessary.

For the purpose of avoiding ambiguity and unclear choices of questions and words, the questionnaire was subjected to rigorous review, corrections were affected and deletion of redundant questions for final approval by the researcher's supervisor.

3.5 Data Collection Procedure

The researcher obtained an introductory letter from the Department of Information Studies, University of Ghana, to seek the formal consent of the head of Library, Sam Jonah Library, the University of Cape Coast in order to give the assurance that data collected for the research will purely be for an academic purpose. This was to give the researcher access to the population. The researcher explained to the respondents the purpose of the study and assured them of confidentiality and anonymity. The questionnaires were then distributed to the subjects by the research at the appropriate time that was convenient for them. The researcher later went for the questionnaire from those who couldn't complete at the time of distributing the questionnaires.

3.6 Analysis of Data

Data collected was analyzed and findings were presented in a meaningful form to give better insight and understanding of the research problem. This was done using appropriate tools and techniques (Panneerselvam, 2011). The Statistical Package for Social Sciences (SPSS) 23.0 computer program was used to analyze the data that was collected. The SPSS by far is seen as the most widely used computer package for statistical analysis throughout the world, most especially in colleges and universities for data analysis (Howitt & Cramer, 2008). Analysis and presentation

of data were done under the major themes expressed in the research questions. Also, tables, pie chart and column chart were used to represent data that was gathered for a better explanation.

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION OF FINDINGS

4.1 Introduction

This chapter discusses the findings of the data collected from the Sam Jonah Library, the University of Cape Coast based on the objectives of the study. The chapter begun with a response rate. A response rate according to the Cambridge dictionary is the number of people who answer a question in a survey (set of questions about a product or services) as a percentage of the number of people who are asked to take it. The study obtained a total of 113 questionnaire out of the 120 questionnaire that was distributed to the subject of the study representing a responses rate of 94%.

The chapter has been organized under the following major sub-headings:

- i. Socio-demographic characteristics and professional background
- ii. The use and Advantages of open source software in academic libraries
- iii. The extent of the use of open source software in academic libraries.
- iv. ICT skills and competencies of library staff.
- v. Sources of funding for open-source software in academic libraries.
- vi. Limitations of Open Source Software for library work.

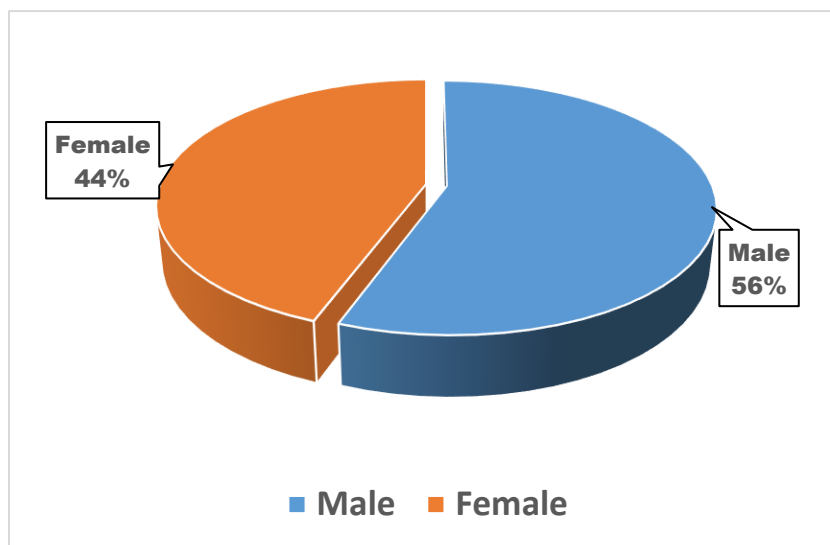
4.2 Socio-Demographic Characteristics and Professional Background

“Socio-demographics are nothing more than the characteristics of a population. Generally, characteristics such as age, gender, ethnicity, education level, income, type of client, years of experience, location, etc. are being considered as socio-demographic and are being asked in all kinds of surveys (Dobronte, 2013). This section includes the age, gender and educational level of education.

4.2 .1 Gender

Gender has a significant influence on the use of new technology (Davis, 2000). In light of this background, the respondents were asked to indicate their gender as shown in Figure 4.1

Figure 4.1: Gender Distribution of respondents



Source: Field data, 2019

As indicated in Figure 4.1, 63 (56%) of the respondents were male while the remaining respondents were 50 (40%). This response depicts that the number of males in Sam Jonah Library of the University of Cape Coast who uses the open source software is more than the females.

4.2 .2 Age

According to Aramide, Ladipo, and Adebayo (2015), age is one of the critical Demographics characteristics in research that need to be considered especially in the area of electronic learning. Upon this background, respondents were asked to indicate their age ranges as showed in Table 4.1.

Table 4.1: Age Distribution of Respondents

Age ranges	Frequency	Percent (%)
Less than 24	10	8.8
25-30	38	33.6
31-35	44	38.9
36-40	14	12.4
40 years and above	7	6.2
Total	113	100.0

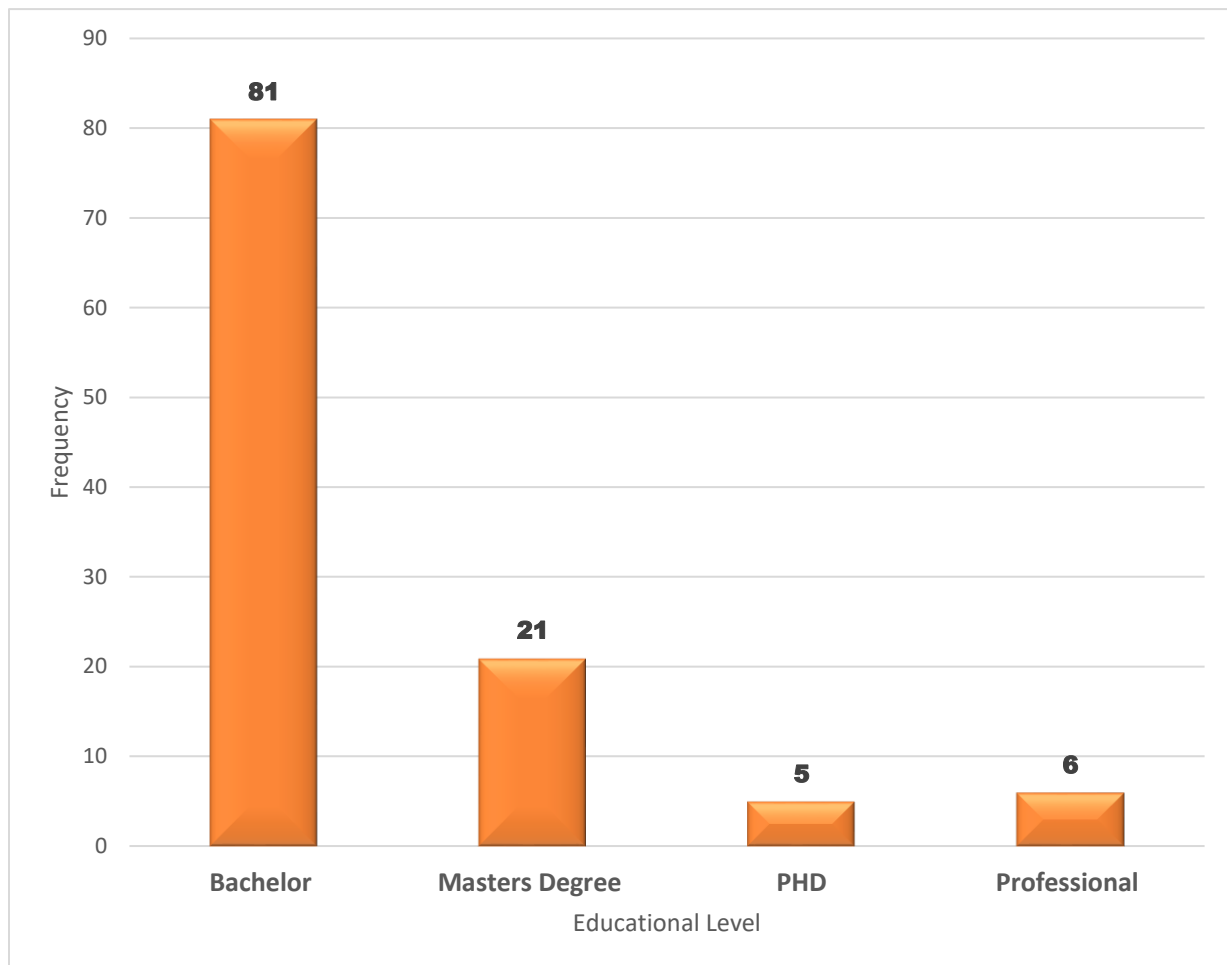
Source: Field data, 2019

Table 4.1 shows that out of the total number of respondents, 4 (38.9%) are within the age range of 36-40, follow by 38 (33.6%) which constitute the ages of 25-30. Also, the age range of 36-40 were 14 (12.4%) while 10 (8.8%) and 7(6.2%) constituted the ages of less than 24 and 40 years and above respectively. Responses based on age, is an indication that the majority of the staff in Sam Jonah Library of the University of Cape Coast falls within the ages of 31-35. This finding is in support of the works of Erdamar and Demirel (2014) in which it was found that the age of 18-35 are considered the technological age and therefore they are often exposed to the use of ICT than the older people who are normally described as emigrants. It can, therefore, be inferred that there is the propensity of the library staffs being able to use the open source software with ease for the activities of the library staff will be high.

4.2.3 Level of Education

Respondents were asked to show their level of education by choosing from the category they belong as depicted in Figure 4.2

Figure 2: Respondents' level of Education



Source: Field data, 2019

It can be seen from Figure 4. 2 that the majority of the respondents 81 (752%) holds a Bachelor degree, followed by 21 (19%) who have obtained a master's degree. Also, a few of them 5 (4%)

and 6 (5%) holds a Ph.D. degree and professional certificate respectively. The response is an indication that most of the library staff hold at least a bachelor degree.

4.3 The use and advantages of open source software in academic libraries

Literature has made it clear that open source software performs phenomenal roles in libraries. For instance, PriYal, Prabu, and Poongodi (2012) postulated that “shrinking budget is a great crisis in the Library to fulfill the need the Open source software came into existence”.

4.3.1 The use of open source software

Open source software has been widely employed for library activities at the expense of the proprietary software.

4.3.1.1 Number of open software used

Respondents were asked to indicate the number of open source software used in the library.

Responses are shown in Table 4.2

Table 4.2: Number of open source software used

Items	Frequency	Percent (%)
One	42	37.2
Two	43	38.1
More than	28	24.8
Total	113	100.0

Source: Field data, 2019

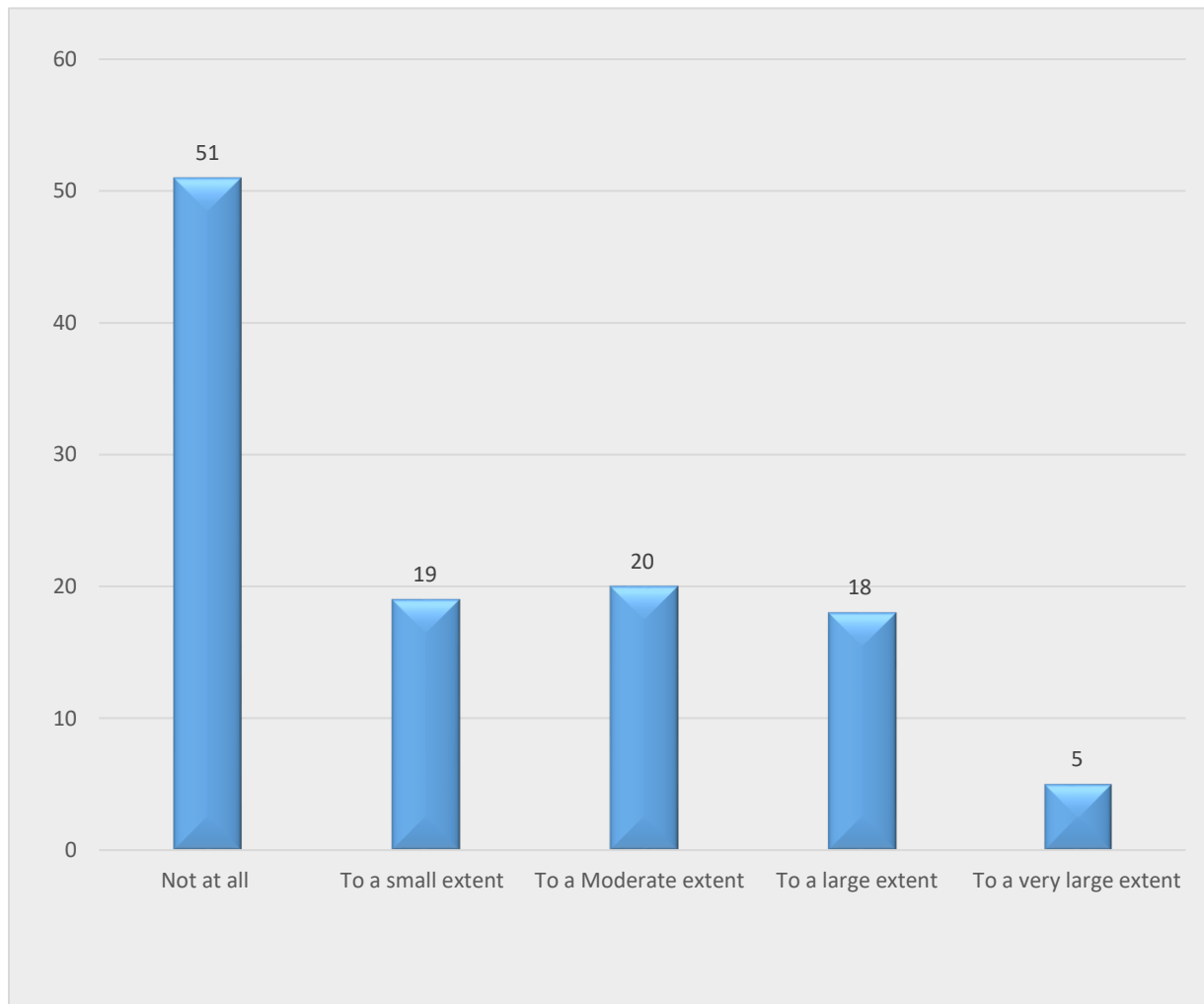
It is evident in Table 4.2 that majority of the respondents 43 (38.1%) indicated that, they use two open source software adopted by the library, 42 (37.2%) confirmed that they use two of the open source software while 28 (24.8%) representing the least categories of the respondents responded in affirmative that they use more than two open source software employed by the library. The two open source software are Dspace which is used to manage institution's repository and Koha which is used for the processing of library materials such as cataloging, classification, ordering of materials, circulation, and many more.

4.3.1.2 How user-friendly is the open source software.

The friendliness of a software or program is a key contributor to determine the extent of its use. In relation to the Technology Acceptance Model (TAM) as theorized by Davis (1958), if a system is easy to use it means, there is the propensity that users will use it the more. Likewise, if the open

source software employed by the library management is user-friendly, then there is the likelihood that, the extent of its use will increase. As shown in Figure 4.3, respondents were asked to indicate the extent at which they consider open source software employed by the library as friendly.

Figure 4.3: Respondents perception about the friendliness of the open source software.



Source: Field data, 2019

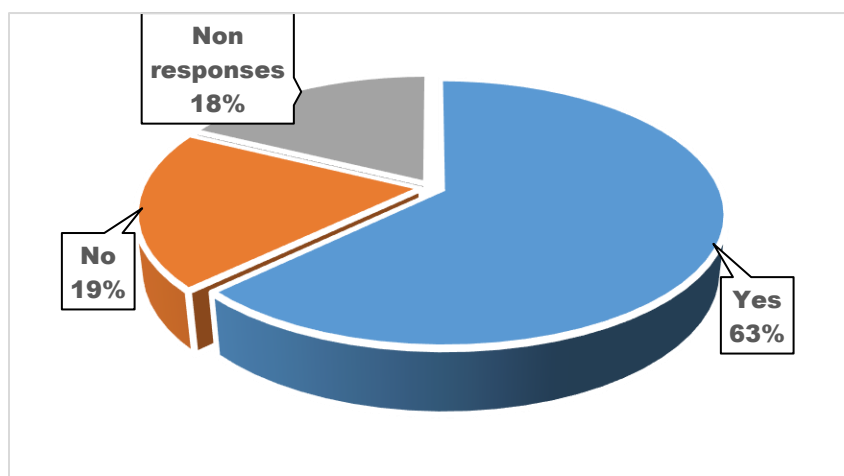
It is evident in Figure 4.3 that, a considerable number of the respondents 51 (45%) affirmed that, the open source software adopted by the library is not user-friendly by indicating Not at all followed by 20 (18%) who indicated to a moderate extent. Other responses are as follows; to a

small extent 19 (17%), to a large extent 18 (16%) and to a very large extent 5 (4%). It can be inferred from this finding that the open source software is not user-friendly as perceived by the majority of the users in the library. These findings are inconsistent with the works of RajKumar & Krishnan (2011) who explored the effectiveness of open source software in which flexibility and freedom were emphasized as a critical advantage of the open source software for libraries.

4.3.1.3: Staff ability to use the Open Source Software

Respondents were asked to confirm whether the open source software is able to handle all the functions and processes of the library. Responses are shown in Figure 4.4

Figure 4.4: Respondents ability use to the Open Source Software



Source: Field data, 2019

It can be observed from Figure 4 that, a greater percentage of the respondents 71 (63%) affirmed that, the open source software adopted by the library can handle all the functions and processes of the library. However, 22 (19%) responded otherwise by indicating no. It can be extrapolated from this finding that the open source software can handle almost all the functions and process of the

library. These findings support the works of Randhawa (2018) who investigated the open source software and libraries, the study found that the integrated sources such as Koha can handle almost every functions of the library and no wonder majority of libraries have adopted it.

4.3.2 Advantages of Open Source Software in academic libraries.

As elucidated Venkatesh et al., (2003), Performance Expectancy (PE) is the degree at which an individual believes that using a particular system or technology will improve work performance then they will continue to use it. In relation to this study, if the users of the open source software believe that the open source software adopted by the library management is advantageous. In light of this background, respondents were asked to indicate whether the open source software adopted by the library is advantageous using the 5-Likert scale. Responses are shown in Table 4.3 below.

Figure 4.3: Advantages of Open Source Software.

No	Items	(SD)	(D)	(N)	(A)	(SA)	Nonresponses
		<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>	-
1.	Lower software costs	7(6.2%)	18 (15.9%)	46 (40.7%)	11 (9.7%)	31(27.4%)	-
2.	Simplified license management:	4 (3.5%)	14(12.4%)	39(34.5%)	29(25.7)	27(23.9%)	-
3.	Lower hardware costs	3(2.7%)	11 (9.7%)	41(36.3%)	29(25.7%)	29 (25.7%)	-
4.	Scaling/consolidation potential	5(4.4%)	16(14.2%)	34(30.1%)	37(32.7%)	21(18.6%)	-

5.	Support is available for open source	4(3.5%)	15(13.3%)	50(44.2%)	20(17.7%)	23(20.4%)	1(0.9%)
6.	Escape vendor lock-in	2(1.8%)	19(16.8%)	42(37.2%)	19(16.8%)	31(27.4%)	-
7	The capability to integrate or consolidate server, service, application, and workstation management for powerful administration.	4(3.5%)	10(8.8%)	38(33.6%)	39(34.5%)	22(19.5%)	-
8	Quality software: Evidence and research indicate that open source software is good stuff	2(1.8%)	19(16.8%)	31(27.4%)	29(25.7%)	32(28.3%)	-
9	Ease of availability and access	2 (1.8%)	14(12.4%)	37(32.7%)	34(30.1%)	26(23%)	-
10	Cost effective	2(1.8%)	11(9.7%)	34(30.1%)	40(35.4%)	26(23.0%)	-
	Server/software maintenance: web-based software with free desktop clients or thin client access, thus freeing up the libraries from server maintenance requirements	4(3.5%)	7(6.2%)	36(31.9%)	38(33.6%)	25(22.1%)	3(2.7%)
11	Ease of operations for both staff and users	1 (0.9%)	14(12.4%)	40(35.4%)	36(31.9%)	22(19.5%)	-
12	Libraries can use a number of open source software applications together to effectively build a customized solution from among the best-	4(3.5%)	11(9.7%)	40(35.4%)	38(33.6%)	20(17.7%)	-

	of-breed OSS for their patrons.						
13	Consortia approach: Libraries using OSS systems can discuss the problems with existing users and software experts, and this consortia approach will benefit all.	15(13.3%)	45(39.8%)	33(29.2%)	18(15.9%)	2(1.8%)	2(1.8%)
14	Free to distribute modified versions of the software	1 (0.9%)	15(13.3%)	35(31.0%)	38(33.6%)	23(20.4%)	-

Source: Field data, 2019

As shown in Table 4.3, it can be observed that majority of the respondents 46 (40.7%) were neutral to the fact that, the open source software used in the library has lower cost, 31(27.4%) of the respondents strongly agree while 18 (15.9%) disagree. It can, therefore, be inferred that most of the users do not have much information in order to fathom the cost of the software. Also, 39(34.5%) of the respondents did not take any stand on the statement “simplified license management” as an advantage of the open source software 29(25.7) agree while a few of them 14(12.4%) responded otherwise by indication disagree. Again, on the assertion “lower hardware costs”, a considerable number of the respondents 41(36.3%) indicated neutral, 29(25.7%) of the respondents indicated agree and the same number also indicated strongly agree, however, 11 (9.7%) disagreed.

Addition, on scaling/consolidation potential as an advantage of the open source software, a greater percentage of the respondents 37(32.7%) agree, 34(30.1%) were neutral while 16(14.2%) disagreed. Also, on the statement “support is available for open source” 50(44.2%) representing the majority of the respondents did not take any stand, 23(20.4%) strongly agree while 15 (13.3%)

disagree. Again, it can be observed in Table 3 that, 42(37.2%) of the respondents representing the greater percentage were ambivalent on the assertion “escape vendor lock-in” followed by 31(27.4%) who strongly agreed, 19(16.8%) agreed and the same number 19(16.8%) disagreed. Again, it is evident from the table that, 39(34.5%) out of the total respondents agreed to the statement “the capability to integrate or consolidate server, service, application, and workstation management for powerful administration.” 38(33.6%) indicated neutral while 10(8.8%) indicated disagree.

Further, one of the advantages of open source software which state “Quality software: Evidence and research indicate that open source software is good stuff” it was reported that 42(37.2%) of the respondents neither agree nor disagree, 32(28.3%) strongly agree while disagreed. Moreover, in terms of the perceived ease of use of the open source software, majority of the respondents 38(33.6%) were ambivalent on the assertion “Ease of operations for both staff and users” 37(32.7%) reported neutral, 34(30.1%) agree but a few of them indicated 14(12.4%) disagree. Also, in terms of cost-effectiveness of the open source software, 40(35.4%), which is the greater percentage of the respondent agreed, 34(30.1%) were undecided while 11(9.7%). Also, 38(33.6%) which occupy the greater number of the respondents reported agree to the assertion “Server/software maintenance: web-based software with free desktop clients or thin client access, thus freeing up the libraries from server maintenance requirements”, 36(31.9%) were not certain while a few of the respondents 7(6.2%) indicated disagree. Addition, 40(35.4%) the respondents neither agree nor disagree to the statement that was posse to them which was “Ease of operations for both staff and users” (6.2%) on the same statement, 36(31.9%) responded in affirmative while 14(12.4%) responded otherwise by indicating disagree.

Again, respondents were asked to rate if the libraries can use a number of open source software applications together to effectively build a customized solution from among the best-of-breed OSS for their patrons, it can be observed that 40(35.4%) were not sure of which stand to take, 38(33.6%) agree and 11(9.7%) disagreed. Further, it was put before the respondents to react to the assertion “Consortia approach: Libraries using OSS systems can discuss the problems with existing users and software experts, and this consortia approach will benefit all”, majority of the respondents 45(39.8%) disagreed, 33(29.2%) indicated neutral while 81 (15.9%) agreed”. Addition, majority of the respondents 38(33.6%) agreed to one of the advantages of the open source software which state “free to distribute modified versions of the software” followed by 35(31.0%) who were neutral and 15(13.3%) who disagreed.

Table 4.4: Overall impression of the advantages of open source software.

Items	Frequency	Percent (%)
Positive impression	580	39.9%
Moderate impression	576	36.6%
Negative impression	297	20.4%
Total	1453	100

Source: Field data, 2019

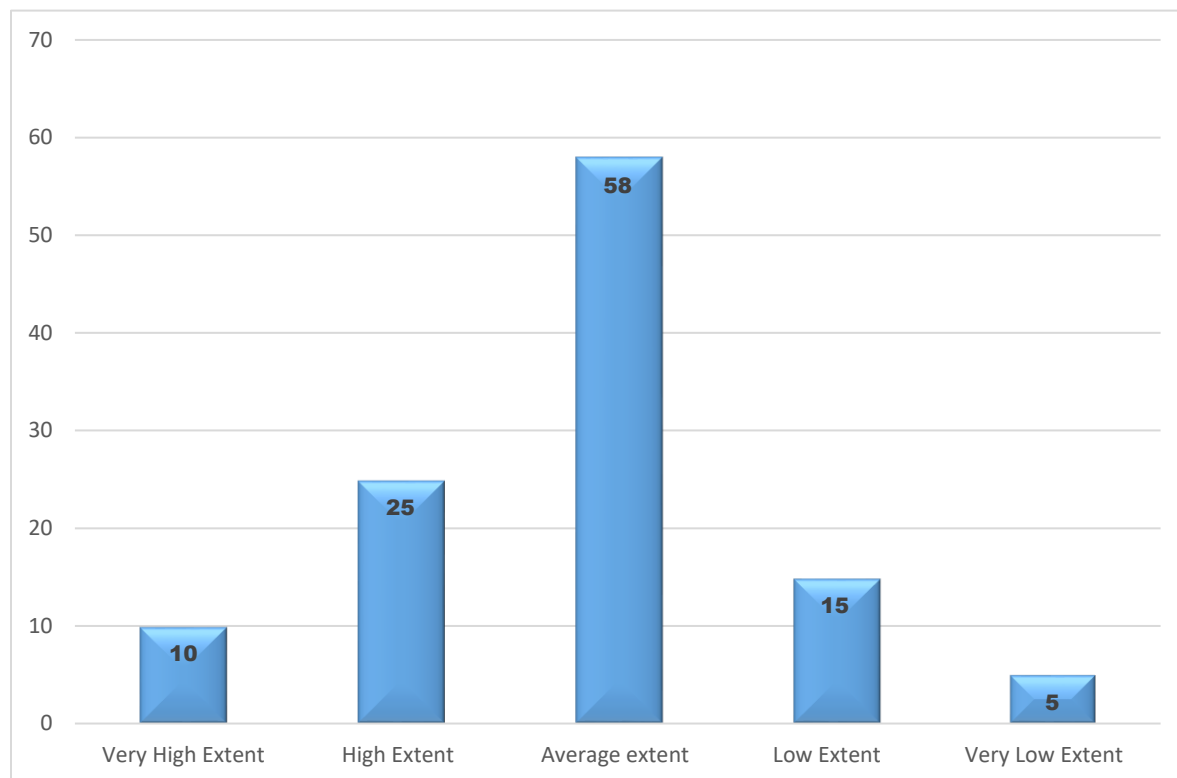
It is evident in Table 4.4 that, majority of the respondents 580 (39.9%) thus agreed and strongly disagreed put together had a positive impression towards the advantages of the open source software in support of library activities, a considerable number of the 576 (36.6%) t had a moderate

impression while 297 (20.4%) thus disagree and strongly disagree put combined had a negative impression.

The first objective of the study sought to find out the advantages of open source software in academic libraries. In summation, it can, therefore, be seen that majority of the respondents reacted positively on the advantages of the open source software adopted by the library. Hence this finding is an indication that the use of open source software for the running of the activities of the library is very advantageous. Other remarks from the respondents were as follows; the open source software is easy to update, it is flexible, easy to modify, easy accessibility and reliability. This finding supports the works of Hanumappa et al., (2014) in which it was found that the use of open source software is coupled with several advantages and one of the topmost is the ease of availability and access. It is also consistent with the works of Ray (2017) whereby it was revealed the open source software adopted for the running of the activities of the library performed phenomenal roles, for instance, open source software is considered as cost-effective and can be customized to suit the interest of the adopter. Similar findings were found in the works of (Upasani, 2016; Ray, 2017; Satheesh, 2012; Morgan, 2015; Asay, 2007, Morgan, 2015, Raj and Sangeeta, 2012, Satheesh, 20012).

4.4 The extent of the use of open source software in academic libraries.

Macmillan dictionary defined extent as “the degree to which something happens or is likely to happen. The extent of use of any program or software is determinant on some factors such as perceived usefulness and perceived ease of use which is considered the critical factors. Respondents were asked to show their extent of use of the open sources software as shown in Figure 4.

Figure 4.5: Extent of the use of open source software in academic libraries.

It is evident in Figure 4.5 that majority of the respondents 58 (51%) which is more than half of the respondents indicated that the extent of use of the open source software is remarked as an average extent. It can also be observed that 25 (22%) of the respondent indicated a high extent, 15 (13%) indicated a low extent. It can also be observed that 10 (9%) and 5(4%) of the respondents indicated a very high extent and very low extent respectively. It can be observed from these responses that most of the users of open source software do not really use open source software as envisioned by the library management. It can, therefore, be attributed to the limitations plagued in the use of the open source software for the running of the day to day activities of the library. This finding did not support the study of Baeza-Yates and Ribeiro (2011) in which it was found that the extent of use of the open source software by the library staffs was found high.

4.4.1 Reasons for using the open source software

Open source software is adopted for varying reasons. In light of this respondents were asked for the reasons for using open source software as shown in the Table below.

Table 4.5: Respondents reasons for using open source software.

No.	Items	YES		NO	
		Freq.	Percent (%)	Freq.	Percent (%)
1.	Openness	79	70	34	30
2.	Flexibility	75	66	38	34
3.	Speed	73	65	40	35
4.	Compatibility	64	57	49	43
5.	Easily extensible to support other languages	61	54	52	46
6.	Ease of availability and access	68	60	45	40
7.	Cost effective	79	70	34	30
8.	Ease of operations for both staff and users:	34	30	79	79
9.	New open additions	77	68	36	32
10.	Consortia approaches	45	40	68	60

It is evident in Table 4.5, out of 113 respondents, 79 (70%) of the respondents affirmed that they use open source software because of its openness, 75 (66%) responded in affirmative that they use open source software because of its flexibility. also, in terms of speed, 73 (65%) indicated in

affirmative. the rest of the responses are as follows; compatibility 64 (57%), easily extensible to support other languages 61 (54%), ease of availability and access 68 (60%), cost-effective 79 (70%), ease of operations for both staff and users 34 (30%), new open additions 77(68%) and consortia approaches 45 (40%).

The 2nd objective of the study was to determine the extent of the use of open source software in academic libraries. In summation, it can be observed from the above findings that, factors such as openness and cost-effective are most critical reasons for the use of open source software as indicated by the majority of the participants of the study. This finding can be extrapolated that, most libraries use open source software because of its cost-effectiveness and openness as compared to proprietary software. This finding is in agreement with the works of Upasani (2016) in which it was found that the cardinal reasons for the use of open source software are because of its cost-effectiveness for instances open source software is developed for free or without major licensing costs. Also consistent with the works of Hanumappa et al., (2014) and Ray (2017) in which was cost-effective and openness emerged as the most advantageous factors of the open source software.

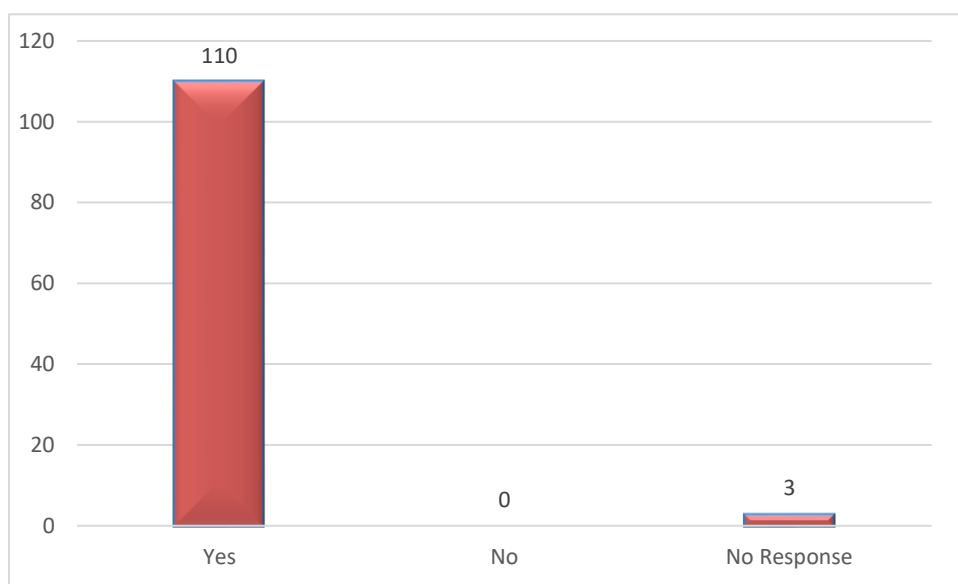
4.5: ICT Skills and Competencies of Library Staff.

According to Eshet-Alkalai (2004) computer literacy comprises a variety of complex skills (which include: booting a computer, how to use a keyboard, edit work, retrieve information from computers, send and receive e-mails, etc.) which users need in order to function effectively in digital environments. In this regard, it can be deduced that the ICT skills and competencies of library staff determine the perception of the open source software.

4.4.1 Knowledge and skills to use a computer and other related technologies

Knowledge and skills are very critical in the use of open source software for library activities. Respondents were asked to indicate if they have knowledge and skills to use a computer and other related technology as shown in Figure 4.6

Figure 4.6: Respondents' Knowledge and skills to use a computer and other related technology

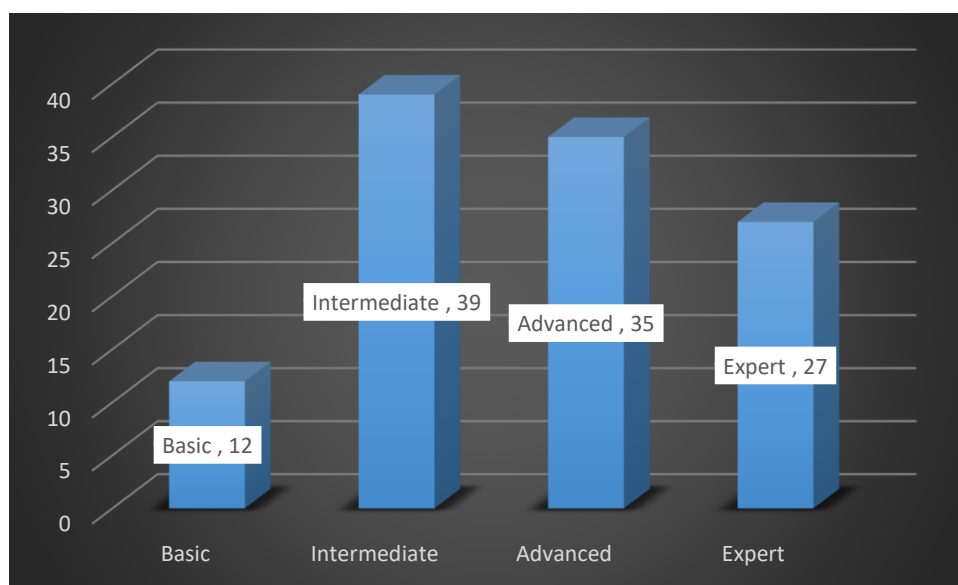


It can be observed from Figure 4.6 that majority of the respondents 111 (97%) responded in affirmative that they possess knowledge and skills to use a computer and other related technology while none of them responded otherwise. This finding can be explained that at least almost every library staff possesses some level of knowledge and skills to use the open source software for the running of the activities of the library. This finding corroborates with the study of Bansode and Viswe (2017). The study revealed that the majority of library professionals have acquired the basic ICT literacy skills which are required to handle day to day library operations.

4.5.1 Level of knowledge and ICT skills of library staff.

The level of computer literacy is the stage at which one may be classified as far as knowledge and skills to use a computer is concerned. It is critical to know the different levels of computer experience of users in order to holistically determine the ease of use and extent of use of the e-learning platform (Fusilier & Durlabhji, 2005). It is obvious that the level of ICT skills is a determinant of the use of open source software for day to day running of libraries. Respondents were asked to indicate their level of ICT skills as reported in Figure.4.7

Figure 4.7: Respondents' level of knowledge and ICT skills



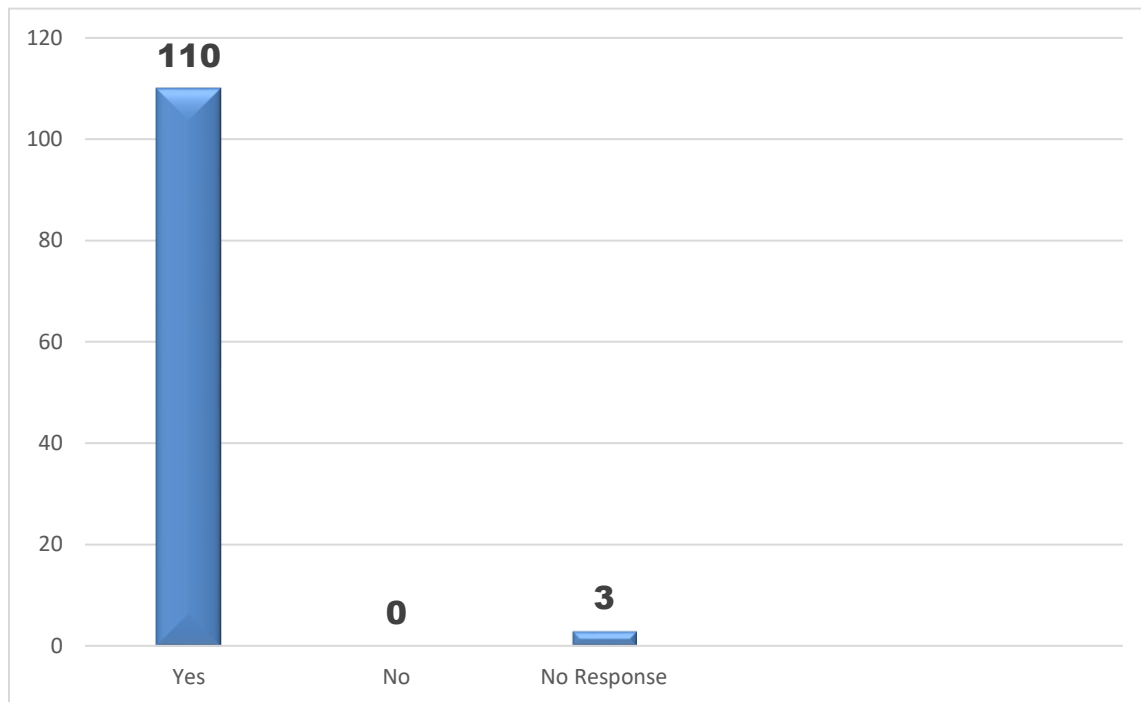
It can be seen from Figure 4.7 that, majority of the respondents 39 (35%) classified them intermediate as far as level of knowledge and ICT skills are concerned, 35 (31%) rated themselves under Advanced level, 27 (14%) were expert while 12 (11%) rated themselves as basic level. These responses are an indication that the library staff possesses basic knowledge skills to use the open

source software for running of the day to day activities of the library. As observed by Igun and Adogbeji (2007) librarian competency is very crucial to the successful implementation and application of ICT to library operations. In this regard, it can be extrapolated from the findings that the library staff possess knowledge and skills that will fuel them to use the open source software for the day to day activities of the library. This finding is in agreement with the works of Bansode and Viswe (2017) who investigated ICT Literacy among Library Professionals Working in the University Libraries in Maharashtra, India. The study revealed that the majority of library professionals have acquired the basic ICT literacy skills which are required to handle day to day library operations.

4.5.2 Training on the use of open source software for library services.

Sufficient training on the use of a system is a crucial factor to determine a user's perception and the level of usage. This implies that if users of the open source software receive sufficient training on its use, they will find it easy to use it and which will eventually increase the extent of its use (Davis, 1958). Based on this background, the respondents were asked to indicate the extent of training they had received on the open source software provided by the library management as shown in Figure 4.8

Figure 4.8: Respondents' level of training on the use of open source software.



Responses in Figure 4.8 shows that majority of the respondents 69 (61%) affirmed that they once a while receive training on the use of the open source software for the running of the activities of the library, a few of them 20 (18%) indicated often. Other responses were as follows; not at all 14 (12%), not sure 8(7%), very often 2(2%). It can be inferred from this finding that; the library staff does not really often receive training on the use of open source software which is considered as a critical factor in the implementation of every program. It can also be explained that needed attention has not been given out to champion training on the use of open source software in the library.

4.5.3 Knowledge in the use of open source software

Knowledge is the theoretical or practical understanding of a subject and skills are the proficiencies developed through training and experience (Lauby, 2013). Respondents were asked to rate their level of knowledge in the use of open source software as depicted in Table 4.6

Table 4.6: Respondents knowledge in the use of open source software

No.	Item	<i>Very Bad</i>	<i>Bad</i>	<i>Average</i>	<i>Good</i>	<i>Very Good</i>	<i>Non-Response</i>
1.	Your ability to download and uncompressed the source code	6(5.3%)	20(17.7%)	20(17.7%)	29(25.7%)	29(25.7%)	9(8%)
2.	In the terminal, your ability to move into the extracted directory	1(0.9%)	10(8.8%)	51(45.1%)	28(24.8%)	15(13.3%)	8(7.1%)
3.	Your ability to Configure software	3(2.7%)	8(7.1%)	52(46.0%)	20(17.7%)	22(19.5%)	8(7.1%)
4.	Your ability to run "make" to compile the software	12(10.6%)	8(7.1%)	48(42.5%)	32(28.3%)	13(11.5%)	-
5.	<ul style="list-style-type: none"> Your ability to install the software. 	12(10.6%)	8(7.1%)	44(38.9%)	28(24.8%)	21(18.6%)	-
6.	Your ability to acknowledge that Windows is not a friend of open source software.	4(3.5%)	18(15%)	39(34.5%)	29(25.7%)	23(20.4%)	-

7	<ul style="list-style-type: none"> Your ability to check for parts of the program 	2(1.8%)	19(16.8%)	44(38.9%)	23(20.4%)	25(22.0%)	-
9	<ul style="list-style-type: none"> Your ability to download and run the installer 	8(7.1%)	13(11.5%)	49(43.4%)	28(24.8%)	15(13.3%)	-
10	<ul style="list-style-type: none"> Your ability to detect errors in open end software 	-	19(16.8%)	32(28.3%)	33(29.2%)	29(25.7%)	-

As reported in Table 4.6 number of the respondents 29(25.7%) representing the majority remarked the assertion “Your ability to download and uncompressed the source code” as good, 20 (17.1%) indicated average and the same number 20 (17.1%) indicated bad. on the assertion, “in the terminal, your ability to move into the extracted directory” majority of the respondents 51(45.1%) remarked it as average, 28(24.8%) indicated good while a couple of them 10(8.8%) indicated bad. Also, a considerable number of the respondents 52(46.0%) indicated average, 20(17.7%) selected good and 8(7.1%) indicated bad on the statement “Your ability to Configure software”. Addition, it can be observed from Table 11 that, majority of the respondents 48(42.5%) classified themselves as average on the knowledge “your ability to run "make" to compile the software” 32(28.3%) indicated good while 8(7.1%) indicated good. Also, on the avowal “Your ability to acknowledge that windows are not a friend of open source software” 39(34.5%) indicated average, 29(25.7%) and 18(15%) of the respondents indicated good and bad respectively.

Further, 44(38.9%) of the respondents brought to fore that their ability to check for parts of the program is average, 23(20.4%) indicated good and 19(16.8%) indicated bad. Also, the majority of the respondents rated themselves as average in their ability to download and run the installer, 28(24.8%) indicated good. while 13(11.5%) indicated bad. In addition, in terms of their ability to detect errors in open-end software, 33(29.2%) rated themselves as good, 32(28.3%) indicated average while 19(16.8%) indicated bad.

The 3rd objective of the study investigated the respondent's knowledge and skills in the use of open source software in the library. In totality, it can be observed from Table 11 that the majority of the respondents rated themselves as average. This finding is an indication that the library management needs to frequently organized training library staff in the use of open source software for the running of the activities of the library. This finding also confirmed the earlier objective whereby most of the respondents indicated that they do not often receive training on the open source software. This finding is inconsistent with the works of Ekoja (2007) in which it was found that knowledge ICT competency library staff in Nigerian universities are still pertaining to open source software is below average.

4.6 Sources of funding for academic libraries

Funding is one of the critical factors that fuel the success of a library. Respondents were asked to indicate the sources of funding for the implementation of the open source software adopted for the running of the activities of the library. Responses are presented in Table 4.7

Table 4.7: Sources of funding for academic libraries

No.	Items	<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>	<i>Non responses</i>
1.	Finding Community Support	2(1.8%)	15(13.3%)	35(31.0%)	32(28.3%)	18(15.9%)	8.7
2.	Digital Humanities Start-Up Grants	9(8.0)	11(9.7%)	25(22.1%)	47(41.6%)	20(17.7%)	1(0.9%)
3.	Government Funding	1(0.9%)	8(7.1%)	28(24.8%)	47(41.6%)	19(1.8%)	14(1.8%)
4.	Fees for Services	-	13(11.5%)	35(21.0)	36(31.9%)	21(18.6%)	8(7.1%)
5.	Private Donations	-	15(13.3%)	42(37.2%)	26(22.3%)	20(17.7%)	2(1.8%)
6.	Corporate and Foundation Grants	1(0.9%)	5(4.4%)	41(36.3%)	30(26.5%)	28(24.8%)	8(7.1%)
7.	Fines and Fees	1(0.9%)	9(8.0%)	49(43.4%)	23(20.4%)	23(20.4%)	8(7.1%)
8.	Individual Donations	3(2.7%)	14(12.4%)	25(22.1%)	42(37.2%)	20(17.7%)	1(0.9%)
9.	Corporate Sponsorships	2(1.8)	11(9.7%)	37(32.7%)	35(31.0%)	20(17.7%)	8(7.1%)
10.	Public funding state	11(9%)	4(3.5%)	43(38.1%)	32(28.3%)	24(21.2%)	-
11.	Special fundraising events	8(7.1%)	11(9.7%)	33(29.2%)	32(28.3%)	29(25.7%)	-

As reported in Table 4.7, majority of the respondents 32(28.3%) were neutral to finding community support as a source of funding for the library, 35(31.0%) agreed and 15(13.3%) disagreed. On digital humanities start-up grants 47(41.6%) agreed as a source of funding,

25(22.1%) did not take any stand while 11(9.7%) disagreed. Also, to 47(41.6%) of the respondent's government funding is a source of funding, 28(24.8%) were not sure while 8(7.1%) disagreed. Also, 42(37.2%) did not take any stand private donations as a source of funding, 26(22.3%) and 15(13.3%) disagreed. Again, as indicated in Table 8 majority of the respondents 36 (31.9%) were not sure of fees for services as a source of funding for the library, 35(21.0) and 21(18.6%) agreed and disagreed respectively. Also, on corporate and foundation grants 41(36.3%) representing the majority disagreed, 30(26.5%) were undecided while 28(24.8%) agreed. On fees and funds, a greater percentage of the respondents 49(43.4%) were ambivalent, 23(20.4%) agreed, and the same number disagreed.

Further, it is evident in Table 4.6 that 42(37.2%) of the respondents agreed to the fact that individual donations are a source of fund for the library, 14(12.4%) and 25(22.1%) indicated disagree and neutral respectively. In addition, a considerable number 37(32.7%) of the respondents were neutral to Corporate Sponsorships as a source of funding, 35(31.0%) settle while 11(9.7%) differ. Also, special fundraising events which are considered as a source of funding, 33(29.2%) indicated neutral, 32(28.3%) agreed while 11(9.7%) were not decided.

The fourth objective of the study was to determine the source of funding for open source software adopted by library management. As observed from Table 8, it is evident that a considerable number of the respondents affirmed their main source of income for funding the library is the state funding and Digital Humanities Start-Up Grants. This finding supports the works of Tracey (2014) in which it was found the main sources of funding for open source software for libraries is the state funds. In further elucidation from the author, it was stated that state funding commonly addresses specific efforts such as long-range planning, resource sharing, and state-wide cooperative information systems. The finding is also consistent with Twene (2008) in which it was found that

the government is considered to play a central role in the funding for libraries to help maintain open source software which has been adopted.

Table 4.8: Total impression on the source of funding of open source software.

Positive		Moderate	Negative	
Strongly agree	230 (19%)	Neutral	Strongly Disagree	38 (3%)
Disagree	408(34%)		Disagree	191 (16%)
Total	638 (53%)		341 (28%)	Total

Source: Field data, 2019

As depicted in Table 4.8, it can be observed that a greater percentage of the responses 638 (53) did agree to the sources of funding for open source software for the library, 367 (30%) were undecided while 229(19%) disagreed.

4.7 Limitations of Open Source Software

It is obvious that every program or software has varying levels of limitations that need to be dealt with in order to ensure its efficiency and effectiveness. Respondents were asked to rate the level of limitation of the open source software through the 5-Likert scale as shown in Table 4.9.

Table 4.9: Limitations of open source software.

No.	Items	(SD)	(D)	(N)	(A)	(SA)	Non-responses
		<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly Agree</i>	-
1.	Installation, customization, and maintenance support: The current training of the library staff does not involve expertise in handling computers, networks, and open source software	8(7.1%)	11(9.7%)	39(34.5%)	31(27.4%)	24(21.2%)	-
2.	Updates: Commercial software vendors usually bundle in the cost of upgrades and support in the product price	-	11(9.7%)	37(32.7%)	35(31.0%)	30(26.5%)	-
3.	Modules/components missing: Every OSS system may not have all the modules or components required by the library	-	7(6.2%)	46(40.7%)	36(31.9%)	24(21.2%)	-

4.	Accountability: Often an OSS system is accessed using thin clients, so patrons often come to expect ubiquitous access to the system	1(0.9%)	13(11.5%)	35(31.0%)	40(35.4%)	24(21.2%)	-
5.	Breakdown: Any breakdown would require some troubleshooting, which is often beyond the expertise of library staff	1(0.9%)	22(19.5%)	31(27.4%)	38(33.6%)	12(10.6%)	-
6.	Vulnerable to malicious users	4(3.5%)	16(14.2%)	37(32.7%)	26(23%)	22(19.5%)	8(7.1%)
7	Might not be as user-friendly as commercial versions	1(0.9%)	17(15.0%)	38(3.6%)	33(29.2%)	15(14.3%)	8(7.1%)
8	Don't come with extensive support	1(.9%)	11(9.7%)	39(34.5%)	27(23.9%)	25(22.1%)	10(8.8%)
9	Limited funding	3(2.7%)	13(11.5%)	17(15%)	35(31.0%)	36(31.9%)	1(0.9%)
11	Higher lack of IT infrastructure.	-	13(11.5%)	41(36.3%)	25(22.1%)	26(23%)	8(7.1)
12	Lower technical knowledge on the part of library professionals.	8 (7.1%)	19(16.8%)	34(30.1%)	31(27.4)	21(18.6%)	

Source: Field data, 2019

As observed in Table 4.9, on one of the limitations of the open source software which states “Installation, customization, and maintenance support: The current training of the library staff does not involve expertise in handling computers, networks, and open source software”, majority of the participants 39(34.5%) showed neutral, 31(27.4%) affirmed by indicating agree while 11(9.7%) of them disagreed. Also, on updates, a greater percentage of the respondents 37(32.7%) were neutral on the fact that commercial software vendors usually bundle in the cost of upgrades and support in the product price, on this assertion, 35(31.0%) agree but a few of the respondents 11(9.7%) disagreed. Again, with respect to accountability, 40(35.4%) of the respondents brought to bear that often an OSS system is accessed using thin clients, so patrons often come to expect ubiquitous access to the system, on this same statement, 35(31.0%) agreed while 13(11.5%) disagreed. Further, respondents were asked to react to breakdown as a limitation to the open source software, as reported in Table5, 38(33.6%) of the respondents agreed to the assertion “any breakdown would require some troubleshooting, which is often beyond the expertise of library staff 31(27.4%) were not sure of their stand while 22(19.5%) disagreed.

Again, on vulnerable which is one of the critical limitations of the software, 37(32.7%) of the respondents did not take any stand on the statement vulnerable to malicious users, 26(23%) agree while 16(14.2%) disagreed. In comparison, might not be as user-friendly as commercial versions, 38(3.6%) of the respondents were not decided, 33(29.2%) agree and 17(15.0%) disagreed. Addition, with respect to support, 39(34.5%) of the respondents were neutral on the fact that the open source software does not come with extensive support, it can also be observed that 27(23.9%) of the respondents agreed and disagreed 11(9.7%). In every organization, fund is one of the scarce resources which all department tend to fight for, majority of the respondents 36(31.9%) strongly

agreed to that, the library is lumbered with limited funding to run its activities, 35(31.0%) agreed while 17(15%) and 13(11.5%) of the respondents disagreed and indicated neutral respectively.

Further, on the assertion, “the open source development process may not be well defined and the stages in the development process, such as system testing and documentation may be ignored”

Also on the statement “lower technical knowledge on the part of library professionals” majority of the respondents 34(30.1%) were not decided, 34(30.1%) agreed and 19(16.8%) disagreed.

Overall impression

Table 4.10: Overall impression on the limitation of open source software.

Item	Frequency	Percent (%)
Strongly Disagree	27	2
Disagree	153	13
Neutral	394	33
Agree	357	30
Strongly Agree	259	22

Source: Field data, 2019

Table 4.11: Impressions on the limitations of open source software.

Positive		Moderate	Negative	
Strongly agree	259 (22%)	Neutral 394 (33%)	Strongly Disagree	27 (2%)
Disagree	357 (30%)		Disagree	153 (13%)
Total	616 (52%)		Total	180 (15%)

Source: Field data, 2019

It can be observed from Table 4.11 that, 394 (33%) of the respondents were neutral to the limitation of the open source software in the library, 357 (30%) agreed, 259 (22%) strongly agreed, 153 (13%) disagreed and 27 (2%) strongly disagreed. In summary, as observed in Table 7, it is evident that majority of the respondents 616 (52%) responded in affirmative to the limitation that is lumbered with the use of open source software in the library, 394 (33%) were neutral while 180 (15%) responded otherwise.

The fifth objective of the study is to found out some of the limitations plagued on the use of open source software for undertaking activities in the library. It can, therefore, be inferred from this finding that, the use of open source software in the library is mitigated by some limitations that assiduously need to be addressed in order to alleviate its negative impact for the running of the activities in the library. This finding is consistent with the works of Satheesh (2012) which brought about numerous limitations of the open source software used in the library such as open source does not come with support, lack of technical know-how on the part of the users. It also supports the works Maltikarjun (2011) were the majority of the respondents agreed on the limitations of

the open source software used in the library. Also congruent with the works of (RajKumar and Krishnan 2011) in which lack of funding was found mitigating the works of the open source software. The study also supports the study by (Rajkumar and Krishnan; 2011; Anjaneya and Aswath; 2014; Muller; 2011, Anjaneya and Aswath; 2014 and Asay, 2007)

CHAPTER FIVE

5.0 SUMMARY OF FINDINGS, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

This being the last chapter, captures the summary of the major findings based on the objectives of the study as well as conclusion and recommendations from the major findings and then suggests areas which pave the way for further research

5.2 Summary of Findings

The study investigated the use of open source software in academic libraries in Ghana which focused on the Sam Jonah library, University of cape coast. The study was done based on the following objective; the use and Advantages of open source software in academic libraries, the extent of the use of open source software in academic libraries, ICT skills and competencies of library staff , Sources of funding for open-source software in academic libraries, and limitations of Open Source Software for library work.

5.2.1 The use and Advantages of open source software in academic libraries

The first objective of the study sought to find out the use and advantages of open source software in academic libraries. The study found that the library uses two open source software are such as Dspace which is used to manage institutional repository and Koha which is used for processing of library materials such as cataloging, classification, ordering of materials, circulation, borrowing of books, and lending of books.

On the use, the study found that, the use open source software adopted by the Sam Jonah library is not user-friendly as evident from the responses from the majorities of the respondents however in terms of the ability of the adopted open source software by the library, the study found the software can handle all the functions and processes of the library. The second part of the first

objective which sought to find out the advantages of the open sources software adopted by the library, it was found that, use of open source software for the running of the activities of the library was very advantageous with some remarks such as its flexible, easy to modify, easy accessibility and reliability.

5.2.2 The extent of use of open source software in academic libraries

The second objective of the study sought to find out the extent of the use of open source software in academic libraries. From the findings, it was found that, the library staff do not really utilize the adopted open software as envisioned by the library management, the general reason for the of the open source software is as follows; openness and cost-effective are most critical reasons for the use of open source software as indicated by the majority of the participants of the study.

5.2.3 ICT Skills and Competencies of Library Staff.

The Third objective of the study sought to find out the ICT Skills and Competencies of Library Staff. In terms of Knowledge and skills to use a computer and other related technology, the study found all the respondents responded in affirmative that they possess knowledge and skills to use a computer and other related technology. Thusly, all the library staff who uses the open sources software possess bases knowledge and skills to use the open source software. Also, in terms of the level of knowledge and ICT skills, the study found that most of the library staffs are found in the intermediate skills. Further, the study found that, once awhile the library organizes training for the study as far as the use of open source software is concerned. Again, Knowledge in the use of open source software was determined. The study found that knowledge in the use of the adopted open source software was rated as average.

5.2.4 Sources of funding for academic libraries

Source funding which is the pillar of every library was investigated in the third objective of the study. From the fourth objective, the study found that, the main sources of funding for the operation of the adopted open source software are the state funding and Digital Humanities Start-Up Grants., other of funding were as follows; finding community support, fees for services, individual donations, corporate sponsorships, public funding state, special fundraising events, etc.

5.2.5 Limitations of Open Source Software

The fifth objective of the study sought to find out some out the major limitations of the open source software. The study found that the majority of the respondents who confirmed that the open source software adopted by the library is plagued with limitations in the quest of using it for undertaking activities in the library. Some of the limitations were; the current training of the library staff does not involve expertise in handling computers, networks, and open source software, any breakdown would require some troubleshooting, which is often beyond the expertise of library staff, vulnerable to malicious users, might not be as user-friendly as commercial versions, don't come with extensive support, etc.

5.3 Conclusion

Modern libraries are transforming from dowdy, ancient buildings housing precious print collections into modern service centers, hosting print and digital media, providing on-demand access to and management of their collections. In this transformation from mere curating to a central role as the information provider, libraries have been helped by open source software which allows for the effective management of the wide variety of collections from physical to digital. As evident in this study, the use of Koha and Dspace adopted by the library is very advantageous and as remarked by the participants as flexible, easy to modify, easy accessibility and reliability,

however, it is saddled with some limitation such as inadequate training, lack of expertise to train and manage the software, breakdown which requires special expertise, vulnerable to malicious users and not user-friendly as compared to the proprietary software. Therefore, the management of the library should put measures and policies to arrest the challenges faced by the use of open source software.

5.4 Recommendations

The following recommendation were based on the findings of the study

Orientation and Training

Orientation and Training are the critical stages in the implementation of every system. It is the stage whereby users get to know and better learn how to effectively handle and use the system. In light of this, when library staff is taking though orientation and intensive training, it will pave way for them to handle the software adopted by the library management.

Infrastructure Support

Infrastructure support is a compelling factor to ensure the effective use of a program. There should be the provision of constant power, computers, Help Desk for users to aid them in using the open software at the point of their need.

Provision of Technical Support

There are many ways to influence the direction of an open source project, from the testing code in different environments and adding to the code documentation, to funding the project or foundation and participating on the project board, or by using the code in other open source projects. The library can exert the greatest influence in open source projects through the quality,

quantity, and consistency of its code contributions. So, it is in your organization's best interest to provide the tools and processes that will help your team develop high-quality, effective open source code.

Installation of Antivirus

The open source software should be safeguard by strongly protection software such as antivirus and it should be updated consistently to defend any virus attack. Also, windows defender, a firewall should be updated and activated.

Areas for Further Study

1. Further study should be done on the same topic but with a different approach, such as pure qualitative or mixed methodology.
2. A further study should be conducted comparing the impact of open source software and the proprietary software.

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In 2nd Information and Communication Technology Seminar, School of electrical and informatics Engineering. *Bandung Institute of Technology, Bandung, Indonesia*, 404-

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APPENDIX A: RESEARCH QUESTIONNAIRE



QUESTIONNAIRE

DEPARTMENT OF INFORMATION STUDIES

UNIVERSITY OF GHANA, LEGON.

Dear Librarians/Information Professionals,

This questionnaire aims at collecting data on **“Use of Open-Source Software in Academic Libraries in Ghana: a case of Sam Jonah Library, University of Cape Coast, Cape Coast”**

I am a Master of Arts (MA) student at the Department of Information Studies, University of Ghana, conducting research on the topic above as my Dissertation. For this reason, I wish you find time to answer the questions posed in this questionnaire and sincerely. Your responses will be duly appreciated and treated with the utmost confidentiality. Please endeavor to provide your candid responses to the questions, and note that there are no right or wrong answers.

Thank you.

Yours sincerely

Citizen Francis Tetteh

0543871296

PART A: SOCIO-DEMOGRAPHIC CHARACTERISTICS AND PROFESSIONAL BACKGROUND

Please tick [] where appropriate.

1. Your age

- a. Less than 24 []
- b. 25-30 []
- c. 31-35 []
- d. 36-40 []
- e. 40 years and above []

2. Your gender: Male [] Female []

3. Educational Level: Bachelor's Degree [] Master's Degree [] Ph.D [] Professional Degree [] Others: please specify.....

PART B1: USE OF OPEN SOURCE SOFTWARE

1. What is the name of the open source software used in your library?

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2. How many open source software do you use?

- a. 1. []
- b. 2. []
- c. More than 2 []

3. How user-friendly is the open source software?

- a. Not at all b. To a small extent c. To a moderate extent d. To a large extent
 extent , d. To a very large extent

4. Is the open source software an integrated software (able to handle all the functions and processes of the library)

- a. Yes b.

5. If no to the above, which sections or units of the library is it able to serve. ?

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PART B1: ADVANTAGES OF OPEN SOURCE SOFTWARE IN ACADEMIC LIBRARIES

From the table below, tick (✓) the extent to which you agree or disagree with the following statements.

Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A), Strongly Agree (SA)

No.	Items	(SD)	(D)	(N)	(A)	(SA)
1.	Lower software costs:					
2.	Simplified license management:					
3.	Lower hardware costs					
4.	Scaling/consolidation potential					
5.	Support is available for open source					
6.	Escape vendor lock-in					
7	The capability to integrate or consolidate server, service, application, and workstation management for powerful administration.					
8	Quality software: Evidence and research indicate that open source software is good stuff					
9	Ease of availability and access					
10	Cost effective					
	Server/software maintenance: web-based software with free desktop clients or thin client access, thus freeing up the libraries from server maintenance requirements					

11	Ease of operations for both staff and users					
12	Libraries can use a number of open source software applications together to effectively build a customized solution from among the best-of-breed OSS for their patrons.					
13	Consortia approach: Libraries using OSS systems can discuss the problems with existing users and software experts, and this consortia approach will benefit all.					
14	Free to distribute modified versions of the software					

15 In your own opinion what do think are some of the advantages of open source software for your library work?

- 1.....
- 2.....
- 3.....
- 4.....
- 5.....

PART B2: LIMITATIONS OF OPEN SOURCE SOFTWARE FOR LIBRARY WORK

From the table below, tick (✓) the extent to which you agree or disagree with the following statements.

Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A), Strongly Agree (SA)

No.	Items	(SD)	(D)	(N)	(A)	(SA)
1.	Installation, customization, and maintenance support: The current training of the library staff does not involve expertise in handling computers, networks, and open source software					

2.	Updates: Commercial software vendors usually bundle in the cost of upgrades and support in the product price					
3.	Modules/components missing: Every OSS system may not have all the modules or components required by the library,					
4.	Accountability: Often an OSS system is accessed using thin clients, so patrons often come to expect ubiquitous access to the system.					
5.	Breakdown: Any breakdown would require some troubleshooting, which is often beyond the expertise of library staff.					
6.	Vulnerable to malicious users					
7.	Might not be as user-friendly as commercial versions.					
8.	Don't come with extensive support.					
9.	Limited funding					
	The open source development process may not be well defined and the stages in the development process, such as system testing and documentation may be ignored.					
10.	Higher the lack of IT infrastructure.					
11.	Lower the technical knowledge of library professionals on					

PART C: SOURCES OF FUNDING FOR ACADEMIC LIBRARIES

From the table below, tick (✓) the extent to which you agree or disagree with the following statements.

Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A), Strongly Agree (SA)

No.	Items	(SD)	(D)	(N)	(A)	(SA)
1.	Seeking Community Support					
2.	Digital Humanities Start-Up Grants					
3.	Government Funding					
4.	Fees for Services					

5.	Private Donations					
6.	Corporate and Foundation Grants					
7	Fines and Fees					
8	Individual Donations					
9	Corporate Sponsorships					
10	Public funding state					
11	Special fundraising events					

12 Other

13. Don't know/unsure Yes [] No []

PART D: ICT SKILLS AND COMPETENCIES OF LIBRARY STAFF

1. **Do you have knowledge and skills to use a computer and other related technologies?** (i) Yes [], (ii) No []

2. **If yes, which level will you belong to?**

(i) Basic [] (ii) Intermediate [] (iii) Advanced [] (iv) Expert []

3. **How often does the university management provide training on the use of open source software for library services?**

(i) Very often [], (ii) Often [], (iii) Once a while [], (iv) Not at all [], (v) Not sure []

4. **Please rate your knowledge in Open source software**

Very Bad (VB), Bad (B), Average (A), Good (G), Very Good (VG).

No.	Item	VB	B	A	G	VG
1.	Your ability to download and uncompress the source code					
2.	In the terminal, your ability to move into the extracted directory					
3.	Your ability to Configure software					
4.	Your ability to run "make" to compile the software					
5.	Your ability to install the software.					
6.	Your ability to Acknowledge that Windows is not a friend of open source software.					
7	Your ability to check for parts of the program					

8	Your ability to find a port for either Windows or your version of Windows					
9	Your ability to download and run the installer					
10	Your ability to detect errors in open-end software					

PART E: EXTENT OF USE OF OPEN SOURCE SERVICES PROVIDED.

Please rate the extent of use of open source software

Very High Extent [] High Extent [] Low Extent [] Very Low Extent []

Please indicate the reasons for using the open source software and how frequently

Tick (√) all that applies

No.	Items					
11.	Openness					
12.	Flexibility					
13.	Speed					
14.	Compatibility					
15.	Easily extensible to support other languages					
16.	Ease of availability and access					
17.	Cost-effective					
18.	Ease of operations for both staff and users:					
19.	New open additions					
20.	Consortia approaches					

RECOMMENDATIONS

In your own opinion, what do you think can be done to improve the effective use of open source software for library services?

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Thank you for your time.

APPENDIX B: INTRODUCTORY LETTER



UNIVERSITY OF GHANA
DEPARTMENT OF INFORMATION STUDIES
SCHOOL OF INFORMATION AND COMMUNICATION STUDIES

Ref. No.:

April 29, 2019

The University Librarian
Sam Jonah Library
University of Cape Coast
Cape Coast

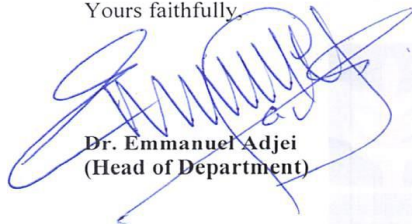
Dear Sir/Madam,

LETTER OF INTRODUCTION

This is to introduce to you **Mr. Citizen Francis Tetteh**, an M.A student of the Department of Information Studies. He is researching on the topic: **“Use of Open Source Software in Academic Libraries in Ghana: a case of Sam Jonah Library, University of Cape Coast and Ghana Institute of Management and Public Administration. (GIMPA)”**. Citizen is expected to submit his dissertation as part of the requirement for the M.A programme.

We would appreciate any support you can give him.

Yours faithfully,



Dr. Emmanuel Adjei
(Head of Department)

COLLEGE OF EDUCATION

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