

**ASSESSMENT OF THE USABILITY OF LIBRARY MANAGEMENT
SOFTWARE IN SERVICE DELIVERY IN SELECTED FEDERAL
UNIVERSITY LIBRARIES IN NIGERIA**

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**A THESIS SUBMITTED TO THE POSTGRADUATE SCHOOL, FEDERAL
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ABSTRACT

Library management software are increasingly being used in academic libraries to improve library operations and facilitate service delivery in Nigerian Universities. However, many libraries have abandoned the use of these software after some time due to the problems associated with their application. This study assessed the usability of library management software in service delivery in federal university libraries in Nigeria. Five objectives and six hypotheses were formulated to guide the study. Quasi experimental and survey research methods were adopted for this study. The population for the study was 51, 524 library staff and undergraduate students. Purposive sampling technique was used to select 206 participants for the study. Observation, questionnaire and interview were the instruments used to collect data during usability testing. Quantitative data collected were analysed using descriptive statistics and Kruskal-Wallis test was used to determine whether there are significant differences in time of effectiveness and efficiency of cataloguing, circulation and OPAC models among library management software used in service delivery. Results for effectiveness of cataloguing were 66.67%, 56.67, 53.33 and 26.67 for SLAM, Alexandria, NewGenLib and Koha respectively. The ease of use of circulation module was in the order: SLAM > Alexandria > NewGenLib >Koha. Result of hypotheses testing indicated significant difference in the efficiency of cataloguing, circulation and OPAC module of LMS. From the results of the study, it can be concluded that SLAM cataloguing and circulation modules were easy to use. Both experienced and inexperienced participants also indicated that Koha cataloguing module was not easy to use to describe library materials hence both users were not satisfied with the interaction. Responses from OPAC participants indicated that SLAM, Alexandria, NewGenLib and Koha were user friendly. Usability issues such as number of steps, many extraneous elements, lock and unlock features were issues reported by respondents interviewed. The study concluded that Alexandria and NewGenLib have less issues than Koha. Therefore it is recommended that cataloguing, circulation and OPAC modules of LMS under study

should be improved upon when designing and developing newer versions by minimising the number of templates and steps required to catalogue library materials. This will enhance the effectiveness and efficiency of use and extraneous data elements should be minimised to avoid confusion and frustration when cataloguing and registering library users.

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ABBREVIATIONS AND SYMBOLS

ILMS	Integrated Library Management system
ISO	International Organization for Standardization
LMS	Library Management Software
MARC	Machine Readable Catalogue
NGL	NewGenLib
OPAC	Online Public Access Catalogue
SDI	Selective Dissemination of information
SLAM	Strategic Library Automation Management
TINLIB	The Information Navigator

CHAPTER ONE

1.0

INTRODUCTION

1.1 Background to the Study

Library Management Software (LMS) are systems that are designed to perform acquisition, cataloguing and circulation functions. The systems are used to handle library's day to day activities. LMS are library management and automation systems that enable libraries to manage and disseminate information in diverse formats. LMS have two user interfaces, one for staff and the second for patrons (Sarma, 2016). The staff can store bibliographic record of library materials in databases, place order for books, purchase books, and create patron database through the use of library software, while patrons can also access Online Public Access Catalogue (OPAC), search for items (books), view book lists which are available in library, place books on hold or reserve information resources. The basic modules in LMS include acquisition, cataloguing, circulation, serials and OPAC. LMS exist in distinct programs called module, each of them integrates with a unique interface that handles specific operation of the library activities (Sarma, 2016).

Basically, there are two types of software developed for library management. These are commercial and open source software. Commercial software also known as proprietary software is profit driven with restriction to use, modification and distribution (Gauri & Shipra, 2016). Hence, its source code is closed. Such application includes SLAM, VIRTUA Alexandria and Millennium. On the other hand, open source software are the software that users have access to the source code, run and study how the program works, modify and distribute. Marshall (2014) asserted that Open source software are free; their source code are available and can be downloaded from the Internet. Examples of such

application include Koha, NewGenLib, Library Manager and Evergreen. Thus, to perform library functions and deliver services effectively and efficiently, an open or commercial LMS is implemented.

In Nigeria, university libraries have taken advantage of evolving technologies to improve their operations and facilitate the dissemination of information in support of teaching, learning and research (Onoriode, 2016). The automation of library routines and information services in Nigeria started in the 1970s but did not yield much result until the mid 1990s when the World Bank in conjunction with National Universities Commission (NUC) donated a 386 ICL computer system and a 4-User TINLIB to Nigerian university libraries and further encouraged them to acquire other LMS for their automation project (Abbas, 2014). Most of the libraries, after sometimes, abandoned the LMS due to difficulty in maintaining and updating software, as some of the software vendors were not supportive (Abbas, 2014; Emasealu, 2019). Today, a number of university libraries in Nigeria have adopted LMS such as Alexandria (used in Federal University of Technology (FUT), Owerri), Koha (used in University of Jos, Ilorin and Federal University of Technology (FUT), Minna), NewGenlib (used in University of Benin) and SLAM (as the case in Federal University of Technology (FUT), Akure for automation of their functions and services.

Strategic Library Automation Management (SLAM) is a standalone LMS with customisable interfaces used to manage the library's database. The modules include cataloguing, circulation, serial control and OPAC. It is fully integrated, but not web based (KGP Software, 2010). Another commercial software is Alexandria. This is a browser based cross-platform LMS. Users can access catalogue from any device on any browser.

It supports cataloguing (MARC and z39.50), OPAC, serials and circulation (Alexandria, 2019). On the other hand, Open LMS includes Koha and NewGenLib. Koha was developed in 1999 and released in 2000 in New Zealand. Its basic modules include, circulation, cataloguing, acquisitions, serials and OPAC. Koha is a full featured integrated software and it is a web based system (Madhusudhan & Singh, 2016). Similarly, Giri, (2012) added that NewGenLib is a web based LMS that runs on distributed computers through a network or server and can run on local area networks without access to the Internet. It supports circulation, acquisition, serials and enhances OPAC accessibility.

The impact of LMS is evident in every activity of the library. The use of LMS has enabled libraries to improve their services to users. Libraries can now provide timely, accurate and precise information to the users as well as give quick access to resources through OPAC. Utilisation of LMS in libraries has also reduced the process of repetitive tasks by librarians as bibliographic information that is used to acquire resources is used in cataloguing and circulation with accuracy. This has introduced speed and control to formerly slow and repetitive processes in library management. In spite of these benefits, automation of library routines and information services in Nigeria has not yielded much result (Emasealu, 2019). Ezechukwu and Odeshi (2018) posited that attempts to fully automate library functions in many libraries in Nigeria have not been fully successful. Of the Nigerian university libraries that have tried to automate their processes using different LMS, very few libraries have been partially successful (Edem, 2016). Edem's study revealed that 75 % of university libraries in Nigeria are partially automated. Thus, library operations in many Nigerian university libraries are still manual. Although the process of

automating university libraries in Nigeria is slow, libraries had their share of successes and failure in the implementation process.

Otunla (2016) reported the use of Koha LMS in Osun State University Library for automation and the modules currently being used are cataloguing and circulation. Similarly, Ezechukwu and Odeshi (2018) recounted that University of Uyo Library use SLAM for its library automation. The modules used are cataloguing and OPAC. Ayodele (2015) identified Koha as the LMS used in Federal University Library, Dutsin-ma, Katsina State and Usmanu Danfodiyo University Library, Sokoto for automation of library operations. The module in use is cataloguing, in the case of Usmanu Danfodiyo University Library while cataloguing and circulation modules are utilised in Federal University Library, Dutsin-ma. Hence, Emasealu (2019) posited that most Nigerian university libraries that have automated their processes have only concentrated on cataloguing, circulation and OPAC modules. This means that the LMS implemented in many Nigerian university libraries are underutilised.

The reasons behind the failure of library automation include insufficient funds to maintain automation process, Librarian's attitude towards automation, poor ICT skills among Librarians and lack of constant power supply (Otunla, 2016). Iroaganachi *et al.*, (2015) reported that the passion and attitude of library staff towards the use of LMS is lacking. Emasealu (2019) also identified low internet bandwidth, poor internet connection, poor feasibility study and lack of staff commitment as reasons responsible for the failure of library automation in Nigerian university libraries. Other reasons are attributed to maintenance support, high cost of updating software, inadequate staff training and lack of adequate planning (Emezie & Nwaochiri, 2014; Kari & Baro, 2014).

Lee *et al.* (2015) and Ljiljana (2013) also noted that the problem of many software including LMS is rooted in usability issues that frustrate users when using the software interface to perform tasks as well as influence the adoption and use of an application (Wang *et al.*, 2022). Other issues include simplicity, robustness and reliability of the software (Benaida, 2023). These necessitated the need to change from one LMS to another, resulting to varying levels of success of automation across university libraries in Nigeria. In addition, inadequate feasibility study of cost implication and knowledge of how to assess the features and usability of these software from user perspective have made individual libraries to make wrong choices in selecting LMS which have contributed to the failure of library automation in Nigeria (Imo & Igbo, 2011; Okpe & Unegbu, 2013).

Usability has long been recognised as an important quality attribute for interactive systems including library management software. The quality of interaction between user and interface defines the success and attitude of users towards the software. Therefore, usability defines how easily people can learn, use and complete tasks without stress with a particular software application. Simoes-Marques and Nunes (2012) defined usability as the ease with which a software system is used to accomplish a given task by its users. In other word, the user's ability to use an application determines its usability (Bokingkito & Caparida, 2021). This implies that an interactive system should be easy and pleasant to use. Thus, usability describes the extent which library management software are learnt and used to achieve library goals in an effective and efficient manner.

The International Organization for Standardization (ISO 9241-11, 1998) defined usability as the extent to which a software can be used by a group of users to achieve specified

goals with effectiveness, efficiency and satisfaction in a specified context of use. In this regard, effectiveness as relates to completeness or accuracy, efficiency refers to the resources needed by the users which include time or mental effort and satisfaction characterise users' feeling and opinion. ISO 9241-11 (1998) emphasised that usability of a system is dependent on the context of use and the context of use include users, goal, software, tasks, and the working environment. Also, Nielsen (2012) described usability in terms of five (5) quality components which include learnability, efficiency, memorability, errors and subjective satisfaction. Thus, effectiveness, efficiency and satisfaction describe how well users can use the system to achieve desire goals. These attributes are commonly assessed to determine system usability.

According to Alzahrani *et al.*, (2022), effectiveness is characterise by accuracy and completeness with which users accomplish stated objectives. Similarly, Komninos (2019), defines effectiveness as the ability of users to perform and complete their goals with a high degree of accuracy. Thus, effectiveness can be achieved when users perform their tasks wholly and accurately using a particular software system. Efficiency describes how easily and quickly users can perform tasks after learning to perform a software system (Nielsen, 2012). Similarly, Georgsson and Staggers (2016) viewed efficiency as a performance metric that reflects the level of productivity of users. In this regard, the ability of users to be productive would depend on the software used. Therefore, efficiency defines the amount of effort needed to accomplish a particular objective (Alkoblan & Abudullah-Al-Wadud, 2023). These definations explains users' time and mental effort involve in achieving a set of objective. Ease of use is a fundamental concept that explain how easily users can learn and interact with a software system. According to Roy and

Pattanak (2014), satisfaction describes the comfort and acceptability of software used. This is reflected in the attitudes, feelings and opinions of the users towards the software and is measured subjectively. Good usability results in ease of learning, effectiveness, efficiency and satisfaction from the use of an application. As such, usability of an application can be rated differently resulting from heterogeneity of users (Henzen, 2018). This means that usability of LMS can be assessed with different users.

The quality in use of a software can be determined by measuring the outcome of interactions with a software system, which include if the intended goals of the software are achieved with effectiveness and appropriate expenditure of resources such as time, mental effort in a way that the user finds acceptable and satisfactory. This can be determined through usability evaluation. Usability evaluation is broadly categorised into user-based and expert-based methods. User-based method requires a user to test the software and it mainly consists of usability tests and questionnaire. Expert-based method is applied when the system is already in use and its goal is to determine the overall usability of the system friendliness (Thuseenthan *et al.*, 2015).

When usability is assessed, the focus is on improving the user interaction, while the context of use is treated as given. This implies that the level of usability achieved depends on simplicity of the interface and ease of use of the application. Thus, any software that supports library task should be easy to learn, provide library staff with whatever assistance needed to perform library functions. However, Londhe (2015) argued that from the vast majority of LMS available, very few of them are useful and easy to use. Hence, it is paramount to assess the usability of LMS. The purpose is to find out and conclude the extent to which LMS enhances library operations and service delivery as

well as to identify usability issues from user's perspective. This study assess the usability of LMS in selected representative federal university libraries in Nigeria.

1.2 Statement of the Research Problem

With the advent of information and communication technologies, university libraries have acquired and implemented LMS to enhance their house-keeping operations and improve their service delivery. Federal university libraries in Nigeria are not exempted from this development considering the potentials of controlling circulation operation, facilitating cataloguing function and providing access to library materials. They are presently at different stages of deploying LMS to support and enhance service delivery. This process requires interactive LMS that are user friendly to support them in carrying out library operations and delivery of good services to users.

However, preliminary investigation revealed that many federal university libraries in Nigeria have continued to change from one LMS to another in an attempt to automate their services, due to difficulty of the library management software which are not usable and users are not satisfied using the library management software (Ferreira *et al.*, 2020). Also, there are challenges that are related to usability of LMS, which lead to errors, reduced acceptance and affect user productivity (Abedini *et al.*, 2021). Furthermore, there is knowledge void of empirical studies regarding usability of the existing LMS by staff of library and library patrons. It is these observations that motivated this study to assess the usability of LMS used in federal university libraries from library staff and students' perspective. This research therefore, assessed the usability of LMS in service delivery in selected federal university libraries in Nigeria.

1.3 Aim and Objectives of the Study

The aim of this study is to assess the usability of LMS in service delivery in federal university libraries in Nigeria. The objectives are to:

1. determine the effectiveness of library management software in service delivery in selected federal university libraries in Nigeria;
2. ascertain the efficiency of library management software in service delivery in selected federal university libraries in Nigeria;
3. determine the ease of use of library management software in service delivery in selected federal university libraries in Nigeria;
4. determine the satisfaction derived from using library management software in service delivery in selected federal university libraries in Nigeria; and
5. identify the challenges of using library management software in service delivery in selected federal university libraries in Nigeria.

1.4 Research Questions

The following are the research questions developed to guide the study:

1. What is the effectiveness of library management software in service delivery in selected federal university libraries in Nigeria?
2. What is the efficiency of library management software in service delivery in selected federal university libraries in Nigeria?
3. What is the ease of use of library management software in service delivery in selected federal university libraries in Nigeria?
4. What is the satisfaction derived from using library management software in service delivery in selected federal university libraries in Nigeria?

5. What are the challenges of using library management software in service delivery in selected federal university libraries in Nigeria?

1.5 Research Hypotheses

H₀ 1. There is no significant difference in the effectiveness of cataloguing module among library management software used by experience participants in service delivery in selected federal university libraries in Nigeria

H₀ 2. There is no significant difference in the effectiveness of cataloguing module among library management software used by inexperience participants in service delivery in selected federal university libraries in Nigeria

H₀ 3. There is no significant difference in the effectiveness of circulation module among library management software used by experience participants in service delivery in selected federal university libraries in Nigeria

H₀ 4. There is no significant difference in the effectiveness of circulation module among library management software used by inexperience participants in service delivery in selected federal university libraries in Nigeria

H₀ 5 There is no significant difference in the effectiveness of OPAC module among library management software used by experience participants in service delivery in federal university libraries in Nigeria

H₀ 6 There is no significant difference in the effectiveness of OPAC module among library management software used by inexperience participants in service delivery in selected federal university libraries in Nigeria

- H₀ 7. There is no significant difference in the efficiency of cataloguing module among library management software used by experience participants in service delivery in selected federal university libraries in Nigeria
- H₀ 8. There is no significant difference in the efficiency of cataloguing module among library management software used by inexperience participants in service delivery in selected federal university libraries in Nigeria
- H₀ 9. There is no significant difference in the efficiency of circulation module among library management software used by experience participants in service delivery in selected federal university libraries in Nigeria
- H₀ 10. There is no significant difference in the efficiency of circulation module among library management software used by inexperience participants in service delivery in selected federal university libraries in Nigeria
- H₀ 11. There is no significant difference in the efficiency of OPAC module among library management software used by experience participants in service delivery in selected federal university libraries in Nigeria
- H₀ 12. There is no significant difference in the efficiency of OPAC module among library management software used by inexperience participants in service delivery in selected federal university libraries in Nigeria

1.6 Significance of the Study

This study will give an insight on usability of LMS from users' perspective. The findings of the study will be of benefit to library managers and librarians, software developers and students of Library and Information Science.

It is expected that the outcome of this study will help library managers and librarians to make appropriate choice by selecting an LMS that is usable before deciding on its acquisition.

It is hopeful that the study will provide a feedback to software developers concerning usability problems in order to improve the usability of new version(s) of LMS.

Furthermore, this study will serve as a guide to students of Library and Information Science for further study as well as contribute to the growing existing literature in the field of Library and Information Science and also serve as reference for future researchers.

1.7 Scope of the Study

The study focused on the assessment of the usability of Library Management Software (LMS). This study concentrated mainly on selected representative LMS which included Koha, NewGenLib, Alexandria and SLAM. Furthermore, the study was restricted to usability of cataloguing, circulation and OPAC modules of LMS from user's point of view. The users who are the subject of the study were library staff and students from selected representative of federal university libraries in Nigeria. The geographical coverage of the study was restricted to Federal University of Technology, Akure, Federal University of Technology, Owerri, University of Benin, Benin, and University of Jos, Jos,

because these were the functional LMS in the university libraries visited as at the time the study was conducted.

1.8 Operational Definition of Terms

The following terms were operationally defined as they were used in the study.

Assessment is the process of appraising library management software of federal university libraries in Nigeria to determine the extent to which they are usable.

Cataloguing is a module in LMS that allows library staff to enter bibliographic data of an item on template(s)

Circulation is a module in LMS that covers membership management. It allows circulation staff to add, modify, renew, block, delete and import patron data. The module also supports transaction management functions which include issue, return, renew, recall, reserve, and inter library loan

Effectiveness is the degree of completeness and accuracy with which library staff and users can achieve library goals in service delivery in federal university libraries in Nigeria.

Efficiency is the ability of library staff and users to use LMS to complete library tasks with relative speed in service delivery in federal university libraries in Nigeria.

Federal University Libraries are libraries established by federal government to support the mission and objectives of universities which are in the area of teaching, learning, research and community service by making available and accessible print and non print collections to academic community.

Library Management Software is also known as Integrated Library Management System. Library Management Software is an integrated Library System used to assist Nigerian federal university libraries in performing their house-keeping activities, such as acquisition, cataloguing, circulation process and the use of OPAC to provide and allow users retrieve and search for information in federal university libraries in Nigeria.

The Online Public Access Catalogue (OPAC) is a module in LMS that allows library users to search for availability of books or non-book item through cataloguing details, such as author, title, subject, class or keyword.

Satisfaction is the level of comfort and pleasantness library staff and users derive from the using library management software in service delivery in federal university libraries in Nigeria.

Service delivery is the task performed by the library staff to ensure that information is provided or made accessible to users in federal university libraries in Nigeria.

Usability is the ease and the extent to which Library Management Software (LMS) is used by library staff and patrons to achieve library goals with effectiveness, efficiency and satisfaction in federal university libraries in Nigeria.

CHAPTER TWO

2.0

LITERATURE REVIEW

2.1 Conceptual Framework

The conceptual framework which is a diagrammatical representation of the variables in the topic of the research is presented in figure 2.1

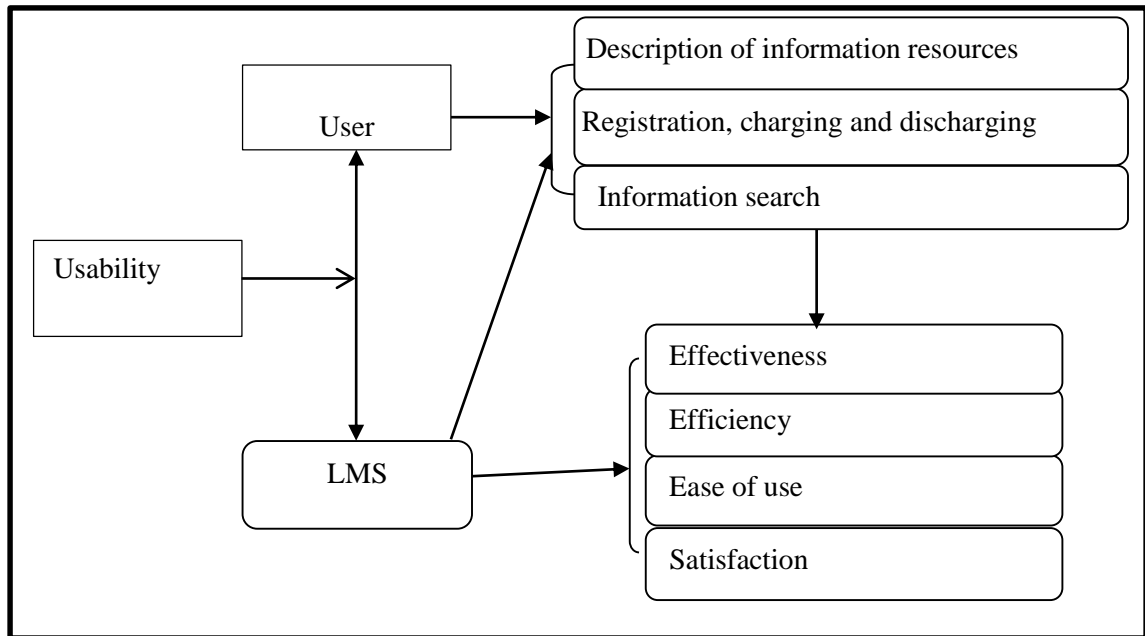


Figure 2.1: Conceptual Framework (Researcher-design, 2019)

The above conceptual framework explains the factors that determine usability of LMS in federal university libraries in Nigeria. The framework states that usability is dependent on the context of use and shaped by the interaction between the user and the LMS. The context of use includes user, task and LMS. Users consist of library staff and users, task includes library operations and a defined or particular LMS. On the other hand, there are measures which contribute towards quality of use. The quality of use is the outcome of interaction and can be measured by effectiveness, efficiency, ease of use and satisfaction. Therefore, the overall factors which include the library staff and users, library task,

effectiveness, efficiency ease of use and satisfaction influence the use of a particular LMS. In addition, the framework also explains that the degree to which LMS is suitable in achieving library goals by library staff and users indicates the level of usability of LMS used in federal university libraries in Nigeria,

2.2 Conceptual Review

2.2.1 Library management software (LMS)

Software was first coined and used by John W. Tukey in 1958 in his article published in the 'American Mathematical Monthly' (Agrawal, 2014). The early software were called computer program and code. They were installed in the computer during their configuration and were difficult to change, delete, uninstall and reinstall on computer. This means that software were initially part of computers, so they were not available separately. Simplileam (2022) defined software as a single entity, separate from computer's hardware that works with the hardware to solve a given problem. According to Ellis (2023) software is defined as program designed to perform specific functions. Central to these definitions is the capability of software to run on computer hardware to effectively carry out specific task(s) of the library. Software such as LMS is an electronic program that allows hardware to perform a set of functions such as tracking circulation, cataloguing, serial control, information search through Online Public Access Catalogue (OPAC) service, among others (Chauhan, 2010). This suggests that an instruction is needed to accomplish a given task.

Basically, software is classified into system software and application software. System software consists of one or more programs that are designed to control the operating system of a computer. These programs include operating systems which control the

overall performance of a computer or any program that supports application software and utility programs. Creating a file, controlling the input/output devices, executing other programs, memory management are controlled by an operating system. DOS, Windows, Mac, UNIX and Linux are examples of system software (Edem, 2016). Application software is a computer program designed to help users perform specific task. These software are menu driven and common among them are relational database management software, microsoft office, word processing, database management, spreadsheet and so on. Software cannot achieve the purpose for which it has been designed until it runs on hardware and produces required result. Therefore, a computer works in response to instructions provided.

Depending on the nature of the source code, software packages can be divided into two distinct categories- closed source software and open source software. Closed software is commercial (proprietary) software developed and supported by profit agencies that sell licenses for the use of their software and it is driven by maximizing profits. Open /free software are dedicated to communities of developers who contribute modification to improve the product continually and decide on the course of the software based on the needs of the community. Open source software is free and distributed at no cost under a licensing agreement which allows source code to be shared, viewed and modified by users (Gauri & Shipra, 2016; Marshall, 2014; Saltis, 2017).

The implication is that the program can be read, so that users can improve on it over time. Source code is a program written in a programming language in which the format is written and readable by human. It is important to have source code so that users can improve on its features to suit their purpose. This is because there is no software that has

all the features you need. Libraries, especially academic libraries whose wealth of resources consists of print and electronic can adopt open software in order to modify or improve it to suite their purpose.

Library Management Software (LMS) also known as integrated library management software (ILMS) is an integrated application software that integrates various modules to perform different operations of the library. The integration of the modules eliminates duplication of data. Muller (2011) defined LMS as multifunction and adaptable application that enable libraries to acquire, catalogue and circulate their materials to the users. By this, a system can track library operations such as items on loan, check in and out, browse the shelves and patrons' records.

In a similar study, Olatunji *et al.* (2020), Chaudhary (2012) and Okewale and Adetimrin (2011) described LMS as a system designed to handle the library house keeping operations which include acquisition, circulation, cataloguing, serials management, statistical reports and references. They argued that LMS are also designed with features to handle digital resources, e-books, e-journals and information searches. The system allows for adequate handling of information in different formats. LMS are capable of operating library functions at ease. The views of Araya and Mengsteab (2020), Ankrah *et al.* (2019) and Hase *et al.* (2010) indicated that LMS help librarians to perform various library operations (such as cataloguing and classification) with minimal stress. Similarly, Abbas (2014) reported that LMS has enhanced efficiency in library services and increased reduction of mistakes in service delivery process. This cannot be completely achieved without a fully integrated system.

Integrated Library Management Software (ILMS) designed and developed for management of library operations are relational database with two graphical user interface (GUI) - one for staff while the other one for patrons. The use of a graphical user interface is the norm for current LMS because users find it easy to work with it and it allows a wide range of tasks to be accomplished with a click of a mouse (Liu & Ma, 2018). Also, Mukhoadhyay (2017) asserted that LMS are set of related modules responsible for the management of different operations of the library. Mukhoadhyay further explained that library integrated systems are based on relational database architecture in which files are interlinked so that deletions, additions, and other changes in one file automatically activate appropriate changes in related files. This means that the software interacts with database, to produce needed result.

As an integrated library system, LMS function in discrete programs called modules. Modules are the operation and services of the library system. Each of them integrates with a unified interface. Mamman (2015), Mulla *et al.* (2010) enumerated the operations of the library that constitute LMS modules to include acquisition (ordering, receiving, and invoicing materials), cataloguing and classification, circulation (lending materials to patrons and receiving them back), serial control, OPAC (public interface for users), reference service, administration which consists of management issues like budgeting, financial management, reports, among others. Library software has evolved by putting together these operations into one library system and providing a platform for automation of all aspects of library operations, allowing the systems to process different tasks such as placing items on hold, online acquisition of documents from vendors, remote access to document and many more are being integrated. Library management software are

responsible for every aspect of the library's daily operations from acquisition to the ability to deliver resources and services through its OPAC (Li, 2014).

2.2.2 Historical development of library management software

The transformation of library operations started in the 1930s when the concept of library automation was introduced by the use of punched-card equipment in library circulation and acquisition. In 1945, Bush envisioned an automated system that would store information, including books, records and articles in an article titled "As you may think". In this article, a device named "memex" was discussed; how to use it to control circulation, cataloguing and indexing of library books so that users can view stored information or items (Agrawal, 2014). This ushered in innovations for library automation and ideas for the use of emerging technologies for the advancement of library systems.

The development of LMS started with an unintegrated system in the mid 1970s when libraries began to adopt software to perform specific functions in the library. Haravu (2009) reported that LMS at this period concentrated on circulation and acquisition modules to improve the efficiency of library operations. Subsequently, the growth and improvement of LMS over the years have given rise to integrated software with the capability to process different tasks such as acquisition, cataloguing, circulation, serial control and administrative task. OPAC later emerged in the late 1990s due to rapid increase in information production and popularity of the Internet. The 21st century brought great impact on efficiency and effectiveness of service delivery due to the application information and related technologies (such as LMS) in libraries (Li, 2014). Thus, the continuous development of LMS through the generations has only provided automation for libraries and effective user interface which support access to multiple

sources and services from multimedia subscription databases and free websites, photographs, images, maps, audio and video recording interface.

2.2.3 Library management software in university libraries in Nigeria

The introduction of automation in Nigerian university libraries started in the 1970s but was not successful. Uzomba *et al.* (2015) reported that the first attempt to computerise Nigerian university libraries in the 1970s. Academic libraries that made efforts to automate their system partially succeeded (Mohammed, 1991). Adegbore (2010) noted that efforts made by University of Lagos, Akoka, University of Ibadan, Ibadan and Ahmadu Bello University, Zaria to automate their libraries in the mid 1970s and 1980s did not yield desired result until in the mid 1990s, when the World Bank project in conjunction with Nigeria University Commission (NUC) donated computers to Nigerian university libraries and encouraged them to acquire TINLIB software for their automation project (Abbas, 2014; Kari & Baro, 2014).

This made National Universities Commission (NUC) to present one microcomputer and a four-user local area network version of the TINLIB (The Information Navigator) software to each of the 20 participating libraries in 1992, but most of the libraries abandoned the software for GLASS, X-Lib and Alice for Windows due to technical issues (Adegbore, 2020, Imo & Igbo, 2011, Kari & Baro, 2014). For instance, University of Ibadan Library abandoned TINLIB for Alice for Windows in 2004. Kari and Baro (2014) posited that DOS operating system lacks flexibility and were not capable of performing advanced functions required for delivering good library services. This necessitated the need to change from TINLIB software to Alice for Windows. However, the Windows based software did not meet their requirements because it was not MARC 21 compliant,

therefore it has no interface for resource sharing. Similarly, the University of Lagos, Akoka and Ahmadu Bello University, Zaria, made attempt to automate their libraries' functions in the mid-1970s and 1980s but failed due to lack of technical know-how relating to software development and maintenance of hardware (Adegboire, 2010).

Today, a number of university libraries in Nigeria have installed LMS (for automation of their functions and services) with significant progress. Kari and Baro (2014) and Uzomba *et al.* (2021) reported that 36 Nigerian university libraries have automated their processes using either Koha, X-Lib, VIRTUA, SLAM, GLASS or TINLIB. In addition to these, Obajemu *et al.* (2013) identified CDS/ISIS and Library Management System and also described their features to enhance selection of suitable software. Similarly, Chukwuemeka *et al.* (2015) revealed that university libraries in South West of Nigeria are automated. The modules used are acquisition, cataloguing, serials, OPAC, charging and discharging of library materials. Although the process of automating university libraries in Nigeria is slow, libraries had their share of successes and failures in the implementation process. The reasons behind the failure include, among other things, inadequate maintenance support, technical guide and poor attitude of librarians toward the use of the software (Imo & Igbo, 2011).

2.2.4 Types of library management software used in Nigerian federal university libraries

The increasing availability of LMS has given libraries opportunity to evaluate and select software that will meet their requirements. Notable among the LMS used in Nigerian university libraries are Koha, NewGenLib, Alexandria, SLAM, VIRTUA, Millennium, ILM and Alice for Window (Ayodele, 2015; Edem, 2016; Kari & Baro, 2014).

2.2.4.1 *Koha*

Koha is an integrated library management software (ILMS) developed by Katipo Communications for Horowhenua Library Trust in New Zealand in 1999 and it was released in 2000 (Ransom, 2014). It is a full-featured ILMS with multilingual and translatable library standards compliant and web-based system. (Madhusudhan & Singh, 2016). It is built with library standards and protocols that ensure inter-operability among Koha and other systems. As a web-based ILMS, Koha is written in Perl and uses MySQL database backend with cataloguing data stored in MARC and accessible through z39.50. The interface is configurable and adaptable and has been translated into many languages (Khatun & Ahmed, 2018). Koha basic functionality modules include circulation, cataloguing, acquisitions, serials and OPAC. Koha can be use for multi branch libraries.

The features in Koha include simple and clear interface for librarians and library patrons. Web 2.0 facilities like tagging and RSS feeds, union catalogue facility, customizable search, circulation and borrower management are provided. Others are acquisition system including budgets and pricing information, simple acquisition system for small libraries, ability to cope with any number of branches, patrons, patron categories, item categories, currencies and other data, serial system for magazines or newspaper and reading list for members (Hazarika, 2017).

Koha comes with MARC framework templates for creating new bibliographic record. It predefined frameworks that can be edited, deleted or users can create their frameworks for specific content to their libraries. Koha supports bibliographic record management functions such as add, edit, duplicate, merge and delete. Koha also supports MARC21 and UNIMARC format as well as provides batch export, import and Z39.50 copy cataloguing

facility (Khatun & Ahmed 2018; Sarma, 2016). In addition, Koha supports analytic cataloging for document like journal articles and articles within monographs. Koha provides required circulation related features which include membership management, transaction management, stock verification process, patron batch export/import, patron card creating facility, fine management, self checkout, RFID support, SMS facility, offline circulation, expiry note to circulation staff after expiry of member and batch modification of patron's data.

The OPAC of Koha has search features that include basic search, advanced search, relevancy sorting, faceted navigation and 'did you mean'. Users can collect call numbers after getting the desired search results and view records in MARC and in normal view with book image. Patrons that want to know what types of books are available on a particular shelf can browse through the virtual shelf as Koha provides virtual shelf for its patrons. Patron related services that can be provided include patron account details, reservation, patron issue history, adding purchase suggestion, print records, add comments and download records. In addition, user-added tags form and the font and size of each keyword or tag indicate that keyword or tag's frequency of use. All the tags in a tag cloud serve as hyperlinks to library materials. Users can write their own reviews to complement the Amazon reviews (Khatun & Ahmed, 2018; Hazaika, 2017). All user-added reviews, descriptions, and comments have to be approved by a librarian before they are finalised for display in the OPAC.

2.2.4.2 *NewGenLib (NGL)*

NewGenLib (NGL) began as proprietary software. Its version 1.0 was released in 2005 and was declared an Open Source Software under GNU General Public License (GNU

GPL) in 2008. NewGenLib was software developed by Verus Solutions in collaboration with Kesavan Institute of Information and Knowledge Management, India. It is a fully web based integrated library management software that runs on distributed computers through a network or server. It can also run on local area networks without access to the Internet, but some of the advantages of using it via the web will be lost (Giri, 2012). NewGenLib has acquisition, technical processing, serials management, circulation, administration, report and OPAC functionality. In addition, NGL has new application that helps to index full text of digital document so that users can use key word to retrieve document (Madhusudhan & Singh, 2016). Thus, NGL perform much more than the basic library functions. It is a flexible and user-friendly library management software.

The circulation module of NGL covers membership management. Therefore, circulation staff can add, modify, renew, block, delete and import patron data. NGL circulation module supports transaction management functions which include issue, return, renew, recall, reserve, and inter library loan. The circulation module of NewGenLib also supports fine management, patron card creation, stock verification process, RFID, self checkout, SDI and binding management. Batch export of patron data and patron card printing are also supported. In addition, the NGL circulation module provides other unique features which include weed out process, reporting lost of item, printing facility and QR code generation. Also provided is NGL Counter, a module for visitor tracking and self service module which supports self checkout, self check in, renew and view the list of overdue items (Giri, 2012; Madhusudhan & Singh, 2016).

The cataloguing module of the NGL is comprehensive covering MARC21, bibliographic record management, item management, authority management, Z39.50 copy cataloguing,

batch export and import. The batch import of bibliographic data can be done using NGL workbench; however the same interface does not provide export option. In the case of exporting bibliographic data a separate MARC export facility is used. Equally provided are customised data entry template for different type of materials, digital file attachment facility and administrative configuration setting. The module also supports analytic cataloguing, create records of chapters in books and articles in serials.

OPAC of NGL supports basic search, advanced search, relevancy sorting, faceted navigation, and browse features. It also supports integrated federated search through discover function. Records in OPAC can be viewed in MARC format. The OPAC module of NGL provides a number of patrons' related services such as my checkout, my reservations, my suggestion, my personal details, my privileges, my request for ILL, my circulation history and favorite. Library patron can add tag and review for particular record, print records, view new arrivals, download record, subscribe RSS feed and view messages. NGL OPAC is zotero compliant and provides access of OPAC on the mobile through android based apps. It does not provide "did you mean and search help file" feature.

2.2.4.3 *Alexandria library management software*

Alexandria Library Management Software is a web-based library management software developed to meet the desired configurations and needs of libraries by COManion Corporation (Walker, 2021). It provides customizable setup, interfaces and two hosting options to empower librarians and patrons with access on any device. It supports customer service. Alexandria has most of the library resource management features which include circulation, patron record management, catalogue building and item reporting. It

also provides reliable mobile compatibility, that is, users can access all functions anywhere anytime. The features of Alexandria include catalogue, circulation, OPAC and patron management. Other features that are also supported are MARC and Z39.50, reserve shelf management, reports and statistics, among others (Yusuf *et al.*, 2015). The cloud-based and self-hosting provide protection to data as well as allow libraries to control their backup and perform all maintenance and update tasks in-house. Alexandria gives librarians the ability to effectively manage their library's catalogue while providing patrons with an interactive way to search a library collection anytime from anywhere (Alexandria Library Management, 2019)

Alexandria supports cataloguing through SmartMARC built-in to obtain MARC references from various sources such as the Library of Congress. The Item Management Window helps in locating and importing complete and up-to-standard MARC records of different resources including e-resources to search the Z39.50 servers, or specifying other sources. The data imported are edited, bearing a customised barcode label before they are saved into the library catalogue (Alexandria Library Management, 2019). Alexandria creates, stores, and updates MARC records. The Item Management Window consists of two distinct areas which include the Item Title List and associated tools at the left-hand side where selected item/title record is displayed to help obtain MARC records from multiple sources.

It also supports circulation tasks by performing circulatory activities that include check-in, check-out, overdue notices, holds, and reserves, book renewal and fines. Thus, librarians and other library staff can access circulation interface for handling day-to-day transactions, keeping track of all the transactions and maintaining control over library

policy (Montserrat Public Library, 2020). Registering of patrons is supported by Alexandria following steps and using easy import wizard, or auto import features. It can email item renewal notices, overdue notices and hold notices to patrons.

The Online Public Access Catalogue (OPAC) allows cataloguing details to be accessible through the Internet anywhere around the world at any time. The cloud-based hosting allows users a centralised access to library resources through the OPAC (Walker, 2021; Yusuf *et al.*, 2015). Library patrons can search the OPAC for availability of item(s) by using a wide range of search terms such as author, title, subject, class or keyword. Thus, users can search for books and periodicals within catalogue online across a variety of interfaces.

2.2.4.4 *Strategic library automation management software*

Strategic Library Automation Management Software (SLAM) is a library automation system designed and developed to manage library operations. It is a customizable solution library software that is based on the user requirement. SLAM is not a web based application. In addition, SLAM supports acquisition, barcoding, membership, circulation, check-in and check-out, fee collection, cataloguing, OPAC, periodical and serial management (Kari & Baro, 2014).

SLAM provides easy access and management of records through its searches and storage facilities. Its cataloguing module allows users to enter bibliographic data of an item on a simple template. SLAM does not support operability; therefore z39.50 feature in cataloguing module is not supported. The circulation module of SLAM supports check-in and check-out of library item(s), place books on holds, keep track of the location and status

of library items, manages users records (add, modify or cancel order), overdue notices and fine management (Kari & Baro, 2014).

SLAM OPAC provides an interface through which users carry out simple search using option. The OPAC provide search medium for library users through the use of key words which include author, title and subject (Benson Idahosa University Library, 2018). It supports navigation from one search result to another with subject or author option. When a user's search yields no result, a list containing alternative suggestion is shown to the user. Library patrons can use this interface to access their accounts, track their circulation history and place holds (Hero, 2022, Kari & Baro, 2014).

2.2.5 Usability of library management software

Usability is one of the important quality attribute that is considered when dealing with interactive systems that are widely used or will be widely used (Iqbal et al., 2022; Tijani, 2016). Effort to define the term usability was first attempted by Miller in 1971 in terms of measures for ease of use (Weichbroth, 2018) but the concept of usability was first discussed by Shackel in 1981 and Bennett modified the concept of the definition in 1984 (Shackel, 2009). According to Weichbroth (2018) software and hardware which were easy to use were said to be user friendly but the term could not prevail because efficiency of computer programmes were deliberated and the issues were recognised together by several researchers. As a significant factor that defines the success of software, Nielsen (2012), Hayat *et al* (2015), Baguma *et al* (2016) have attempted to define usability from the simplified (ease of use) to the complex concept of usability, which describes the successful completion of a task by the user. Simoes-Marques and Nunes (2012) defined

usability as the ease with which the software system is used by its users to solve an intended task.

Similarly, Nielsen (2012) described usability as a quality attribute that assesses how easy user software interfaces are use. He further defined the terms by five (5) quality components which include learnability, efficiency, memorability, errors, and subjective satisfaction. Learnability is emphasised as the fundamental attribute of usability, since a software needs to be learnt before it is used. Given the first experience that users have with a new software product and the subsequent use of the software, Nielsen related this to novice ability to reach a reasonable level of proficiency which indicates direct relation between learnability and efficiency. Thus, LMS user interface should be easy to learn so that real users (library staff and patrons) can complete a given task successfully.

In addition, Nielsen's model or definition does not consider utility to be part of usability but a separate attribute of a system. But both utility and usability combine to determine whether a system is useful. According to Nielsen (1993) utility is the ability of a system to meet the needs of the user. If a product fails to provide utility then it does not offer the features and functions required; then, the usability of software becomes unnecessary as it will not allow the user to achieve their goals. This means that an interactive and useful software is one that empowers users to achieve their goals (Fontdevila, *et al.*, 2017). Thus, usability is the suitability for the task and conformity with user expectation (Kreichgauer, 2014).

Usability, according to Shackel (1991), is an attribute that describes a system's acceptability. For a system to be acceptable, it must be functional, suitable for the user

and balanced in term of its cost. This means that the degree of acceptability is directly related to the level of system utility, usability, likability and cost. Shackel described usability as the capability in human functional terms to be used easily and effectively by specified users, given specified training and user support, to fulfil specified tasks within specified range of environmental scenarios. This definition emphasises the human aspects of interaction which is determined by the context in which users operate. Therefore, it can be concluded that usability depends on the design of the software in relation to the user, the task and the environment upon which the success of the user support is provided (Shackel, 2009).

According to Shackel (1991) utility is the ability to do the needed functionality (that is, will the system do what is needed functionally?); usability (will the user actually work with it successfully?); likability (will the users feel it is suitable?) and must be balanced in term of cost (what are the capital and running cost and what are the social and organizational consequences?). This implies that his idea of acceptable software is one that satisfies its users' requirements for utility, usability and cost. Four dimensions which include effectiveness, learnability, flexibility and attitude are considered in defining and determining usability of software.

ISO 9241-11 (1998) considered effectiveness, efficiency and satisfaction as usability measures. This view regards usability as a high quality objective which is reflected in the definition that stated that usability is the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use. ISO 9241-11 (2018) included service to be used by users. The definition considered user (the person who interacts with the product); goal (the intended

outcome) and the context of use (which include the users, tasks, equipment - hardware, software and materials, and the physical and social environments in which a product is used). In this regard, usability is considered in context with software and user.

The factors in the definition may have impact on the overall design of the software and in particular will affect how the user will interact with the software (Harrison *at al.*, 2013). ISO 9241 (1998, 2018) also stressed that usability can contribute to the product or service being use. By implication, usability of a system is the outcome of use and its intended purpose in work environment. Also, emphasised by ISO 9241-11 (1998, 2018) is that usability is dependent on the context of use (users and software). Thus, the quality of use (measured as satisfaction, efficiency and effectiveness) is a result of the outcome of interaction between the user and the software- LMS, while performing a task in a physical, social and organizational environment (Bevan, 1995; ISO 9241-11, 2018).

According to Bevan and Macleod (1994), interactive software such as LMS should enable users to achieve intended goals, as such graphical user interface should be well designed to be usable with high utility. Well designed interactive software support library activities, thereby improving service delivery to users (Farzandipor *et al.*, 2022). Bevan and Macleod (1994) posited that quality can be measured as the outcome of interactions with software system determining whether the goals of the software- LMS are achieved (effectiveness) with appropriate expenditure of resources (effort) in a way the user finds acceptable (satisfaction). Usability describes software that considers the users' capabilities and limitations in term of learning and continual use of the software.

Usability is characterised by good interactions between users and tools that are suitable and satisfactory to use (Fontdevila *et al.*, 2017, Bokinkito & Caparida, 2021). It determines the degree to which it can be successfully integrated to perform tasks in work environment (Mohtar *et al.*, 2023; Mifsud, 2015). By this, LMS can be used to perform all library operations. Operations such as management of bibliographic records, import records with z39.50, patron services, basic and advanced searches depend on the interaction between users and the software. Thus, usability depends on the ease with which users interact with software to perform tasks. LMS provide an easy to use solution to library staff to manage their functions and provide patron with access to information. This is reflected in the flexibility and simplicity of the software to enable users to interact in ways that best suit their needs (Fontdevila, *et al.*, 2017).

Haklay and Tobon (2010) asserted that designers developed software that require users to spend time to learn how to use the software, thinking the software are easy to use, even when they are not convenient. However, users want to get a task done quickly without spending much time to learn (Inostroza *et al.*, 2016). In this regard, software such as LMS have to be easy to use and user friendly since they are designed for end users who have little or no knowledge of the software, but Haklay and Tobon (2010) opined that a lot of software requires significant knowledge to operate. For utilisation of these software, they must be simple. Simplicity in software allows a user to accomplish task with ease. Lee *et al.*, (2015) noted that to achieve simplicity in a software, the application must contain only essential features, which must be structured in a way that is logical to the user, forming a coherent unit of simple tasks. This suggests thoughtful software for users that need to navigate through the modules and fields with certain ease.

Usable software increases productivity and reduces costs with satisfaction. However, advances in software technology have enabled a wide range of applications to be developed that are difficult to use and tend to waste user's time, cause frustration and discourage users from further use (Nielsen, 2012; Hall, 2015). Applications that use interactive interfaces are apparently complex and very often faced with usability issues such as information overload, lack of adequate task support, screen clutter and limited interaction mechanism (Bahrudin *et al.*, 2013). Like other applications that have their limitations, LMS are not better either, since several LMS are designed and developed with newer and additional features to meet the needs of libraries in a cost effective and timely manner. However, Madhavan and Alagarsamy (2013) suggested that interactive software should be comprehensible (simple, logical structure of features and should be based on user terminologies), consistent (comfortability with information flow across the system templates), responsive (speed with which the product respond to user request, screen navigation and visual displays should be immediate after the user selects an option not causing users to keep trying the operation) and easy to navigate (ease in selection of operation, ease of movement from one template to another or menu option to perform operation and the number of movement and clicks should be minimised to improve usability).

For maximal use, software should be useful and useable. To be useful means that the software does what it is expected to do and to be usable means that software users should use it to perform tasks with ease. In addition, LMS are expected not to be difficult to understand, hard to learn, complicated to use, because difficult to use software wastes the Librarian's and library patron's time, cause users to be frustrated and discouraged from

further use of the software. Thus, the end user determines when LMS is easy to use as they interact with the software.

2.2.6 Usability attributes of software system

Usability attributes describe the characteristics desired for various features of the software. It is a specification that defines a property of an object or element. According to Shackel (2009), attributes are given descriptions and further defined by series of parameter used to specify values that establish various levels of performance. This implies that each attribute of software defines how such attribute can be measured. On the other hand, usability is a process of determining the usability goals of a particular software. The process involves specifying usability criteria and then assessing the software against such criteria (Dix *et al.*, 2004; Preece *et al.*, 2015).

Mifsud (2015) asserted that the ideal way to specify and measure usability is identifying the features and attributes required of a software to be usable and specifying whether or not the measure are present in the implemented software. Software quality attributes have been identified to include functionality, usability, efficiency and portability which enables quality to be designed into a software system. However, usability sub attributes are considered difficult to specify because of the nature of the features and attributes software require which depends on the context in which the software is used (Dix *et al.*, 2004; Preece *et al.*, 2015). Thus, standards and researchers have identified usability attributes and guidelines on specifying and measuring usability of any system. Such attributes include:

2.2.6.1 *Effectiveness*

Komninos (2019) views effectiveness as a characteristic of a usable system. According to Komninos (2019), effectiveness defines whether users can complete their goals with a high degree of accuracy. Similarly, ISO ISO/IEC 25010 Qual- in-use (2011) described effectiveness as the capability of the software to enable users to achieve task accuracy and completeness. Effectiveness is more about the accuracy and completeness with which users can achieve certain goals (ISO 9241-11, 1998; 2018). In this regard, the accuracy and completeness with which users perform and achieve specific objectives with no errors cannot be over emphasized. Thus, properties and style of interface, dialogue structure and the nature of the functionality contribute to software effectiveness (Bevan *et al.*, 1991). The interface enables users to perform tasks and also allow a wide range of tasks to be accomplished (Sarma, 2016). This explains the view of Oh *et al.* (2019) on effectiveness which stated that a good software that is effective is characterised by doing what it is supposed to do.

Effectiveness also determines the extent to which an application attains its intended objectives. Hence, Coursaris and Kim (2011) and Hussain *et al.* (2012) stated that effectiveness and utilities refer to usefulness. In this regard, effectiveness is the overall measure of how well users use the software to do the work they need to do. Hussain *et al.* (2012) asserted that effectiveness is regarded as a tool used for measuring the value of an interface. Since effectiveness of software come from the support provided to users when they work with the software (Komninos, 2019). It is therefore used to measure accuracy and completeness with which users achieve specific goals when using the software (Hussain *et al.*, 2012). While Petrie and Bevan (2009) defined accuracy as the ability of a

software to prevent a user from making mistakes or errors when performing task, completeness refers to the extent to which a user is able to complete a task (Tan, 2013). The objective is to determine whether users can perform the task successfully with no errors and the software can support user's requirement in carrying out their operations.

Effectiveness can be measured by evaluating whether or not users can complete a set of tasks with a software and also attain their intended objectives. Oh *et al.* (2019) posited that effectiveness is measured by how accurately and perfectly the user performs a set of tasks. For instance, if the desired goal is to accurately reproduce a page document in a specified format, then the accuracy can be measured by the number of spelling mistakes and the number of deviations from the specified format, and completeness by the number of words of the document transcribed divided by the number of words in the source document. As such, Georgsson and Staggers (2016) suggested that counting the number of errors that occur while attempting to complete a given task can also determine the rate. Errors are unintended actions, mistakes or omission that a user makes while performing a task (Mifsud, 2015). Confusion and frustration that lead to unintended action or unwanted result are also considered as errors.

Furthermore, ISO 9241- 11 (1998) metrics can be used to measure effectiveness of the software. The measurement can be in term of percentage of goals achieved, percentage of users who successfully completed task or average accuracy of complete tasks. In this regard, Joel (2017) stated that a completion rate of 100% is good, but any score above 78% is acceptable. He further explained that effectiveness issues occur when users struggle to complete tasks either through frustration, confusion or inability of the users to find the next step to take.

2.2.6.2 *Efficiency*

Georgsson and Staggers (2016) viewed efficiency as a performance metric that reflects the level of productivity of users. In this regard, stated that the ability of users to be productive by using particular software is necessary. ISO/IEC 9126 -1 (2001) defined efficiency as the capability of a software product to provide appropriate performance, relative to the amount of resources used under particular conditions. This definition is focused on the software system rather than the human ability to efficiently use the software to perform a task. Thus, ISO/IEC 25010 (2011) defined efficiency as the resources expended in relation to the accuracy and completeness with which users can achieve goals. Relevant resources may include time, mental effort or physical effort. Therefore, efficiency is the ability of users to use software to complete a set of tasks with relative speed. This means that the amount of time or effort a user expends to complete a given task.

Hornbak (2006) described efficiency as the degree to which a software product allows the users to carry out or perform a task in a quick and effective way. This definition suggests the ease with which software is used to perform a function by the user. Hence, the easier an application is to be used, the less resources are spent during a given task. This means that the capability of the software system to help users achieve their tasks in a minimum number of steps (minimal action) is important (Coursaris & Kim, 2011). Simplicity of user interface, visual design and shortcut can enhance efficiency of the user performing task (Green, 2015; Inded, 2021). However, if it is takes a long time to perform tasks, the evaluator can consider the software system as having efficiency issues (Joel, 2017).

According to Bevan and Maclead (1994) efficiency can be measured as effectiveness divided by human effort, effectiveness divided by time or effectiveness divided by cost. Efficiency can also be measured by evaluating the time a user spent to complete a given task (Harrison *et al.*, 2013). Mifsud (2015) recommended that efficiency should be measured in seconds and minutes. The time taken to successfully complete a task is calculated by subtracting the start time from the end time or the ratio of the time taken by the users who successfully completed the task in relation to the total time taken by all the users. He further stated that efficiency can be graphically represented.

In addition, Galitz (2007) opined that clarity (clear visual elements), flexibility (enabling targeted users with different level of skills to use the interface easily), obviousness (easily learned and understood), availability (make all desired objects available any time) and aesthetically pleasing (provide visual appeal), minimum number of steps (minimal action), ease of use and minimal action are criteria that can be used to determine the efficiency of software (Coursaris & Kim, 2011).

2.2.6.3 *Satisfaction*

ISO 9126-I (2001) defined satisfaction as the capability of the software to satisfy users in a specified context of use. It also refers to users' subjective assessment of the system concerning how pleasant it is to use. Satisfaction is the level of comfort and pleasantness users derive from the use of software. According to Roy and Pattnak (2014), satisfaction describes the comfort and acceptability of software used. This is reflected in the attitudes, feelings and opinions of the users towards the software and is measured subjectively. Attitude describes the level of users' satisfaction with a software system (Shackel, 2009). Satisfaction provides comfort to the user and leads to a physiological or emotional

responses of the users about the use of the software. It refers to the component of success of a software with a flexible use and is vital for sustaining workforce motivation between the user and the software product (Bijarchian & Ali, 2013; Dubey & Rana, 2012).

Satisfaction determines whether the user feels good, pleased and comfortable when using a software (Zviran *et al.*, 2006; Franke *et al.*, 2012; Vincent, 2019). This may lead to acceptability of use. According to Zviran *et al.* (2006) acceptability of use measures attitude towards software system. The user's opinion, perception and feeling of software used, give insight about the overall usability of the software system. Coursaris and Kim (2011) and Franke *et al.* (2012) suggested that attitude and perception can be used as criteria for user satisfaction. On the other hand, Bevan and Maclead (1994) asserted that satisfaction can be specified and measured by attitude rating scale or measures such as the ratio of positive to negative comments during use.

According to Harrison *et al.* (2013), questionnaire and other qualitative techniques can be used to measure user's attitude and perception towards software application. Although a system may be evaluated favourably on every usability attribute, but users may not want to use the software because they are dissatisfied with it or its user interface (Bijarchian & Ali, 2013). Additional information may be obtained from interviews, reports and frequent requests for transfer to another job, request to change software and streamline the features of software (Bevan & Maclead, 1994).

Mifsud (2015) recommended the use of standardised questionnaire to measure the level of satisfaction. Similarly, Georgsson and Staggers (2016) submitted that satisfaction can be objectively measured with instruments such as System Usability Scale (SUS) or

Questionnaire for User Interaction Satisfaction (QUIS). This instrument measures overall usability and allows comparison across a range of contexts and software systems such as LMS. Georgsson and Stagers (2016) further explained that likert scale can be used to administer the instrument after interaction, allowing representative users to record their feelings and responses to each issue raised; for instance, SUS score range from 0-100 providing an estimate of overall usability of the intervention in the minds of users. Scores of above 70 are considered to be acceptable or good while scores of 85 or above indicate a high level of usability or excellent score, 50 or below scores indicate poor or unacceptable usability (Georgsson & Stagers, 2016).

2.2.6.4 Usability challenges in software system

Sauro (2013) described usability challenge as anything in a software that lead to an undesirable outcome. Similarly, Roy and Pattnak (2014) defined usability challenge as the difficulty encountered by users while performing task. When users face any kind of setback or challenge using any software, they are prone to leave the software for another one (Caro-Alvaro *et al.*, 2018) because there are many alternative software to perform a given task. This means that users do not tolerate encountering problems or difficulties while using software to perform their operation. Problems in software system result in poor usability which is characterised by issues that lead to low performance of the user with a given software system. Thus, usability challenges refer to anything that prevents users from successfully completing and achieving their goal. According to ISO 9241-11 (1998) usability problems are issues that influence effective, efficient and satisfactory use of the software which are identified by the degree of their severity and probability use (Manakhov & Ivanov, 2016). Since usability is the ease with which users interact and

achieve their goal, navigation without encountering difficulties, clarity of the content and fast loading are key aspects that users want to experience (Zippa, 2018).

Lisa (2012) identified usability issues to include load time of the system, structure of front page, background and text colour which could make the graphical user interface difficult to read, excessive text which could makes the users to be confused, inconsistency in the presentation of template result to unfamiliarity and complicated navigation which makes it difficult for users to find desired information. Similarly, Zippa (2018) identified inconsistency in the layout, stopping users from going backward and too high number of submenus as issues that prevent users from using particular software system. Dowding (2018) also itemised usability issues to include excessive clicks and submenu, unclear user interface, slow loading, inconsistency, poor error messages, unclear navigation, broken into several pages and complex signup. The issues also include behaviour that prevent task completion and take users off the course, frustration expressed by users, performing an action that is away from task success and choosing wrong links (Monsoon, 2017). Other issues identified include simplicity, robustness and reliability of the software (Benaïda, 2023).

Tullis and Albert (2013) noted the importance of performance metrics in estimating the magnitude of specific usability issues. They argued that to identify usability issues, one has to determine how many people encountered the same issue when using the software. For instance, calculating a success rate that includes confidence interval can be used to estimate the gravity of usability issues. To measure usability issues using task completion time, the percentage of the target audience that completed a predetermined task within specified time limit defines the users who are successful (Tullis & Albert, 2013). If only

20% of the target users successfully completed the predetermined task, it is concluded that the system has usability problems.

2.2.7 Usability evaluation of library management software

Usability Professionals Association (2012) defined usability evaluation as the process of assessing usability of software with the purpose of identifying usability problems and/or obtaining usability measures. It determines how well users are able to use software- LMS to meet their expectation. Paz and Pow-Sang (2016) asserted that usability evaluation assesses how easy it is for end users to learn and to use a particular software. Manandhar (2016) stated that usability evaluation also assesses how satisfied users are with the software and the process of achieving intended objectives. Asemi and Asemi (2022) described usability evaluation as an activity that examine the degree to which an interactive system satisfies users' expectation. The goal of usability evaluation is to identify usability problems, improve the product and thereby help the developers to fulfill the users' requirements (Ali *et al.*, 2023; Riihiaho, 2015) which can be achieved through formative and summative evaluation.

Formative evaluation involves monitoring the process, product development and gathering user feedback for use in modification and product development (Riihiaho, 2015). The purpose of formative evaluation is to identify and eliminate usability problems during development process. So, feedback is provided to software developers concerning usability problems in order to improve the software (Rubin & Chisnell, 2008). On the other hand, summative evaluation assesses the extent to which usability objectives have been achieved (Riihiaho, 2015). The aim is to evaluate the usability of a completed software product under realistic condition (real world) to determine if the software meets

specific measurable performance and satisfaction goals or establish usability benchmark and also make comparisons (Sauro, 2010). Thus, three usability evaluation methods which include usability inspection methods, usability testing with users and questionnaires and or surveys have been identified by Almasi *et al.*, (2023) and Usability Professionals Association (2012).

2.2.7.1 *Usability inspection approach*

This approach is commonly used by experienced evaluators (usability specialist/experts, software developers and experienced professionals) to examine usability related issues of user interface. Moreso, Adams *et al.* (2023) asserted that evaluators are asked to comment and record their thoughts on contents, navigation and interface features necessary to improve end user experience with software system. Evaluators can evaluate software based on guidelines and their own judgments to identify usability problems and possibly get quantitative measures about the software (Bligard & Osvalder, 2013). Nielsen (1993) opined that the methods in this approach are easy to learn, inexpensive, fast to apply, do not require special equipment. However, they are performed by software developers and expert evaluators because it requires participants with usability knowledge to perform the evaluation. Heuristic, pluralistic walkthrough and cognitive walkthrough are examples of evaluation methods in usability inspection approach (Usability Professionals Association, 2012).

In heuristic evaluation, usability experts compare software to a set of list or design principles (heuristic) and identify where the product does not follow those recognized principles (User Experience Professional Association, 2012). Similarly, Muniz (2016) stated that experts evaluate user interface of a product against accepted usability

principles. Nielsen developed ten heuristic principles to serve as guidelines for usability evaluation to discover system usability problems (Serafinelli, 2022; Nielsen, 2020). The set of heuristic principles for user interface design includes visibility of system status, match between system and the real world, user control and freedom, consistency and standard, error prevention, recognition rather than recall, flexibility and efficiency of use, aesthetic and minimalist design, help users recognize, diagnose and recover from errors and help and documentation. Thus, each evaluator examines each dialogue element several times, comparing with the set of guidelines.

Cognitive walkthrough method: Ghalibaf *et al.* (2018) recognized Cognitive Walkthrough as a task-based, expert-centered and analytical usability evaluation method that tries to identify problems through simulating end-users' cognitive abilities. The expert(s) assess the degree of difficulty users may experience while learning to operate an application to perform a given task. The idea is to identify users' goals, how they attempt to achieve the goals using the system. During a cognitive walkthrough, evaluators inspect an interface in the context of specified tasks by adopting the role of the targeted end-user and consider each action necessary to accomplish the task.

Pluralistic walkthrough method: is a group activity that is based on participation and is characterized as an inspection method where a group of stakeholders such as users, management and developers collaborate with varying competence to review a software (Thorvalda *et al.*, 2015). The usability experts serve as walkthrough administrators and guide users through tasks simulation on hard-copy and facilitate feedback about the tasks while developers and other members of the product team address issues or questions about the interface (Usability Professional Association, 2012).

2.2.7.2 Usability testing with users

Usability testing with user is a process whereby the intended users of a system perform a predetermined task on the system while they are being observed by evaluators (Tullis & Albert, 2013). Rubin and Chisnell (2008) described usability testing as the process that employs participants who are representative of the target audience to evaluate the degree to which a product meets specific usability criteria. The participants should represent real users and they should perform the tasks that the real users perform, only then will the test give the developers meaningful results (Dumas & Redish, 1999). Kreichgauer (2014) suggested that to determine whether a software is usable, usability test should be runned with real users. The purpose is to find out the difficulty to effective and efficient use of software as well as software acceptability and satisfaction. So, usability testing with users can be used to uncover the challenges with the use of software. Usability testing involves activity that focuses on observing users working with a product, performing tasks that are real to them (Adams *et al.*, 2023; Barnum, 2011).

The classic method of ‘usability testing in the laboratory’ is normally considered as the clearest example of these methods. Hence, the test is conducted by test-moderator and observers. The users perform several usability tasks by following the test-moderator's instructions. During the session, each user follows a specific protocol (that is ‘thinking aloud’ protocol) in order to provide feedback to test-moderator regarding their experiences with the software (Nielsen, 2012). This feedback is systematically collected and analyzed in order to produce a list of usability problems (Rubin & Chisnell, 2008).

Usability testing is an effective way of evaluating usability of software through testing and the testing can be performed throughout the development lifecycle, starting from the

early stage of the product to its implementation (Petrie & Bevan, 2009; Rubin & Chisnell, 2008). During the development phase, developers will get to know to what extent users are getting satisfied with the software and the result obtained can be used to improve usability of the software system. This approach enables developers to detect and fix usability issues as soon as they appear, and thus improve overall usability of a system (Sauro, 2013). Usability testing can also be done using comparative, remote and think-aloud testing methods.

Comparative usability testing is a method used to evaluate similar features of software, allows discovering of features and interactive design of software that works better (Loranger, 2014). It also compares existing software with each other, using quantitative metrics such as task completion and error rates (Ross, 2017) as well as analyze various aspects of navigation, interaction, visual presentation and textual information with emphasis on goal achievement of the users; Remote usability testing exploits user work environment (home or office), that is, natural environment and transforms it into a usability laboratory where users are observed with screen sharing applications (Moran, 2021). During the remote usability testing participants and researchers are located separately (Barnum, 2011). The aim of remote testing is to interact or reach out to users around the world without necessarily being present (Baker, 2014); and the think-aloud testing involves users vocalizing their thoughts and feelings while performing required tasks (Bergstrom & Olmsted-Hawala, 2013; Nielsen, 2012). Nielsen (1993) recognized think-aloud testing as one of the most valuable method that enables usability experts to reveal what users actually keep in mind while interacting with a particular software.

2.2.7.3 Questionnaire and survey method

Another method used to assess usability of software is the use of questionnaire and surveys which facilitate the collection of feedback from participants during and after the usability testing (Barnum, 2011). Questionnaire can be open-ended or closed-ended. While open-ended questionnaire allow participants to response and express their view in their own words, closed-ended questionnaire limit the participants to the options provided (Sauro & Lewis, 2012). Examples of formalized questionnaire that can be used include System Usability Scale (SUS), Questionnaire for User Interaction Satisfaction (QUIS) and Software Usability Measurement Inventory (SUMI) (Mifsud, 2015). Tullis and Albert (2013) asserted that this method provides a set of statements related to a particular topic. The use of this method enables the participants to express their extent of agreement or disagreement with each sentence by using a five or four point scale. Data obtained are later quantified in order to analyze the status of the usability of the software evaluated (Brooke, 1996).

2.3 Theoretical Framework

This study adapted Nielsen (1993) and ISO 9241-11 (1998) usability models to explain the assessment of the usability of LMS in federal university libraries in Nigeria.

2.3.1 Nielsen's model of usability

Jakob Nielsen developed a usability model known as Nielsen's model of usability in 1993. The model considered usability as an integral part of system usefulness. Practical and social acceptability contribute to overall acceptability of a system. The model divided acceptability into practical and social acceptability. Practical acceptability is further subdivided into reliability, cost, compatibility and usefulness. These factors collectively

contribute to system acceptability. Usability merged with utility of system can make a system attain its usefulness. While utility describe whether the functionality of the system can perform what is needed, usability describes how well users can exploit the functionality. By implication, any system that does not meet its users' needs and requirements is not useful whether the system is usable or not, because users will not accept it.

Nielsen's model identified five important characteristics of usability to include easy to learn (learnability), efficient to use (efficiency), easy to remember (memorability), few errors (low error rate) and subjectively pleasing (satisfaction). The characteristics are defined as embedding

- i. Learnability- the system must be easy to learn, to allow novice users to be able to work with it satisfactorily
- ii. Efficiency of use- the system must perform or function efficiently, to allow high productivity, in term of the resources spent to achieve the goals with accuracy and completeness
- iii. Memorability- the system must be easy to remember, after a period of interregnum
- iv. Error frequency- the accuracy and completeness with which users achieve specific objectives. It is a measure of usage, which involves how well users can perform their task. For instance, the physical or cognitive skills require to achieve objectives from a set of action
- v. Satisfaction – the attitude of users toward the system, which involves desirable, positive attitude and lack of discomfort. It measures the degree to which each user enjoys interacting with the system.

Neilsen specified usability metrics to include success rate, the time a task requires, the error rate and subjective satisfaction. According to this model, to measure learnability, an evaluator should select new users or novices and measure how long it takes the new users or novices to reach proficiency level with a system (Nielsen, 1993).

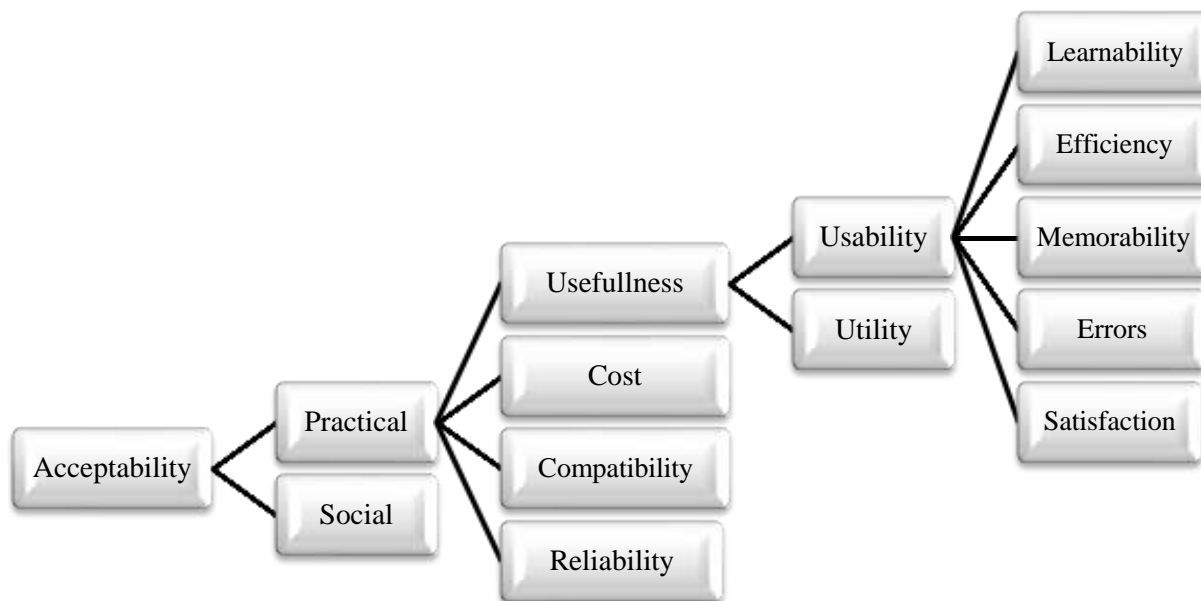


Figure 2.2: Nielsen’s model of usability (1993)

2.3.2 ISO 9241-11 model

Part 11 of ISO 9241 model was originally titled Ergonomic requirements for office work with visual display terminals (VDTs) and later it was changed to human system interaction in 2006 (ISO 9241- 11, 1998). The 1998 ISO 9241- 11 model considers usability as a factor and is further subdivided into three subfactors: effectiveness, efficiency and satisfaction. The factor - Usability is the extent to which a product can be used by specified users to achieve specific goals with effectiveness, efficiency and satisfaction in a specified context of use. The factor considered user (the person who interacts with the product); goal (the intended outcome) and the context of use (which

include the users, tasks, equipment - hardware, software and materials, and the physical and social environments in which a product is used). The above factors may have impact on the overall design of the product and in particular will affect how the user will interact with the system (Harrison *et al.*, 2013).

The subfactors are defined as follows:

1. Effectiveness is the accuracy and completeness with which users achieve specified goals.
2. Efficiency is the resources expended in relation to the accuracy and completeness with which users achieve goals.
3. Satisfaction is the freedom from discomfort and attitudes towards product use.

ISO's view is concerned with the outcome of using the product even though it is broad because it is intended to be used for procurement, design, development, communication and evaluation. This implies that intended product for general application and specific product such as LMS can use this model for its evaluation.

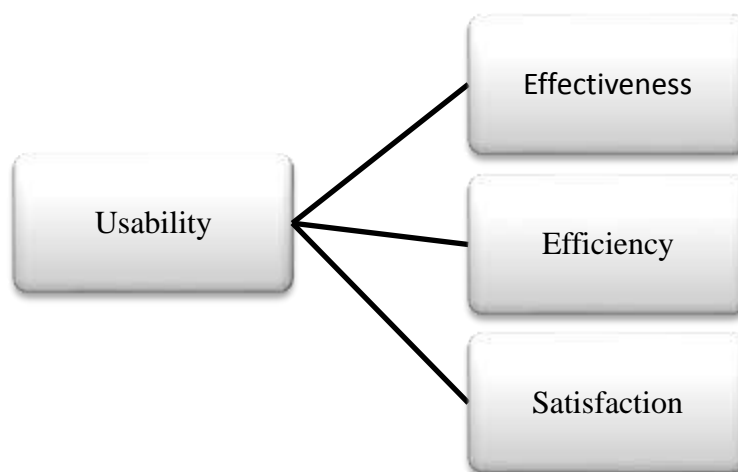


Figure 2.3: ISO 9241-11 Usability model (1998)

The model focused on two general purposes which include performance and satisfaction. Performance defines effectiveness and efficiency in product usage as an objective attribute, whereas satisfaction is subjective based on each user's feeling about the product used. Also contained in the model is the specification of measures in terms of effectiveness (accuracy), efficiency (effort) and satisfaction (Opinion) with regard to the goals of the product. To measure usability, Aspiazu (2013) suggested that it is necessary to identify the goals and to separate effectiveness, efficiency and satisfaction with measurable attributes. Thus, ISO 9241- 11 (1998) specified measures for evaluation of software as seen in Table 2.1

Table: 2.1: Overall Usability Measure from ISO 9241-11

Usability objective	Effectiveness measures	Efficiency measures	Satisfaction measures
	Percentage of goals achieved	Time to complete a task	Rating scale for satisfaction
Overall usability	Percentage of users who successfully completed tasks	Tasks completed per unit time	Frequency of discretionary use
	Average accuracy of completed tasks	Monetary costs of performing the task	Frequency of complaints

Source: ISO 9241-11 (1998)

2.4 Empirical Review of Related Literature

Khatun and Ahmed (2018) carried out a research on usability testing for an open-source integrated library system. The study aimed at examining the usability of Koha OPAC from end user point of view and twenty four (24) students from different departments comprising of experienced and novice volunteers participated in the usability test with Koha interface. A number of usability tests were performed on Koha interface, while

experienced users participated once, novices perform three set of successive tests. Data was collected through a computer screen recording software. Satisfaction scores were obtained using Questionnaire on User Interface Satisfaction (QUIS). Performance and satisfaction with Koha OPAC of experienced users and novices were compared.

The findings revealed significant performance difference between the experienced users and the novices initial test session. After the briefing session, novices were able to locate the functionality of Koha OPAC and perform task. The comparative analysis of performance between experienced users and novice learning showed significant difference between the test results. The test results also indicated that there was significant difference between the experienced users and novice in terms of success score and errors made. The result of QUIS indicated significant difference in the subjective satisfaction for several items between the experienced users and the novices. The study concluded that Koha integrated library system was not easy for new users, and therefore suggested that Koha OPAC interface should be improved. The study is similar to the present research in the use of performance and satisfaction measures to assess both experienced and inexperienced users, but while their research adopted QUIS to assess users' satisfaction, the present study developed a questionnaire to assess participant's satisfaction which allowed the study focused on the content and features of LMS modules.

Kous *et al.* (2018) evaluated the usability of a library website with different end users. The objective of the study was to investigate different types of end users interaction with library website, in terms of effectiveness, efficiency and satisfaction. The sampled population consists of representative of pupils, students, community members, seniors

and researchers. The evaluation method used for the study were formal usability testing and think-aloud protocol and the instrument used to collect data were observation and questionnaire. The result of the study revealed that different groups of end users achieve different levels of effectiveness, efficiency and satisfaction. The study found out that there was no significant difference between groups in satisfaction level. The results also showed that the inexperienced users did not achieve the threshold for usable website. Thus, the study suggested the improvement of the website's usefulness, especially for the non-experienced users. Similar to this study is the use of experienced and inexperienced users to assess the outcome of interaction between the users and library management software in terms of effectiveness, efficiency and satisfaction, but differs in the use of quasi experimental method for usability testing.

Farrahi *et al.* (2019) conducted a usability testing of an admission, discharge and transfer modules of Hospital Information System in Health Information Management Department of Shahid Beheshti Hospital, Kashan, Iran. The study aimed to evaluate the usability of admission, discharge and transfer module of hospital information system and to assess the effect of user interface problems on effectiveness, efficiency and satisfaction of the system. The participating users were eight undergraduate students selected from Health Information Technology College, University of Medical Sciences, Kashan, Iran. The participants were introduced to the module functions in two hours. Ten days later, the participants were asked to perform scenarios designed based on seven tasks and the evaluator took note and recorded the performance. Related to this is the use of metric to assess effectiveness, efficiency and satisfaction, however, while their research used Spearman to test the relationship between the features and the number of problems noted,

this study used Kruskal-Wallis test to determine the difference among groups of independent variables on dependent variables. Kruskal-Wallis test was used because the study could not meet the assumption of normality and equal variance among group scores.

Effectiveness was measured based on the rate of completion of tasks, efficiency based on the time taken to perform each task and satisfaction based on users' answers to a satisfaction questionnaire. The result of the finding revealed that usability problems were identified from the perspective of users. Effectiveness was rated as 58.9%, efficiency was rated as 53.3% and mean user satisfaction as 54.4%. Hospital Information System used in Iran has a number of usability problems in its admission, discharge and transfer modules. Thus, its effectiveness, efficiency and user satisfaction were not acceptable as usability problems affected the effectiveness, efficiency and user satisfaction of the system. The current research is related to this study in the use of metrics to measure effectiveness and efficiency, however, this study developed questionnaire to assess satisfaction, ease of use and challenges of using LMS in service delivery.

Richardson and Mahmood (2012) carried out an evaluative study on eBook readers with reference to user satisfaction and usability issues. The aim of the study was to examine the state of satisfaction with the technology in order to determine the capabilities and limitations of multiple eBook readers (Amazon Kindle Keyboard 3G, Apple iPad MB292LL/A, Barnes & Noble's Nook BNRV100, Borders' kobo reader N647-BUS-S and Sony Digital Reader PRs-950). A mixed approach of experiment and survey was used to conduct test and administered questionnaire to respondents. Purposive sampling technique was used to select the eBook readers. Four volunteer students performed task

on information access in order to discuss their familiarity with readers and their desired feature. Questionnaire was used to collect response from 81 graduating students through their emails.

The findings revealed that the Kindle is the most popular, but regardless of readers, the respondents disliked the poor navigation and inability to loan titles in their collection. The study also discovered that respondents did not value non-Roman script support or color display of the system. The study concluded that eBook readers have usability issues, hence it suggested that eBook readers should be improved when designing and developing newer version. Like the study under review, this present research is related in the methodology and sampling technique used. However, a volunteer method of selecting respondents was not considered in this research because selection was based on participants who were experienced or not experienced in the use of the modules. So, the adoption of experimental and survey methods as well as the use of purposive sampling technique are similar to this present study.

A study was conducted on usability testing of digital libraries to measure the level of interaction of eprints software by Dalkirana *et al.* (2014) in Hacettepe University, Turkey. The aim of the study was to assess the level of interaction of users with Digital Archive system interface in order to determine its ease of use. Five (5) volunteers (without taking into consideration their age, sex, educational background, computer and Internet skill levels) were purposively selected to participate in the study. Usability testing method was employed for the study and the data collection instruments were observation and questionnaire. The test was divided into three sections, pre-test, usability test and post-

test. A total of 4 questions were identified which aimed at measuring the ease of finding an article, accessing full texts, signing up for a new account and finding a given author.

The findings revealed that the most convenient option that ePrints software provided was in finding an article. Participants' response indicated that the software are "fairly easy and quick" but observation revealed that the users had difficulty in signing up for a new account and most participants were not satisfied with the search features of the Digital Archive system as they find it difficult to understand the terminology and the language used. The study concluded that interaction with eprint software was difficult. The study suggested that eprint software should be improved in the subsequent version. The current research is related to this study in the use of purposive sampling technique to select participants for the study and the use of questionnaire and observation as instruments to collect data for usability of LMS.

Hussain *et al.* (2017) conducted a usability evaluation of mobile Amazon Kindle e-book reader app. The aim of the study was to evaluate user experience based on ease of use, satisfaction and efficiency. Fifteen (15) students were purposively selected as the sample of the study from School of Computing, University Utara, Malaysia. A laboratory-based usability testing was used to assess Amazon Kindle e-book reader app and five tasks on the Kindle e-book were performed. Instrument used for data collection were observation and questionnaire. A post-test questionnaire was administered to the participants on completion of the tasks. Quantitative data were collected on the tasks performed based on completion time, error frequency and success rate.

Descriptive statistics such as mean and frequency distribution were used to analyse the data collected. The findings revealed that most of the users were satisfied and delighted by the services offered by the app based on the usability qualities evaluated in the study. However, some of the participants had issues with the application. The researchers suggested that the application need a continual improvement to accommodate the challenges especially those that are not familiar with the system. Related to this research is the use of descriptive statistics to analyse the data collected from performance metrics. Although the study under review is a laboratory based usability evaluation study, this present research was conducted in a real work environment by library staff and users of LMS in federal university libraries.

Thuseethan *et al.* (2015) evaluated the usability of LMS in Sri Lankan universities. The aim of the study was to examine the usability of LMS by measuring the effectiveness, flexibility, learnability and attitude of the students. Shackel's model was adopted for this study. Survey method was used for this study. Students of computer science from seven different universities in Sri Lanka were purposively selected for the study. Testing approach was used to perform four tasks based on three features or functions of the system and questionnaire was used to collect subjective data from the users.

The study discovered that learning management systems were effective; students liked the systems and found them easy to access. However, students found the system hard to login to submit their assignments, the systems were not easily learnable as students required help from specialized persons to enable them download course materials and handouts, check notices and complete online quizzes. The study also revealed that the system had much more than required information by users, which made them confused. The study

concluded that every learning system should be evaluated in order to improve the existing usability and also maintain the consistency of the system. This study is related to the present research in the adoption of usability model for the evaluation, however the present research adapted two models to guide the study because of the variables in the study.

A study on the perspective of students and faculty members on the efficiency and usability of e-learning courses at Ajman University, United Arab Emirate was investigated by Eltabir *et al.* (2019). The study investigated the usability of the e-learning courses from the perspective of students and faculty members. The study randomly selected 377 students as sample. Questionnaire and structured interview were used as instruments for data collection. The structured interview was used to gather data for the evaluation of e-learning usability in order to collect qualitative data from the faculty members.

The research revealed that the attitude of the majority of the respondents toward the usability of e-learning courses in the University was agreed, which means that there is a positive agreement for using e-learning courses in the university. Most of the participants viewed the e-learning courses as fairly easy to use, easy to learn and with user user-friendly interface. However, the result of the first year students indicated that the system was difficult and not easy to use, while some students hesitated to express a firm opinion about the usability of e-learning courses system. Interview with faculty members revealed that most staff members were satisfied with moodle system. The study concluded that there was need to conduct more training for the fresh students on how to use e-learning courses system. Similar to the present research is the use of structured interview to collect data on the usability of library management software. However, the present study

adopted purposive sampling technique to obtain the sample size from the population, because of task performance that is focussed on the variables and the modules.

A research was conducted by Solano *et al.* (2016) on usability of interactive software system. The aim of the research was to assess the effectiveness, efficiency and satisfaction with the use of interactive digital television, transactional web and mobile application. Usability testing method was used to conduct formal experiment for the study. Observation, questionnaire and interview were used as instruments for data collection from the participants. Usability testing was performed by eight end-users in a laboratory. Questionnaire and interview were administered to all respondents that participated in the usability test experiment.

The study found some usability issues with the interactive systems as users spent much time to complete the task. The issues were directly related to the ease of learning and use of the applications. From the results of the interview conducted, participants considered the interaction with the application to be unfriendly. The study concluded that end-users were dissatisfied with the control of the application. Similar to this study is the factors used for the assessment of LMS and the use of observation, questionnaire and interview as instruments for data collection and the used of end users. However, the present study used two groups which are experienced and inexperienced users to perform quasi experiment. Formal experiment was not used because real work environment was used and participants were not randomly selected to perform the test.

Mattias and Stagers (2016) conducted a usability evaluation of diabetes mHealth system on effectiveness, efficiency and satisfaction metrics with associated user characteristics.

The study evaluated patients' task performance, satisfaction and the relationship of these measures to user characteristics. The population of the study consisted of 2,317 patients from 18 primary health care databases. Convenience sampling technique was used to select 10 patients who were novices in the use of mHealth system. The metrics in ISO 9241-11 (1998) was utilized for the evaluation. After a brief exploration and training, the patients performed representative task and metrics on effectiveness (task success, errors), efficiency (time on task), satisfaction (system usability scale) and user characteristics was assessed. Data collected was analyzed using microsoft excel spread sheet. Descriptive statistics such as mean and standard deviations were calculated and used in the study.

The study revealed usability issues with mHealth information system. The tasks of exporting and correcting values were the most difficult to perform with most errors, the lowest success rate spent much time on task. The average system usability scale satisfaction score was 80.5 percent indicating good but not excellent. Descriptive results were compared to social demographic data. The results revealed that males were more successful in task completion and younger participants had higher performance score. The study concluded that mHealth system was difficult for novices to learn and perform tasks. This study is related to the present study in term of the metrics and subjective satisfaction factors used to assess performance of LMS. However, this present study uses a self developed questionnaire to measure user subjective satisfaction with the use of LMS in federal university libraries in Nigeria, which allowed the research focused on the content and features of LMS modules.

2.5 Summary of Literature Reviewed

This chapter reviewed relevant literature on library management software and usability. It provided an overview of the concept of library management software, its historical development, library management software in university libraries in Nigeria and the types of LMS used in federal university libraries in Nigeria were described including their features. Usability and usability attributes, usability challenges as well as usability evaluation methods and empirical studies were also reviewed. Furthermore, Nielsen's Model and ISO standard were adapted to support and explain that usability is dependent on the interaction between users (library staff and library patrons) and library management software. Researchers such as Richardson and Mahmood (2012), Khatun and Ahmed (2018) Solano *et al.* (2016) and Mattias and Staggers (2016) concluded from their various studies that the software examined were difficult to learn and use, hence they influence users interaction with software.

Usability issues such as poor navigation, control, terminology and language used, load time, structure of front page, background and text colour, excessive text and inconsistency in the presentation of templates layout frustrate users from using interactive software (Lisa, 2012; Zippa, 2018 & Dowding, 2018). Despite the fact that studies have been carried out on the usability of different interactive software, this review revealed and concluded that, there is no study that has been carried out on the usability of library management software in service delivery in federal university libraries in Nigeria. This means that there is a lack of empirical studies regarding usability of LMS used in university libraries in Nigeria from users point of view. This is the gap that this study identified from the previous study. It is in the light of this that the researcher attempts to

assess the usability of library management software in service delivery in federal university libraries in Nigeria.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Research Design

A combination of Quasi experimental and survey research methods were adopted for this study. Quasi experimental and survey research methods were used because they are necessary for usability testing and task performance that will be assessed on the study in order to identify usability issues. Cohen *et al.* (2011) asserted that quasi experiment is a kind of field experimentation that is conducted outside the laboratory. In an experimental study, one or more independent variables are manipulated by the researcher under controlled condition and their effect observed (Nworgu, 2015). This means that an experiment involves experimental and control groups. The control group provides the baseline for determining the effect of the treatment group, that is, the experimental group which the researcher assigns the subjects to experimental or control on the basis of randomization.

Sauro (2013) and Nworgu (2015) indicated that quasi experiment deals with experiment where subjects in experimental and control groups are not randomly assigned. In this case, the existing groups are used for the experiment. The aim is to maximise the difference between the experimental (treatment) and control groups (Sauro, 2013) for the purpose of finding usability issues. Thus, the researcher used the existing groups which consist of experienced (control) and inexperienced (experimental) groups to conduct usability assessment of LMS. The choice of this method was informed by the nature of the research problem being examined. In line with the variables in the study, a quasi-experimental research method was found to be appropriate because the experimental

group is exposed to treatment. The treatment allowed the researcher to observe the effect on the treated group from which data was collected to draw conclusion on the assessment of the usability of LMS in service delivery in federal university libraries in Nigeria.

In addition to quasi experimental, survey research method was used for this study. This method was also considered suitable for this research because data collected from a sample of individual about the usability of LMS being studied and findings from these individuals were used to generalize and draw conclusion about the usability of library management software used in service delivery in federal university libraries, Nigeria. Survey research is a form of descriptive research used to collect and analyse data from population or sample of the population with the intention of describing the nature of existing condition or determining the relationships that exist between specific events through the use of personal interview, opinion scale and questionnaire (Cohen *et al.*, 2011). According to Babbie (2008), descriptive study involves summarizing factual information into empirical generalizations from a large population or a sample population. This implies that data from a sample of respondents that relate to the problem being investigated and findings are generalised to the entire population (Nworgu, 2015).

3.2 Population of the Study

The population of the study was 51,524 library staff and registered undergraduate students from four federal university libraries. The federal universities are Federal University of Technology, Akure; Federal University of Technology, Owerri; University of Benin and University of Jos. Selection was achieved based on the availability of installed and functioning LMS in Cataloguing, Circulation and OPAC Units of the federal university libraries. Nworgu (2015) stated that population is the entirety of individuals,

subjects, objects, groups and institutions that have one or more common characteristics that are of interest to the researcher. Nworgu (2015) further explained that population defines the limits within which the research findings are applicable and the factors which determines the choice of population is the problem under investigation. Appendix N presents the federal universities with the LMS used in their respective libraries and Table 3.1 presents population for the study.

Table 3.1: Distribution of Population for the Study

S/ N	Federal Universities	LMS	Number of Library Staff	Undergraduate Students
1	Federal University of Technology, Akure	SLAM	27	10480
2	Federal University of Technology, Owerri	Alexandria	79	11771
3	University of Benin, Benin	NewGenLib	192	14148
4	University of Jos, Jos	Koha	86	14741
	Total		384	51140
	Grand Total			51524

Source: The Administrative section of the respective university libraries, 2017

Note: Library staff constitutes all professional and para-professional staff in selected university libraries

3.3 Sample and Sampling Technique

Purposive sampling technique was adopted for this study. In purposive sampling, the researcher selects or hand-picks the individuals to be included in the sample based on the judgment that such persons possess particular characteristics being sought (Cohen *et al.*, 2011 & Nworgu, 2015). As such, the researcher obtained a representative sample that is satisfactory based on one's knowledge of the population, its elements and aim of the

research (Nworgu, 2015). In line with the opinion of Nworgu (2015) and Cohen *et al.* (2011), the researcher obtained sample respondents based on their experience or inexperience in the use of LMS.

Dumas and Redish (1999) posited that five to twelve (5-12) participants are needed for usability measurement of any system, Nielsen (2012) argued that measuring with five (5) participants can discover as much as 85% usability issues, but if participants differ in experience, each group should consist of at least five (5) participants (Francik, 2015). Six and Macefield (2016) also recommended the use of five to ten (5-10) as a baseline for valid results.

Since the study is limited to Cataloguing, Circulation and OPAC activities, the researcher sampled 30 library staff and 24 undergraduate students from each of the sampled federal universities. However, in Federal University of Technology, Akure, the researcher sampled 20 library staff because of the limited number of librarians in Cataloguing Unit of the library. The 30 library staff sampled consist of 10 librarians that have relevant work experience in cataloguing and classification module, five librarians that have relevant work experience in circulation and the other 15 were library staff- para professional who do not have the required experience. Due to the limited number of the librarians in the Federal University Library of Akure, five (5) librarians that have relevant work experience and five library staff who did not have the working experience in cataloguing and classification were sampled. Similarly, 12 of the 24 undergraduate students were sampled based on their unfamiliarity (new users) with OPAC and the other 12 consisted of students that were familiar (experienced) with OPAC from the sampled federal

universities. The experienced and inexperienced users were sampled from the registered library users that were present in the library at the time of the research.

In all, the researcher sampled 206 comprising of both library staff and students participants as sample size for the study from Federal University of Technology, Akure; Federal University of Technology, Owerri; University of Benin, Benin and University of Jos, Jos. Thus, the LMS selected were representative software used for library services and were currently running at the time of the research in these federal university libraries.

Table 3.2 shows the sample distribution:

Table 3.2: Library staff and Students' Sample Distribution of the study

S/N	Federal University, Nigeria	Cataloguing		Circulation		OPAC		Total
		Library Staff		Library Staff		Undergraduate Students		
		Exp	Inexp	Exp	Inexp	Exp	Inexp	
1	Federal University of Technology, Akure	5	5	5	5	12	12	44
2	Federal University of Technology, Owerri	10	10	5	5	12	12	54
3	University of Benin	10	10	5	5	12	12	54
4	University of Jos	10	10	5	5	12	12	54
	Total	35	35	20	20	48	48	206

3.4 Instruments for Data Collection

The instruments that were used to collect data for this study were direct observation, questionnaire and structured interview. The study used observation to collect data during test sessions. Observation is a method that is commonly used in studies relating to

behavioural sciences (Kothari & Garg, 2014). Observation allows the investigator to collect data from naturally occurring social situations (Cohen *et al.*, 2011). This implies that the researcher can watch directly at what is taking place. The purpose of adopting observation is to allow the researcher to carefully collect data by directly watching and recording participants' interaction with LMS and their attitudes towards the use of LMS in accomplishing library tasks in real work environment. With this method, bias can be eliminated because the data collected is based on what is currently happening (Kothari & Garg, 2014).

A structured observation form titled 'Participants Observation and Recording Form' (PORF) for the assessment of the usability of LMS in service delivery was designed by the researcher and validated by the team of supervisors and a usability specialist. The information on the PORF include participant, task completed, task completed with help, task not completed, task completion time and tasks scenario (see Appendix E). According to Ibrahim (2013), observation involves noting and recording something about a phenomenon, with an instrument. The researcher who is the observer adopts a passive, non-intrusive role but noting down the incidence of the variables being studied.

The researcher used stopwatch to time participants during the usability test session and recorded the time it took the participants to complete each task on PORF. Facial expressions of frustration and confusion were also noted and recorded during the observation. The researcher considered direct observation as a suitable method of collecting data for the assessment of the usability of LMS because it allowed the researcher to see whether the users can effectively and efficiently perform library tasks with or without struggle. Therefore, the researcher directly watched how real users

(participants) interacted with LMS in their working environment and noted their frustrations, confusion, failures, successes and the time it took them to perform each task.

Tasks aimed at cataloguing library books, circulating library materials such as charging and discharging, registration of users and information search were performed by participants on Alexandria, SLAM, Koha and NewGenLib to assess users’ effectiveness and efficiency with which users achieve their objectives. Objectives one and two contained six tasks for library staff, three tasks each for objective one and two, while four tasks were designed for undergraduate students, implying two tasks for each objective.

The measurement was based on performance metrics, which included time on task and task success or completeness according to Mifsud (2015) and ISO/IEC 9126-4 (2001).

Table 3.4 shows the metrics

Table 3.3: LMS Dimension with Metrics

S/N	Dimensions	Objectives	Metrics
Obj. 1	Effectiveness of LMS	Completeness	Task completion/success rate- successfully task(s) carried out and completed with or without help by users.
Obj. 2	Efficiency of LMS	Resource expended or effort put in achieving a set of goal	Time on task- amount of time spent to complete library task(s) with or without help by users

Questionnaire was another instrument used for the study. The questionnaire titled “Assessment of the Usability of Library Management Software in Service Delivery in Federal University Libraries in Nigeria” (AULMaSSDFUNL) (Appendices F-H). The questionnaire was validated by the three (3) supervisors, usability expert in human computer interaction and an expert in measurement and evaluation. Questionnaire was

employed because it is easy to administer and facilitate the process of analysis and generalisation (Nworgu, 2015). Since it can be used either as a stand-alone measure or used along with other measures at the end of usability testing to measure the subjective attitudes of users toward the software tested (Dumas, 2003), the researcher administered questionnaire to participants after usability testing to assess their subjective attitudes or opinion towards the interaction with LMS.

The questionnaire contained four sections: Section “A” contained demographic information about the participants; Section “B” depicted participants’ subjective attitudes on the ease of use of LMS; Section “C” determined the satisfaction derived from using LMS and Section “D” described the challenges participants encountered while using LMS. In all, the instrument contained 36 items for cataloguing, 35 items for circulation and 35 items for OPAC which were close ended questionnaire administered to participants. The items in the questionnaire were factors deemed to be important in determining the usability of LMS in federal university libraries in Nigeria. Thus, this method facilitated instant collection of feedback from users to address objectives three to five (3-5) in the study.

Interview, which was the third instrument, was used for exploring user interaction during usability evaluation. It involves eliciting information from the respondent through verbal interaction between the participants and the researcher (Folstad, 2017). Either structured or unstructured, interview allows user’s verbal report to be collected after the completion of usability test. Information gathered from interview served as secondary data for areas on usability of a software that may not have been included in the questionnaire. Kothari and Garg (2014) opined that interview can be used to cross examine participants who are

supposed to have knowledge about the under studied and the information obtained is recorded. Similarly, Nworgu (2015) argued that interview can be used as a follow-up method to further verify the data collected or the result of the research. Thus, the researcher adopted structured interview as a follow-up to results and got more insights from experienced and inexperienced participants towards the use of LMS in their respective university libraries. The structured interview contained five question items (See Appendix I).

In all, 48 out of 206 participants were purposively selected and interviewed from the four participating federal university libraries. Six (6) experienced and six (6) inexperienced participants from each university library represented cataloguing, circulation and OPAC in the interview. They were purposively selected based on their ability to interact with the module and computer system interface. The interview was conducted immediately after the participants completed the task performance.

3.5 Validity of the Data Collection Instrument

According to Singh (2007), the instrument for data collection is said to be valid when it is able to produce correct responses from the subject of the study. Validation of the instruments for this study, ensures that the instruments measure the variables they are designed to measure. In order to validate the instruments for data collection, the researcher subjected the instruments to content and construct validity. The content validity determines the extent to which the instrument adequately covers all the areas of the content of the study by looking at the content of the instrument along with the content of the aspect of the study (Nworgu, 2015). In the same vein, construct validity is a psychological term which measures behaviour in order to determine how often behaviour

happens or occurs (Nworgu, 2015). The essence was to assess the extent to which the instruments measure the content of usability of LMS. So, the researcher subjected the instruments to supervisors, content reader, experts in human computer interaction, (Department of Computer Science, Veritas University Abuja and Federal University of Technology, Minna) measurement and evaluation (Ibrahim Badamasi Babangida University, Lapai). The suggestions from those consulted were used to effect corrections and improve upon the items, structure and format of the instrument.

3.6 Reliability of the Data Collection Instrument

Reliability of an instrument is the degree of consistency with which the instrument measures whatever it is measuring (Cohen *et al.*, 2011). In other words, when an instrument used as a means of testing is bringing out result that is consistent to the previous result, then the instrument is said to be reliable. The reliability of the questionnaire instrument was established by conducting a pilot study at Ibrahim Badamasi Babangida University Library, Lapai. The researcher selected 30 library staff (Librarians and para-professional) and 24 library patrons to perform a usability test with Koha library management software. This is in line with the view of Singh (2007) who stated that pilot test is a ‘trial run’ that is done on a much smaller scale than the main study.

The researcher used test-retest technique to administer the instrument to participants and observations were recorded and participants were also requested to fill the questionnaire. Two weeks later, the researcher retested the same participants with the same instrument and observations were recorded and questionnaire filled. The test and retested results were analyzed using Pearson Product Correlation Coefficient in order to measure the consistency of the instrument at 0.05 level of significance. The results are 0.82, 0.91 and

0.84 for ease of use, satisfaction and challenges of LMS, respectively (see Appendix M). Since the P-values are greater than 0.7, therefore, the questionnaire instrument is reliable (Kothari & Garg, 2014).

3.7 Method of Data Collection

The researcher collected an introductory letter from the Head of Department of Library and Information Technology (LIT) to the selected Federal university libraries in Nigeria. The researcher, with the help of research assistants who were conversant of LMS module conducted usability test on LMS user interface with two distinct groups of users (library staff and library patrons). The head library staff group was further divided into two groups (the cataloguing and the circulation groups). Both library staff and library patron groups consisted of the experienced and inexperienced users. The inexperienced group consisted of participants that have basic knowledge and skills of computer operation but lack knowledge on the use of LMS, while the experienced group defined those that have been using LMS to catalogue, circulate (library staff) or search for library materials (library patrons). Each of the participants performed usability test at a time.

Since the inexperienced group had no required experience, they were given hands-on training and allowed to practice and explore Alexandria (FUT, Owerri), SLAM (FUT, Akure), Koha (University of Jos, Jos) and NewGenLib (University of Benin, Benin) LMS before performing the predetermined tasks. Cataloguing participants were given more time to practice or explore cataloguing module. This process allowed familiarization with the LMS. This preliminary practice and exploration was not needed for experienced users (library staff and undergraduate students), since they are familiar with the process of cataloguing, circulation and information searching

Before the commencement of the usability test, the researcher explained the experimental procedures for performing the task. Both library staff and library users were encouraged to use the LMS to perform predetermined tasks. The instruction given to the participants included that they should work on their own to complete the entire task given to them, note the problems they encountered while performing the task, skip the task that is difficult to accomplish but if they feel that difficult tasks could be accomplished with assistance, they could call for help and participants that took much time to complete a task were asked to move on to the next task.

Three different sets of usability tests were conducted. The first and second sets of tasks were performed by library staff. Six description (cataloguing) tasks were performed by experienced and inexperienced participants. Similarly, six circulation (registration of users, charging and discharging) tasks were performed by experienced and inexperienced participants. The third set of tasks was performed by library users. Four search tasks were performed by experienced and inexperienced participants. Thus, the experienced group started the usability test, while the researcher observed and recorded the task success, errors committed and time taken (task completed, task completed with help, task not completed and task completion time) to perform each task by the participants on the PORF. At the end of each task performed, the researcher administered copies of questionnaire to participants to fill. Afterwards, the inexperienced participants also carried out the same usability test. Subsequently, circulation and OPAC experienced and inexperienced participants were given predetermined tasks to perform in respect to circulation and OPAC, respectively.

Thereafter, questionnaire was administered to the participants to fill. The researcher also selected participants from each group to interview after the usability test session and their responses were recorded. Thus, the researcher, with the aid of research assistants conducted the experiment, interviewed and administered questionnaire to the participants after a pre-meeting with each of them. The quasi experiment, administration of questionnaire and interview were done within nine weeks.

3.8 Method of Data Analysis

Descriptive statistics was used to analyse the data collected from observation and questionnaire instruments. The results were computed and presented in tables and graphical forms. The data analysed also used mean score comparison.

Effectiveness was calculated in term of tasks completion rate. Thus, number of tasks successfully completed was calculated to obtain the overall effectiveness of LMS. The completion rate was calculated by using the number of tasks completed successfully.

Thus:

$$\text{Effectiveness} = \frac{x}{\sum n} \times 100 \text{ (ISO, 1998; Mifsud, 2015)}$$

x = Number of tasks completed

$\sum n$ = Total number of tasks taken

Further calculation of effectiveness was based on errors. Thus,

$$\text{Error} = \frac{a}{\sum n} \times 100$$

a = Number of tasks not completed

$\sum n$ = Total number of tasks taken

Similarly, efficiency was calculated in terms of time taken to complete task by the participants. Therefore, amount of time taken to successfully complete task(s) was calculated to obtain the overall relative efficiency of LMS. The time taken by participants who completed their tasks in relation to the total time taken by all participants was used. Thus:

$$\text{Efficiency} = \frac{\sum nt}{\sum t} \times 100 \text{ (ISO, 1998; Mifsud, 2015)}$$

nt = Total time on tasks completed

t = Total time on task taken

The classification of System Usability Scale (SUS) modified by Farrahi *et al.* (2019) was adapted for acceptable region of LMS usability. Therefore, the benchmark scores are, 0-25 is considered worst, 25.5 – 52 is poor, 53- 67 is considered okay, 67.5- 74.5 is good, 75- 85 is excellent and 85.5 - 100 is best. Therefore, from 53 – 100 score is considered an acceptable region.

Kruskal-Wallis test was used to determine whether there are significant difference in the effectiveness and efficiency of cataloguing, circulation and OPAC modules among LMS used in service delivery in federal university libraries in Nigeria. H statistic was calculated manually and the table value of χ^2 at 0.05 level of significant was used to either accept or reject the H_0 . Kruskal-Wallis test was calculated using this formula thus:

$$H = \left(\frac{12}{n(n+1)} \sum_{j=1}^c \frac{t_j^2}{n_j} \right) - 3(n+1)$$

Responses from interview were interpreted alongside observed behaviours and questionnaire.

CHAPTER FOUR

4.0. RESULTS AND DISCUSSION

4.1 Response Rate for the Study

A total of 1044 tasks were performed by library staff and registered undergraduate students of the selected federal universities. A breakdown of the tasks performance from the different universities is presented in Table 4.1a. The Table shows the number of tasks performed by selected library staff and students of selected universities.

Table 4.1a: Performance Rate of Library Staff and Undergraduate Students

University	Library management software	Library Staff		UG Students
		Number of tasks performed with cataloguing module	Number of tasks performed with circulation module	Number of tasks performed with OPAC module
FUTA, Akure	SLAM	60	60	96
FUTO, Owerri	Alexandria	120	60	96
	a			
Uni. of Benin, Benin	NewGenLi	120	60	96
	b			
Uni of Jos, Jos	Koha	120	60	96
Total		420	240	384
Grand total			1044	

Key: UG = Undergraduate

Table 4.1a showed the performance rate of the participants according to their university libraries. All participants from the sampled federal university libraries performed either cataloguing, circulation or OPAC tasks. Four hundred and twenty (420) tasks were performed by cataloguing participants, 240 tasks were also performed by circulation

participants and 384 tasks were performed by OPAC participants. The researcher observed each participant as they performed the tasks and observations were noted and documented on the Participants Observation and Recording Form (PORF). Participation was at 100 % as all participants selected performed the tasks assigned to them. The high response rate could be as a result of the researcher’s presence to administer the tasks in each of the university sampled for the study. Results of the performance as documented on PORF were presented based on the objectives formulated. The response rate of the administered questionnaire from each university is presented in Table 4.1b

Table 4.1b: Response Rate of the Administered Questionnaire from Selected Universities

University	LMS	Cat.	Cir	OPAC	Quest. Admin	Quest. Returned	Percentage
FUTA, Akure	SLAM	10	10	24	44	44	100
FUTO, Owerri	Alexandria	20	10	24	54	54	100
Uni. of Benin, Benin	NewGenLib	20	10	24	54	54	100
Uni of Jos, Jos	Koha	20	10	24	54	54	100
		70	40	96	206	206	100

Key: Cat = cataloguing; Cir = Circulation; OPAC = Online Public Access Catalogue; Quest = Questionnaire; Admin = Administered

Table 4.1b showed the response rate of the respondents as well as their distribution by their university libraries. A total of 206 copies of questionnaires were administered to library staff and undergraduate students respectively. At Federal University of Technology, Akure, 44 copies of questionnaire were administered, in Federal University of Technology, Owerri, University of Benin, Benin and University of Jos, Jos, 54 copies of questionnaire were administered to each of them. After the performance, questionnaire were administered and successfully filled and returned, giving a response rate of 100%. A total

of twenty four (24) participants, consisting of two experienced and inexperienced were interviewed for cataloguing, circulation and OPAC modules in each federal university library visited. They were purposively selected based on their ability to interact with the module and computer system interface. The high response rate could be as a result of the researcher's presence to administer the questionnaire and interview participants in each of the university sampled for the study.

4.2 Data Presentation and Analysis

Data of the various performance carried out as documented on PORF and results analysis were presented based on the objectives formulated.

4.2.1 Research Questions 1: What is the effectiveness of LMS in service delivery in federal university libraries?

To examine the effectiveness of LMS in service delivery in federal university libraries under study, participants performed defined library tasks. Experienced and inexperienced participants used LMS cataloguing module to describe library materials, circulation module to register users, charge and discharge books and OPAC module was used to search for availability of books in the library. Table 4.2- 4.19 showed the time on tasks, recapitulation of time in average on tasks performed and completion rate used to determine the effectiveness of LMS in percentage.

4.2.1.1 Effectiveness of cataloguing module of LMS

Table 4.2: Time (in seconds) on Tasks on Effectiveness of SLAM Cataloguing Module

Participants (library staff)	Experienced			Inexperienced		
	Task 1: Descrip of of lib items	Task 2: Descrip of Lib item	Task 3: Descrip of Lib item	Task 1: Descrip of Lib item	Task 2: Descrip of Lib item	Task 3: Descrip of Lib item

Participant 1	189	176	191	389 ^C	351 ^C	351 ^C
Participant 2	127	201	182	392 ^{NC}	342 ^C	343 ^C
Participant 3	180	210	187	345 ^C	367 ^{NC}	356 ^C
Participant 4	179	146	192	386 ^{NC}	390 ^{NC}	367 ^{NC}
Participant 5	182	189	204	361 ^C	355 ^C	359 ^C

Key: Descrip = Description; Lib = Library

Table 4.2 showed the time taken to describe library books with SLAM cataloguing module. The least time on tasks 1, 2 and 3 were 127, 146 and 182 seconds and the highest time were 189, 210 and 204 seconds with experienced users. The Table also showed that not all inexperienced users completed the tasks. The least time spent to perform the tasks were 341, 342 and 343 seconds and the highest time taken to perform the tasks were 392, 390 and 367 seconds (tasks 1, 2 and 3).

Table 4.3: Time (in seconds) on Tasks on Effectiveness of Alexandria Cataloguing Module

Participants (library staff)	Experienced			Inexperienced		
	Task 1: Description of lib items	Task 2: Descrip of lib item	Task 3: Descrip of lib item	Task 1: Descrip of lib item	Task 2: Descrip of lib item	Task 3: Descrip of lib item
Participant 1	259	312	258	602 ^{NC}	583 ^{NC}	559 ^C
Participant 2	255	269	231	617 ^{NC}	591 ^{NC}	592 ^{NC}
Participant 3	216	251	307	530 ^C	522 ^C	548 ^C
Participant 4	234	232	234	533 ^{NC}	579 ^{NC}	590 ^{NC}
Participant 5	247	253	301	562 ^C	543 ^C	539 ^C
Participant 6	271	238	261	526 ^C	541 ^C	536 ^C
Participant 7	301	227	234	499 ^C	512 ^{NC}	601 ^{NC}
Participant 8	242	268	259	593 ^{NC}	539 ^C	531 ^C
Participant 9	391	272	247	531 ^C	545 ^C	517 ^C
Participant 10	303	302	302	592 ^{NC}	601 ^{NC}	571 ^C

The result in Table 4.3 revealed the time taken to perform cataloguing tasks with Alexandria LMS. The least time experienced participants spent to complete tasks 1, 2 and 3 were 216, 227 and 231 seconds and the highest time spent on the same tasks were 303, 312 and 307 seconds. The Table also showed that not all inexperienced participants completed the tasks. The least time spent to perform tasks 1, 2 and 3 with inexperienced participants were 499, 512 and 517 seconds and the highest time taken to performed the same tasks were 617, 601 and 601.

Table 4.4: Time (in seconds) on Tasks on Effectiveness of NewGenLib Cataloguing Module

Participants (library staff)	Experienced			Inexperienced		
	Task 1: Descrip of lib items	Task 2: Descrip of lib item	Task 3: Descrip of lib item	Task 1: Descrip of lib item	Task 2: Descrip of lib item	Task 3: Descrip of lib item
Participant 1	241	279	249	601 ^C	598 ^C	599 ^C
Participant 2	380	315	297	699 ^{NC}	649 ^C	662 ^{NC}
Participant 3	314	372	302	619 ^C	679 ^{NC}	610 ^C
Participant 4	299	321	287	590 ^C	635 ^C	605 ^C
Participant 5	318	361	331	687 ^{NC}	648 ^C	608 ^C
Participant 6	260	269	249	614 ^C	594 ^C	597 ^C
Participant 7	294	351	328	660 ^{NC}	710 ^{NC}	694 ^{NC}
Participant 8	359	362	361	651 ^{NC}	619 ^C	612 ^C
Participant 9	367	318	354	679 ^{NC}	635 ^{NC}	687 ^{NC}
Participant 10	247	289	240	696 ^{NC}	674 ^{NC}	677 ^{NC}

Table 4.4 revealed the time spent to perform cataloguing tasks with NewGenLib LMS. The least time spent on tasks 1, 2 and 3 were 241, 269 and 240 seconds and the highest time were 380, 372 and 361 seconds with experienced participants. Table 4.4 also showed that only 16 tasks were completed with inexperienced participants. The least

time inexperienced participants spent to perform tasks 1, 2 and 3 were 590, 594 and 597 seconds and the highest time taken to perform the same tasks were 699, 710 and 694 seconds.

Table 4.5: Time (in seconds) on Tasks on Effectiveness of Koha Cataloguing Module

Participants (library staff)	Experienced			Inexperienced		
	Task 1: Descrip of lib items	Task 2: Descrip of lib item	Task 3: Descrip of lib item	Task 1: Descrip of lib item	Task 2: Descrip of lib item	Task 3: Descrip of lib item
Participant 1	915	778	887	1698 ^C	1681 ^C	1631 ^C
Participant 2	861	889	781	1603 ^{NC}	1441 ^{NC}	1572 ^{NC}
Participant 3	947	892	816	1637 ^C	1628 ^C	1620 ^C
Participant 4	851	801	913	1491 ^{NC}	1607 ^{NC}	1742 ^{NC}
Participant 5	825	896	899	1597 ^{NC}	1466 ^{NC}	1678 ^{NC}
Participant 6	834	949	1021	1515 ^{NC}	1551 ^{NC}	1529 ^{NC}
Participant 7	901	840	913	1556 ^{NC}	1539 ^{NC}	1496 ^{NC}
Participant 8	897	908	857	1615 ^{NC}	1558 ^{NC}	1612 ^C
Participant 9	919	825	819	1475 ^{NC}	1661 ^C	1697 ^{NC}
Participant 10	834	904	775	1608 ^{NC}	1546 ^{NC}	1437 ^{NC}

Result in Table 4.5 revealed the time taken to perform cataloguing tasks with Koha LMS. The least time experienced participants spent to complete tasks 1, 2 and 3 were 825, 825 and 816 seconds and the highest time spent on the same tasks were 947, 949 and 1021 seconds. Table 4.5 further showed that majority of inexperienced participants could not complete the predetermined tasks. The least time spent to perform tasks 1, 2

and 3 with inexperienced participants were 1475, 1441 and 1437 seconds and the highest time taken to perform the same tasks were 1698, 1681 and 1697.

Table 4.6: Participants' Time (in seconds) on Tasks for Effectiveness of Cataloguing Module of LMS for Experienced and Inexperienced users

LMS	SLAM						Alexandria							
	Participants			Experienced			Inexperienced			Experienced			Inexperienced	
Task: Description of library items	T1 (secs)	T2 (secs)	T3 (secs)	T1 (secs)	T2 (secs)	T3 (secs)	T1 (secs)	T2 (secs)	T3 (secs)	T1 (secs)	T2 (secs)	T3 (secs)		
Time on task completed with or without help	877.00	907.00	936.00	1085.00	1048.0	1409.0	2619.0	2564.0	2614.0	2,648.00	2,690.00	3,801.00		
Ave time on task completed with or without help	175.40	181.14	187.20	361.67	349.33	352.25	261.90	256.40	261.40	529.60	538.00	543.00		
Time on task not completed	-	-	-	778.00	757.00	367.00	-	-	-	2,937.00	2,866.00	1783.00		
Ave time on task not completed	-	-	-	389.00	378.50	367.00	-	-	-	587.40	573.20	594.33		
Total time on tasks taken	877.00	907.00	936.00	1863.00	1805.0	1777.0	2619.0	2564.0	2614.0	5585.0	5556.0	5584.00		
Average total time on tasks taken	175.40	181.14	187.20	372.60	361.00	355.40	261.90	256.40	261.40	558.50	555.60	558.40		

Keys: LMS = Library Management Software; T= Task, Secs = seconds

Table 4.6: Participants' Time (in seconds) on Tasks for Effectiveness of Cataloguing Module of LMS for Experienced and Inexperienced Users (Cont.)

LMS	NewGenLib						Koha							
	Participants			Experienced			Inexperienced			Experienced			Inexperienced	
Task: Description of library items	T1 (secs)	T2 (secs)	T3 (secs)	T1 (secs)	T2 (secs)	T3 (secs)	T1 (secs)	T2 (secs)	T3 (secs)	T1 (secs)	T2 (secs)	T3 (secs)		
Time on task completed with or without help	3362.00	3296.00	3238.00	2424.00	3743.00	3631.0	8824.0	8682.0	8747.0	3335.00	4970.00	4948.00		
Ave time on task completed with or without help	336.20	329.6	323.80	606.00	623.83	605.17	882.40	868.20	874.70	1667.50	1656.67	1649.33		
Time on task not completed	-	-	-	4072.00	0	0	-	-	-	12460.0	10708.0	11066.0		
Ave time on task not completed	-	-	-	678.67	674.50	680.00	-	-	-	1557.50	1529.71	1580.86		

Total time on tasks taken	3362.00	3296.00	3238.00	6496.00	6440.0	6351.0	8824.0	8682.0	8747.0	15795.0	15678.0	16014.0
					0	0	0	0	0	0	0	0
Average total time on tasks taken	336.20		323.80	649.60	644.00	635.10	882.40	868.20	874.70	15790.5	1567.90	1601.40
		329.6								0		
		0										

Keys: LMS = Library Management Software; T= Task, Secs = seconds

Result in Table 4.6 showed that all experienced participants completed the cataloguing tasks. The result in Table 4.6 revealed that Koha participants had the highest average time of 882.40 (task 1), 868.20 (task 2) and 874.70 seconds (task 3). This was followed by NewGenLib participants with mean time of 336.20 (task 1), 329.60 (task 2) and 323.80 (task 3) seconds. Also revealed in the Table is SLAM participants with the lowest average time of 175.40 (task 1), 181.14 (task 2) and 187.20 seconds (task 3) indicating a major difference in time used to complete cataloguing tasks.

Furthermore, the result in Table 4.6 revealed the average time of inexperienced participants on cataloguing library material. The Table indicated that SLAM inexperienced participants completed cataloguing task with the lowest average time of 361.67, 349.33 and 352.25 seconds for tasks 1, 2 and 3. Alexandria inexperienced participants that completed cataloguing task spent an average time of 529.60, 538.00 and 543.00 seconds in completing cataloguing tasks 1, 2 and 3. Table 4.6 further showed that NewGenLib inexperienced participants completed tasks 1, 2 and 3 with an average time of 606.00, 623.83 and 605.17 seconds and the highest average time spent on tasks completion was 1667.50, 1656.67 and 1649.33 seconds for tasks 1, 2 and 3 with Koha. Inexperienced participants who committed errors while cataloguing library items spent longer time to complete the predetermined task(s). Closed observation revealed that some of the participants were confused and could not complete the tasks across all the LMS study.

Interview with SLAM, Alexandria, NewGenLib and Koha participants revealed that all the LMS were used to describe library materials. The participants interviewed responded to the question: (Would you recommend this software to another university library?)

Alexandria, NewGenLib and Koha respondents said 'yes', but SLAM participants expressed their displeasure toward the non web-based of SLAM LMS, hence did not recommend the software to any academic library.

Table 4.7: Distribution of Participants' Completion Rate of Tasks Performed for Effectiveness of Cataloguing Module of LMS

LMS	SLAM			Alexandria			NewGenLib			Koha														
Number of Participants	5			5			10			10			10			10								
Task	T1	T2	T3	T2	T3	T1	T2	T3	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3
Number of tasks completed with or without help	5	5	5	3	3	4	10	10	10	5	5	7	10	10	10	4	6	6	10	1	1	2	3	3
Number of tasks not completed	0	0	0	2	2	1	0	0	0	5	5	3	0	0	0	6	4	4	0	0	0	8	7	7

Key: LMS= Library Management Software; T= Task

Table 4.7 revealed the distribution of tasks completion used to determine the effectiveness of cataloguing module. The results showed that all experienced participants completed 105 cataloguing tasks. The Table further revealed that not all inexperienced participants completed cataloguing tasks given to them. Of the 105 tasks performed by 35 participants, only 52 tasks were completed without or with help. From Table 4.7, 10 tasks were completed with SLAM, 17 tasks were completed with Alexandria, 16 tasks were also completed with NewGenLib and 9 tasks were completed with Koha. It can be seen from Table 4.7 that SLAM had the highest number of task completed, followed by Alexandria, next was NewGenLib and the least number of tasks completed was with Koha LMS. Closed observation showed that many inexperienced participants completed the tasks with help across the LMS under study and 53 tasks could not be completed.

Effectiveness of cataloguing module was further calculated and represented as percentage using completion rate. Thus, effectiveness = $\frac{x}{\sum n} \times 100$. The results are presented in Figure 4.1

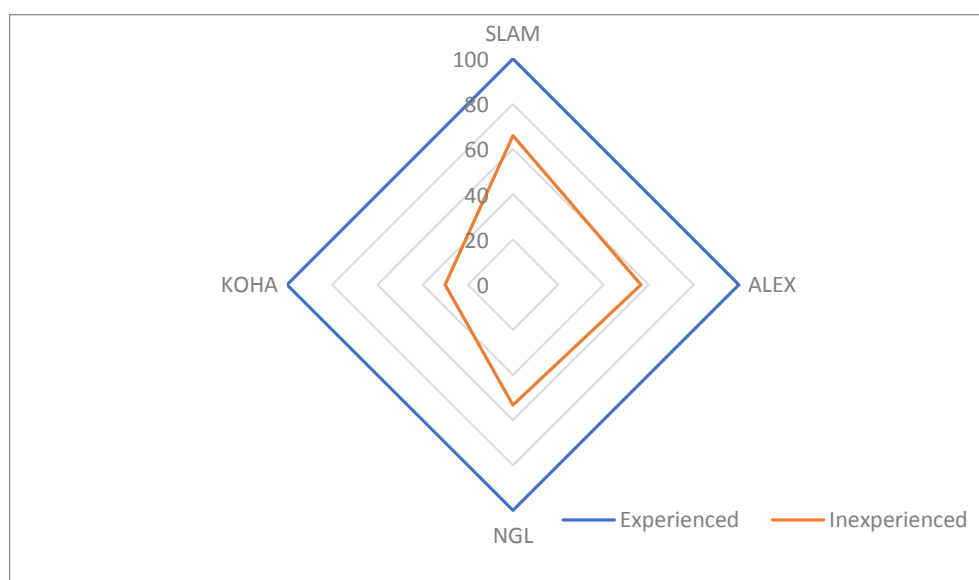


Figure 4.1: Percent Effectiveness of Cataloguing Module

Figure 4.1 showed the percentage of cataloguing tasks successfully completed with LMS module. The Figure depicts tasks completion rate. Figure 4.1 revealed that all experienced participants completed cataloguing tasks. Hence, they all attained 100 % effectiveness. The graph also showed that not all inexperienced participants completed cataloguing tasks as indicated in completion rate in Figure 4.7. The Figure showed that the completion rate (represented as percentage) for SLAM was 66.00 %, Alexandria was 56.67 %, NewGenLib was 53.33% and Koha was 26.67 %. This means that error rate with SLAM was 34.00 %, Alexandria was 43.33 %, NewGenLib is 46.67 % and Koha is 73.33 %.

4.2.1.2 *Effectiveness of circulation module of Library Management Software*

Table 4.8: Time (in seconds) on Tasks on Effectiveness of SLAM Circulation Module

Participants Tasks: Circulation routines	Experienced			Inexperienced		
	Task 1: Reg of lib user	Task 2: Charging of lib item	Task 3: Discharging of lib item	Task 1: Reg of lib user	Task 2: Charging of lib item	Task 3: Discharging of lib item
Participant 1	101	81	60	189 ^C	111 ^C	101 ^C
Participant 2	103	75	58	210 ^{NC}	126 ^C	99 ^C
Participant 3	99	78	65	211 ^{NC}	147 ^{NC}	127 ^{NC}
Participant 4	103	80	55	199 ^C	129 ^C	101 ^C
Participant 5	99	87	50	203 ^C	123 ^C	103 ^C

Key: Reg = Registration; Lib = Library; C = Completed; NC = Not Completed

Table 4.8 revealed the time taken to register library user (task 1), charge (task 2) and discharge (task 3) library book to and from users. The highest time taken on tasks 1, 2 and 3 were 103, 87 and 65 seconds and the least time spent on the same tasks were 99, 75 and 50 seconds with experienced participants. Table 4.8 also revealed that not all inexperienced participants completed tasks 1, 2 and 3. The highest time spent to perform

the tasks were 211, 147 and 127 seconds and the lowest time taken to perform the same tasks were 189, 111 and 99 seconds with inexperienced participants.

Table 4.9: Time (in seconds) on Tasks on Effectiveness of Alexandria Circulation Module

Participants	Experienced			Inexperienced		
	Task 1: Reg of lib user	Task 2: Charging of lib item	Task 3: Discharging of lib item	Task 1: Reg of lib user	Task 2: Charging of lib item	Task 3: Discharging of lib item
Participant 1	126	79	69	236 ^{NC}	149 ^{NC}	117 ^C
Participant 2	121	97	65	228 ^C	136 ^C	138 ^{NC}
Participant 3	138	81	78	215 ^C	131 ^C	119 ^C
Participant 4	126	76	72	233 ^{NC}	146 ^{NC}	119 ^C
Participant 5	129	88	67	211 ^C	139 ^C	115 ^C

Key: Reg = Registration; Lib = Library; C = Completed; NC = Not Completed

The result in Table 4.9 revealed the time taken to register library users, charge and discharge tasks with Alexandria LMS. The least time experienced participants spent to complete tasks 1, 2 and 3 were 121, 79 and 65 seconds and the highest time spent on the same tasks were 138, 97 and 65 seconds. Table 4.9 also showed that not all inexperienced participants completed circulation tasks. The least time spent to register library user was 211 seconds, ‘charge’ was 131 seconds and ‘discharge’ was 115 seconds and the highest time spent on the same tasks were 233, 149 and 138 seconds (tasks 1, 2 and 3) with inexperienced participants.

Table 4.10: Time (in seconds) on Tasks on Effectiveness of NewGenLib Circulation Module

Participants	Experienced			Inexperienced		
	Task 1: Reg of lib user	Task 2: Charging of lib item	Task 3: Discharging of lib item	Task 1: Reg of lib user	Task 2: Charging of lib item	Task 3: Discharging of lib item
Participant 1	133	102	65	263 ^{NC}	207 ^{NC}	127 ^{NC}
Participant 2	128	99	79	225 ^C	148 ^C	118 ^C
Participant 3	140	98	74	239 ^C	161 ^C	116 ^C

Participant 4	155	104	75	229 ^C	152 ^C	109 ^{NC}
Participant 5	129	87	56	258 ^{NC}	199 ^{NC}	119 ^C

Key: Reg = Registration; Lib = Library; C = Completed; NC = Not Completed

Result in Table 4.10 showed the time taken to perform circulation tasks with NewGenLib LMS. The least time experienced participants spent to complete tasks 1, 2 and 3 were 128, 87 and 56 seconds and the highest time spent on the same tasks were 155, 104 and 79 seconds. Table 4.10 also showed that not all inexperienced participants completed circulation tasks. The least time spent to perform tasks 1, 2 and 3 with inexperienced participants were 225, 148 and 109 seconds and the highest time taken to performed the same tasks were 263, 207 and 127 seconds.

Table 4.11: Time (in seconds) on Tasks on Effectiveness of Koha Circulation Module

Participants	Experienced			Inexperienced		
	Task 1: Reg of lib user	Task 2: Charging of lib item	Task 3: Discharging of lib item	Task 1: Reg of lib user	Task 2: Charging of lib item	Task 3: Discharging of lib item
Participant 1	216	157	89	418 ^{NC}	225 ^{NC}	133 ^C
Participant 2	199	119	98	376 ^C	199 ^C	138 ^C
Participant 3	209	118	91	355 ^C	195 ^C	129 ^C
Participant 4	208	127	87	411 ^{NC}	220 ^{NC}	147 ^C
Participant 5	221	131	79	406 ^{NC}	186 ^C	164 ^{NC}

Key: Reg = Registration; Lib = Library; C = Completed; NC = Not Completed

Table 4.11 revealed the time taken to perform circulation tasks with Koha LMS. The least time experienced participants spent to complete tasks 1, 2 and 3 were 199, 118 and 79 seconds and the highest time spent on the same tasks were 221, 157 and 98 seconds. Table 4.11 further revealed that not all inexperienced participants completed circulation tasks. The least time spent to perform circulation tasks 1, 2 and 3 with inexperienced

participants were 355, 186 and 129 seconds and the highest time taken to perform the same tasks were 418, 225 and 164 seconds.

Table 4.12: Participants' Time (in seconds) on Tasks for Effectiveness of Circulation Module of LMS for Experienced and Inexperienced Users

LMS Participants	SLAM						Alexandria					
	Experienced			Inexperienced			Experienced			Inexperienced		
Task: Description of library items	T1 (secs)	T2 (secs)	T3 (secs)	T1 (secs)	T2 (secs)	T3 (secs)	T1 (secs)	T2 (secs)	T3 (secs)	T1 (secs)	T2 (secs)	T3 (secs)
Time on task completed with or without help	473.0 0	337.00	278.0 0	591.00	489.00	404.00	563.00	398.00	324.00	654.00	406.00	470.00
Ave time on task completed with or without help	94.60	67.40	55.60	197.00	122.25	101.00	112.60	79.60	64.80	218.00	135.33	117.50
Time on task not completed	-	-	-	421.00	150.00	127.00	-	-	-	469.00	295.00	146.00
Ave time on task not completed	-	-	-	210.50	150.00	127.00	-	-	-	234.50	147.50	146.00
Total time on tasks taken	473.0 0	337.00	278.0 0	1012.00	639.00	531.00	563.00	398.00	324.00	1123.00	701.00	616.00
Average total time on tasks taken	94.60	67.40	55.60	202.40	127.80	106,20	112.60	79.60	64.80	224.60	140.20	123.20

Keys: LMS = Library Management Software; T= Task, Secs = seconds

Table 4.12: Participants' Time (in seconds) on Tasks for Effectiveness of Circulation Module of LMS for Experienced and Inexperienced Users (Cont.)

LMS	NewGenLib						Koha							
	Participants			Experienced			Inexperienced			Experienced			Inexperienced	
Task: Description of library items	T1 (secs)	T2 (secs)	T3 (secs)	T1 (secs)	T2 (secs)	T3 (secs)	T1 (secs)	T2 (secs)	T3 (secs)	T1 (secs)	T2 (secs)	T3 (secs)		
Time on task completed with or without help	620.00	462.00	343.00	693.00	461.00	462.00	1035.00	608.00	474.00	731.00	580.00	400.00		
Ave time on task completed with or without help	124.00	92.40	68.60	231.00	153.67	115.50	207.00	121.60	94.80	365.50	193.33	133.33		
Time on task not completed	-	-	-	521.00	406.00	131.00	-	-	-	1235.00	445.00	386.00		
Ave time on task not completed	-	-	-	260.50	213.00	131.00	-	-	-	411.67	222.50	193.00		
Total time on tasks taken	620.00	462.00	343.00	1214.00	867.00	593.00	1035.00	608.00	474.00	1966.00	1025.00	786.00		
Average total time on tasks taken	124.00	92.40	68.60	242.80	173.40	118.60	207.00	121.60	94.80	393.20	205.00	157.20		

Keys: LMS = Library Management Software, T= Task,; Secs = seconds

Table 4.12 showed that all experienced participants completed circulation tasks with the highest average time spent on task 1 which is registration of library users. Koha experienced participants completed registration task with a high average time of 365.50 seconds, next to Koha was NewGenLib and Alexandria experienced participants with average time of 231.00 and 218.00 seconds and SLAM experienced participants completed registration task with a low average time of 197.00 seconds. A careful observation of the Table revealed that Koha experienced participants spent more time to complete task 1 when compare to other LMS experienced participants who completed task 1. Table 4.12 also revealed that SLAM experienced participants spent the average time of 67.40 and 55.60 seconds for circulation tasks 2 and 3, Alexandria experienced participants spent average time of 79.60 and 64.80 seconds and Koha experienced participant completed the same tasks with average time of 121.60 and 94.80.

Results in Table 4.12 further showed that not all inexperienced participants completed circulation tasks. The Table indicated that SLAM inexperienced participants completed task 1 with the lowest average time of 197.00 seconds, followed by Alexandria inexperienced participants with average time of 218.00 seconds and the highest average time of 365.50 seconds was spent with Koha LMS. Table 4.12 also showed the average time spent on circulation tasks 2 and 3. The results in the Table showed that SLAM inexperienced participants spent average time of 122.25 and 101.00 seconds to complete tasks 2 and 3, Alexandria inexperienced participants that completed the same tasks spent average time of 135.33 and 117.50 seconds. Table 4.12 further showed that NewGenLib inexperienced participants completed tasks 2 and 3 with average time of 153.67 and

115.50 seconds and the highest average time spent on tasks completion was 193.33 and 133.33 seconds for tasks 2 and 3 with Koha.

Interview with experienced participants revealed that Alexandria, Koha and NewGenLib registration templates contain much information than is required and some of the data elements or information required to be filled for registration are similar or repetitive. For instance, all the different fields have phone numbers, emails and alternate contact numbers and addresses. Furthermore, Alexandria experienced users expressed their displeasure over the reading level of users in registration templates and the yearly registration of library users to maintain active status of library use. A SLAM participant said ‘I love SLAM circulation module because of its ease, security and displaying feature, a librarian can view all users that have borrowed books at a glance’.

Similarly, interview with inexperienced participants revealed that registration templates are difficult. Alexandria respondent stated that some data elements needed to be filled are not necessary, for example, hostel address, suspension of users, multiple address and contact address. Similarly, Koha and NewGenLib expressed their displeasure over the use of registration templates, both the participants interviewed stated that “it is frustrating to register library users using this software”. According to Koha inexperienced participant interviewed, the numbers of fields to be filled are confusing, some of them are similar and repetition on different section of the field. For example, phone numbers, e-mails, alternate numbers and alternate contact addresses made it confusing which resulted in abandoning of the registration process. The similarity of

information on registration templates got me confused that is why I did not continue with the registration' (one of the Koha respondent).

Table 4.13: Distribution of Participants' Completion Rate of Tasks Performed for Effectiveness of Circulation Module of LMS

LMS	SLAM					Alexandria					NewGenLib					Koha								
Number of Participants	5					5					5					5								
Tasks: Reg., charging and discharging	T1	T2	T3	T2	T3	T1	T2	T3	T3	T	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3
										1														
Number of tasks completed with or without help	5	5	5	3	4	4	5	5	5	3	3	4	5	5	5	3	3	4	5	5	5	2	3	4
Number of tasks not completed	0	0	0	2	1	1	0	0	0	2	2	1	0	0	0	2	2	1	0	0	0	3	2	1

Key: LMS= Library Management Software; T= Task

Table 4.13 showed the distribution of tasks completion used to determine the effectiveness of circulation module. The results showed that all experienced participants completed 60 circulation tasks (registration of users, charging and discharging tasks). Table 4.13 further revealed that not all inexperienced participants completed circulation tasks given to them. Of the 60 tasks performed by 20 participants, 40 tasks were completed without or with help. From Table 4.13, 11 tasks were completed with SLAM, 10 tasks each with Alexandria and NewGenLib and 9 tasks were completed with Koha. Close observation of Table 4.13 revealed that SLAM had the highest number of tasks completed, followed by Alexandria and NewGenLib and the least number of tasks completed was with Koha LMS.

Effectiveness of circulation module was further calculated and represented as percentage using the completion rate. Thus, effectiveness = $\frac{x}{\sum n} \times 100$. The results are presented in

Figure 4.2



Figure 4.2: Percent Effectiveness of Circulation Module

Figure 4.2 revealed the percentage of tasks successfully completed. The Figure depicts that all experienced participants completed all circulation tasks. Hence, they all attained 100 % effectiveness. The graph also showed that not all inexperienced participants completed circulation tasks. Figure 4.2 also showed that not all inexperienced participants completed circulation tasks as shown in the graph. The completion rate of circulation tasks for SLAM was 73.33 %, Alexandria was 66.67 %, NewGenLib was 66.67 % and Koha was 53.33 %. This implies that error rate with SLAM was 26.67 %, Alexandria was 33.33 %, NewGenLib is 33.33 % and Koha is 46.67 %.

4.2.1.3 Effectiveness of Online Public Access Catalogue (OPAC) module of LMS

Table 4.14: Time (in seconds) on Tasks on Effectiveness of SLAM OPAC Module

Participants	Experienced		Inexperienced	
	Task 1	Task 2	Task 1	Task 2
Tasks:				
Search for books				
Participant 1	25	24	27	29
Participant 2	19	20	31	30
Participant 3	26	27	21	22
Participant 4	22	24	29	27
Participant 5	25	23	51	53
Participant 6	27	28	32	29
Participant 7	24	25	52	43
Participant 8	19	20	31	32
Participant 9	17	19	28	31
Participant 10	27	28	52	51
Participant 11	24	25	29	27
Participant 12	26	24	31	29

Table 4.14 revealed the time taken to perform OPAC tasks with SLAM LMS. The least time experienced participants spent to complete tasks 1 and 2 were 17 and 19 seconds and the highest time spent on the same tasks were 27 and 28 seconds. Table 4.13 also revealed that majority of inexperienced participants completed OPAC tasks. The least time spent to perform search tasks 1 and 2 were 21 and 22 seconds and the highest time taken to perform the same tasks were 52 and 53 seconds with inexperienced participants.

Table 4.15: Time (in seconds) on Tasks on Effectiveness of Alexandria OPAC Module

Participants	Experienced		Inexperienced	
	Task 1	Task 2	Task 1	Task 2
Tasks:				
Search for books				
Participant 1	34	31	44	47
Participant 2	28	29	41	38
Participant 3	32	30	45	42
Participant 4	28	29	43	53
Participant 5	33	31	53	41
Participant 6	34	30	39	44
Participant 7	31	28	52	54
Participant 8	28	29	45	48
Participant 9	29	30	51	49
Participant 10	34	29	46	51
Participant 11	27	31	52	54
Participant 12	31	29	43	46

Results in Table 4.15 revealed the time taken to perform OPAC tasks with Alexandria LMS. The least time taken to complete tasks 1 and 2 were 27 and 28 seconds and the highest time spent on the same tasks were 34 and 31 seconds with experienced participants. Similarly, the inexperienced participants performed the same tasks with the least time of 39 and 38 seconds and the highest time of 53 and 54 seconds (search tasks 1 and 2).

Table 4.16: Time (in seconds) on Tasks on Effectiveness of NewGenLib OPAC Module

Participants	Experienced		Inexperienced	
	Task 1	Task 2	Task 1	Task 2
Tasks: Search for books				
Participant 1	30	25	39	45
Participant 2	26	28	40	52
Participant 3	27	26	36	33
Participant 4	29	28	52	55
Participant 5	30	28	38	36
Participant 6	28	26	37	38
Participant 7	25	27	39	35
Participant 8	30	29	37	39
Participant 9	29	24	53	53
Participant 10	36	28	51	43
Participant 11	27	29	38	39
Participant 12	29	27	40	53

Table 4.16 showed the time taken to perform OPAC tasks with NewGenLib LMS. The Table revealed that the least time experienced participants spent to complete tasks 1 and 2 were 17 and 19 seconds and the highest time spent on the same tasks were 25 and 24 seconds. Furthermore, revealed in Table 4.16 was the time inexperienced participants spent to complete OPAC tasks. The least time inexperienced participants spent to perform search tasks 1 and 2 were 36 and 35 seconds and the highest time spent on the same tasks were 53 and 55 seconds.

Table 4.17: Time (in seconds) on Tasks on Effectiveness of Koha OPAC Module

Participants	Experienced		Inexperienced	
	Task 1	Task 2	Task 1	Task 2
Tasks:				
Search for books				
Participant 1	25	23	39	37
Participant 2	27	24	34	36
Participant 3	24	25	53	52
Participant 4	26	27	38	36
Participant 5	25	23	34	38
Participant 6	25	22	39	37
Participant 7	23	24	37	39
Participant 8	26	25	40	38
Participant 9	25	24	51	54
Participant 10	23	26	38	39
Participant 11	26	23	54	51
Participant 12	24	23	36	38

Table 4.17 revealed the time taken to perform OPAC tasks with Koha LMS. The least time experienced participants spent to complete tasks 1 and 2 were 23 and 22 seconds and the highest time spent on the same tasks were 27 and 27 seconds. Table 4.17 also revealed the time inexperienced participants used to perform OPAC search tasks. The least time inexperienced participants spent to perform search tasks 1 and 2 were 34 and 36 seconds and the highest time taken to perform the same tasks were 54 and 54 seconds.

Table 4.18: Participants' Time (in seconds) on Tasks for Effectiveness of OPAC Module of LMS for Experienced and Inexperienced Users

LMS Participan ts	SLAM				Alexandria				NGL				Koha			
	Experienced		Inexperience d		Experienced		Inexperience d		Experienced		Inexperience d		Experience d		Inexperience d	
	T1 (secs)	T2 (secs)	T1 (secs)	T2 (secs)	T1 (secs)	T2 (secs)	T1 (secs)	T2 (secs)	T1 (secs)	T2 (secs)	T1 (secs)	T2 (secs)	T1 (secs)	T2 (secs)	T1 (secs)	T2 (secs)
Time on task completed	281.00	287.00	328.00	369.00	369.00	356.00	346.00	355.00	336.00	325.00	344.00	308.00	299.00	289.00	336.00	338.00
Aver time on task completed	23.41	23.92	36.44	36.90	30.75	29.67	43.25	44.38	28.00	27.08	38.22	38.50	24.92	24.08	37.33	37.56
Time on task not completed	-	-	155.00	104.00	-	-	208.00	212.00	-	-	156.00	213.00	-	-	158.00	157.00
Aver time on task not completed	-	-	51.67	52.00	-	-	52.00	53.00	-	-	52.00	53.25	-	-	52.67	52.33
Total time on task taken	281.00	287.00	483.00	473.00	369.00	356.00	554.00	567.00	336.00	325.00	500.00	521.00	299.00	289.00	494.00	510.00

Total aver time on task taken	23.41	23.92	40.25	39.42	30.7	29.67	46.17	47.25	28.00	27.08	41.67	43.42	24.91	24.08	41.17	41.25
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Keys: LMS = Library Management Software; T= Task, Secs = seconds; OPAC = Online Public Access Catalogue

Results in Table 4.18 showed that all the experienced participants completed search tasks across the OPAC modules used to search for available books in the libraries. SLAM experienced participants performed tasks 1 and 2 with average time of 23.41 and 23.92 seconds. Followed by Koha participants with average time of 24.92 and 24.08 seconds, next was NewGenLib experienced participants with average time of 28.00 and 27.08 seconds and Alexandria experienced participants spent the highest average time of 30.75 and 29.67 seconds to complete OPAC tasks.

Table 4.18 further revealed that not all inexperienced participants completed OPAC search tasks. SLAM inexperienced participants completed search tasks 1 and 2 with the lowest average time of 36.44 and 36.90 seconds, followed by Koha inexperienced participants with the average time of 37.33 and 37.56 seconds. The next was NewGenLib inexperienced participants who completed tasks 1 and 2 with average time of 38.22 and 38.50 seconds and the highest average time taken to complete the same tasks was 43.25 and 44.38 seconds with Alexandria inexperienced participants. A careful look at the OPAC interface showed that the templates contained essential information on the basic search templates, but the slight variation in time was due to individual speed of typing and load time (network service) of the respective LMS

Table 4.19 showed the distribution of participants' completion rate of tasks performed for effectiveness of OPAC module of LMS.

Table 4.19: Distribution of Participants' Completion Rate of Tasks Performed for Effectiveness of OPAC Module of LMS

LMS	SLAM		Alexandria				NewGenLib				Koha					
	12	12	12	12	12	12	12	12	12	12	12	12				
Number of Participants	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
Tasks: Reg., charging and discharging																
Number of tasks completed with or without help	12	12	9	10	12	12	8	8	12	12	9	8	12	12	9	9
Number of tasks not completed	0	0	3	2	0	0	4	4	0	0	3	4	0	0	9	9

Key: LMS= Library Management Software, T= Task

Table 4.19 revealed the results of the OPAC search tasks performed by participants. The results showed that experienced participants completed all the OPAC search tasks. However, not all inexperienced participants completed the search tasks. Of the 96 tasks performed by inexperienced participants, 70 tasks were completed and 26 tasks could not be completed across the LMS under study. 19 tasks were completed with SLAM, 16 tasks completed with Alexandria, 17 tasks completed with NewGenLib and 18 tasks were completed with Koha inexperienced participants.

Effectiveness of OPAC module was further calculated and represented as percentage using the completion rate. Thus, effectiveness = $\frac{x}{\sum n} \times 100$. The results are presented in

Figure 4.3



Figure 4.3: Percent Effectiveness of OPAC Module

Figure 4.3 revealed the percentage of OPAC tasks successfully completed. The Figure showed that all experienced participants completed all OPAC search tasks. Hence, they all attained 100 percent effectiveness. The graph also showed that not all inexperienced participants completed OPAC search tasks as indicated in the effectiveness OPAC module in Figure 4.3. The Figure showed that the completion rate of OPAC search tasks for SLAM was 79.67 %, Alexandria was 66.67 %, NewGenLib was 70.83 % and Koha was 75.00 %. The error rate for SLAM was 20.33, %, Alexandria was 33.33 %, NewGenLib was 29.17 % and Koha was 25.00 %

4.2.2 Research Questions 2: What is the efficiency of LMS in service delivery in federal university libraries in Nigeria?

To examine the efficiency of LMS used in service delivery in federal university libraries under study, participants performed defined library tasks. Both experienced and inexperienced participants used LMS cataloguing module to describe library materials, circulation module to registered users, charge and discharge books and library users used OPAC module to search for availability of books in the library. Tables 4.20 – 4.32 shows the time on tasks used for efficiency of LMS.

4.2.2.1 Efficiency of Cataloguing Module of LMS

Table 4.20: Time (in seconds) on Tasks on Efficiency of SLAM Cataloguing Module

Participants	Experienced			Inexperienced		
	Task 1:	Task 2:	Task 3:	Task 1:	Task 2:	Task 3:
Description of lib items	Descrip of lib item	Descrip of lib item	Descrip of lib item	Descrip of lib item	Descrip of lib item	Descrip of lib item
Participant 1	206	198	156	369 ^{NC}	349 ^C	377 ^{NC}
Participant 2	228	162	169	337 ^C	390 ^{NC}	324 ^C
Participant 3	179	171	143	298 ^C	361 ^{NC}	352 ^C
Participant 4	222	215	178	331 ^C	347 ^C	319 ^C
Participant 5	211	181	186	360 ^C	312 ^C	319 ^C

Table 4.20 showed the time taken to catalogue library books with SLAM cataloguing module. The least time experienced participants spent to achieve cataloguing tasks 1, 2 and 3 were 179, 162 and 143 seconds and the highest time spent to achieve the same tasks were 228, 215 and 186 seconds with experienced participants. The Table also showed that not all inexperienced users completed the tasks. The least time spent to

perform tasks 1, 2 and 3 were 298, 312 and 319 seconds and the highest time taken to perform the same tasks were 369, 390 and 377 seconds (tasks 1, 2 and 3).

Table 4.21: Time (in seconds) on Tasks on Efficiency of Alexandria Cataloguing Module

Participants	Experienced			Inexperienced		
	Task 1: Descrip of lib item	Task 2: Descrip of lib item	Task 3: Descrip of lib item	Task 1: Descrip of lib item	Task 2: Descrip of lib item	Task 3: Descrip of lib item
Participant 1	302	253	239	508 ^C	511 ^C	501 ^C
Participant 2	237	239	303	611 ^{NC}	607 ^{NC}	605 ^{NC}
Participant 3	257	303	234	545 ^C	519 ^C	481 ^{NC}
Participant 4	231	261	247	603 ^{NC}	544 ^C	564 ^C
Participant 5	232	307	254	562 ^{NC}	600 ^{NC}	591 ^{NC}
Participant 6	294	231	219	587 ^C	588 ^C	492 ^C
Participant 7	271	276	238	642 ^C	516 ^{NC}	583 ^C
Participant 8	250	223	304	499 ^{NC}	620 ^{NC}	507 ^C
Participant 9	278	229	261	554 ^C	592 ^{NC}	629 ^{NC}
Participant 10	322	304	228	589 ^{NC}	567 ^C	544 ^C

Result in Table 4.21 showed the time taken to perform cataloguing tasks with Alexandria LMS. The least time experienced participants spent to achieve cataloguing tasks 1, 2 and 3 were 128, 87 and 56 seconds and the highest time spent on the same tasks were 155, 104 and 79 seconds. Table 4.10 also showed that not all inexperienced participants completed circulation tasks. The least time spent to perform tasks 1, 2 and 3 with inexperienced participants were 225, 148 and 109 seconds and the highest time taken to performed the same tasks were 263, 207 and 127 seconds.

Table 4.22: Time (in seconds) on Tasks on Efficiency of NewGenLib Cataloguing Module

Participants	Experienced			Inexperienced		
	Task 1: Description of lib items	Task 2: Descrip of lib item	Task 3: Descrip of lib item	Task 1: Descrip of lib item	Task 2: Descrip of lib item	Task 3: Descrip of lib item
Participant 1	261	264	299	697 ^{NC}	677 ^{NC}	711 ^{NC}
Participant 2	311	379	319	581 ^C	627 ^C	609 ^C
Participant 3	276	341	327	587 ^C	636 ^C	701 ^{NC}
Participant 4	293	395	368	659 ^{NC}	629 ^C	634 ^C
Participant 5	357	351	356	663 ^{NC}	603 ^C	643 ^C
Participant 6	362	418	322	642 ^C	651 ^{NC}	581 ^C
Participant 7	349	287	301	575 ^C	703 ^{NC}	719 ^{NC}
Participant 8	339	357	349	660 ^{NC}	643 ^C	639 ^C
Participant 9	327	383	278	652 ^C	597 ^C	589 ^C
Participant 10	297	239	221	712 ^{NC}	698 ^{NC}	702 ^{NC}

Table 4.22 revealed the time taken to perform OPAC tasks with NewGenLib LMS. The highest time experienced participants spent to perform tasks 1, 2 and 3 were 362, 418 and 368 seconds and the least time spent to complete the same tasks were 261, 239 and 221 seconds by experienced participants. Table 4.22 also showed that many inexperienced participants could not complete cataloguing tasks. The highest time spent to perform cataloguing tasks 1, 2 and 3 were 712, 703 and 717 seconds and the least time taken to perform the same tasks were 581, 597 and 581 seconds with inexperienced participants.

Table 4.23: Time (in seconds) on Tasks on Efficiency of Koha Cataloguing Module

Participants	Experienced			Inexperienced		
	Tasks: Description of lib items	Task 1: Descrip of lib item	Task 2: Descrip of lib item	Task 3: Descrip of lib item	Task 1: Descrip of lib item	Task 2: Descrip of lib item
Participant 1	934	896	949	1545 ^{NC}	1349 ^{NC}	1456 ^{NC}
Participant 2	968	801	867	1547 ^{NC}	1649 ^{NC}	1529 ^{NC}
Participant 3	839	925	832	1618 ^C	1657 ^C	1602 ^C
Participant 4	892	871	911	1711 ^{NC}	1739 ^{NC}	1668 ^{NC}
Participant 5	941	879	831	1638 ^C	1641 ^C	1552 ^C
Participant 6	878	904	887	1591 ^{NC}	1458 ^{NC}	1628 ^C
Participant 7	734	792	799	1607 ^{NC}	1677 ^{NC}	1621 ^{NC}
Participant 8	834	891	908	1659 ^{NC}	1601 ^C	1531 ^{NC}
Participant 9	892	896	906	1541 ^{NC}	1516 ^{NC}	1587 ^C
Participant 10	899	943	766	1499 ^{NC}	1380 ^{NC}	1749 ^{NC}

Result in Table 4.23 revealed the time taken to perform cataloguing tasks with Koha LMS. The least time experienced participants spent on cataloguing tasks 1, 2 and 3 were 734, 792 and 799 seconds and the highest time spent on the same tasks were 941, 943 and 949 seconds. Table 4.23 also showed that majority of the inexperienced participants could not complete cataloguing tasks. The least time inexperienced participants spent to perform tasks 1, 2 and 3 were 1499, 1349 and 1456 seconds and the highest time spent on the same tasks were 1711, 1739 and 1749 seconds

Table 4.24: Participants' Time (in seconds) on Tasks for Efficiency of Cataloguing Module of LMS for Experienced and Inexperienced Users

LMS Participants	SLAM						Alexandria					
	Experienced			Inexperienced			Experienced			Inexperienced		
Task: Description of library items	T1 (secs)	T2 (secs)	T3 (secs)	T1 (secs)	T2 (secs)	T3 (secs)	T1 (secs)	T2 (secs)	T3 (secs)	T1 (secs)	T2 (secs)	T3 (secs)
Time on task completed with or without help	1046.00	927.00	700.00		1008.0	1314.0	2674.0	2626.0	2527.0	2,836.00	2,729.00	3,191.00
				1326.0	0	0	0	0	0			
				0								
Ave time on task completed with or without help	209.20		140.00	331.50	336.00	328.50	267.40	262.60	252.70	567.20	545.80	531.83
		185.4										
		0										
Time on task not completed	-	-	-	369.00	751.00	377.00	-	-	-	2864.0	2,935.00	2306.0
										0		0
Ave time on task not completed	-	-	-	369.00	375.50	377.00	-	-	-	572.80	587.00	576.50
Total time on tasks taken	1046.0	927.00	700.00	1695.00	1759.0	1691.0	2674.0	2626.0	2527.0	5700.0	5664.0	5497.0
	0				0	0	0	0	0	0	0	0
Average total time on tasks taken	209.20		140.00	339.00	351.80	338.20	267.40	262.60	252.70	570.00	566.40	549.70

185.4

0

Keys: LMS = Library Management Software, T= Task, Secs = Seconds

Table 4.24: Participants' Time (in seconds) on Tasks for Efficiency of Cataloguing Module of LMS for Experienced and Inexperienced Users (Cont.)

LMS	NewGenLib						Koha					
	Experienced			Inexperienced			Experienced			Inexperienced		
Participants	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3
Task: Description of library items	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)
Time on task completed	3,172.00	3,414.00	3140.0		3,735.0	3,695.0	8811.0	8798.0	8656.0	3,256.00	4,899.00	6,369.00
			0	3,037.00	0	0	0	0	0			
Ave time on task completed	317.20	341.40	314.00	607.40	622.50	615.83	881.10	879.80	865.60	1628.00	1633.00	1,592.25
Time on task not completed	-	-	-	3,391.00	2729.0	2,833.0	-	-	-	12,700.00	10,768.0	9,554.00
					0	0					0	
Ave time on task not												

completed	-	-	-	678.20	682.25	708.25	-	-	-	1587.50	1,550.00	1,592.33
Total time on tasks taken	3,172.00	3,414.00	3140.0	6428.0	6,464.0	6,528.0	8811.0	8798.0	8656.0	15,956.0	15,667.0	15,923.00
			0	0	0	0	0	0	0	0	0	
Average total time on tasks taken	317.20	341.40	314.00	642.80	646.40	652.80	881.10	879.80	865.60	1566.70	1592.30	1,592.30

Keys: LMS = Library Management Software, T= Task, Secs = Seconds

The results in Table 4.24 showed that all experienced participants completed the process of description of library resources. The highest average time spent to complete task 1 was used on Koha. Koha experienced participants completed cataloguing task 1 with the highest average time of 881.10 seconds and the lowest average time was 209.20 seconds obtained for task 1 by SLAM experienced participants. Similarly, Koha experienced participants had the highest average time of 879.80 and 865.60 seconds for tasks 2 and 3. The Table also revealed that SLAM experienced participants completed tasks 2 and 3 with the lowest average time of 185.40 and 140.00 seconds. Alexandria and NewGenLib experienced participants completed cataloguing task 1, 2 and 3 with average time of 267.40, 262.60 and 252.70 seconds (Alexandria) and 317.20, 341.40 and 314.00 seconds (NewGenLib) respectfully.

The results in Table 4.24 also showed the average time of inexperienced participants for cataloguing tasks performed. SLAM inexperienced participants completed task 1 with the least average time of 331.50 seconds, followed by Alexandria inexperienced participants with an average time of 567.20 seconds. Next to Alexandria is NewGenLib inexperienced participants who completed task 1 with an average time of 607.40 seconds and the highest average time spent to complete the same task was 1628.00 seconds with Koha inexperienced participants. The results in Table 4.24 further revealed that the highest average time taken to complete cataloguing task 2 was 1,633.00 seconds with Koha, followed by an average time of 622.50 seconds with NewGenLib. The lowest average time taken to complete task 2 was 366.00 seconds with SLAM. The Table also revealed that, the highest average time of inexperienced participants who completed task 3 was 1592.25 seconds (Koha) and the lowest average time was 325.50 seconds (SLAM).

It can be clearly seen from Table 4.24 that the efficiency of both experienced and inexperienced participants differ from one LMS to the other. Close observation and interview with the participants revealed that, SLAM has one template with only needed information, Alexandria has 3 templates, NewGenLib has 4 templates to be filled with few information elements that are not used during the process but Koha has 9 templates with much information elements that are not used while cataloguing.

The results on tasks presented in Tables 4. - 4.7 were further calculated to obtain the overall efficiency of each LMS. Therefore, the overall efficiency on the ratio of time

was calculated based on this formula: $\frac{\sum nt}{\sum t} \times 100$

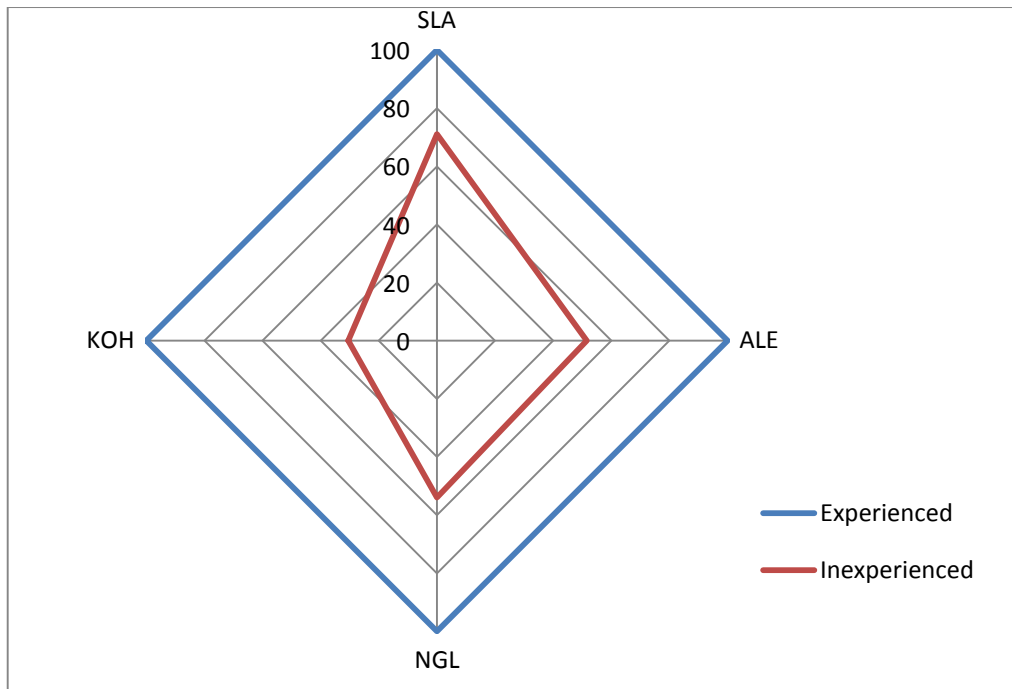


Figure 4.4: Overall Relative Efficiency of Cataloguing Modules

The overall efficiency in Figure 4.4 depicted that all experienced participants completed the predetermined cataloguing tasks at low time. Hence, they all attained 100 per cent efficiency. The graph also showed that not all inexperienced participants completed cataloguing tasks at low time. Most of the inexperienced participants performed and achieved the predetermined cataloguing tasks at high time as indicated in Figure 4.4 with difference between the experienced and inexperienced participants. The Figure showed that the overall efficiency of cataloguing module by inexperienced participants' for SLAM was 71.08, Alexandria was 53.95, NewGenLib was 53.87 and Koha was 30.55 indicating low efficiency for Koha cataloguing module. The high response from inexperienced participants' for SLAM signify good efficiency for SLAM cataloguing module.

4.2.2.2 Efficiency of Circulation Module of LMS

Table 4.25: Time (in seconds) on Tasks on Efficiency of SLAM Circulation Module

Participants	Experienced			Inexperienced		
Tasks: Circulation routines	Task 1: Reg of lib user	Task 2: Charging of lib item	Task 3: Discharging of lib item	Task 1: Reg of lib user	Task 2: Charging of lib item	Task 3: Discharging of lib item
Participant 1	101	71	60	188 ^C	108 ^C	95 ^C
Participant 2	99	62	55	199 ^C	127 ^C	107 ^C
Participant 3	104	69	59	220 ^{NC}	140 ^{NC}	105 ^C
Participant 4	101	75	65	205 ^{NC}	123 ^C	110 ^{NC}
Participant 5	97	68	51	185 ^C	125 ^C	101 ^C

Table 4.25 showed the time taken to perform circulation tasks with SLAM LMS. The Table revealed that the least time experienced participants spent to complete tasks 1, 2 and 3 were 97 (participant 5), 62 (participant 2) and 51 (participant 5) seconds and the highest time spent on the same tasks were 104 (participant 3), 71 (participant 1) and 65 (participant 4), seconds. Also revealed in Table 4.25 was the time inexperienced participants spent to perform circulation tasks. The least time inexperienced participants spent to perform circulation tasks 1, 2 and 3 were 185 (participant 5), 108 (participant 1) and 95 (participant 1) seconds and the highest time spent on the same tasks were 220 (participant 3), 140 (participant 3) and 110 (participant 4) seconds.

Table 4.26: Time (in seconds) on Tasks on Efficiency of Alexandria Circulation Module

Participants	Experienced			Inexperienced		
Tasks: Circulation routines	Task 1: Reg of lib user	Task 2: Charging of lib item	Task 3: Discharging of lib item	Task 1: Reg of lib user	Task 2: Charging of lib item	Task 3: Discharging of lib item
Participant 1	115	73	60	207 ^C	137 ^C	114 ^C
Participant 2	106	84	65	253 ^{NC}	139 ^{NC}	123 ^{NC}
Participant 3	118	80	70	198 ^C	120 ^C	117 ^{NC}
Participant 4	111	79	68	216 ^C	140 ^C	123 ^C
Participant 5	113	81	54	211 ^{NC}	142 ^{NC}	119 ^C

Table 4.26 revealed the result on time taken to perform circulation tasks with Alexandria circulation module. The Table revealed that the least time experienced participants spent to complete tasks 1, 2 and 3 were 106 (participant 2), 73 (participant 1) and 54 (participant 5) seconds and the highest time spent on the same tasks were 118 (participant 3), 84 (participant 2) and 70 (participant 3) seconds. Also revealed in Table 4.26 was the time inexperienced participants spent to perform circulation tasks. The least time inexperienced participants spent to perform circulation tasks 1, 2 and 3 were 198, 120 and 114 seconds and the highest time spent on the same tasks were 253, 142 and 123 seconds.

Table 4.27: Time (in seconds) on Tasks on Efficiency of NewGenLib Circulation Module

Participants	Experienced			Inexperienced		
	Task 1: Reg of lib user	Task 2: Charging of lib item	Task 3: Discharging of lib item	Task 1: Reg of lib user	Task 2: Charging of lib item	Task 3: Dischargin g of lib item
Participant 1	119	88	63	246 ^{NC}	189 ^{NC}	142 ^{NC}
Participant 2	125	93	61	241 ^C	177 ^C	122 ^C
Participant 3	123	85	70	234 ^{NC}	191 ^{NC}	116 ^{NC}
Participant 4	121	91	69	227 ^C	170 ^C	119 ^C
Participant 5	130	100	78	231 ^C	179 ^C	124 ^C

Table 4.27 showed the result on time taken to perform circulation tasks with NewGenLib circulation module. The Table revealed that the least time experienced participants spent to complete tasks 1, 2 and 3 were 119 (participant 1), 85 (participant 3) and 61 (participant 2) seconds and the highest time spent on the same tasks were 130 (participant 5), 100 (participant 5) and 78 (participant 5) seconds. The Table also showed the time inexperienced participants spent to perform circulation tasks. The least time inexperienced participants spent to perform circulation tasks 1, 2

and 3 were 227 (participant 4), 170 (participant 4) and 116 (participant 3) seconds and the highest time spent on the same tasks were 246 (participant 1), 191 (participant 3) and 142 (participant 1) seconds.

Table 4.28: Time (in seconds) on Tasks on Efficiency of Koha Circulation Module

Participants	Experienced			Inexperienced		
	Task 1: Reg of lib user	Task 2: Charging of lib item	Task 3: Dischargin g of lib item	Task 1: Reg of lib user	Task 2: Charging of lib item	Task 3: Dischargin g of lib item
Participant 1	207	118	67	399 ^C	197 ^C	127 ^C
Participant 2	189	115	83	401 ^{NC}	208 ^{NC}	158 ^{NC}
Participant 3	198	109	79	399 ^{NC}	201 ^{NC}	131 ^C
Participant 4	201	121	86	388 ^{NC}	199 ^C	143 ^{NC=}
Participant 5	203	119	77	298 ^C	188 ^C	131 ^C

Results in Table 4.28 showed the time taken to perform circulation tasks with Koha LMS. The Table revealed that the least time experienced participants spent to complete tasks 1, 2 and 3 were 189 (participant 2), 109 (participant 3) and 67 (participant 1) seconds and the highest time spent on the same tasks were 207 (participant 1), 121 (participant 4) and 86 (participant 4), seconds. Table 4.28 also revealed the time inexperienced participants spent to perform circulation tasks. The least time inexperienced participants spent to perform circulation tasks 1, 2 and 3 were 298 (participant 5), 188 (participant 5) and 127 (participant 1) seconds and the highest time spent on the same tasks were 401 (participant 2), 208 (participant 2) and 158 (participant 2) seconds.

Table 4.29: Participants' Time (in seconds) on Tasks for Efficiency of Circulation Module of LMS for Experienced and Inexperienced Users

LMS Participants	SLAM						Alexandria					
	Experienced			Inexperienced			Experienced			Inexperienced		
Task:	T1 (secs)	T2 (secs)	T3 (secs)	T1 (secs)	T2 (secs)	T3 (secs)	T1 (secs)	T2 (secs)	T3 (secs)	T1 (secs)	T2 (secs)	T3 (secs)
Registration, charging and discharging tasks												
Time on task completed with or without help	502.00	345.00	290.00	572.00	483.00	408.00	563.00	397.00	317.00	414.00	397.00	356.00
Ave time on task completed with or without help	100.40	69.00	58.00	190.67	120.75	102.00	112.60	79.40	63.40	207.00	132.33	118.67
Time on task not completed	-	-	-	425.00	140.00	110.00	-	-	-	671.00	281.00	240.00
Ave time on task not completed	-	-	-	212.50	140.00	110.00	-	-	-	223.67	140.50	120.00
Total time on tasks taken	502.00	345.00	290.00	997.00	623.00	518.00	563.00	397.00	324.00		678.00	596.00
										1,085.00		
Average total time on tasks taken	100.40	69.00	58.00	199.40	124.60	103.60	112.60	79.60	64.80	217.00	135.60	119.20

Keys: LMS = Library Management Software, T= Task, Secs = Seconds

Table 4.29: Participants' Time (in seconds) on Tasks for Efficiency of Circulation Module of LMS for Experienced and Inexperienced Users (Cont.)

LMS	NewGenLib						Koha					
	Experienced			Inexperienced			Experienced			Inexperienced		
Participants	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3
Tasks:	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)
Registration, charging and discharging tasks												
Time on task completed with or without help	618.00	457.00	341.00	699.00	526.00	365.00	998.00	582.00	392.00	697.00	584.00	389.00
Ave time on task completed with or without help	123.60	91.40	68.20	233.00	175.33	121.67	199.60	116.40	78.40	348.50	194.67	129.00
Time on task not completed	-	-	-	480.00	380.00	258.00	-	-	-	1188.00	409.00	301.00
Ave time on task not completed	-	-	-	240.00	186.67	129.00	-	-	-	396.00	204.50	150.50
Total time on tasks taken	618.00	457.00	341.00	1179.00	906.00	623.00	998.00	582.00	392.00	1885.00	993.00	690.00
Average total time on tasks taken	123.60	91.40	68.20	235.80	181.20	124.60	199.60	116.40	78.40	413.40	198.00	138.00

Keys: LMS = Library Management Software, T= Task, Secs = Seconds

Results in Table 4.29 revealed that all experienced participants completed and achieved circulation tasks with the highest average time spent on task 1 which is registration of library user. Koha experienced participants completed registration task with an average time of 199.60 seconds, next to Koha was NewGenLib experienced participants with an average time of 123.60 seconds, followed by Alexandria experienced participants with an average time of 112.60 seconds and SLAM experienced participants completed registration task with the least average time of 100.40 seconds. It can be seen from the Table that Koha experienced participants spent more time compare to other LMS experienced participants who completed task 1. The difference in the average time could be attributed to the number of templates, steps and data elements required to be filled on registration templates. Charging and discharging were the next circulation tasks performed. Results in the Table revealed that Koha experienced participants spent the highest average time of 116.40 and 78.40 seconds and SLAM participants spent the lowest average time of 69.00 and 58.00 seconds for tasks 2 and 3 respectively.

Table 4.29 also showed the average time of tasks performed by the inexperienced participants. The results in Table 4.29 indicated that Koha inexperienced participants spent the longest time to perform task 1 (registration of library users). Koha inexperienced participants completed task 1 with the highest average time of 348.50 seconds and SLAM inexperienced participants completed task 1 with the shortest average time of 190.67 seconds. Interview with Koha participants revealed that Koha circulation module has 4 templates with cumbersome data elements that need to be filled. This could have contributed to the high an average time used to complete task 1. Similarly, SLAM inexperienced participants spent the lowest mean time of 120.75

seconds on task 2 (charging) and 102.00 seconds on task 3 (discharging). Simplicity and single page template could have contributed to the shortest average time used to complete tasks 2 and 3. The Table further showed that Koha inexperienced participants spent the highest an average time of 194.67 and 129.00 seconds to complete task 2 and 3.

The time taken to complete circulation task was further calculated to obtain the overall efficiency of circulation module of LMS. Therefore, ratio of the time taken by participants who completed their tasks in relation to the total time taken by all participants was used. Thus, data on time on tasks are presented in Tables 4.8 – 4. 11 and overall efficiency on the ratio of time was calculated based on this formula: $\frac{\sum nt}{\sum t} \times 100$

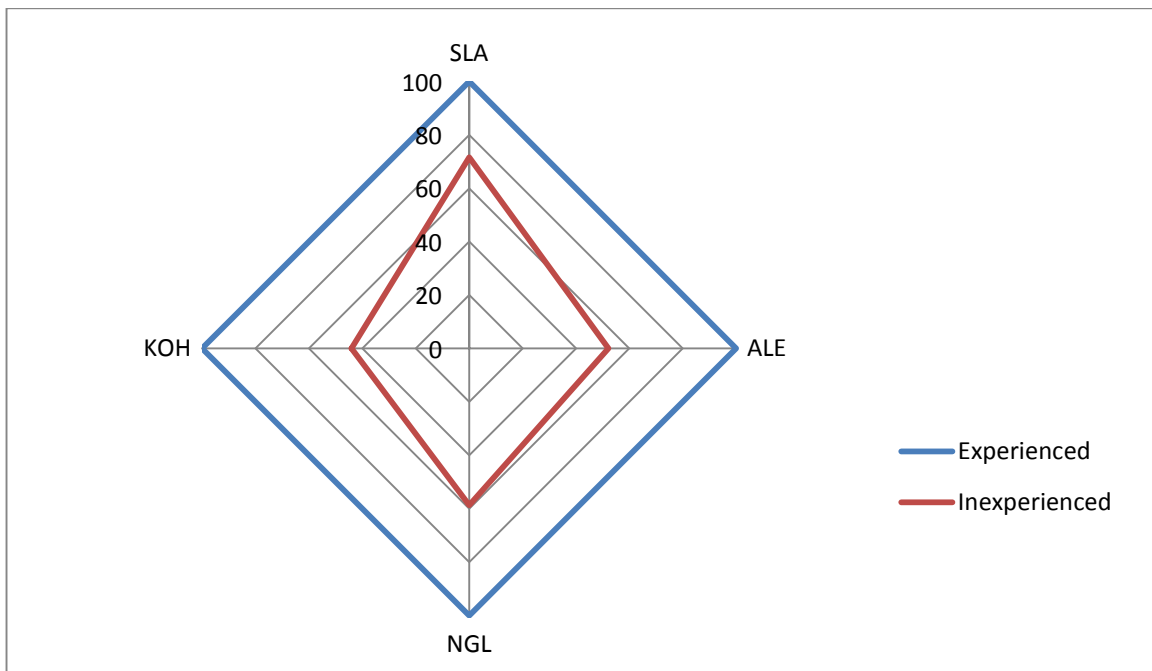


Figure 4.5: Overall Efficiency of Circulation Module

The overall efficiency in Figure 4.5 depicted that all experienced participants performed and completed circulation tasks with ease at low time. Hence, they all attained 100 per

cent efficiency. The graph showed that not all inexperienced participants completed circulation tasks. Most of the inexperienced participants performed registration predetermined tasks with much effort at high time taken to complete circulation tasks with some LMS. This resulted in high time taken to complete circulation tasks as indicated in the low overall efficiency in Figure 4.4. The Figure showed that the overall efficiency of inexperienced participants' for SLAM was 71.54, Alexandria was 56.26, NewGenLib was 58.65 and Koha was 44.04 different level of efficiency of circulation module.

4.2.2.3 Efficiency of OPAC module of LMS

Table 4.30: Time (in seconds) on Tasks for Efficiency of SLAM OPAC Modules

Participants	Experienced		Inexperienced	
	Task 1	Task 2	Task 1	Task 2
Tasks:				
Search for books				
Participant 1	24	23	33 ^C	35 ^C
Participant 2	22	24	24 ^C	22 ^C
Participant 3	20	19	39 ^C	37 ^C
Participant 4	23	22	44 ^C	42 ^C
Participant 5	26	25	51 ^{NC}	53 ^{NC}
Participant 6	24	26	26 ^C	37 ^C
Participant 7	20	24	35 ^C	35 ^C
Participant 8	23	25	50 ^{NC}	45 ^C
Participant 9	24	23	36 ^C	37 ^C
Participant 10	25	27	51 ^{NC}	52 ^{NC}
Participant 11	23	25	39 ^C	34 ^C
Participant 12	24	26	46 ^C	38 ^C

Table 4.30 showed the result on time taken to perform OPAC search tasks with SLAM OPAC module. The Table revealed that the least time experienced participants spent to

complete tasks 1 and 2 were 20 and 19 seconds and the highest time spent on the same tasks were 26 and 27 seconds. The Table also showed the time inexperienced participants spent to perform OPAC search tasks. The least time inexperienced participants spent to perform search tasks 1 and 2 were 24 and 22 seconds and the highest time spent on the same tasks were 51 and 53 seconds.

Table 4.31: Time (in seconds) on Tasks for Efficiency of Alexandria Modules

Participants	Experienced		Inexperienced	
	Task 1	Task 2	Task 1	Task 2
Tasks:				
Search for books				
Participant 1	31	29	45 ^C	46 ^C
Participant 2	29	30	52 ^{NC}	47 ^C
Participant 3	30	27	35 ^C	44 ^C
Participant 4	31	31	47 ^C	55 ^{NC}
Participant 5	35	29	51 ^{NC}	44 ^C
Participant 6	29	25	39 ^C	41 ^C
Participant 7	28	31	49 ^C	53 ^{NC}
Participant 8	31	29	52 ^{NC}	39 ^C
Participant 9	29	26	43 ^C	55 ^{NC}
Participant 10	31	29	48 ^C	41 ^C
Participant 11	32	31	51 ^{NC}	49 ^C
Participant 12	30	30	39 ^C	44 ^C

Results in Table 4.31 showed the result on time taken to perform OPAC search tasks with Alexandria OPAC module. The Table revealed that the least time experienced participants spent to complete tasks 1 and 2 were 29 and 25 seconds and the highest time spent on the same tasks were 32 and 31 seconds. Table 4.31 also showed the time inexperienced participants spent to perform OPAC search tasks. The least time inexperienced participants spent to perform search tasks 1 and 2 were 35 and 39 seconds and the highest time spent on the same tasks were 52 and 55 seconds.

Table 4.32: Time (in seconds) on Tasks for Efficiency of NewGenLib OPAC Modules

Participants	Experienced		Inexperienced	
	Task 1	Task 2	Task 1	Task 2
Tasks:				
Search for books				
Participant 1	27	25	41 ^C	36 ^C
Participant 2	25	22	29 ^C	27 ^C
Participant 3	25	23	43 ^C	39 ^C
Participant 4	27	25	52 ^{NC}	44 ^C
Participant 5	31	29	38 ^C	51 ^{NC}
Participant 6	28	27	36 ^C	35 ^C
Participant 7	26	28	44 ^C	53 ^{NC}
Participant 8	27	24	52 ^{NC}	45 ^C
Participant 9	28	27	42 ^C	39 ^C
Participant 10	26	24	38 ^C	36 ^C
Participant 11	29	25	45 ^C	41 ^C
Participant 12	26	27	51 ^{NC}	52 ^{NC}

Results in Table 4.32 showed the result on time taken to perform OPAC search tasks with NewGenLib OPAC module. The Table revealed that the least time experienced participants spent to complete tasks 1 and 2 were 25 and 22 seconds and the highest time spent on the same tasks was 29 seconds for each of the task. Table 4.32 also revealed the time inexperienced participants spent to perform OPAC search tasks. The least time inexperienced participants spent to perform search tasks 1 and 2 were 29 and 27 seconds and the highest time spent on the same tasks were 52 and 53 seconds.

Table 4.33: Time (in seconds) on Tasks for Efficiency of Koha OPAC Modules

Participants	Experienced		Inexperienced	
	Task 1	Task 2	Task 1	Task 2
Tasks:				
Search for books				
Participant 1	24	25	33 ^C	30 ^C
Participant 2	23	24	41 ^C	38 ^C
Participant 3	24	25	52 ^{NC}	51 ^{NC}
Participant 4	25	28	40 ^C	37 ^C
Participant 5	26	27	29 ^C	28 ^C
Participant 6	24	23	53 ^{NC}	50 ^{NC}
Participant 7	23	25	42 ^C	40 ^C
Participant 8	21	24	34 ^C	35 ^C
Participant 9	24	25	39 ^C	36 ^C
Participant 10	22	26	51 ^{NC}	52 ^{NC}
Participant 11	23	23	43 ^C	40 ^C
Participant 12	26	27	37 ^C	39 ^C

Table 4.33 revealed the result on time taken to perform search tasks with Koha OPAC module. The Table revealed that the least time experienced participants spent to complete tasks 1 and 2 were 21 and 23 seconds and the highest time spent on the same tasks were 26 and 27 seconds. Table 4.33 also showed the time inexperienced participants spent to perform OPAC search tasks. The least time inexperienced participants spent to perform search tasks 1 and 2 were 29 and 28 seconds and the highest time spent on the same tasks were 53 and 52 seconds.

Table 4.34: Participants' Time (in seconds) on Tasks for Efficiency of OPAC Module of LMS for Experienced and Inexperienced Users

LMS	SLAM				Alexandria				NewGenLib				Koha			
	Experience		Inexperienced		Experience		Inexperienced		Experienced		Inexperienced		Experienced		Inexperience	
Participants	d				d								d			
Tasks:	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
Search items/terms	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)	(secs)
Time on task completed	278.00	289.00	322.00	362.00	366.00	347.00	345.00	395.00	325.00	306.00	356.00	342.00	286.00	311.00	338.00	323.00
Aver time on task completed	23.17	24.08	35.78	36.20	30.50	28.92	43.13	43.89	27.08	25.50	39.56	38.00	23.84	25.91	37.56	35.89
Time on task not completed	-	-	152.00		-	-	206.00	164.00	-	-	155.00	156.00	-	-	156.00	153.00
				105.00												
Aver time on task not completed	-	-	50.67	52.50	-	-	51.50	54.67	-	-	51.67	52.00	-	-	52.00	51.00
Total time on task taken	278.00	289.00	474.00		366.00	347.00	551.00	559.00	325.00	306.00	511.00	498.00	286.00	302.00	494.00	476.00
				467.00												
Total aver time on	23.17	24.08	39.50	38.92	30.50	28.92	45.92	46.58	27.08	25.50	42.58	41.50	23.84	25.17	41.17	39.67

task taken

Keys: LMS = Library Management Software, T= Task, Secs = Seconds

Results in Table 4.34 showed that all experienced participants completed the search tasks but not all inexperienced participants completed the search tasks across the OPAC modules under study. The Table revealed that SLAM experienced participants completed tasks 1 and 2 with average time of 23.17 and 24.08 seconds and the inexperienced participants' performed the same tasks with average time of 35.78 and 36.20 seconds. Table 4.34 also revealed that Alexandria experienced participants completed tasks 1 and 2 with mean time of 30.50 and 28.92 seconds and the inexperienced participants' performed the same tasks with mean time of 43.13 and 43.89 seconds. Furthermore, NewGenLib experienced participants completed tasks 1 and 2 with average time of 27.08 and 25.50 seconds and the inexperienced participants completed the same tasks with average time of 39.56 and 38.00 seconds for tasks 1 and 2. In the same vein, Table 4.34 further revealed that Koha experienced participants completed tasks 1 and 2 with average time of 23.84 and 25.91 seconds and the inexperienced participants' performed the same tasks with average time of 37.56 and 35.89 seconds.

Table 4.34 further showed that the lowest average time taken to complete tasks 1 and 2 with experienced participants was with SLAM, followed by Koha and the highest average time was taken with Alexandria experienced participants. The results in Table 4.34 also revealed the lowest average time spent to complete tasks 1 and 2 with inexperienced participants. SLAM inexperienced participants spent the lowest average time on task 1 and the highest average time for the same task was spent with Alexandria (inexperienced participants). Similarly, Koha inexperienced participants spent the lowest average time on task 2 and the highest average time for the same task was spent with Alexandria. This means that SLAM module was faster in loading the

result output, but participants who made spelling mistakes also took more time to perform and possibly complete the search tasks across the four LMS OPAC.

Close observation revealed that inexperienced participants who struggled to differentiate between title and subject option took more time to perform the search tasks. Some were confused about the right search option to use, so they kept entering data into wrong option cell(s) indicating that inexperienced participants did not have adequate searching skills, while some made spelling mistakes. Interview with both experienced and inexperienced participants revealed that OPAC modules were easy to use and OPAC was faster than manual catalogue but the interfaces do not have spelling suggestions. A NewGenLib participant stated that “OPAC is faster than manual catalogue but students do not know that OPAC is made for us”. Similarly, interview with inexperienced participants revealed that many students were not conversant with the use of OPAC and did not know that the OPAC was for them. Also, SLAM participants noted that the OPAC interface was dull. Experienced and inexperienced participants interviewed expressed their frustration over the poor network service available for use of Alexandria, NewGenLib and Koha OPAC. This would have affected the level of interaction with the OPACs. Findings from the result also indicated that there was no significant difference in the time taken to search for book using the LMS studied. The difference in the average time of search items could be attributed to speed of typing, spelling mistakes while typing and poor network service. This means that library users could easily use all the software under study to search for books in the library.

The time taken to perform OPAC task was further calculated to obtain the overall efficiency of circulation module of LMS. Therefore, ratio of the time taken by participants

who completed their tasks in relation to the total time taken by all participants was used.

The overall efficiency on the ratio of time was calculated based on this formula: Overall

$$\text{efficiency} = \frac{\sum nt}{\sum t} \times 100$$

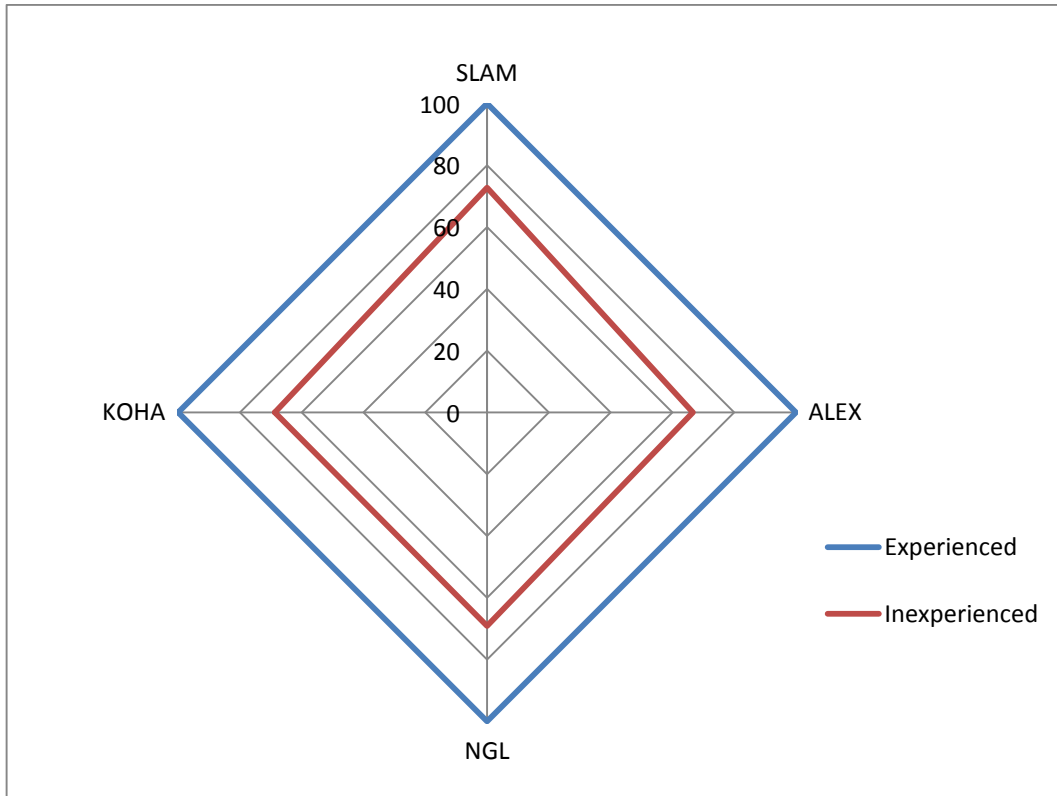


Figure 4.6: Overall efficiency of OPAC module

Figure 4.6 depicted that all experienced participants performed and achieved all the search tasks. Hence, they all attained 100 per cent efficiency. The graph showed that not all inexperienced participants completed search tasks. The Figure also showed that the overall efficiency of inexperienced participants' for SLAM was 72.73 per cent, Alexandria was 66.64 per cent, NewGenLib was 69.17 and Koha was 68.64 per cent.

4.3.3 Research Questions 3: What is the ease of use of LMS in service delivery in federal university libraries?

To determine the ease of use of LMS used in service delivery in federal university libraries under study, a number of items were assessed. The opinions of the participants on the items on ease of use were analysed and the mean value derived from the data points were used to determine decision of experienced and inexperienced participants on each of the questionnaire items. The benchmark mean of ≥ 2.50 and ≤ 2.40 on four points scale was used to either agreed or disagreed with the items in the questionnaire. The summary of ease of use of SLAM, Alexandria, NewGenLib and Koha LMS cataloguing, circulation and OPAC modules of the LMS are presented in Tables 4.35 – 4.37. See appendix J1- J12 for the distribution of scores, agreed and disagreed items between experienced and inexperienced respondents on each module of LMS studied. A number of participants were also interviewed and their responses are presented.

4.2.3.1 Ease of use of cataloguing module of library management software

Table 4.35: Ease of Use of LMS Cataloguing Module in Service Delivery in Federal University Libraries

S/N	Statements	SLAM				Alexandria				NewGenLib				Koha			
		Mean value		Decision		Mean		Decision		Mean value		Decision		Mean value		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	It is easy to learn to operate the cataloguing module of LMS in my library	3.40	3.00	A	A	2.40	1.90	D	D	2.40	2.00	D	D	2.10	1.60	D	D
2	It is easy to explore the features / cataloguing module of LMS in my library	3.00	2.60	A	A	2.20	1.70	D	D	2.20	1.90	D	D	1.80	1.50	D	D
3	It is easy to learn to describe/catalogue library materials with LMS in my library	3.40	2.60	A	A	2.40	2.10	D	D	2.40	1.50	D	D	2.10	1.80	D	D
4	It is easy to describe/catalogue library materials with LMS after learning to use cataloguing module	3.60	2.80	A	A	2.50	2.10	A	D	2.50	2.30	A	D	2.20	1.70	D	D
5	It is easy to use z39.50 to import or MARC to catalogue library items	1.00	1.20	D	D	3.30	2.60	A	A	3.40	2.60	A	A	2.70	2.20	A	D
6	It is easy to use the characters on the cataloguing module of the LMS interface	3.00	2.80	A	A	3.10	2.70	A	A	3.30	2.80	A	A	2.80	2.70	A	A
7	It is easy to return to the previous or home page	3.20	3.00	A	A	3.40	3.10	A	A	3.50	3.20	A	A	3.30	3.00	A	A
8	It is easy to navigate through cataloguing module	3.40	2.60	A	A	3.00	2.60	A	A	3.00	2.70	A	A	2.90	2.60	A	A
9	It is easy to access help messages	3.00	2.80	A	A	3.00	2.50	A	A	2.90	2.50	A	A	3.00	2.50	A	A
10	There is clarity in accessing help messages	2.80	2.80	A	A	2.90	2.60	A	A	2.80	2.50	A	A	2.90	2.60	A	A
11	There is clarity of the organization of information on the interface	3.00	2.80	A	A	3.00	2.60	A	A	3.20	2.60	A	A	2.60	2.50	A	A
12	The sequence of the appearance of template(s) (field) is logical	3.00	2.60	A	A	3.10	2.80	A	A	3.10	2.50	A	A	3.10	2.50	A	A
13	The cataloguing module is designed to allow only experienced users to catalogue library materials	1.60	2.00	D	D	2.70	2.50	A	A	2.60	3.00	A	A	2.60	3.30	A	A

Note: A = Agreed, D = Disagreed, Exp = Experienced, Inexp = Inexperienced

Table 4.35 presented the results of the ease of use of LMS cataloguing module in service delivery in federal university libraries in Nigeria. Results in Table 4.35 revealed that SLAM experienced and inexperienced participants agreed with items 1–4 and 6–12 with mean values of ≥ 2.50 . The experienced participants agreed with mean values from 2.80 to 3.60 and the inexperienced participants agreed with mean values from 2.60 to 3.00. The results also revealed that items 1–4 and 6–12 had mean values that are ≥ 2.50 benchmark mean on four points Likert scale. The Table also revealed that SLAM experienced and inexperienced participants disagreed with items 5 and 13 with mean values of ≤ 2.40 . The mean values which indicated that, the experienced participants disagreed with items 5 and 13 were 1.00 and 1.60. Similarly, the inexperienced participants disagreed with the same (items 5 and 13) with mean values of 1.20 and 2.00 indicating that both experienced and inexperienced users can catalogue library resources. Although, participants disagreed with item 5, which state that, it is easy to use z39.50 to import or MARC to catalogue library item. Close observation revealed that SLAM has no z39.50 or MARC feature. Interview with experienced and inexperienced participants revealed that they will not recommend SLAM cataloguing module to other academic libraries to acquire because it does not have z39.50 feature.

Table 4.35 also showed that Alexandria experienced and inexperienced participants disagreed with some items while majority of the items listed in the Table were agreed upon. The results in the Table revealed that both experienced and inexperienced participants disagreed with items 1–3 with mean values of ≤ 2.40 . The experienced participants also disagreed with mean score of 2.40 obtained for “it is easy to learn to operate the cataloguing module of LMS in my library”, 2.20 for “it is easy to explore the features / cataloguing module of LMS in my library” and 2.40 for “it is easy to

describe/catalogue library materials with LMS after learning to use cataloguing module”. Also, inexperienced participants disagreed with mean values of 1.90 for “it is easy to learn to operate the cataloguing module of LMS in my library”, 1.70 for “it is easy to explore the features/cataloguing module of LMS in my library” and 2.10 for “it is easy to describe/catalogue library materials with LMS after learning to use cataloguing module”. Table 4.35 further showed that experienced participants agreed with item 4 (It is easy to describe/catalogue library materials with LMS after learning to use cataloguing module) with a mean value of 2.50, but the inexperienced participants disagreed with item 4 with a mean value of 2.10. Interview with an experienced participant revealed that cataloguing module of Alexandria is “complicated for new users”. Similarly, an inexperienced participant expressed his displeasure over the use of Alexandria to catalogue library material due to its difficulty.

Furthermore, results in Table 4.35 revealed that experienced and inexperienced participants agreed with items 5 - 13 with mean scores of ≥ 2.50 . The experienced participants agreed with mean values which range from 2.70 to 3.40 and the inexperienced participants agreed with mean scores of 2.50 to 3.10. Although experienced and inexperienced participants agreed with item 8, but close observation and interview revealed that effective use of the “lock and unlock feature” was an impediment to the process of cataloguing. Interview with an experienced participant revealed that “navigating from one field to another is a challenge” Similarly, interview with an inexperienced participant revealed that lock and unlock feature confused new users who are not conversant with the process of cataloguing and it was not easy to move from one template to another.

Table 4.35 further revealed that NewGenLib experienced and inexperienced participants disagreed with items 1-3 with mean values of ≤ 2.40 . The experienced participants disagreed with mean values of 2.40 for “it is easy to learn to operate the cataloguing module of LMS in my library”, 2.20 for “it is easy to explore the features / cataloguing module of LMS in my library” and 2.40 for “it is easy to describe/catalogue library materials with LMS after learning to use cataloguing module”. Similarly, the inexperienced participants disagreed with items 1 - 3 mean with values of 2.00, 1.90 and 1.50. The Table also showed that experienced participants agreed with item 4 (it is easy to describe/catalogue library materials with LMS after learning to use cataloguing module) with a mean value of 2.50, however, the inexperienced participants disagreed with item with a mean value of 2.30 indicating that NewGenLib LMS cataloguing module is not easy to use to process library materials. The results in Table 4.35 also showed that experienced and inexperienced participants agreed with items 5- 13 with mean scores of ≥ 2.50 . The experienced participants agreed with mean scores from 2.60 to 3.50 and inexperienced participants agreed with means scores from 2.50 to 3.20. Although experienced and inexperienced participants agreed with item 8 (it is easy to navigate through cataloguing module), interview revealed that participants could not easily navigate through the templates.

Furthermore, results in Table 4.35 revealed that Koha experienced and inexperienced participants disagreed with items 1 - 4 with mean scores of ≤ 2.40 . The experienced participants disagreed with mean scores of 2.10 for item 1 (it is easy to learn to operate the cataloguing module of LMS in my library), 2.20 for item 2 (it is easy to explore the features / cataloguing module of LMS in my library), 2.10 for item 3 (it is easy to describe/catalogue library materials with LMS after learning to use cataloguing module) and 2.20 for item 4 (it is easy to describe/catalogue library materials with LMS after learning to use cataloguing module). Similarly, the inexperienced participants disagreed

with mean values of 1.60, 1.50, 1.80 and 1.70 for items 1 - 4 respectively. The Table also showed that Koha experienced participants agreed with item 5, that, it is easy to use z39.50 to import catalogue of an item(s) with a mean score of 2.70 but Koha inexperienced participants disagreed with the item (5) with a mean score of 2.20. It was observed that even after importing cataloguing data, it was still difficult to edit the imported bibliographical data of an item. The results also showed that both experienced and inexperienced participants agreed with items 6 – 13 with mean scores of ≥ 2.50 . Experienced participants agreed with mean scores from 2.60 to 3.30 and the inexperienced participants agreed with mean scores from 2.50 to 3.00.

4.2.3.2 Ease of Use of circulation module of library management software

Table 4.36: Ease of Use of LMS Circulation Module in Service Delivery in Federal University Libraries

S/N	Statements	SLAM				Alexandria				NewGenLib				Koha			
		Mean value		Decision		Mean value		Decision		Mean value		Decision		Mean value		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	It is easy to learn to operate the circulation module of LMS	3.60	3.00	A	A	2.60	2.20	A	D	2.80	2.60	A	A	2.20	1.80	D	D
2	It is easy to explore the features / circulation module of LMS	3.00	2.60	A	A	2.20	2.00	D	D	2.20	2.00	D	D	2.00	1.40	D	D
3	It is easy to use circulation module to register library users after learning	3.20	2.60	A	A	2.40	2.20	D	D	2.40	2.20	D	D	2.40	1.80	D	D
4	It is easy to charge and discharge library materials to users after learning	3.60	2.80	A	A	3.40	2.80	A	A	3.40	2.80	A	A	3.00	2.80	A	A
5	It is easy to navigate through circulation module	3.40	2.60	A	A	3.20	2.60	A	A	3.40	2.60	A	A	2.80	2.60	A	A
6	It is easy to return to the previous or home page	3.60	3.00	A	A	3.40	3.20	A	A	3.60	3.20	A	A	3.40	3.00	A	A
7	It is easy to access help messages	3.20	2.80	A	A	3.20	2.60	A	A	3.20	2.80	A	A	2.80	2.60	A	A
8	There is clarity in accessing help messages	3.40	2.60	A	A	3.20	2.60	A	A	3.20	2.80	A	A	2.80	2.60	A	A
9	The sequence of the appearance of template(s) (field) is logical	3.00	2.60	A	A	3.00	2.60	A	A	3.00	2.60	A	A	3.00	2.60	A	A
10	The LMS is designed to allow only experienced users perform circulation task with it	1.40	1.80	D	D	2.00	2.40	D	D	2.00	2.20	D	D	2.40	2.00	D	D

Key: A = Agreed, D = Disagreed, Exp = Experienced, Inexp = Inexperienced; see appendix J5 – J8 for detail distribution of scores.

Table 4.36 presented the result of experienced and inexperienced participants on 10 items of ease of use of LMS circulation module. The results revealed that SLAM experienced and inexperienced participants agreed with items 1- 9 with mean score of ≥ 2.50 . The experienced participants agreed with mean scores between 3.00 and 3.60 while the inexperienced agreed with mean scores between 2.60 and 3.00 indicating that circulation module of SLAM LMS is easy to use. Table 4.36 also showed that both experienced and inexperienced participants disagreed with item 10 which state that LMS is designed to allow only experienced users perform circulation task.

Table 4.36 also showed that Alexandria experienced participants agreed with item 1 which state that, it is easy to learn to operate the circulation module of LMS with a mean value of 2.60 and the inexperienced participants disagreed with item 1 with a mean value of 2.20. The Table also revealed that experienced and inexperienced participants disagreed with items 2 and 3 with mean scores of 2.20 and 2.40 (experienced); and 2.00 and 2.20 (inexperienced) indicating that, the process of registering library users is difficult. The result also indicated that experienced and inexperienced participants agreed with items 4 - 9 with mean scores of ≥ 2.50 . The experienced participants agreed with mean scores ranging from 3.00 to 3.40 and the inexperienced participants agreed with mean scores of 2.60 to 3.20. Also, the experienced and inexperienced participants disagreed with item 10 (the LMS is designed to allow only experienced users perform circulation task) with mean values of 2.00 (experienced) and 2.40 (inexperienced) indicating that the circulation module of Alexandria is designed to allow both experienced and inexperienced users to perform circulation tasks. Interview with both experienced and inexperienced

participants revealed that with continues practice and use of circulation module, inexperienced users may find the LMS easy to register library users.

Furthermore, Table 4.36 revealed that NewGenLib experienced and inexperienced participants agreed with item 1 which state that, it is easy to learn to operate the circulation module of LMS with mean values of 2.80 and 2.60 for the experienced and inexperienced participants respectively. Also, the result showed that experienced and inexperienced participants disagreed with items 2 and 3 with mean scores of 2.20 and 2.40 for experienced participants and 2.00 and 2.20 for inexperienced participants. The result in Table 4.36 also revealed that NewGenLib experienced and inexperienced participants agreed with items 4- 9 with mean values of ≥ 2.50 . The experienced participants agreed with mean scores from 3.00 to 3.60 and the inexperienced agreed with mean scores from 2.60 to 3.20. The Table also revealed that NewGenLib experienced and inexperienced participants disagreed with item 10 which state that LMS is designed to allow only experienced users perform circulation task. This implies that inexperienced librarians and para professional can easily use NewGenLib circulation module to perform circulation tasks. However, interview with experienced and inexperienced participants on the ease of use of NewGenLib registration templates revealed that registration templates of circulation module were difficult to use.

The result in Table 4.36 further revealed that Koha experienced and inexperienced participants disagreed with items 1- 3 with mean values of ≤ 2.40 . The experienced participants disagreed with mean values of 2.20, 2.00 and 2.40; and the inexperienced participants disagreed with mean values of 1.80, 1.20 and 1.80. Interview with experienced and inexperienced participants revealed that registering users with Koha

circulation module is difficult and confusing. The Table also showed that Koha experienced and inexperienced participants agreed with items 4-9 with mean values of ≥ 2.50 . The experienced participants agreed with mean values from 2.80 to 3.40 and the inexperienced participants agreed with mean values from 2.60 to 3.00. Also, experienced and inexperienced participants disagreed with item 10 which states that LMS is designed to allow only experienced users perform circulation task with it. The experienced participant disagreed with a mean value of 2.40 and the inexperienced participants disagreed with a mean value of 2.00. Interview with experienced participants revealed that registration module was confusing making it difficult to easily register library users. Similarly, an inexperienced participant revealed that the process of registration of library users is difficult. This implies that Koha circulation module is not easily used without any form of confusion and difficulty when registering users.

4.2.3.3 Ease of Use of online public access catalogue module of library management software

Table 4.37: Ease of Use of LMS OPAC Module in Service Delivery in Federal University Libraries

SN	Statements	SLAM				Alexandria				NewGenLib				Koha			
		Mean value		Decision		Mean alue		Decision		Mean value		Decision		Mean value		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	It is easy to learn to operate the OPAC module of the LMS in my library	3.33	3.00	A	A	3.33	2.91	A	A	3.42	3.00	A	A	3.33	3.17	A	A
2	It is easy to explore the features of OPAC module of LMS in my library	3.00	2.83	A	A	3.25	2.83	A	A	3.25	2.92	A	A	3.17	2.92	A	A
3	It is easy to use OPAC module to search for books in my library	3.33	2.91	A	A	3.42	3.00	A	A	3.42	3.17	A	A	3.50	3.33	A	A
4	It is easy to use the characters on the LMS OPAC interface	3.17	3.00	A	A	3.33	3.17	A	A	3.50	3.17	A	A	3.50	3.42	A	A
5	It is easy to navigate through OPAC module to search for books	3.08	2.83	A	A	3.25	3.08	A	A	3.50	3.17	A	A	3.42	3.08	A	A
6	It is easy to return to the previous or home page	3.42	3.42	A	A	3.33	3.08	A	A	3.50	3.50	A	A	3.42	3.50	A	A
7	It is easy to access help messages	3.33	3.08	A	A	3.17	3.00	A	A	3.42	3.33	A	A	3.42	3.33	A	A
8	There is clarity in accessing help messages	3.42	2.91	A	A	3.25	2.83	A	A	3.50	3.17	A	A	3.50	3.33	A	A
9	There is clarity *in the organization of information on the screen	3.33	3.08	A	A	3.33	3.00	A	A	3.42	3.25	A	A	3.33	3.08	A	A
10	The sequence of the appearance of template (field) is logical in OPAC module	3.42	3.17	A	A	3.25	3.08	A	A	3.50	3.42	A	A	3.33	3.17	A	A
11	The OPAC module of LMS is designed to allow only experienced users to search for books in the library	1.42	1.67	D	D	1.67	1.83	D	D	1.33	1.75	D	D	1.17	1.58	D	D

Note: A = Agreed, D = Disagreed, Exp = Experienced, Inexp = Inexperienced; see appendix J9 – J12 for detail distribution of scores.

Table 4.37 presented the results of ease of use of LMS OPAC module in service delivery in federal university libraries. The results showed that SLAM experienced and inexperienced participants agreed with majority of the items on the ease of use of OPAC module with mean values of ≥ 2.50 . SLAM experienced participants agreed with items 1-10 with mean values of 3.00 to 3.42 and the inexperienced participants agreed with items 1 - 10 with mean values of 2.83 to 3.42. Table 4.37 also revealed that SLAM experienced and inexperienced participants disagreed with item 11 (OPAC module of LMS is designed to allow only experienced users to search for books in the library). Experienced participants disagreed with a mean value of 1.42 and inexperienced participants disagreed with a mean value 1.67 indicating that SLAM OPAC module is easy to use to search for books in the library.

Table 4.37 further revealed that Alexandria experienced and inexperienced participants agreed with majority of the items listed in the Table with mean scores of ≥ 2.50 . The results showed that experienced participants agreed with items 1- 10 with mean values from 3.17 to 3.42 and inexperienced participants agreed with items 1- 10 with mean values' ranging from 2.83 to 3.17 indicating that Alexandria OPAC module is easy to use when searching for books in the library. Table 4.37 also revealed that both experienced and inexperienced participants disagreed that OPAC module of Alexandria LMS is designed to allow only experienced users to search for books in the library (item 11) with mean scores ≤ 2.40 . Experienced participants disagreed with a mean value of 1.67 and inexperienced participants disagreed with a mean value of 1.83.

Results in Table 4.37 also revealed that NewGenLib experienced and inexperienced participants agreed with majority of the items listed in the Table with mean scores of

≥ 2.50. The experienced participants agreed with items 1- 10 with mean values from 3.25 to 3.50 and inexperienced participants agreed with items 1- 10 with mean values from 2.92 to 3.50 implying that NewGenLib OPAC module is easy to use in order to search for books in the library. Table 4.37 also revealed that NewGenLib experienced and inexperienced participants disagreed with item 11 (OPAC module of LMS is designed to allow only experienced users to search for books in the library). Experienced participants disagreed with a mean value of 1.33 and inexperienced participants disagreed with a mean value of 1.75 indicating that OPAC module of NewGenLib is designed to allow both experienced and novices to easily search for books in the library.

Furthermore, the results in Table 4.37 revealed that Koha experienced and inexperienced participants agreed with items 1-10 with mean scores of ≥2.50. The experienced participants agreed with mean scores from 3.17 to 3.50 and the inexperienced participants agreed with mean values from 2.92 to 3.50 implying that OPAC module of Koha is easy to use to search for books in the library. The Table also showed that Koha experienced participants disagreed with item 11 (OPAC module of LMS is designed to allow only experienced users to search for books in the library) with mean value of 1.17. Similarly, Koha inexperienced participants disagreed with item 11 with mean value of 1.58 indicating that OPAC module of Koha is designed to allow both experienced and inexperienced users to search for 12 books.

4.2.4 Research Questions 4: What is the satisfaction derived from using LMS in service delivery in federal university libraries?

To determine the satisfaction derived from using LMS in service delivery in federal university libraries under study, a number of items were assessed. The opinions of the participants on the items on satisfaction derived from using LMS were analysed and mean values derived from data points were used to determine decision of experienced and inexperienced participants on each of the questionnaire items. The benchmark mean of ≥ 2.50 and ≤ 2.40 on four points scale was used to either agreed or disagreed with the items in the questionnaire. Summary on the satisfaction derived from using cataloguing, circulation and OPAC modules of SLAM, Alexandria, NewGenLib and Koha LMS are presented in Table 4.38 - 4.40. (See appendix K1-12 for the distribution of scores, agreed and disagreed items between experienced and inexperienced respondents of each module of LMS studied. A number of participants were also interviewed and their responses are presented.

4.2.4.1 Satisfaction derived from using cataloguing module of library management software

Table 4.38: Satisfaction derived from Using LMS Cataloguing Module in Service Delivery in Federal University Libraries

S/ N	Statements	SLAM				Alexandria				NewGenLib				Koha			
		Mean value		Decision		Mean value		Decision		Mean value		Decision		Mean value		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	I am comfortable with steps required in cataloguing library materials	3.60	3.00	A	A	2.40	2.00	D	D	2.40	2.00	D	D	1.80	1.70	D	D
2	Cataloguing library materials are performed in a straightforward manner	3.80	3.40	A	A	2.80	2.40	A	D	3.00	2.40	A	D	2.30	1.60	D	D
3	I am satisfied with the amount of information displayed in the cataloguing module of LMS	2.80	3.00	A	A	3.20	2.50	A	A	3.20	3.00	A	A	3.50	2.30	A	D
4	I am satisfied with the help received through the help mode of the LMS	2.60	2.60	A	A	2.90	2.50	A	A	3.20	2.60	A	A	2.70	2.50	A	A
5	The user interface messages that appear on the cataloguing module are appropriate	3.00	2.80	A	A	3.10	2.60	A	A	3.30	2.90	A	A	2.90	3.00	A	A
6	The terms used in the cataloguing module are appropriate	3.00	3.20	A	A	3.10	2.70	A	A	3.20	2.70	A	A	2.90	2.70	A	A
7	I find the cataloguing module of the LMS enjoyable when using it	3.60	3.20	A	A	2.80	2.40	A	D	2.90	2.30	A	D	2.00	1.70	D	D
8	I find the cataloguing module of the LMS well designed to use	2.20	2.60	D	A	2.50	2.30	A	D	2.40	2.20	D	D	2.10	1.90	D	D
9	The castaloguing module of LMS is colourful and appealing	3.00	3.00	A	A	3.10	2.90	A	A	2.70	3.00	A	A	3.40	3.20	A	A
10	My overall impression about the interaction with the LMS user interface is satisfying	3.40	3.00	A	A	2.40	2.20	D	D	2.40	2.20	D	D	2.00	1.50	D	D

Key: A = Agreed, D = Disagreed, Exp = Experienced, Inexp = Inexperienced; see appendix K1– K4 for detail distribution of scores.

The results in Table 4.38 revealed that SLAM experienced and inexperienced participants agreed with items 1 - 7, 9 - 10 with mean scores of ≥ 2.50 . SLAM experienced participants agreed with mean scores from 2.60 to 3.80 and the inexperienced participants agreed with mean scores from 2.60 to 3.40. Table 4.18 also revealed that SLAM experienced participants disagreed with item 8 (I find the cataloguing module of the LMS well designed to use) with a mean value of 2.20, however, inexperienced participants agreed on the same item with a mean value of 2.60. Interview with an experienced participant revealed that participants disagreed with item 8 due to lack of z39.50 feature in cataloguing module of SLAM. Furthermore, both experienced and inexperienced participants expressed their satisfaction with the interaction process because of the single template of SLAM cataloguing module.

Table 4.38 also showed that Alexandria experienced and inexperienced participants disagreed with item 1 (I am comfortable with steps required in cataloguing library materials) with mean value of 2.40 (experienced) and 2.00 (inexperienced). The result further showed that experienced participants agreed with item 2 (cataloguing library materials are performed in a straightforward manner) with a mean value of 2.80. However, interview with experienced participant revealed that cataloguing module of Alexandria “is not straightforward”. The inexperienced participants disagreed with same statement (item 2) with a mean value of 2.00. Also, Table 4.38 revealed that experienced participants agreed with items 3- 9 with mean values of ≥ 2.50 . Similarly, the inexperienced participants agreed with items 3, 4, 5, 6 and 9 with mean values of ≥ 2.50 , however, the inexperienced participants disagreed with items 7 and 8 with mean scores of ≤ 2.40 . The Table also revealed that experienced and inexperienced

participants disagreed with item 10 with mean values of 2.40 (experienced) and 2.20 (inexperienced) indicating that majority of the participants were not satisfied with the interaction while performing cataloguing tasks with Alexandria LMS.

Results in Table 4.38 also revealed that NewGenLib experienced and inexperienced participants disagreed with item 1 (I am comfortable with steps required in cataloguing library materials). The experienced participants disagreed with a mean score of 2.40 and the inexperienced disagreed with a mean value of 2.00. Also, Table 4.38 revealed that NewGenLib experienced participants agreed with item 2 with a mean value of 3.00. However, majority of inexperienced participants disagreed with item 2 with a mean time of 2.40. The results in Table 4.38 also revealed that experienced participants agreed with items 3 - 7 and 9 with mean scores of ≥ 2.50 . Similarly, the inexperienced participants agreed with items 3 - 6 and 9 with mean scores of ≥ 2.50 . Furthermore, the inexperienced participants disagreed with items 7 (I find the cataloguing module of the LMS enjoyable when using it), and 8 (I find the cataloguing module of the LMS well designed to use) with mean scores of ≤ 2.40 . The Table also showed that both experienced and inexperienced participants disagreed with item 10 with mean value of ≤ 2.40 indicating that users were not satisfied with the interaction when performing cataloguing tasks.

Furthermore, Table 4.38 showed that Koha experienced and inexperienced participants disagreed with items 1 (I am comfortable with steps required in cataloguing library materials) and 2 (cataloguing library materials are performed in a straightforward manner) with mean values of ≤ 2.40 . The result also showed that experienced participants agreed with item 3 with a mean value of 3.50, however, the inexperienced

participants disagreed with item 3 with a mean value of 2.30. Interview with both experienced and inexperienced participants revealed that there is too much information in cataloguing templates of which some are repeated and some are not necessary, so they are use. Table 4.38 also revealed that experienced and inexperienced participants agreed with items 4- 6 and 9 with mean scores ≥ 2.50 . The experienced participants agreed with mean scores from 2.70 to 3.40 and the experienced participants agreed with mean scores from 2.50 to 3.20. Furthermore, both experienced and inexperienced participants disagreed with items 7, 8 and 10 with mean values of ≤ 2.40 . The experienced participants disagreed with mean scores of 2.00 for item 7 (I find the cataloguing module of the LMS enjoyable when using it), 2.10 for item 8 (I find the cataloguing module of the LMS well designed to use) and 2.00 for item 10 (My overall impression about the interaction with the LMS user interface is satisfying). Similarly, the inexperienced participants disagreed with mean scores of 1.70 (item 7), 1.90 (item 8) and 1.50 (item 10). It can be deduced that many participants are not satisfied with the cataloguing module of Koha LMS.

4.2.4.2 Satisfaction derived from using circulation module of library management software

Table 4.39: Satisfaction derived from Using LMS Circulation Module in Service Delivery in Federal University Libraries

S/ N	Statements	SLAM				Alexandria				NewGenLib				Koha			
		Mean value		Decision		Mean value		Decision		Mean value		Decision		Mean value		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	I am comfortable with the steps required in registering library users	3.00	2.80	A	A	3.20	2.40	A	D	2.80	2.60	A	A	2.20	2.00	D	D
2	I am comfortable with the steps required in charging and discharging library materials to users	3.40	3.00	A	A	3.40	2.80	A	A	3.40	2.80	A	A	3.00	2.80	A	A
3	Registering library users are perform in a straightforward manner	3.40	3.00	A	A	3.20	2.60	A	A	2.60	2.60	A	A	2.40	2.00	D	D
4	Charging and discharging of library materials are perform in a straightforward manner with LMS	3.80	3.20	A	A	3.20	2.80	A	A	3.40	3.00	A	A	3.00	3.00	A	A
5	I am satisfied with the amount of information displayed on circulation module of the LMS	3.00	3.00	A	A	3.00	2.80	A	A	3.00	3.00	A	A	2.80	3.00	A	A
6	I am satisfied with the appropriateness of terms used in the circulation module	3.20	3.00	A	A	3.20	2.80	A	A	3.00	3.00	A	A	3.40	3.00	A	A
7	I am satisfied with the messages that appear on the circulation module	2.80	2.60	A	A	3.20	2.60	A	A	2.60	2.60	A	A	2.60	2.60	A	A
8	I find the circulation module of the LMS enjoyable when using it	3.00	2.80	A	A	2.80	2.60	A	A	2.80	2.60	A	A	2.40	2.00	D	D
9	I find the circulation module of the LMS well designed to use	3.20	2.80	A	A	3.20	2.40	A	D	2.60	2.60	A	A	2.40	2.20	D	D
10	The circulation module of LMS is colourful and appealing when am using it	3.00	3.00	A	A	3.40	3.20	A	A	3.00	3.20	A	A	3.00	3.40	A	A
11	My overall impression about the interaction with circulation module of the LMS user interface is satisfying	3.20	3.00	A	A	3.40	2.60	A	A	2.80	2.60	A	A	2.20	2.00	D	D

Note: A = Agreed, D = Disagreed, Exp = Experienced, Inexp = Inexperienced; see appendix K5 – K8 for detail distribution of scores.

Table 4.39 revealed the result of experienced and inexperienced participants on 11 items of satisfaction derived from using LMS circulation module in service delivery in Federal University Libraries in Nigeria. The results in Table 4.39 showed that SLAM experienced and inexperienced participants agreed with items 1 - 11 with mean scores of ≥ 2.50 . The experienced participants agreed with mean values from 2.80 to 3.80 and the inexperienced participants agreed with mean values from 2.60 to 3.20. Interview with experienced participants revealed that circulation module of SLAM was “interesting, as all books borrowed and returned are display; fines are calculated and clearly display”. Similarly, interview with an inexperienced participant revealed that they were satisfied with SLAM circulation module because new “users easily used it without any confusion to register users”.

Results in Table 4.39 also revealed that Alexandria experienced participants agreed with items 1-11 with mean scores of ≥ 2.50 . The experienced participants agreed with mean values from 2.80 to 3.40. The Table also showed that Alexandria inexperienced participants did not agreed with all the items on satisfaction derived from using LMS circulation module. The inexperienced participants agreed with items 2 – 8 and 10 - 11 with mean scores of ≥ 2.50 . Also, Alexandria inexperienced participants disagreed with items 1 (I am comfortable with the steps required in registering library users) and 9 (I find the circulation module of the LMS well designed to use) with mean scores of 2.40. The mean score of ≤ 2.40 can be attributed to the unpleasantness in the process of registration of library users with Alexandria circulation module. Interview with inexperienced participant revealed that the process of registration is “likable” but it is not satisfactory.

Table 4.39 further showed that NewGenLib experienced and inexperienced participants agreed with items 1 - 11 with mean scores of ≥ 2.50 . The experienced participants agreed with mean scores from 2.60 to 3.40. Similarly, the inexperienced participants agreed with mean scores from 2.60 to 3.20 indicating that both experienced and inexperienced participants were pleased using circulation module of NewGenLib in service delivery, but closed observation revealed that some of the inexperienced participants did not find the process of registering library users easy and interesting as the process was frustrating. Interview with both experienced and inexperienced participants revealed that they were not satisfied with process of registering library users. Experienced participant revealed his displeasure over the use of NewGenLib circulation module noting that some necessary features were not included.

Furthermore, the result in Table 4.39 revealed that Koha experienced and inexperienced participants disagreed with items 1 (I am comfortable with the steps required in registering library users) and 3 (Registering library users are perform in a straightforward manner with LMS) with mean values of ≤ 2.40 . It was also revealed from Table 4.19 that Koha experienced and inexperienced participants agreed with items 2, 4 - 7 and 10 with mean scores of ≥ 2.50 . Table 4.19 also revealed that Koha experienced and inexperienced participants disagreed with items 8 (I find the circulation module of the LMS enjoyable when using it), 9 (I find the circulation module of the LMS well designed to use) and 11 (interaction with circulation module of the LMS user interface is satisfying) with mean values of ≤ 2.40 . Closed observation revealed that inexperienced participants struggle to register library users, indicating their level of dissatisfaction with Koha circulation module.

4.2.4.3 Satisfaction derived from using online public access catalogue module of library management software

Table 4.40: Satisfaction derived from Using OPAC Module of LMS in Service Delivery in Federal University Libraries

S/ N	Statements	SLAM				Alexandria				NewGenLib				Koha			
		Mean value		Decision		Mean		Decision		Mean value		Decision		Mean value		Decision	
		Exp	Inexp	Exp	Nexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	I am comfortable with the steps required in searching for book(s)	3.42	3.33	A	A	3.08	2.75	A	A	3.17	2.92	A	A	3.33	3.08	A	A
2	I am satisfied with the number of steps required in searching for book(s)	3.42	3.33	A	A	3.17	2.75	A	A	3.17	2.92	A	A	3.42	3.08	A	A
3	I can search for book(s) in a straightforward manner	3.33	3.08	A	A	3.08	2.83	A	A	3.25	3.00	A	A	3.17	3.08	A	A
4	I am satisfied with the amount of bibliographic information displayed in the OPAC module	3.33	3.00	A	A	3.33	3.00	A	A	3.42	3.25	A	A	3.42	3.00	A	A
5	I am satisfied with the appropriateness of terms used in the OPAC module	3.33	2.83	A	A	3.25	2.83	A	A	3.33	3.08	A	A	3.42	3.17	A	A
6	I am satisfied with the help messages that appear on the OPAC module of the LMS	3.00	2.75	A	A	2.83	2.50	A	A	3.00	2.83	A	A	3.08	2.75	A	A
7	I find the OPAC module enjoyable when I am using it	3.50	3.08	A	A	3.33	3.17	A	A	3.42	3.25	A	A	3.42	3.17	A	A
8	The OPAC module of LMS is colourful and appealing when I am using it	2.92	2.67	A	A	3.08	2.83	A	A	3.17	2.92	A	A	3.50	3.33	A	A
9	The OPAC module of the LMS is well designed to use	3.08	2.67	A	A	2.92	2.58	A	A	3.17	2.67	A	A	3.33	2.92	A	A
10	My overall impression about the interaction with the OPAC	3.33	3.08	A	A	3.42	3.17	A	A	3.33	3.00	A	A	3.42	3.33	A	A

interface of the LMS is satisfying

Note: A= Agreed, D = Disagreed, Exp = Experienced, Inexp = Inexperienced; see appendix K9– K12 for detail distribution of scores.

The results in Table 4.40 showed the responses of experienced and inexperienced participants on 10 items of satisfaction derived from using OPAC module of LMS in service delivery in federal university libraries in Nigeria. Table 4.40 revealed that SLAM experienced and inexperienced participants agreed with items 1- 10 with mean scores of ≥ 2.50 . SLAM experienced participants agreed with mean scores from 2.92 to 3.50. Similarly, inexperienced participants agreed with mean scores from 2.67 to 3.33. This indicates that both participants were comfortable and satisfied with the steps required in searching for book(s) and it was easy for the participants to interact with the software as they search for books through the library OPAC. Although experienced and inexperienced participants agreed with item 8 (the OPAC module of LMS is colourful and appealing when I am using it), interview with experienced participant revealed that the interface is dull, while the inexperienced participant noted that the interface is not attractive because of the colour. Interview also review that no image is attached from the result of document searched.

Table 4.40 also revealed that Alexandria experienced and inexperienced participants agreed with items 1- 10 with mean scores of ≥ 2.50 . Alexandria experienced participants agreed with mean scores from 2.83 to 3.42. Similarly, inexperienced participants agreed with mean scores from 2.50 to 3.17, implying that all participants were satisfied with all the items but interview with experienced and inexperienced participants revealed that both participants were frustrated because the OPAC was slow to load and slow to respond to search query.

The results in Table 4.40 further revealed that NewGenLib experienced and inexperienced participants agreed with items 1 - 10 with mean scores of ≥ 2.50 . The experienced participants agreed with mean values from 3.17 to 3.42. Similarly, inexperienced participants agreed with mean values from 2.67 to 3.25 indicating that experienced and inexperienced participants enjoy using the OPAC module of NewGenLib to search for books were satisfied with the interaction process. This could be attributed to the limited number of steps required to search for book(s) and the straightforward nature of the interaction with the OPAC module. Interview with an inexperienced participant revealed that the participant(s) could not differentiate between title and subject option.

Furthermore, Table 4.40 showed that Koha experienced and inexperienced participants agreed with items 1 - 10 with mean scores of ≥ 2.50 . Koha experienced participants agreed with mean scores from 3.08 to 3.50 and the inexperienced participants agreed with mean scores from 2.75 to 3.33 indicating that the participants were comfortable and satisfied with the steps required to search for book(s) and they were satisfied with the interaction with the OPAC interface of Koha LMS. Interview also confirmed that both participants were satisfied with the search process.

4.2.5 Research Questions 5: What are the challenges of using library management software in service delivery in federal university libraries?

To identify the challenges encountered while using LMS in service delivery in federal university libraries under study, a number of items were assessed. The opinions of the participants on the items on challenges encountered while using LMS were analysed and the mean value obtained from the data points were used to determine decision of experienced and inexperienced on each questionnaire item. The benchmark mean of ≥ 2.50 and ≤ 2.40 on four points scale was used to either agreed or disagreed with the items in the questionnaire. A number of participants were also interviewed and their responses were also presented. The summary of the challenges encountered while using cataloguing, circulation and OPAC modules of SLAM, Alexandria, NewGenLib and Koha LMS are presented in Tables 4.41 - 4.43

4.2.5.1 Challenges of using cataloguing module of library management software

Table 4.41: Challenges Encountered while Using Cataloguing Module in Service Delivery in Federal University Libraries

S/ N	Statements	SLAM				Alexandria				NewGenLib				Koha			
		Mean value		Decision		Mean value		Decision		Mean value		Decision		Mean value		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	The number of steps required to catalogue library materials with LMS are many.	1.20	1.60	D	D	2.50	2.70	A	A	2.80	3.10	A	A	3.10	3.60	A	A
2	The terms used in the LMS cataloguing module are unfamiliar	1.40	2.00	D	D	1.30	1.60	D	D	1.40	1.70	D	D	1.60	1.50	D	D
3	The terms used in the LMS cataloguing module are confusing	1.20	1.40	D	D	2.00	2.20	D	D	1.60	2.30	D	D	2.30	2.30	D	D
4	The LMS cataloguing module is difficult to use	1.20	1.40	D	D	2.40	2.80	D	A	2.40	2.70	D	A	2.90	3.30	A	A
5	The LMS cataloguing module is cumbersome to use	1.00	1.60	D	D	2.50	2.70	A	A	2.60	3.00	A	A	3.00	3.40	A	A
6	There is inconsistency in the use of terms throughout the cataloguing module	1.40	2.00	D	D	1.30	1.80	D	D	1.50	1.70	D	D	1.60	1.80	D	D
7	The cataloguing module of the LMS has many extraneous elements	1.20	1.80	D	D	2.40	2.70	D	A	2.50	3.00	A	A	3.10	3.50	A	A
8	I find it difficult to catalogue library materials with LMS because the templates are many	1.00	1.20	D	D	2.20	2.60	D	A	2.40	2.90	D	A	2.60	3.00	A	A

Note: A = Agreed, D = Disagreed, Exp = Experienced, Inexp = Inexperienced

Table 4.41 showed that SLAM experienced and inexperienced participants disagreed with items 1 – 8 with mean scores of ≤ 2.40 indicating that usability issues with the use of SLAM cataloguing module have not been identified. This could be attributed to the number of templates and data entry elements required to be filled. Interview with both experienced and inexperienced users revealed that SLAM cataloguing module has one template on which all bibliographic information of an item is entered. When interviewed, an experienced participant said “you can catalogue as much materials as possible in a day”, however, SLAM cataloguing module “is not detailed”, has no feature for z39.50 or MARC and is not web based. Therefore, the participants could not recommend circulation module of SLAM LMS to other university libraries for use.

Table 4.41 also revealed that both Alexandria experienced and inexperienced participants agreed with items 1 (the number of steps required to catalogue library materials are many) and 5 (the LMS cataloguing module is cumbersome to use). Experienced participants agreed with mean values of 2.50 and the inexperienced participants agreed with mean values of 2.70. Table 4.41 also showed that both experienced and inexperienced participants disagreed with items 2, 3 and 6 with mean scores of ≤ 2.40 . Furthermore, Table 4.41 indicated that experienced participants disagreed with items 4, 7 and 8 with mean values of ≤ 2.40 . Although the response from the experienced participants revealed that participants disagreed that cataloguing module of the LMS has many extraneous data elements and templates, interview with an experienced participant revealed that the “templates are many and it is difficult to use”. Table 4.41 further showed that inexperienced participants agreed with items 4 (the LMS cataloguing module is difficult to use), 7 (the cataloguing module of the LMS has many

extraneous elements) and 8 (I find it difficult to catalogue library materials with LMS because the templates are many) with mean values of ≥ 2.50 . Interview with an inexperienced participant revealed that “cataloguing module of Alexandria is not straight forward, templates are many with a lot of data elements that made the process of cataloguing complicated for me and other new users of this module”. Interview with both participants also revealed that lock and unlock features of the cataloguing process slowed down the work and makes navigating from one field (template) to another a challenge. Although, experienced and inexperienced participants recommended Alexandria cataloguing module to other university libraries if they can afford it, however, the experienced participant opined the inability of the module to identify items that have been catalogue without duplication or submitting the item the second time. Closed observation of the task performance and interview revealed that Alexandria cataloguing module has three (3) templates and “subject template should be changed or moved to title template”.

Results in Table 4.41 further revealed that both NewGenLib experienced and inexperienced participants agreed with items 1 (the number of steps required to catalogue library materials are many), 5 (the LMS cataloguing module is cumbersome to use) and 7 (The cataloguing module of the LMS has many extraneous elements) with mean scores of ≥ 2.50 . NewGenLib experienced participants agreed with mean scores of 2.80 (item 1), 2.60 (item 5) and 2.50 (item 7). Similarly, inexperienced participants agreed with mean scores of 3.10 (item 1), 3.00 (item 5) and 3.00 (item 7). The Table also revealed that NewGenLib experienced and inexperienced participants disagreed with items 2, 3 and 6 with mean values of ≤ 2.40 . Furthermore, experienced participants

disagreed with items 4 and 8. The experienced participants disagreed with mean values of ≤ 2.40 but the inexperienced participants agreed with items 4 and 8. The inexperienced participants agreed with mean values of ≥ 2.50 indicating different opinion between the experienced and the inexperienced participants. Although the responses of experienced participants indicated that NewGenLib cataloguing module was not difficult to use, interview with experienced participant revealed that users cannot move easily without clicking on each cell to type-in data. In other words, users cannot use tap arrow key to move quickly and easily from one cell to another unless they use the mouse to click in the cell. Also, interview with an inexperienced participant also revealed that new users find cataloguing process difficult because the templates and data entering elements are many. Closed observation showed that inexperienced participants were confused while cataloguing using the NewGenLib cataloguing module which had four (4) templates. However, both experienced and inexperienced participants recommended NewGenLib LMS to other university libraries to use.

Table 4.41 further revealed that experienced and inexperienced participants agreed with items 1, 4, 5, 7 and 8. Both the participants agreed with mean scores of ≥ 2.50 indicating that participants agreed with majority of items on challenges encountered while using Koha cataloguing module. Experienced participants agreed with mean values from 2.60 to 3.10 and the inexperienced participants agreed with mean values from 3.00 to 3.60. When interviewed, an experienced participant said “you cannot use Koha cataloguing module when you have not learnt it and even after learning, it takes time and continues practice before you can be able to use it”. Furthermore, the result in Table 4.41 revealed that Koha experienced and inexperienced participants disagreed with items 2, 3 and 6 with mean

values of ≤ 2.40 . Interview with an experienced participant revealed that, “clicking and going through one to nine (1-9) fields (templates) is frustrating”, the fields contain many data entering elements that were not used, making it cumbersome and difficult to use. Also noted was that, Koha cataloguing module does not have option for other languages. The participants revealed that “Koha cataloguing cannot be used to catalogue Arabic materials because there is no options for other languages”. Interview with experienced and inexperienced participants also revealed that Koha cataloguing module was “very difficult and frustrating” to use, “even after learning and telling me what to do, I could not remember, the steps and data elements needed to be filled are too many, I had to stop cataloguing the items”. Despite the issues participants encountered when cataloguing, experienced participants recommended Koha cataloguing module to other university libraries because it is open and free but the inexperienced participants could not recommend Koha cataloguing module to any university library to use because it is difficult to learn and use.

4.2.5.2 Challenges of using circulation module of library management software

Table 4.42: Challenges Encountered while Using LMS Circulation Module in Service Delivery in Federal University Libraries

S/N	Statements	SLAM				Alexandria				NewGenLib				Koha			
		Mean value		Decision		Mean value		Decision		Mean value		Decision		Mean value		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	The number of steps required for circulating library materials are many	1.40	2.00	D	D	2.00	2.40	D	D	2.00	2.20	D	D	2.40	2.40	D	D
2	The terms used in the LMS circulation module are unfamiliar	1.20	1.80	D	D	1.60	2.00	D	D	2.00	2.20	D	D	1.60	2.00	D	D
3	The terms used in the LMS circulation module are confusing	1.20	1.60	D	D	2.20	2.40	D	D	2.40	2.60	D	A	3.00	3.00	A	A
4	The LMS circulation module is complex to use	1.20	2.00	D	D	2.20	2.40	D	D	2.00	2.40	D	D	2.40	2.40	D	D
5	The LMS circulation module is cumbersome to use	1.20	1.80	D	D	2.00	2.40	D	D	2.40	2.60	D	A	3.00	3.00	A	A
6	There is inconsistency in the use of terms throughout the circulation module	1.40	2.00	D	D	1.00	2.00	D	D	1.60	2.00	D	D	1.60	2.00	D	D
7	The circulation module of the LMS has many extraneous elements	1.00	2.00	D	D	2.60	2.80	A	A	2.40	2.60	D	A	3.20	3.00	A	A
8	I find it difficult to register library users because the templates/steps and the information required to be filled are many	1.00	1.60	D	D	2.40	2.80	D	A	2.20	2.80	D	A	3.00	3.20	A	A
9	I find it difficult to circulate library materials because the templates/steps are many	1.20	1.60	D	D	1.20	1.60	D	D	1.60	2.00	D	D	1.40	2.00	D	D

Key: A = Agreed, D = Disagreed, Exp = Experienced, Inexp = Inexperienced

The result in Table 4.42 revealed that SLAM experienced and inexperienced participants disagreed with items 1 - 8 with mean scores of ≤ 2.40 indicating that usability issues were not encountered with the use of SLAM circulation module. Interview with both experienced and inexperienced participants revealed that there is nothing frustrating about using SLAM circulation module. According to an experienced participant, “anyone that is not taught how to use SLAM can easily use it for circulation activities”. Similarly, an inexperienced participant expressed his thought as “I explore SLAM circulation module within a short period of time and I can use it to register user, charge and discharge books without confusion”. Both experienced and inexperienced participants recommended SLAM circulation module to other university libraries because of its ease of use.

Results in Table 4.42 also revealed that both Alexandria experience and inexperience participants disagreed with items 1 - 6 with mean values of ≤ 2.40 . Experienced participants disagreed with mean values from 1.00 to 2.20 and the inexperienced participants disagreed with mean values from 2.00 to 2.40. Results further showed that experienced and inexperienced participants agreed with item 7 (the circulation module of the LMS has many extraneous elements). The experienced participants agreed with a mean value of 2.60 and the inexperienced participants agreed with a mean value of 2.80. The Table also showed that experienced participants disagreed with item 8 (I find it difficult to register library users because the information/steps required on the templates were many) with a mean score of 2.40 but inexperienced participants agreed that, it was difficult to register library users because the information and steps required on the templates were many with a mean value of 2.80. Interview with experienced and

inexperienced participants revealed that some data entering elements in registration templates were not necessary since they were not used. Some of the data element that were not used include: graduation data, yearly status of students and suspension of users. Furthermore, Table 4.42 showed that both experienced and inexperienced participants disagreed with items 9 (I find it difficult to circulate library materials because the templates/steps are many) with mean values of ≤ 2.40 indicating that the templates for charging and discharging of library materials are not many. Interview with experienced and inexperienced participants further revealed that “reading level of library users” cannot be determined, as such the feature is not necessary. Closed observation also showed that Alexandria circulation module had two (2) templates for registration.

The result in Table 4.42 further revealed that NewGenLib experienced and inexperienced participants disagreed with items 1, 2, 4 and 6 (see Table 4.42) with mean values of ≤ 2.40 . Experienced participants disagreed with mean values from 1.60 to 2.40 and the inexperienced participants disagreed with mean values from 2.00 to 2.40. Table 4.42 also revealed that experienced participants disagreed with items 3, 5, 7 and 8 with mean values of ≤ 2.40 , however, responses from the inexperienced participants revealed that majority of the participants agreed with items 3 (The terms used in the LMS circulation module are confusing), 5 (The LMS circulation module is cumbersome to use), 7 (the circulation module of the LMS has many extraneous elements) and 8 (I find it difficult to register library users because the information/steps required on the templates are many) with mean values of ≥ 2.50 . Interview with experienced and inexperienced participants revealed the presence of some data entry elements in the registration templates that made the registration process cumbersome and confusing. The Table also revealed that

experienced and inexperienced participants disagreed with item 9 with mean values of ≤ 2.40 indicating that the process of charging and discharging library materials with NewGenLib circulation module is not difficult. Interview with both experienced and inexperienced participants revealed that some data entering elements were repeated. Closed observation and interview also revealed that NewGenLib circulation module have three (3) templates for registration.

Table 4.42 further revealed that majority of Koha experienced and inexperienced participants disagreed with items 1 (the number of steps required to circulate library materials are many), 2 (the terms used in the circulation module are unfamiliar) and 4 (LMS circulation module is complex to use) with mean values of ≤ 2.40 . The result in Table 4.42 also revealed that majority of experienced and inexperienced participants agreed with items 3 (the terms used in the LMS circulation module are confusing), 5 (LMS circulation module is cumbersome to use), 7 (the circulation module of the LMS has many extraneous elements) and 8 (I find it difficult to register library users because the information/steps required on the templates are many) with mean values of ≥ 2.50 . Interview with an experienced participant further revealed that the “number of fields to be filled are similar and confusing, almost like repetition of what you have filled, phone number and email on different section of the field and there are alternate contact numbers and you do not know which one to use”. Similarly, interview with an inexperienced participant revealed that the data required to register users were many and confusing. According to the participant, “generation of student number is difficult and alternate contact addresses are also confusing because I don’t know what they mean”. Close observation and interview with participants also revealed that Koha registration module

had 5 templates with a number of data entry elements required to be filled. Table 4.42 also revealed that majority of experienced and inexperienced participants disagreed with items 6 (There is inconsistency in the use of terms throughout the circulation module) and 9 (I find it difficult to circulate library materials because the template are many) with mean scores of ≤ 2.40 indicating the ease of charging and discharging of library items to users using a single template for each of the function.

4.2.5.3 Challenges of using online public access catalogue module of library management software

Table 4.43: Challenges Encountered while Using OPAC Module of LMS in Service Delivery in Federal University Libraries

S/N	Statements	SLAM				Alexandria				NewGenLib				Koha			
		Mean value		Decision		Mean value		Decision		Mean value		Decision		Mean value		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	The number of steps required to search library materials with OPAC module of LMS are many	1.50	1.67	D	D	1.67	1.83	D	D	1.50	1.75	D	D	1.42	1.67	D	D
2	The terms used in the OPAC module of the LMS are unfamiliar	1.42	1.75	D	D	1.58	1.92	D	D	1.42	1.67	D	D	1.50	1.67	D	D
3	The terms used in the OPAC module of LMS are confusing	1.42	1.58	D	D	1.58	1.75	D	D	1.42	1.75	D	D	1.42	1.50	D	D
4	The OPAC module of the LMS is difficult to use	1.50	1.67	D	D	1.50	1.75	D	D	1.33	1.50	D	D	1.33	1.50	D	D
5	The OPAC module of the LMS is cumbersome to use	1.33	1.58	D	D	1.67	1.92	D	D	1.50	1.67	D	D	1.42	1.67	D	D
6	There is inconsistency in the use of terms throughout the OPAC module	1.33	1.50	D	D	1.50	1.58	D	D	1.58	1.75	D	D	1.42	1.67	D	D
7	The OPAC module of the LMS has many extraneous elements	1.42	1.75	D	D	1.58	1.75	D	D	1.42	1.58	D	D	1.33	1.50	D	D
8	I find it difficult to use the search options in the OPAC module of the LMS to search for books	1.25	1.50	D	D	1.58	1.92	D	D	1.50	1.67	D	D	1.42	1.58	D	D

Note: A = Agreed, D = Disagreed, Exp = Experienced, Inexp = Inexperienced; OPAC= Online public access catalogue

Result in Table 4.43 presented the opinion of experienced and inexperienced participants on eight (8) items of challenges encountered while using OPAC module of LMS to search for document in libraries under study in Federal University in Nigeria. The Table revealed that SLAM experienced and inexperienced participants disagreed with items 1 - 8 (see Table 4.43) with mean scores of ≤ 2.40 indicating that both experienced and inexperienced participants did not encountered usability problems while using OPAC module of SLAM LMS, but interview with both experienced and inexperienced participants revealed that OPAC module was not difficult to use. Close observation revealed that some inexperienced participants could not clearly differentiate between title and subject search option and also made spelling mistake.

Table 4.43 further revealed that Alexandria experienced and inexperienced participants disagreed with all the items on challenges encountered while using OPAC module of LMS to search for books. Experienced and inexperienced participants disagreed with items 1 - 8 (see Table 4. 43) with mean scores of ≤ 2.40 indicating that both experienced and inexperienced participants did not encountered usability issues while using OPAC module of Alexandria LMS. However, interview with experienced and inexperienced participants revealed that internet service of the library was poor thereby frustrating the search process.

The Table 4.43 also showed that all NewGenLib experienced and inexperienced participants disagreed with the items on challenges encountered while using OPAC module of LMS to search for books. Experienced and inexperienced participants disagreed with items 1- 8 (see Table 4.43) with mean values of ≤ 2.40 . Experienced

participants disagreed with mean scores from 1.33 to 1.58. Similarly, the inexperienced participants disagreed with mean scores from 1.50 to 1.75. Interview revealed that both experienced and inexperienced participants were impressed with the use of OPAC module, but inexperienced participant noted that OPAC does not provide for spelling option, therefore they some of them made spelling mistakes. Close observation revealed that inexperienced participant made spelling mistakes and could not differentiate between title and subject search option. Experienced participants also noted that they cannot use other features such as advanced search, checkout, reservation and suggestion of NewGenLib OPAC module and OPAC search help was not provided for in the interface.

The result in Table 4.43 also revealed that Koha experienced and inexperienced participants of Koha disagreed with all the items on challenges encountered while using OPAC module of LMS to search for books. Experienced and inexperienced participants disagreed with items 1 - 8 with mean values of ≤ 2.40 . The experienced participants disagreed with mean scores from 1.33 to 1.50 and the inexperienced participants disagreed with mean scores from 1.50 to 1.67. Interview with both experienced and inexperienced participants revealed that Koha OPAC module was not difficult to use. The experienced participant also noted their inability to use other features like advanced search, relevancy sorting, purchase suggestion and hold of OPAC module. Both experienced and inexperienced participants express their concerned about lack of spelling suggestion in Koha interface. Close observation revealed that inexperienced participant made spelling mistakes and could not differentiate clearly between title and subject search option.

4.3 Hypotheses testing of Library Management Software using Kruskal-Wallis Test

Since this study could not meet the assumption of normality and equal variance among group scores, it used Kruskal-Wallis test to determine the difference in effectiveness and efficiency of cataloguing, circulation and cataloguing modules among LMS used in service delivery in federal university libraries in Nigeria. Kruskal-Wallis test was therefore, used to determine the difference among groups of independent variables on dependent variables and also compares the mean of ranks. Kruskal-Wallis test is a rank-based nonparametric alternative to one way ANOVA. According to Field (2005), Kruskal-Wallis test does not assume normal distribution of dependent variable as well as equal variance among group scores.

The equation for Kruskal-Wallis test as used in this study is: $H = \left(\frac{12}{n(n+1)} \sum_{j=1}^c \frac{t_j^2}{n_j} \right) - 3(n+1)$ (Abifarin *et al.*, 2019)

4.3.1 Effectiveness of library management software

4.3.1.1 *Effectiveness of cataloguing module among library management software*

H₀ 1. There is no significant difference in the effectiveness of cataloguing module among LMS used by experience users in service delivery in federal university libraries in Nigeria

Table 4.44: Effectiveness of Cataloguing Module by Experienced Users in Service Delivery in Federal University Libraries in Nigeria

	SLAM: Time in seconds	Rank	S/N	ALEX Time in seconds	Rank	S/N	NGL Time in seconds	Rank	S/N	KOHA Time in seconds	Rank
1	127	1	1	216	16	1	240	24	1	775	76
2	146	2	2	227	17	2	241	25	2	778	77
3	176	3	3	231	18	3	247	28	3	781	78
4	179	4	4	232	19	4	249	30.5	4	801	79
5	180	5	5	234	21	5	249	30.5	5	816	80
6	182	6.5	6	234	21	6	269	40.5	6	819	81
7	182	6.5	7	234	21	7	279	44	7	825	82.5
8	187	8	8	238	23	8	287	45	8	825	82.5
9	189	9.5	9	242	26	9	289	46	9	834	84.5
10	189	9.5	10	247	28	10	294	47	10	834	84.5
11	191	11	11	247	28	11	297	48	11	840	86
12	192	12	12	251	32	12	299	49	12	851	87
13	201	13	13	253	33	13	301	51	13	857	88
14	204	14	14	255	34	14	302	53	14	861	89
15	210	15	15	258	35	15	314	58	15	887	90
			16	259	36.5	16	315	59	16	889	91
			17	259	3.5	17	318	60.5	17	892	92
			18	261	38	18	318	60.5	18	896	93
			19	268	39	19	321	62	19	897	94
			20	269	40.5	20	328	63	20	899	95
			21	271	42	21	331	64	21	901	96
			22	272	43	22	351	65	22	904	97
			23	301	50.5	23	354	66	23	908	98
			24	301	50.5	24	359	67	24	913	99.5
			25	302	53	25	361	68.5	25	913	99.5
			26	302	53	26	361	68.5	26	915	101
			27	303	55	27	362	70	27	919	102
			28	307	56	28	367	71	28	947	103
			29	312	57	29	372	72	29	949	104
			30	391	74	30	380	73	30	1021	105
Total		120			1063.5			1609.5			2715

Table 4.44 showed the completion time of experienced participants arranged in ranks of ascending order used for effectiveness of SLAM, Alexandria, NewGenLib and Koha LMS

$$\frac{12}{105(105+1)} \left[\frac{(120)^2}{15} + \frac{(1063.5)^2}{30} + \frac{(1609.5)^2}{30} + \frac{(2715)^2}{30} \right] - 3(105+1)$$

$$\frac{12}{11025+105} \left(\frac{14400.00}{15} + \frac{1131032.25}{30} + \frac{2590490.25}{30} + \frac{7371225.00}{30} \right) - 3(105+1)$$

$$\frac{12}{11130} (960.00 + 37701.08 + 86349.68 + 245707.50) - 318$$

$$0.00108(370718.26) - 318 = 400.87 - 318 = 82.38$$

H = 82.38

Table 4.45: Result of hypothesis testing

Calculated H statistic	Critical χ^2 values	Df	Alpha level	Decision
82.38	7.81	3	0.05	$H_0 =$ Rejected

The test showed that the calculated value ($H = 82.38$) and the critical chi-square (χ^2) at 0.05 level of significance for 3 Df is 7.81. Since the H - statistic value of 82.38 is greater than the critical χ^2 value of 7.81, the null hypothesis is rejected, hence there is significant difference in the effectiveness of cataloguing module among LMS used by experience users in service delivery in federal university libraries in Nigeria.

$H_0 2$. There is no significant difference in the effectiveness of cataloguing module among LMS used by inexperience users in service delivery in federal university libraries in Nigeria

Table 4.46: Effectiveness of cataloguing module of LMS by inexperienced participants in service delivery in federal university libraries in Nigeria

S/N	SLAM Time in second	Rank	S/N	ALEX Time in seconds	Rank	S/N	NGL Time in seconds	Rank	S/N	KOHA Time in seconds	Rank
1	342	1	1	499A	16	1	590N	36	1	1437	76
2	343	2	2	512A	17	2	594N	41	2	1441	77
3	345	3	3	517A	18	3	597N	42	3	1466	78
4	351	4.5	4	522A	19	4	598N	43	4	1475	79
5	351	4.5	5	526A	20	5	599N	44	5	1491	80
6	355	6	6	531A	21	6	601N	46	6	1496	81
7	356	7	7	531A	22	7	605N	49	7	1515	82
8	359	8	8	533A	23	8	608N	50	8	1529	83
9	361	9	9	536A	24	9	610N	51	9	1539	84
10	367	10.5	10	539A	25.5	10	612N	52	10	1546	85
11	367	10.5	11	539A	25.5	11	614N	53	11	1551	86
12	386	12	12	541A	27	12	619N	55.5	12	1556	87
13	389	13	13	543A	28	13	619N	55.5	13	1558	88
14	390	14	14	545A	29	14	635N	56.5	14	1572	89
15	392	15	15	559A	30	15	645N	59	15	1597	90
			16	562A	31	16	648N	60	16	1603	91
			17	571A	32	17	649N	61	17	1607	92
			18	579A	33	18	651N	62	18	1608	93
			19	583A	34	19	660N	63	19	1612	94
			20	590A	35	20	662N	64	20	1615	95
			21	591A	37	21	674N	65	21	1620	96
			22	592A	38	22	677N	66	22	1628	97
			23	593A	39.5	23	679N	67.5	23	1631	98
			24	593A	39.5	24	679N	67.5	24	1637	99
			25	601A	46	25	687N	69.5	25	1661	100
			26	601A	46	26	687N	69.5	26	1678	101
			27	602A	48	27	694N	71.5	27	1681	102
			28	617A	54	28	694N	71.5	28	1697	103
			29	635N	56.5	29	699N	73	29	1698	104
			30	651A	62.5	30	710N	74	30	1742	105
Total		120			977			1738.5			2715

Table 4.46 showed the completion time of inexperienced participants arranged in ranks of ascending order used for effectiveness of SLAM, Alexandria, NewGenLib and Koha LMS arranged in ranks of ascending order.

$$\frac{12}{105(105+1)} \left[\frac{(120)^2}{15} + \frac{(977)^2}{30} + \frac{(1738.5)^2}{30} + \frac{(2715)^2}{30} \right] - 3(105+1)$$

$$\frac{12}{11025+105} \left(\frac{14400.00}{15} + \frac{954529.00}{30} + \frac{3022382.25}{30} + \frac{7371225.00}{30} \right) - 3(105+1)$$

$$\frac{12}{11130} (960.00 + 31817.63 + 100746.08 + 245707.50) - 318$$

$$0.00108 (379231.21) - 318 = 409.57 - 318 = 91.57$$

H= 91.57

Table 4.47: Result of Hypothesis Testing

Calculated H statistic	Critical x ² values	Df	Alpha level	Decision
91.57	7.81	3	0.05	H ₀ = Rejected

The test in Table 4.47 showed that the calculated value (H= 91.57) and the critical chi-square (x²) at 0.05 level of significant for 3 Df is 7.81. Since the H- statistic value of 91.57 is greater than the critical x² value of 7.81, the null hypothesis is rejected and concluded that there is significant difference in the effectiveness of cataloguing module among LMS used by inexperience users in service delivery in federal university libraries in Nigeria

4.3.1.2 Effectiveness of circulation module among library management software

H₀ 3 There is no significant difference in the effectiveness of circulation module among LMS used by experience users in service delivery in federal university libraries in Nigeria

Table 4.48: Effectiveness of Circulation Module LMS by Experienced Participants in Service Delivery in Federal University Libraries in Nigeria

S/N	SLAM: Time in seconds	Rank	S/N	ALEX Time in seconds	Rank	S/N	NGL Time in seconds	Rank	S/N	KOHA Time in seconds	Rank
1	50	1	1	65	6.5	1	56	3	1	71	10
2	55	2	2	67	8	2	74	12	2	79	19.5
3	58	4	3	69	9	3	75	13.5	3	79	19.5
4	60	5	4	72	11	4	79	19.5	4	87	27
5	65	6.5	5	76	15	5	87	27	5	87	27
6	75	13.5	6	78	16.5	6	98	33.5	6	89	31
7	78	16.5	7	79	19.5	7	99	36	7	98	33.5
8	80	22	8	81	23.5	8	102	39	8	118	43
9	81	23.5	9	88	30	9	103	40.5	9	119	44
10	87	27	10	97	32	10	104	42	10	127	48
11	87	27	11	121	45	11	128	49	11	131	52
12	99	36	12	126	46.5	12	129	50.5	12	199	57
13	99	36	13	126	46.5	13	133	53.5	13	208	58
14	101	38	14	129	50.5	14	133	53.5	14	209	59
15	103	40.5	15	138	55	15	155	56	15	216	60
Total		298.5			414.5			528.5			588.5

Table 4.48 revealed the completion time of experienced participants sorted in ranks of ascending order used for effectiveness of circulation tasks of SLAM, Alexandria, NewGenLib and Koha LMS.

$$H = \frac{12}{60(60+1)} \left(\frac{(298.5)^2}{15} + \frac{(414.5)^2}{15} + \frac{(528.5)^2}{15} + \frac{(588.5)^2}{15} \right) - 3(60 + 1)$$

$$\frac{12}{3660} \left(\frac{89102.25}{15} + \frac{171810.25}{15} + \frac{279312.25}{15} + \frac{346332.25}{15} \right) - 183$$

$$0.00328 (5940.15 + 11454.02 + 18620.82 + 23088.82) - 183$$

$$0.00328 (59103.81) - 183 = 193.86 - 183 = 10.86$$

$$H = 10.86$$

Table 4.49: Result of Hypothesis Testing

Calculated H statistic	Critical x^2 values	Df	Alpha level	Decision
10.86	7.81	3	0.05	$H_0 =$ Rejected

The test in Table 4.49 revealed that the calculated value ($H = 10.86$) and the critical chi-square (x^2) at 0.05 level of significant for 3 Df is 7.81. Since the H - statistic value of 10.86 is greater than the critical x^2 value of 7.81, the null hypothesis is rejected and concluded that there is significant difference in the effectiveness of circulation module among LMS used in service delivery in federal university libraries in Nigeria

H₀ 4 There is no significant difference in the effectiveness of circulation module among LMS used by inexperienced users in service delivery in federal university libraries in Nigeria

Table 4.50: Effectiveness of circulation module by inexperienced participants

S/N	SLAM: Time in seconds	Rank	S/N	ALEX Time in seconds	Rank	S/N	NGL Time in seconds	Rank	S/N	KOHA Time in seconds	Rank
1	99	1	1	115	8	1	109	5.5	1	109	5.5
2	101	2.5	2	117	10.5	2	116	9	2	117	10.5
3	101	2.5	3	119	14	3	118	12	3	126	17.5
4	103	4	4	119	14	4	119	14	4	131	22.5
5	111	7	5	131	22.5	5	127	19.5	5	138	25.5
6	123	16	6	136	24	6	148	31	6	147	29.5
7	126	17.5	7	138	25.5	7	152	33	7	164	35
8	127	19.5	8	139	27	8	161	34	8	195	37
9	129	21	9	146	28	9	199	39	9	199	39
10	147	29.5	10	149	32	10	207	42	10	220	47
11	189	36	11	211	44.5	11	225	48.5	11	225	48.5
12	199	39	12	215	46	12	229	51	12	355	57
13	203	41	13	228	50	13	239	54	13	376	58
14	210	43	14	233	52	14	258	55	14	406	59
15	211	44.5	15	236	53	15	263	56	15	418	60
Total		344			451			503.5			551.5

Table 4.50 showed the completion time of inexperienced participants sorted in ranks of ascending order and used for effectiveness of circulation tasks of SLAM, Alexandria, NewGenLib and Koha LMS

$$H = \frac{12}{60(60+1)} \left(\frac{(344)^2}{15} + \frac{(451)^2}{15} + \frac{(503.5)^2}{15} + \frac{(551.5)^2}{15} \right) - 3(60 + 1)$$

$$\frac{12}{3660} \left(\frac{118336}{15} + \frac{203401}{15} + \frac{253512.25}{15} + \frac{304152.25}{15} \right) - 183$$

$$0.00328 (7889.07 + 13560.07 + 16900.82 + 20276.82) - 183$$

$$0.00328 (58626.78) - 183 = 192.29 - 183 = 9.29$$

$$H = 9.29$$

Table 4.51: Result of Hypothesis Testing

Calculated H statistic	Critical χ^2 values	Df	Alpha level	Decision
9.29	7.81	3	0.05	$H_0 =$ Accepted

Table 4.51 showed that the calculated value ($H = 9.29$) and the critical chi-square (χ^2) at 0.05 level of significant for 3 Df is 7.81. Since the H - statistic value of 9.29 is greater than the critical χ^2 value of 7.81, the null hypothesis is rejected and concluded that there is significant difference in the effectiveness of circulation module among LMS used in service delivery in federal university libraries in Nigeria

4.3.1.3 Effectiveness of OPAC module among library management software

H₀ 5 There is no significant difference in the effectiveness of OPAC module among LMS used by experienced users in service delivery in federal university libraries in Nigeria

Table 4.52: Effectiveness of OPAC module by experienced participants

S/N	SLAM: Time in seconds	Rank	S/N	ALEX Time in seconds	Rank	S/N	NGL Time in seconds	Rank	S/N	KOHA Time in seconds	Rank
1	17	1	1	27	52.5	1	24	21	1	22	7.5
2	19	3	2	28	63	2	25	32.5	2	23	12
3	19	3	3	28	63	3	25	32.5	3	23	12
4	19	3	4	28	63	4	26	43	4	23	12
5	20	5.5	5	28	63	5	26	43	5	23	12
6	20	5.5	6	29	74	6	26	43	6	23	12
7	22	7.5	7	29	74	7	27	52.5	7	23	12
8	23	12	8	29	74	8	27	52.5	8	24	21
9	24	21	9	29	74	9	27	52.5	9	24	21
10	24	21	10	29	74	10	27	52.5	10	24	21
11	24	21	11	29	74	11	28	63	11	24	21
12	24	21	12	30	82.5	12	28	63	12	24	21
13	24	21	13	30	82.5	13	28	63	13	25	32.5
14	25	32.5	14	30	82.5	14	28	63	14	25	32.5
15	25	32.5	15	31	88	15	28	63	15	25	32.5
16	25	32.5	16	31	88	16	29	74	16	25	32.5
17	25	32.5	17	31	88	17	29	74	17	25	32.5
18	26	43	18	31	88	18	29	74	18	25	32.5
19	26	43	19	31	88	19	29	74	19	26	43
20	27	52.5	20	32	91	20	29	74	20	26	43
21	27	52.5	21	33	92	21	30	82.5	21	26	43
22	27	52.5	22	34	94	22	30	82.5	22	26	43
23	28	63	23	34	94	23	30	82.5	23	27	52.5
24	28	63	24	34	94	24	36	36	24	27	52.5
Total		645			1901			1393.5			656.5

Table 4.52 showed the completion time of experienced participants used arranged in ranks of ascending order for effectiveness of OPAC tasks of SLAM, Alexandria, NewGenLib and Koha LMS .

$$H = \frac{12}{96(96+1)} \left(\frac{(645)^2}{24} + \frac{(1901)^2}{24} + \frac{(1393.5)^2}{24} + \frac{(656.5)^2}{24} \right) - 3(96 + 1)$$

$$\frac{12}{9312} \left(\frac{416025.00}{24} + \frac{361380.00}{24} + \frac{1941842.25}{24} + \frac{430992.25}{24} \right) - 3(96 + 1)$$

$$0.00129 (17334.38 + 150575.04 + 80910.94 + 17958.01) - 291$$

$$0.00129 (266778.37) - 291 = 344.14 - 291 = 53.14$$

$$H = 53.14$$

Table 4.53: Result of hypothesis testing

Calculated H statistic	Critical x ² values	Df	Alpha level	Decision
53.14	7.81	3	0.05	H ₀ = Rejected

Table 4.53 showed that the calculated value (H= 53.14) and the critical chi-square (x²) at 0.05 level of significant for 3 Df is 7.81. Since the *H*- statistic value of 53.14 is greater than the critical x² value of 7.81, the null hypothesis is rejected and concluded that there is significant difference in the effectiveness of OPAC module among LMS used in service delivery in federal university libraries in Nigeria

H₀ 6 There is no significant difference in the effectiveness of OPAC module among LMS used by inexperienced users in service delivery in federal university libraries in Nigeria

Table 4.54: Effectiveness of OPAC module by inexperienced participants

S/N	SLAM: Time in seconds	Rank	S/N	ALEX Time in seconds	Rank	S/N	NGL Time in seconds	Rank	S/N	KOHA Time in seconds	Rank
1	21	1	1	38	37	1	33	19	1	34	20.5
2	22	2	2	39	46.5	2	35	22	2	34	20.5
3	27	4	3	41	55.5	3	36	25	3	36	25
4	27	4	4	41	55.5	4	36	25	4	36	25
5	27	4	5	42	57	5	37	30	5	36	25
6	28	6	6	43	59.5	6	37	30	6	37	30
7	29	9	7	43	59.5	7	38	37	7	37	30
8	29	9	8	44	62.5	8	38	37	8	37	30
9	29	9	9	44	62.5	9	38	37	9	38	37
10	29	9	10	45	65	10	39	46.5	10	38	37
11	29	9	11	45	65	11	39	46.5	11	38	37
12	30	12	12	46	67.5	12	39	46.5	12	38	37
13	31	14.5	13	46	67.5	13	39	46.5	13	38	37
14	31	14.5	14	47	69	14	39	46.5	14	39	46.5
15	31	14.5	15	48	70	15	40	53	15	39	46.5
16	31	14.5	16	49	71	16	40	53	16	39	46.5
17	32	17.5	17	51	75	17	43	59.5	17	39	46.5
18	32	17.5	18	51	75	18	45	65	18	40	53
19	43	59.5	19	52	82	19	51	75	19	51	75
20	51	75	20	52	82	20	52	82	20	51	75
21	51	75	21	53	89	21	52	82	21	52	82.5
22	52	82	22	53	89	22	53	89	22	53	89
23	52	82	23	54	94.5	23	53	89	23	54K	94.5
24	53	89	24	54	94.5	24	53	89	24	54K	94.5
Total		645			1901			1393.5			656.5

Table 4.54 showed the completion time of inexperienced participants used for effectiveness of OPAC tasks of SLAM, Alexandria, NewGenLib and Koha LMS sorted in ranks of ascending order

$$H = \frac{12}{96(96+1)} \left(\frac{(633.5)^2}{24} + \frac{(1615.5)^2}{24} + \frac{(1231)^2}{24} + \frac{(1140.5)^2}{24} \right) - 3(96 + 1)$$

$$\frac{12}{9312} \left(\frac{401322.25}{24} + \frac{2727452.25}{24} + \frac{1515361.00}{24} + \frac{1300740.25}{24} \right) - 3(96 + 1)$$

$$0.00129 (16721.76 + 113643.38 + 63140.04 + 54197.51) - 291$$

$$0.00129 (247702.39) - 291 = 319.54 - 291 = 28.54$$

$$H = 28.54$$

Table 4.55: Result of hypothesis testing

Calculated H statistic	Critical χ^2 values	Df	Alpha level	Decision
28.54	7.81	3	0.05	$H_0 =$ Rejected

Result in Table 4.53 revealed that the calculated value ($H = 28.54$) and the critical chi-square (χ^2) at 0.05 level of significant for 3 Df is 7.81. Since the H - statistic value of 28.54 is greater than the critical χ^2 value of 7.81, the null hypothesis is rejected and therefore, concluded that there is significant difference in the effectiveness of OPAC module among LMS used in service delivery in federal university libraries in Nigeria

4.3.2 Efficiency of Library Management Software

4.3.2.1 *Efficiency of cataloguing module among library management software*

Ho 7. There is no significant difference in the efficiency of cataloguing module among LMS used by experienced users in service delivery in federal university libraries in Nigeria

Table 4.56: Efficiency of cataloguing module by experienced participants

S/N	SLAM: Time in seconds	Rank	S/N	ALEX Time in seconds	Rank	S/N	NGL Time in seconds	Rank	S/N	KOHA Time in seconds	Rank
1	143	1	1	219	14	1	221	15	1	734	76
2	156	2	2	223	17	2	239	28	2	766	77
3	162	3	3	228	18.5	3	261	36	3	792	78
4	169	4	4	229	20	4	264	38	4	799	79
5	171	5	5	231	21.5	5	276	40.5	5	801	80
6	178	6	6	231	21.5	6	278	42.5	6	831	81
7	179	7	7	232	23	7	287	44	7	832	82
8	181	8	8	234	24	8	293	45	8	834	83.5
9	186	9	9	237	25	9	297	47	9	834	83.5
10	198	10	10	238	26	10	299	48	10	839	85
11	206	11	11	239	28	11	301	49	11	861	86
12	211	12	12	239	28	12	311	56	12	871	87
13	215	13	13	247	30	13	319	57	13	878	88
14	222	16	14	250	31	14	322	58.5	14	879	89
15	228	18.5	15	253	32	15	327	60.5	15	887	90
16			16	254	33	16	327	60.5	16	891	91
17			17	257	34	17	339	62	17	892	92
18			18	261	36	18	341	63	18	896	93
19			19	261	36	19	349	64.5	19	896	94
20			20	271	39	20	349	64.5	20	899	95
21			21	276	40.5	21	351	66	21	904	96
22			22	278	42.5	22	356	67	22	906	97
23			23	294	46	23	357	68.5	23	908	98
24			24	302	50	24	357	68.5	24	911	99
25			25	303	51.5	25	362	70	25	925	100
26			26	303	51.5	26	368	71	26	934	101
27			27	304	53.5	27	378	72	27	941	102
28			28	304	53.5	28	379	73	28	943	103
29			29	307	55	29	383	74	29	949	104
30			30	322	58.5	30	395	75	30	968	105
Total		125.5			1044			1684.5			2715

Table 4.56 showed the time used to perform cataloguing tasks with SLAM, Alexandria,

NewGenLib and Koha LMS sorted in ranks of ascending order by experienced participants

$$\frac{12}{105(105+1)} \left[\frac{(125.5)^2}{15} + \frac{(1044)^2}{30} + \frac{(1684.5)^2}{30} + \frac{(2715)^2}{30} \right] - 3(105+1)$$

$$\frac{12}{11025+105} \left(\frac{15750.25}{15} + \frac{1089936.00}{30} + \frac{2837540.25}{30} + \frac{7371225.00}{30} \right) - 3(105+1)$$

$$\frac{12}{11130} (1050.02 + 36331.20 + 94584.68 + 245707.50) - 318$$

$$0.00108(377,673.40) - 318 = 407.87 - 318 = 89.89$$

H = 89.89

Table 4.57: Result of hypothesis testing

Calculated H statistic	Critical χ^2 values	Df	Alpha level	Decision
89.89	7.81	3	0.05	H ₀ =Rejected

The test in Table 4.57 showed that the calculated value (H= 91.57) and the critical chi-square (χ^2) at 0.05 level of significant for 3 Df is 7.81. Since the *H*- statistic value of 89.89 is greater than the critical χ^2 value of 7.81, the null hypothesis is rejected and therefore, concluded that there is significant difference in the efficiency of cataloguing module among LMS used in service delivery in federal university libraries in Nigeria

Ho 8. There is no significant difference in the efficiency of cataloguing module among LMS used by inexperienced users in service delivery in federal university libraries in Nigeria

Table 4.58: Efficiency of cataloguing module by inexperienced participants

S/N	SLAM: Time in seconds	Rank	S/N	ALEX Time in seconds	Ran k	S/N	NGL Time in seconds	Ran k	S/N	KOHA Time in seconds	Rank
1	298	1	1	451	16	1	575	33	1	1349	76
2	312	2	2	481	17	2	581	34.5	2	1380	77
3	319	3.5	3	492	18	3	581	34.5	3	1456	78
4	319	3.5	4	499	19	4	587	37.5	4	1458	79
5	324	5	5	501	20	5	589	40.5	5	1499	80
6	331	6	6	507	21	6	597	43	6	1516	81
7	337	7	7	508	22	7	603	45.5	7	1529	82
8	347	8	8	511	23	8	609	49	8	1531	83
9	349	9	9	516	24	9	627	52	9	1541	84
10	352	10	10	519	25	10	629	53.5	10	1545	85
11	360	11	11	529	26	11	634	55	11	1547	86
12	361	12	12	544	27.5	12	636	56	12	1552	87
13	369	13	13	544	27.5	13	639	57	13	1587	88
14	377	14	14	554	29	14	642	58.5	14	1591	89
15	390	15	15	562	30	15	643	60.5	15	1601	90
16			16	564	31	16	643	60.5	16	1602	91
17			17	567	32	17	651	62	17	1607	92
18			18	583	36	18	652	63	18	1618	93
19			19	587	37.5	19	659	64	19	1621	94
20			20	588	39	20	660	65	20	1628	95
21			21	589	40.5	21	663	66	21	1638	96
22			22	592	42	22	677	67	22	1641	97
23			23	600	44	23	697	68	23	1649	98
24			24	603	45.5	24	698	69	24	1657	99
25			25	605	47	25	701	70	25	1659	100
26			26	607	48	26	702	71	26	1668	101
27			27	611	50	27	703	72	27	1677	102
28			28	620	51	28	711	73	28	1711	103
29			29	629	53.5	29	712	74	29	1739	104
30			30	642	58.5	30	719	75	30	1749	105
Total		120			1000.5			1729.5			2715

Table 4.58 showed the time used to perform cataloguing tasks with SLAM, Alexandria, NewGenLib and Koha LMS sorted in ranks of ascending order by inexperienced participants.

$$\frac{12}{105(105+1)} \left[\frac{(120)^2}{15} + \frac{(1000.5)^2}{30} + \frac{(1729.5)^2}{30} + \frac{(2715)^2}{30} \right] - 3(105 + 1)$$

$$\frac{12}{11025 + 105} \left(\frac{14400.00}{15} + \frac{1001,000.25}{30} + \frac{2,990,132.64}{30} + \frac{7,371,225.00}{30} \right) - 3(105 + 1)$$

$$0.00108 (960.00 + 33,366.68 + 99,671.09 + 245,707.50) - 315 + 3$$

$$0.00108 (379,705.27) - 318 = 410.08 - 318 = 92.08.$$

H = 92.08

Table 4.59: Result of hypothesis testing

Calculated H statistic	Critical χ^2 values	Df	Alpha level	Decision
92.08	7.81	3	0.05	$H_0 =$ Rejected

Result in Table 4.59 revealed that the calculated value (H= 92.08) and the critical chi-square (χ^2) at 0.05 level of significant for 3 Df is 7.81. Since the H- statistic value of 92.08 is greater than the critical χ^2 value of 7.81, the null hypothesis is rejected and therefore, concluded that there is significant difference in the efficiency of cataloguing module among LMS used in service delivery in federal university libraries in Nigeria

4.3.2.2 Efficiency of circulation module among library management software

Ho. 9 There is no significant difference in the efficiency of circulation module LMS used by experienced users in service delivery in federal university libraries in Nigeria

Table 4.60: Efficiency of circulation module by experienced participants

S/N	SLAM: Time in seconds	Rank	S/N	ALEX Time in seconds	Rank	S/N	NGL Time in seconds	Rank	S/N	KOHA Time in seconds	Rank
1	51	1	1	54	2	1	61	7	1	67	12
2	55	3	2	60	5.5	2	63	9	2	77	22
3	59	4	3	65	10.5	3	69	15.5	3	79	24.5
4	60	5.5	4	68	13.5	4	70	17.5	4	83	28
5	62	8	5	70	17.5	5	78	23	5	86	31
6	65	10.5	6	73	20	6	85	30	6	109	42
7	68	13.5	7	79	24.5	7	88	32	7	115	45.5
8	69	15.5	8	80	26	8	91	33	8	118	47.5
9	71	19	9	81	27	9	93	34	9	119	49.5
10	75	21	10	84	29	10	100	37	10	121	51.5
11	97	35	11	106	41	11	119	49.5	11	189	56
12	99	36	12	111	43	12	121	51.5	12	198	57
13	101	38.5	13	113	44	13	123	53	13	201	58
14	101	38.5	14	115	45.5	14	125	54	14	203	59
15	104	40	15	118	47.5	15	130	55	15	207	60
Total		289			396.5			501			643.5

Table 4.60 showed the time used to perform circulation tasks with SLAM, Alexandria, NewGenLib and Koha LMS sorted in ranks in ascending order by experienced participants

$$H = \frac{12}{60(60+1)} \left(\frac{(289)^2}{15} + \frac{(396.5)^2}{15} + \frac{(501)^2}{15} + \frac{(643.5)^2}{15} \right) - 3(60 + 1)$$

$$\frac{12}{3660} \left(\frac{83521.00}{15} + \frac{157212.25}{15} + \frac{251001.00}{15} + \frac{414092.25}{15} \right) - 183$$

$$0.00328 (5568.07 + 10480.82 + 16733.40 + 27606.15) - 183$$

$$0.00328 (60388.44) = 198.07 - 183 = 15.07$$

$$H = 15.07$$

Table 4.61: Result of hypothesis testing

Calculated H statistic	Critical χ^2 values	Df	Alpha level	Decision
15.07	7.81	3	0.05	H_0 =Rejected

Table 4.61 revealed that the calculated value ($H= 15.07$) and the critical chi-square (χ^2) at 0.05 level of significant for 3 Df is 7.81. Since the H - statistic value of 15.07 is greater than the critical χ^2 value of 7.81, the null hypothesis is rejected and therefore, concluded that there is significant difference in the efficiency of circulation module among LMS used in service delivery in federal university libraries in Nigeria

$H_{0.10}$ There is no significant difference in the efficiency of circulation module LMS used by inexperienced users in service delivery in federal university libraries in Nigeria

Table 4.62: Efficiency of circulation module by inexperienced participants

S/N	SLAM: Time in seconds	Rank	S/N	ALEX Time in seconds	Rank	S/N	NGL Time in seconds	Rank	S/N	KOHA Time in seconds	Rank
1	95	1	1	114	7	1	116	8	1	127k	19.5
2	101	2	2	117	9	2	119	10.5	2	131	21.5
3	105	3	3	119	10.5	3	122	13	3	131	21.5
4	107	4	4	120	12	4	124	17	4	143	29
5	108	5	5	123	15	5	142	27.5	5	158	30
6	110	6	6	123	15	6	170	31	6	188	35.5
7	123	15	7	137	23	7	177	32	7	197	39
8	125	18	8	139	24	8	179	33	8	199	41.5
9	127	19.5	9	140	25.5	9	189	37	9	201	43
10	140	25.5	10	142	27.5	10	191	38	10	208	46
11	185	34	11	198	40	11	227	50	11	298	56
12	188	35.5	12	207	45	12	231	51	12	388	57
13	199	41.5	13	211	47	13	234	52	13	399	58
14	205	44	14	216	48	14	241	53	14	399	59
15	220	49	15	253	55	15	246	54	15	401	60
Total		303			403.5			507			616

Table 4.62 showed the time used to perform circulation tasks with SLAM, Alexandria, NewGenLib and Koha LMS sorted in ranks in ascending order by inexperienced participants

$$H = \frac{12}{60(60+1)} \left(\frac{(303)^2}{15} + \frac{(403.5)^2}{15} + \frac{(507)^2}{15} + \frac{(616)^2}{15} \right) - 3(60 + 1)$$

$$\frac{12}{3660} \left(\frac{91809.00}{15} + \frac{162812.25}{15} + \frac{257049.00}{15} + \frac{379456.00}{15} \right) - 3(60 + 1)$$

$$0.00328 (6120.60 + 10854.15 + 17136.60 + 25297.07) - 183$$

$$0.00328 (59408.42) - 183 = 194.86 - 183 = 11.86$$

H= 11.86

Table 4.63: Result of hypothesis testing

Calculated H statistic	Critical χ^2 values	Df	Alpha level	Decision
11.86	7.81	3	0.05	H ₀ =Rejected

Table 4.63 showed that the calculated value (H= 11.86) and the critical chi-square (χ^2) at 0.05 level of significant for 3 Df is 7.81. Since the *H*- statistic value of 11.86 is greater than the critical χ^2 value of 7.81, the null hypothesis is rejected and therefore, concluded that there is significant difference in the efficiency of circulation module among LMS used in service delivery in federal university libraries in Nigeria

4.3.2.3 Efficiency of online public access catalogue module among library management software

Ho. 11 There is no significant difference in the efficiency of OPAC module among LMS used by experienced users in service delivery in federal university libraries in Nigeria

Table 4.64: Efficiency of OPAC module by experienced participants

S/N	SLAM: Time in seconds	Rank	S/N	ALEX Time in seconds	Rank	S/N	NGL Time in seconds	Rank	S/N	KOHA Time in seconds	Rank
1	19	1	1	25	41	1	22	6.5	1	21	4
2	20	2.5	2	26	53.5	2	23	14	2	22	6.5
3	20	2.5	3	27	63.5	3	24	26.5	3	23	14
4	22	6.5	4	28	71	4	24	26.5	4	23	14
5	22	6.5	5	29	78	5	25	41	5	23	14
6	23	14	6	29	78	6	25	41	6	23	14
7	23	14	7	29	78	7	25	41	7	23	14
8	23	14	8	29	78	8	25	41	8	24	26.5
9	23	14	9	29	78	9	25	41	9	24	26.5
10	23	14	10	29	78	10	26	53.5	10	24	26.5
11	24	26.5	11	29	78	11	26	53.5	11	24	26.5
12	24	26.5	12	30	84.5	12	26	53.5	12	24	26.5
13	24	26.5	13	30	84.5	13	27	63.5	13	24	26.5
14	24	26.5	14	30	84.5	14	27	63.5	14	25	41
15	24	26.5	15	30	84.5	15	27	63.5	15	25	41
16	24	26.5	16	31	90.5	16	27	63.5	16	25	41
17	25	41	17	31	90.5	17	27	63.5	17	25	41
18	25	41	18	31	90.5	18	27	63.5	18	25	41
19	25	41	19	31	90.5	19	28	71	19	26	53.5
20	25	41	20	31	90.5	20	28	71	20	26	53.5
21	26	53.5	21	31	90.5	21	28	71	21	26	53.5
22	26	53.5	22	31	90.5	22	29	78	22	27	63.5
23	26	53.5	23	32	95	23	29	78	23	27	63.5
24	27	63.5	24	35	96	24	31	90.5	24	28	71
Total		303			403.5			507			616

Table 4.64 showed the time experienced participants used to perform OPAC search tasks with SLAM, Alexandria, NewGenLib and Koha LMS sorted in ranks in ascending order

$$H = \frac{12}{96(96+1)} \left(\frac{(1054.5)^2}{24} + \frac{(1515)^2}{24} + \frac{(1279.5)^2}{24} + \frac{(803)^2}{24} \right) - 3(96 + 1)$$

$$\frac{12}{9312} \left(\frac{1111970.25}{24} + \frac{2295225.00}{24} + \frac{1637120.25}{24} + \frac{644809}{24} \right) - 3(96 + 1)$$

$$0.00129 (46332.09 + 95634.38 + 68213.34 + 26867.04) - 291$$

$$0.00129 (237046.85) - 291 = 303.79 - 291 = 14.79$$

$$H = 14.79$$

Table 4.65: Result of hypothesis testing

Calculated H statistic	Critical χ^2 values	Df	Alpha level	Decision
14.79	7.81	3	0.05	H_0 =Rejected

Table 4.65 showed that the calculated value ($H= 14.79$) and the critical chi-square (χ^2) at 0.05 level of significant for 3 Df is 7.81. Since the H - statistic value of 14.79 is greater than the critical χ^2 value of 7.81, the null hypothesis is rejected and therefore, concluded that there is significant difference in the efficiency of OPAC module among LMS used in service delivery in federal university libraries in Nigeria

H_0 . 12 There is no significant difference in the efficiency of OPAC module among LMS used by experienced users in service delivery in federal university libraries in Nigeria

Table 4.66: Efficiency of OPAC module by inexperienced participants

S/N	SLAM Time in seconds	Rank	S/N	ALEX Time in seconds	Rank	S/N	NGL Time in seconds	Rank	S/N	KOHA Time in seconds	Rank
1	22	1	1	35	15.5	1	27	4	1	28	5
2	24	2	2	39	37	2	29	6.5	2	29	6.5
3	26	3	3	39	37	3	35	15.5	3	30	8
4	33	9.5	4	39	37	4	36	21	4	33	9.5
5	34	11.5	5	41	47	5	36	21	5	34	11.5
6	35	15.5	6	41	47	6	36	21	6	35	15.5
7	35	15.5	7	43	54	7	38	30.5	7	36	21
8	35	15.5	8	44	58.5	8	38	30.5	8	37	26
9	36	21	9	44	58.5	9	39	37	9	37	26
10	37	26	10	44	58.5	10	39	37	10	38	30.5
11	37	26	11	45	63.5	11	41	47	11	39	37
12	37	26	12	46	66.5	12	41	47	12	39	37
13	38	30.5	13	47	68.5	13	42	51	13	40	43
14	39	37	14	47	68.5	14	43	54	14	40	43
15	39	37	15	48	70	15	44	58.5	15	40	43
16	42	51	16	49	71.5	16	44	58.5	16	41	47
17	44	58.5	17	49	71.5	17	45	63.5	17	42	51
18	45	63.5	18	51	78.5	18	45	63.5	18	43	54
19	46	66.5	19	51	78.5	19	51	78.5	19	50	73.5
20	50	73.5	20	52	86.5	20	51	78.5	20	51	78.5
21	51	78.5	21	52	86.5	21	52	86.5	21	51	78.5
22	51	78.5	22	53	92.5	22	52	86.5	22	52	86.5
23	52	86.5	23	55	95	23	52	86.5	23	52	86.5
24	53	92.5	24	56	96	24	53	92.5	24	53	92.5
Total		926			1541			1176			1015

Table 4.66 showed the time inexperienced participants used to perform OPAC search tasks with SLAM, Alexandria, NewGenLib and Koha LMS sorted in ranks in ascending order

$$H = \frac{12}{96(96+1)} \left(\frac{(926)^2}{24} + \frac{(1541)^2}{24} + \frac{(1176)^2}{24} + \frac{(1015)^2}{24} \right) - 3(96 + 1)$$

$$\frac{12}{9312} \left(\frac{857476.00}{24} + \frac{2374681.00}{24} + \frac{1382976.00}{24} + \frac{1030225.00}{24} \right) - 3(96 + 1)$$

$$0.00129 (35728.17 + 98945.04 + 57624.00 + 42926.04) - 291$$

$$0.00129 (235223.25) - 291 = 303.47 - 291 = 12.44$$

$$H = 12.44$$

Table 4.67: Result of hypothesis testing

Calculated H statistic	Critical x ² values	Df	Alpha level	Decision
12.44	7.81	3	0.05	H ₀ = Rejected

Table 4.65 showed that the calculated value (H= 12.44) and the critical chi-square (x²) at 0.05 level of significant for 3 Df is 7.81. Since the *H*- statistic value of 12.44 is greater than the critical x² value of 7.81, the null hypothesis is rejected and therefore, concluded that there is significant difference in the efficiency of OPAC module among LMS used in service delivery in federal university libraries in Nigeria

4.4 Discussion of the Results

4.4.1 Effectiveness of library management software

4.4.1.1 *Effectiveness of cataloguing module of library management software*

The results of effectiveness of cataloguing module indicated that all experienced participants completed the cataloguing tasks. SLAM experienced participants took the least average time to complete cataloguing tasks and the highest average time used to complete the cataloguing tasks was obtained for Koha indicating a difference in the time used to complete cataloguing tasks with each LMS. The results obtained from inexperienced participants also indicated that, 52 out of 105 tasks were completed. SLAM participants had the highest number of tasks completion and lowest time while Koha

participants had the least number of tasks completed with the highest time for cataloguing. The order of maximum tasks completed was SLAM, Alexandria, then NewGenLib before Koha LMS.

The study discovered that it was easy for experienced participants to catalogue the items given to them. On the other hand, inexperienced participants found the tasks difficult to perform, even with the initial training and time given to them to practice. Inexperienced participants who committed errors while cataloguing library items spent more time in completing the task(s); others could not complete the tasks due to information overload on the interface and lack of clarity of the content, they were confused on the next steps to take. Information that may not be used for cataloguing are embedded in cataloguing module, as such new cataloguers find the use of the module difficult and frustrating and abandoned the use of LMS for manual operation. So, there was difference between inexperienced and experienced participants in term of task performance. Inexperienced participants took more time to perform the assigned tasks and were less successful when compare to experienced participants. This findings agreed with the finding of Khatun and Ahmed (2018) who reported significant difference between novice and experienced users in the first usability experiment test of a library management software.

Interview with SLAM, Alexandria, NewGenLib and Koha participants revealed that all the LMS were used to describe library materials, however, SLAM user expressed their displeasure toward the non web based form of the software (SLAM). This implies that SLAM cataloguing module does not have either MARC/Z39.50 feature and cataloguers cannot have access to catalogued and classified materials of other libraries through the use of Z39.50. Koha participants described the process of cataloguing with Koha LMS as tedious, confusing and frustrating due to the number of templates, steps and amount of bibliographic information required to be filled. Alexandria participants revealed that the

software was not straight forward and it was complicated for both experienced and inexperienced users and NewGenLib noted that imputing data in the templates is confusing. This would have contributed to the errors committed and low per cent of effectiveness LMS cataloguing modules.

The completion rate (percent effectiveness) revealed that all experienced participants completed cataloguing tasks. Hence, they all attained 100 per cent effectiveness. However, most of the inexperienced participants could not complete the cataloguing tasks. The per cent effectiveness for SLAM is 66.67 %, Alexandria is 56.67 %, NewGenLib is 53.33 % and Koha is 26.67 %. From the classification of System Usability Scale (SUS) modified by Farrahi *et al.* (2019) and adapted for acceptable region of LMS usability, 0-25 is considered worst, 25.5 – 52.5 is poor, 53- 67 is considered ok, 67.5- 74.5 is good, 75- 85 is excellent and 85.5 - 100 is consider best. SLAM, Alexandria and NewGenLib cataloguing modules are said to be ok, therefore concluded that SLAM, Alexandria and NewGenLib cataloguing modules are effective. The findings agreed with the finding of Soewardi and Perdana (2019) who reported that English board game developed for educational learning was effective. However, Koha cataloguing module is said to be poor, thus, not effective for cataloguing. Interview with participants revealed that the cumbersomeness and multiplicity of information required for cataloguing when Koha is used contributed to the low effective value obtained for Koha inexperienced participants. The result of Koha effectiveness agreed with the finding of Wirasmiata and Uska (2018) on E-Rapor effectiveness. Wirasmiata and Uska (2018) discovered that E-Rapor system was not effective because many errors were committed.

4.4.1.2 *Effectiveness of circulation module of library management software*

Results of effectiveness of circulation module showed that all experienced participants completed and achieved circulation tasks with the highest time spent on registration of library users obtained with Koha experienced participants and the lowest time was obtained with SLAM participants. The variation in the average time could be attributed to the extraneous data element required to be filled on registration templates. The results of the inexperienced participants revealed that, not all inexperienced participants completed the circulation task. Of the 60 tasks performed, 40 tasks were completed. SLAM inexperienced participants had the highest number of tasks completed and the least number of tasks completed was with Koha participants. The order of maximum tasks completed is SLAM followed by Alexandria, next to Alexandria is NewGenLib and the least is Koha LMS. The difference in the number of completed tasks is attributed to level of information and steps involves in registering users. The findings on registration of users (task 1) are similar to the finding of Mattia and Staggers (2016) which reported that the tasks of exporting was difficult, so users committed errors while performing the tasks and Thuseethan *et al.* (2015) who reported that students found the system hard to login to submit their assignment.

The results also indicated difference between inexperienced and experienced participants in term of task performance. Inexperienced participants took more time to perform registration tasks and were less successful when compare to experienced participants. This could be attributed to the number of templates, extraneous element needed to be filled and navigation issues. The opinion expressed by experienced and inexperienced participants during interview revealed that Alexandria, Koha and NewGenLib registration templates contain more information than required. The alternate addresses and phone numbers on all templates of Koha module are confusing. These findings are in line with Dowding (2018) and Monsoon (2017) reports on usability of systems. Monsoon (2017) reported that

participants could not complete tasks assigned to them because they were frustrated and Dowding (2018) submitted that excessive information led users to make errors when performing tasks

The effectiveness of circulation tasks revealed that all experienced participants completed all circulation tasks. Hence, they all attained 100 per cent effectiveness. However, not all inexperienced participants completed circulation tasks. The per cent effectiveness for SLAM is 73.33 %, Alexandria is 66.67 %, NewGenLib is 66.67 % and Koha is 53.33%. From the classification of System Usability Scale (SUS) modified by Farrahi *et al.* (2019) and adapted for acceptable region of LMS usability, 0-25 is considered worst, 25.5 – 52 is poor, 53- 67 is considered ok, 67.5- 74.5 is good, 75- 85 is excellent and 85.5 - 100 is said to be the best. SLAM, Alexandria, NewGenLib and Koha circulation modules are considered ok and concluded to be effective for use. This finding agreed with the finding of Dinar and Iga (2019) that immunization monitoring interface system was effective because participants achieved their objectives easily, but contrary to the findings of Sara and Nurwulan (2021) who found that Gojek application was usable because novice users achieved below 60 percent effectiveness with the system.

4.4.1.3 Effectiveness of online public access catalogue module of library management software

Result of the effectiveness of OPAC module showed that all the experienced participants completed the search terms. SLAM experienced participants had the lowest average time and Alexandria experienced participants had the highest average time used to complete OPAC search tasks. The variation in the average time of tasks performed could be attributed to speed of load time (network service) and individual speed of typing. A close look at the OPAC interface shows that the templates contain essential and similar information. This would have contributed to the moderate average time taken to perform

OPAC search tasks of all LMS under study by the experienced participants. The finding in this study agreed with the finding of Pratama (2018) who discovered that Jakarta Academic Information System was effective because participants completion rate was at excellent.

The result also revealed that not all inexperienced participants completed the information search across the LMS under study. The highest average time spent to achieve OPAC tasks was with Alexandria and the lowest average time spent to complete OPAC search tasks was with SLAM. A careful observation of Table 4.18 indicated that there is no much difference in the time taken to complete the search tasks across LMS studied. The difference could be attributed to individual ability to choose the correct option, speed of typing and load time of the respective LMS. Of the 96 tasks performed by 48 inexperienced participants, 70 tasks were completed and 26 tasks could not be completed across the LMS under study. The order of maximum tasks completed is SLAM (19), followed by Koha (18), next is NewGenLib (17) before Koha (16).

The percent effectiveness revealed that all experienced participants completed all search tasks. Hence, they all attained 100 percent effectiveness. However, not all inexperienced participants completed OPAC search tasks. The percent effectiveness for SLAM is 79.67 %, Alexandria was 66.67 %, NewGenLib was 70.83 % and Koha is 75.00 %. From the classification of System Usability Scale (SUS) modified by Farrahi *et al.* (2019) and adapted for acceptable region of LMS usability, 0-25 is considered worst, 25.5 – 52 percent is poor, 53- 67 percent is considered ok, 67.5- 74.5 percent is good, 75- 85 percent is excellent and 85.5 - 100 percent is said to be best. It can be concluded that SLAM and Koha OPAC modules are excellent, NewGenLib OPAC module is good, Alexandria OPAC module is ok and hence all OPAC modules are effective for use. These findings are

in line with Abifarin *et al.* (2019) and Soewardi and Perdana (2019) observations. Abifarin *et al.* (2019) discovered that academic library web site systems were effective and Soewardi and Perdana (2019) also reported that English board game developed for educational learning of English are effective.

4.4.2 Efficiency of cataloguing module of library management software

4.4.2.1 Efficiency of cataloguing module of library management software

Findings from the results of efficiency of cataloguing module indicated that all experienced participants completed the process of description. The highest average time spent to complete the cataloguing tasks was used on Koha and the lowest average time spent to complete cataloguing tasks was used on SLAM. The results also indicated that the efficiency of experienced participants differs from one LMS to the other. This could be attributed to the number of templates and steps required to be filled. Work environment, typing speed and network service could have also contributed to the difference in the average time. This study concurred with the finding of Kous *et al.* (2018) that different groups of users achieve different levels of efficiency with library website.

The results also showed that not all inexperienced participants completed the cataloguing tasks. SLAM inexperienced participants had the least average time of 331.50 seconds, followed by Alexandria inexperienced participants with an average time of 545.80 seconds. The next was NewGenLib inexperienced participants with an average time of 607.40 seconds and the highest average time used to complete task 1 was 1628.00 obtained with Koha participants. This implies more effort would be needed to catalogue library materials with Koha when compare Alexandria and NewGenLib. Findings from the result also revealed that the highest time taken to perform and achieve cataloguing tasks 2 and 3 were obtained using Koha, followed by NewGenLib and Alexandria. The lowest time

taken to perform and achieve cataloguing tasks 2 and 3 was with SLAM. The length of time used to complete cataloguing tasks could be attributed to the number of templates and steps participants followed to fill-in the bibliographic data of each item and network service.

The help rendered to the inexperienced participants could have also contributed to long length of average time used to complete cataloguing tasks and large number of data elements (bibliographic data) required to be filled in the templates. Also, the different degree of steps and templates coupled with the simplicity and clarity of the information on cataloguing module interface could also be the reason behind the long length of time taken to complete cataloguing tasks. SLAM has 1 template, Alexandria has 3 templates, NewGenLib has 4 templates with more data elements and Koha has 9 templates with much data elements that are not used while cataloguing and a number of steps involve in describing library materials. This means that productivity of cataloguers would depend on the type of LMS a particular library is using. Similar findings were reported by Jun *et al.* (2021) and Nyame *et al.* (2019). Jun *et al.* (2021) and Nyame *et al.* (2019) reported that users spent long time on tasks because the content of the websites were clustered with much data.

The results also indicated that inexperienced participants spent more than twice the time it took the experienced participants to catalogue library item across all the LMS. This implies that new users require more effort and time to catalogue library materials. This is contrary to the views of Harrison *et al.* (2013) and Nyame *et al.* (2019). Harrison *et al.* (2013) stated that a system should be easy to allow new users to learn and efficiently start working with the system. Nyame *et al.* (2019) also noted that a user centred system must be usable to first time users. Therefore, the productivity of new cataloguers who spent

much time on cataloguing will be low, compare to those who spent less time to catalogue an item. This is due to the long time taken to accomplish cataloguing task. Further observation indicated that Koha participants had the highest time spent on tasks performed, followed by NewGenLib, next was Alexandria and the least time was spent using SLAM LMS. This implies that cataloguers who use SLAM and Alexandria would catalogue more resources within short period of time compared to those who use NewGenLib and Koha.

The overall efficiency of cataloguing module revealed that experienced participants completed all cataloguing tasks. Hence, they all attained 100 per cent efficiency. However, not all inexperienced participants completed cataloguing tasks. The per cent efficiency of inexperienced participants for SLAM is 71.08, Alexandria is 51.53, NewGenLib is 53.89 and Koha is 30.55. From the classification of system usability scale (SUS) modified by Farrahi *et al* (2019) and adapted for acceptability region of LMS effectiveness, 25- 37.5 is considered poor, 37.6-52.9 is considered fair, 53-67 % is adequate, 67.5-74.5 % is good, 75-85 is excellent and 85.5-100 % is considered best. This means that SLAM and NewGenLib cataloguing modules are within acceptable region, therefore, SLAM and NewGenLib cataloguing modules are adequate and hence, efficient for use. Alexandria is considered to be fair and Koha cataloguing modules is not within the acceptable region. Therefore, Alexandria is said to be fair and Koha cataloguing module is considered to be poor and hence may not be efficient to allow users to quickly describe library materials. These findings are contrary to those reported for efficiency of E-Rapor by Wirasasmia and Uska (2018). The report stated that there was no time difference in the tasks performed between novice and expert users, therefore concluded that E-Rapor system was efficient.

4.4.2.2 *Efficiency of circulation module of library management software*

The finding showed that all experienced participants completed and achieved circulation tasks with the highest average time spent on registration of library users. Koha experienced participants completed registration task with the highest average time of 199.60 seconds, followed by NewGenLib experienced participants with a average time of 123.60 seconds, next was Alexandria experienced participants with a average time of 112.60 seconds and SLAM experienced participants completed registration task with the least average time of 100.40 seconds. The difference in the average time could be attributed to the number of steps and data elements required to be filled on registration templates. Also, findings from the results revealed that Koha participants spent the highest average time of 116.40 and 78.20 seconds and SLAM participants spent the lowest average time of 69.00 and 58.00 seconds to charge and discharge library book (tasks 2 and 3).

Finding from the results also revealed that not all inexperienced participants completed circulation tasks. The longest average time was spent on Koha and the shortest average time was spent on SLAM. The difference in the time spent to complete tasks could be attributed to the number of fields needed to be filled. Finding from the interview revealed that Koha circulation module has four (4) templates with cumbersome data elements that need to be filled for registration of library users, while Alexandria and NewGenLib had three (3) templates and SLAM had one (1) template. This could have contributed to the high average time taken to register library users. This implies that it will take library staff longer time to use Koha circulation module when compared to Alexandria, NewGenLib and SLAM circulation module to register library users. Therefore, the high time used to register library user implies that productivity of some circulation staff will be low when compared to those that spent low time to register library users using circulation module of LMS.

Furthermore, the findings from the results also indicated that SLAM inexperienced participants spent the shortest average time on charging and discharging of library books to and from library user. Similarly, Koha inexperienced participants spent the highest average time on charging and discharging of borrowed book from the library user indicating difference in the average time taken to achieve circulation tasks. The difference in the average time could be attributed to the number of data elements to be filled before charging, discharging and network service to allow the completion of the process. The low time values indicates the simplicity, single template, few data element to be filled and good network service that allow users to perform circulation tasks at ease with efficiency of time. The finding of this study agreed with the finding of Kous *et al.* (2018) and Dalkirana *et al.* (2014) reports. Kous *et al.* (2018) reported that different groups of users achieve level levels of efficiency with library website. Also, Dalkirana (2014) finding indicated that Eprint software was easy and quick to use to some users while other set of users noted that the system was difficult to use.

A close observation of the result on efficiency of circulation module indicated that there is difference in the time spent to register library user (task 1) between the experienced and the inexperienced participants. This means that circulation staff who are not conversant with the registration templates would spent more time to register library users. Therefore, the high time used to register library user (task 1) implies that productivity of some circulation staff will be low when compare to those that spent low time to register library users using circulation module of LMS.

Overall efficiency of circulation showed that experienced participants completed all circulation tasks, hence, they all attained 100 per cent efficiency. The per cent efficiency of inexperienced participants for SLAM was 71.54 %, Alexandria is 56.26 %, NewGenLib

was 58.65 % and Koha was 44.04% indicating that not all circulation tasks were completed across the LMS used. From the classification of SUS modified by Farrahi *et al* (2019) and adapted for acceptability region of LMS efficiency, 0-25 is considered worst, 25.5 – 52 per cent is poor, 53- 67 per cent is considered ok, 67.5- 74.5 per cent is good, 75- 85 per cent is excellent and 85.5 - 100 per cent is said to be best. This implies that SLAM, Alexandria, NewGenLib and Koha circulation modules are within the acceptable region. Therefore, SLAM circulation module is said to be good, Alexandria and NewGenLib circulation modules considered to be adequate and hence, efficient for use but Koha circulation module is considered to be fair and hence may not be efficient for use. This could be due to the excessive data elements required to be entered when registering library users. These findings are in agreement with the findings of Farrahi *et al.* (2019) and Indrawan *et al.* (2020). Farrahi *et al.* (2019) found out that admission, discharge and transfer module of information system was efficient at 53.3 %. Indrawan *et al.* (2020) also discovered that that Academic progress information system was efficient but at a higher level of excellent.

4.4.2.3 Efficiency of online public access catalogue module of library management software

Results on efficiency of OPAC showed that all experienced participants completed the search tasks with OPAC modules. The result indicated that the lowest average time of experienced participants on search task was with SLAM and the highest average time was spent with Alexandria. The result also revealed that many inexperienced participants completed the search tasks. Findings from the results also showed that the lowest mean time taken to complete search tasks was with SLAM and the highest average time was spent with Alexandria. This means that, SLAM module was faster in loading the result output, but participants who made spelling mistakes also took more time to perform and

possibly complete the search tasks across the OPAC LMS under study. These findings are in agreement with the findings of Wirasmiata and Uska (2018) and Eltabir *et al.* (2019). Wirasmiata and Uska (2018) discovered that E-Rapor system was efficient for use and Eltabir *et al.* (2019) found out that e-learning courses was efficient because the interface was user- friendly.

Findings from interview and close observation revealed that inexperienced users could not easily differentiate between title and subject options when searching for availability of book in the library, as such they were confused about the right search option to use, so they kept entering data into wrong option cell. This means they entered subject of a book in place of title of book option. Results of the interview also revealed that NewGenLib participants were not aware that OPAC was made for their use; and Alexandria participants complained of lack of good network service. This would have affected their interaction with the OPAC module. Both experienced and inexperienced participants noted that searching books through OPAC module was interesting and attractive as the process is faster than manual catalogue. But OPAC interface does not provide spelling suggestion. Findings from the results in Tables 4.30 – 4.33 also indicated that there was no much difference in the time taken to search for book(s) between the experienced and inexperienced users. This means that library users could easily use all the software under study to search for books in the library. Thus, the difference in the average time of search items could be attributed to inadequate searching skills, speed of typing, spelling mistakes while typing and network service. This finding corroborated with the finding of Khatun and Ahmed (2018) who stated that there was difference between novice and experienced users in the usability testing of open source library software.

Figure 4.6 showed overall efficiency of OPAC modules. All experienced participants completed all circulation tasks. Hence, they all attained 100 per cent efficiency. However, not all inexperienced participants completed search tasks. The overall efficiency of inexperienced participants for SLAM was 72.73, Alexandria was 66.64 NewGenLib was 69.17 and Koha was 68.64. From the classification of system usability scale (SUS) modified by Farrahi *et al.* (2019) and adapted for acceptability region of LMS efficiency, 0-25 is worst, 25.5 – 52 per cent is poor, 53- 67 per cent is considered ok, 67.5- 74.5 is good, 75- 85 per cent is excellent and 85.5 - 100 per cent is best. This implies that SLAM, Alexandria, NewGenLib and Koha OPAC modules are within the acceptable region. Therefore, SLAM, Alexandria, NewGenLib and Koha OPAC modules are considered to be good and hence, efficient for use, since they are within the acceptable region of LMS usability (Farrahi *et al.*, 2019). The findings of this study concurred with that of Studiyanti *et al.* (2019) and Indrawan *et al.* (2020) who discovered that the student information system was efficient at 66% and Academic progress information system was discovered to be efficient but at a higher level of excellent.

4.4.3 Ease of use of library management software

4.4.3.1 *Ease of use of cataloguing module of library management software*

The results of the ease of use of LMS cataloguing modules in service delivery revealed that SLAM cataloguing module is easy to learn and use. The experienced and inexperienced participants agreed with majority of the statements (see appendix J1) regarding the ease of use of SLAM cataloguing module and noted that SLAM cataloguing module was not designed to allow only experienced users to catalogue library materials. This means that SLAM cataloguing module can be used productively with less effort by inexperienced users to describe or catalogue library materials. This result agreed with the findings of Gohain and Saikia (2013) who discovered that LMS OPAC was easy use. Also, both experienced and

inexperienced participants disagreed with the use of z39.50 feature and could not recommend SLAM cataloguing module to other university libraries due to lack of z39.50 feature.

The finding from the results also showed that both experienced and inexperienced participants agreed with some statements and disagreed with other statements regarding ease of use of Alexandria cataloguing module (see appendix J2). Both experienced and inexperienced participants' responses indicated that Alexandria cataloguing module is easy to learn, interaction with Alexandria cataloguing module interface is fairly easy for experienced users but difficult for inexperienced users to use the module to catalogue library materials. Both experienced and inexperienced participants had issues with navigation. Therefore, both experienced and inexperienced participants agreed that Alexandria cataloguing module was designed for experienced users. This result is similar to that of Abedini *et al* (2021) and Solano *et al* (2016) who discovered that the interactive digital system, transactional web and mobile application were not easy to use, as such concluded that the systems were not user friendly.

The results further indicated the opinion of experienced and inexperienced participants as regarding to ease of use of NewGenLib cataloguing module (see appendix J3). The results indicated that both experienced and inexperienced participants agreed or disagreed with the statements on the ease of use of NewGenLib cataloguing module. The responses of experienced and inexperienced participants indicated that NewGenLib cataloguing module is easy to learn, however, interaction with the interface is fairly easy for experienced users and not easy to use for inexperienced participants. Hence, both experienced and inexperienced participants had issues with navigation and noted that NewGenLib cataloguing module was designed to allow only experienced users to successfully catalogue library materials. The findings of this study agreed with the finding of Solano *et*

al. (2016) who discovered usability issues with interactive digital system and affected the use of the application.

Furthermore, results of ease of use of cataloguing module revealed that experienced and inexperienced participants agreed with some statements and disagreed with other statements on the ease of use of Koha cataloguing module (appendix J4). The responses of both experienced and inexperienced participants indicated that, it was not easy to learn and use Koha cataloguing module to describe library materials even after learning the interface. Hence, both experienced and inexperienced participants noted that Koha cataloguing module is designed for only experienced users due to the level of its complexity. The finding of this results concorded with the finding of Phongphaew and Jiamsanguanwong (2018) who discovered that learning management system was complex to use.

4.4.3.2 *Ease of use of circulation module of library management software*

Findings on the ease of use of LMS circulation modules in service delivery revealed that experienced and inexperienced participants agreed with majority of the statements regarding the ease of use of SLAM circulation module (appendix J5). It was easy for experienced and inexperienced participants to learn to operate circulation module. As such, ease of use, to register library users was good. From the result, it could be deduced that inexperienced library staff can use SLAM circulation module to perform circulation activities without getting confused and/or frustrated. Due to simplicity of SLAM circulation module, both experienced and inexperienced participants agreed that it was designed to allow users with different technological skills to register, charge and discharge library materials to library users. This implies that inexperience users can use circulation module of SLAM with less effort to register, charge and discharge library materials to

library users. The findings of this study corroborated with the finding of Adegboro (2020) and Juhary (2014). Both researchers reported that library website and Learning Management Systems were easy to use.

The findings from the results also showed that both experienced and inexperienced participants agreed with majority of the statements regarding ease of use of Alexandria circulation module (appendix J6). Experienced participants agreed that Alexandria circulation module is easy to learn to operate but the inexperienced participants disagreed with the statement. The response of the experienced users could be due to continual use of the module. Looking at the mean values, it is clear that the difference between experienced and inexperienced participants is low. This implies that Alexandria circulation module is not very simple to allow users to easily learn and use the interface for circulation activities. Furthermore, findings from the results also showed that both experienced and inexperienced participants disagreed with the statement “it is easy to use circulation module to register library users even after learning the interface”. This could be attributed to the number of steps, many input options and excessive data entering points in the templates. However, the result also showed that navigating through circulation module to charge and discharge library materials was easy as the obtained values were above average for both experienced and inexperienced participants.

Furthermore, findings from the results revealed that both experienced and inexperienced participants agreed with majority of the statements regarding ease of use of circulation module of NewGenLib LMS (appendix J7). The response of both experienced and inexperienced participants showed that, it is easy to learn to operate circulation module of NewGenLib LMS. The results also showed that both experienced and inexperienced participants disagreed that it is easy to use circulation module to register library users after

learning, indicating that registration templates of circulation module is not easy to use to register library users. This means that, it will take users a long time to become proficient in the use of registration templates due to the number of templates and data input elements. The finding also indicated that charging and discharging of library materials to library users is easy as well as navigating through the circulation module as values obtained from experienced and inexperienced participants were high (>2.50).

Findings from the results further showed that both experienced and inexperienced participants agreed with majority of the statements regarding ease of use of Koha circulation module (appendix J8). However, both experienced and inexperienced participants responses revealed that Koha circulation module is not easy to learn and use to register library users. The result also revealed that registering users with Koha circulation module is difficult and confusing. This is indicated by the low values obtained by experienced and inexperienced participants implying that registration templates of Koha circulation module is not easily used without any form of confusion and difficulty when registering library users. This finding is contrary to the finding of Scholtz *et al.* (2016) which reported that application for learning of enterprise resource planning systems were easy to use. This could be attributed to the number of data input element, similarity and repetition of data input element, number of templates and steps required to be filled. The result also indicated that Koha circulation module is designed to allow experienced users perform circulation task especially registration of library users. This means that, it will take users a very long time to understand, differentiate and be familiar with data input elements that are considered similar and confusing.

4.4.3.3 *Ease of use of online public access catalogue module of library management software*

The results of the ease of use of OPAC modules revealed that experienced and inexperienced participants agreed with majority of the statements regarding the ease of use of SLAM OPAC module (appendix J9). Both experienced and inexperienced participants agreed that it was easy to learn to operate, explore and use SLAM OPAC module to search for library materials with high values. The high values obtained imply that it is very easy for users to search for an item in the library collection. The findings also indicated that experienced and inexperienced participants noted that OPAC module of LMS was not designed to allow only experienced users to search for books in the library. This is justified by the mean values of 1.42 and 1.67 obtained for experienced and inexperienced participants. The low values also indicated that SLAM OPAC module is user friendly because it is very easy to use to search for books in the library. The finding is similar with the finding of Shorunke *et al.* (2014) who discovered that both experienced and inexperienced users agreed that the information system was easy to explore, learn and use, indicating that SLAM OPAC module is user friendly and can be used to search for books in the library.

The findings from the results further showed that experienced and inexperienced participants agreed with the majority of the statements regarding the ease of use of Alexandria OPAC module (see appendix J10). Navigating through the OPAC module was easy as both experienced and inexperienced users disagreed that OPAC module of Alexandria LMS is designed to allow only experienced users to search for books. This indicates that OPAC module of Alexandria is usable and was not difficult for inexperienced users to search for library materials in a collection. This finding is in line with Suka and Hasyim (2020) finding that hospital information system was easy to use. Findings from the results also revealed that experienced and inexperienced participants agreed with majority of the statements regarding the ease of use of NewGenLib OPAC

module (see appendix J11). Results indicated that NewGenLib OPAC module was easy to learn to operate, explore and use to search for library materials. Both experienced and inexperienced participants agreed that OPAC module was easy to use with high values (≥ 2.50) indicating that the module is user friendly. Interview indicated that users were not aware that OPAC were made for them to use but were impressed about the ease of use to search for library resources in the library and the manner in which results of search were displayed. Due to the ease in searching for books, the opinion of both experienced and inexperienced users indicated that NewGenLib OPAC module is designed to allow both experienced and inexperienced users to easily search for books in the library.

Furthermore, the findings from the results on Koha OPAC module revealed that both experienced and inexperienced participants agreed with majority of the statements regarding the ease of use (see appendix J12). Both experienced and inexperienced participants agreed with high values (≥ 2.50) indicating that Koha OPAC module is easy to use to search for books in the library. The findings also showed that experienced and inexperienced participants disagreed that OPAC module of Koha was designed to allow only experienced users to search for books in the library with low values of 1.17 and 1.58 for experienced and inexperienced participants respectively. The low values indicated that Koha OPAC is user friendly and can easily be used to search for books in the library. These findings are in agreement with the finding of Shorunke *et al.* (2014) and Scholtz *et al.* (2016). The finding of Shorunke *et al.* (2014) discovered that information system was easy to explore, learn and use. Similarly, Scholtz *et al.* (2016) finding indicated that enterprise resource planning system was user friendly as users indicated that enterprise resource planning system was easy to use

4.4.4 Satisfaction derived from using Library Management Software

4.4.4.1 *Satisfaction derived from using cataloguing module of library management software*

Results on satisfaction derived from using LMS cataloguing module showed that experienced participants agreed with majority of the statements on satisfaction derived from using LMS cataloguing module but disagreed that the module was well designed for use due to lack of z39.50 feature. Furthermore, the results indicated that inexperienced participants agreed with all the statement on satisfaction derived from using SLAM cataloguing module to catalogue library materials. The participants agreed with high mean scores (appendix K1) indicating that both experienced and inexperienced participants were comfortable and satisfied with the process of entering bibliographic data of library materials using SLAM cataloguing module. The finding of this study concorded with the finding of Munaiseche and Liando (2016) who discovered that participants were satisfied with the use of expert information system.

The results further showed that experienced participants agreed with majority of the statements regarding satisfaction derived from using Alexandria cataloguing module (appendix K2). The findings revealed that both participants were satisfied with the quantity of information displayed on the cataloguing interface, the help received through the help mode of the cataloguing interface, messages that appear on the cataloguing module and the terms used in the cataloguing module. The findings also indicated that experienced participants enjoy using cataloguing module and noted that the module was well designed for use and cataloguing activities were performed in a straightforward manner. However, close observation of performance revealed that both experienced and inexperienced participants were not comfortable with the steps required to catalogue library materials.

The findings further showed equal number of agreed and disagreed with the statements on satisfaction derived from using cataloguing module by inexperienced participants. The findings from the results further indicated that cataloguing module was not well designed, as such, inexperienced users were not comfortable and did not enjoy interacting or cataloguing with the module. Furthermore, interview with both participants showed that Alexandria cataloguing module is not straightforward, this would have contributed to the unpleasant and dissatisfy state experienced by the participants when using Alexandria cataloguing module but continue usage would improve user experience of interacting with Alexandria cataloguing module. Therefore, majority of the participants noted that they were fairly satisfied with Alexandria cataloguing module. The finding in this study corroborated with the finding of Studiyanti (2019) who discovered that participants were not satisfied with the use of information system prototype because of the errors committed.

Findings from the results (appendix K3) also revealed that experienced participants agreed with majority of the statements regarding satisfaction derived from using NewGenLib cataloguing module. Experienced users of NewGenLib cataloguing module were satisfied with the straightforward manner with which library materials were described, amount of information displayed, terms used and also enjoying of cataloguing task using NewGenLib with high mean values. The values obtained from experienced users could be attributed to continual use of the module to catalogue library materials indicating the level of satisfaction with the module. However, few responses of the participants revealed that, experienced users were not comfortable with the steps required to catalogue library materials; hence, the module was not well designed to allow ease of use and the interaction with the cataloguing user interface was not satisfying. This finding is contrary to the finding of Shanbehzadeh *et al.* (2021) who discovered that users were satisfied with the use of information system based on its friendliness and flexibility.

Results further showed equal number of agreed and disagreed with the statements on satisfaction derived from using NewGenLib cataloguing module by inexperienced participants. The results indicated that inexperienced participants were satisfied with the amount of information displayed, help received through the help mode, messages that appear on the user interface and terms used were appropriate in the cataloguing module of NewGenLib LMS. However, further responses of the participants showed that, inexperienced users were not comfortable with steps and did not enjoy cataloguing library materials with NewGenLib cataloguing module, hence, disagreed that cataloguing of library materials are performed in a straightforward manner, cataloguing module is well designed for use and the interaction with the user interface is satisfying. The low values obtained for the inexperienced participants implied that it was not pleasant to use NewGenLib cataloguing module. The finding of this study negated the finding of Munaiseche and Liando (2016) who discovered that participants were satisfied with the use of expert information system.

Findings from Table 4.38 also showed equal number of agreed and disagreed with the statements on satisfaction derived from using Koha cataloguing module by experienced participants, while the inexperienced participants disagreed with majority of the statements regarding satisfaction derived from using Koha cataloguing module (appendix K4). The low values obtained revealed that both experienced and inexperienced participants were not comfortable with the steps required to catalogue library materials, as such both participants indicated that library materials are not catalogued in a straightforward manner.

Results also revealed that both participants were satisfied with the help received through the help mode, user interface messages and terms used in the cataloguing module, indicating that participants were pleased with help received, user interface messages and

terms used in Koha cataloguing module. The findings also showed that both experienced and inexperienced disagreed that cataloguing module of the Koha LMS was enjoyable when using it to input bibliographic data of library materials. Participants noted that Koha cataloguing module was not well designed to use, as interaction with the user interface was not satisfying. This was indicated by the low values of satisfaction obtained. This implies that majority of the participants were not satisfied with the cataloguing module of Koha LMS. This finding is contrary to the findings of Orfanou *et al.* (2015) who reported that users were satisfied with the use of learning management system and rated it at 76.27 per cent.

4.4.4.2 *Satisfaction derived from using circulation module of library management software*

The results revealed the extent of satisfaction derived from using LMS circulation module in service delivery in federal university libraries in Nigeria. The results showed that both experienced and inexperienced participants agreed with all the statements on satisfaction (see appendix K5) derived from using SLAM circulation module. The high values obtained from responses of both experienced and inexperienced participants indicated that users were comfortable with the steps required to register library users. This could be attributed to the straightforward manner in which registration of users were performed. Both participants enjoyed using SLAM circulation module, this would have also contributed to the responses that indicated that SLAM circulation module is well designed to be used, as such, interaction with circulation user interface was satisfying for both participants. Furthermore, the findings from the interview showed that circulation module of SLAM was interesting and satisfying as new users can easily use it without being taught or confused when registering library users. It can be deduced from both experienced and inexperienced participants that the user interface of SLAM circulation module was

pleasant to use when performing circulation tasks. Abdel-Maksoud (2018) also reported similar observation on satisfaction derived from the ease of use of Acadox system.

The findings from the results also revealed that experienced participants agreed with all the statements regarding satisfaction derived from using Alexandria circulation module, while the inexperienced participants agreed with majority of the statements regarding satisfaction derived from using Alexandria circulation module indicating that both experienced and inexperienced participants were satisfied with circulation module. Further responses from the inexperienced participants revealed that participants were not comfortable with the steps required to register library users, therefore, disagreed that Alexandria circulation module was well designed to allow usage. The finding of this study is contrary to the finding of Munaiseche and Liando (2016) who discovered that participants were satisfied with the use of expert information system. This could be attributed to the unpleasant experienced encountered while registering library users with Alexandria circulation module. The result from interview with both experienced and inexperienced participants indicated that the process of registration was likable but it was not satisfactory due to information overload.

The results in Table 4.39 further showed that both experienced and inexperienced participants agreed with all the statements on satisfaction derived from using NewGenLib circulation module (appendix K7) indicating that both experienced and inexperienced participants were satisfied using circulation module of NewGenLib in service delivery. But interaction with participants through interview showed that they were partially satisfied with the process of registration, due to the templates, steps and data input required in the registration process. It can be deduced that both participants were fairly satisfied with NewGenLib circulation module due to information overload on registration templates.

Furthermore, the results revealed that experienced as well as inexperienced participants agreed with majority of the statements on satisfaction derived from using Koha circulation module. Findings from both experienced and inexperienced participants' responses revealed that users were comfortable with the steps required in charging and discharging of library materials to users, charging and discharging were performed in a straightforward manner, satisfied with the amount of information displayed, satisfied with the appropriateness of terms used and satisfied with the messages that appear on the circulation module of Koha LMS. The results further revealed that both experienced and inexperienced participants disagreed that users were comfortable with the steps required to register library users, as such, registration of library users were not perform in a straightforward manner. The finding also revealed that both participants did not enjoy using Koha circulation module due to registration templates. So, both participants' responses indicated that circulation module of Koha LMS was not well designed for use and the interaction with user interface was not satisfying, indicating their level of dissatisfaction with Koha circulation module. This observation is contrary to the finding of Orfanou *et al.* (2015) who reported that users were satisfied with the use of learning management system and it was considered good.

4.4.4.3 Satisfaction derived from using online public access catalogue module of library management software

The results in Table 4.40 revealed the satisfaction derived from using LMS OPAC module in service delivery in federal university libraries in Nigeria. The findings from the results showed that both experienced and inexperienced participants agreed with all the statements on satisfaction (see appendix K9) derived from using SLAM OPAC module. Both experienced and inexperienced participants agreed with good values (≥ 2.50). The good

values obtained from both experienced and inexperienced participants indicated that users were comfortable and satisfied with the template and steps required to search for library materials. Interview with experienced participants revealed that SLAM OPAC user interface was dull and the inexperienced users were delighted to use OPAC module but also noted that the interface was not attractive. This observation is similar to Hassan (2014) report which indicated that the students were satisfied with the content and interaction but dissatisfied with some feature of the websites.

Findings from the results also revealed that both experienced and inexperienced participants agreed with all the statements (see appendix K10) regarding satisfaction derived from using Alexandria OPAC module. Responses of experienced participants indicated that users were comfortable and satisfied with the steps required to search for book(s) and searches were performed in a straightforward manner. The users were also satisfied with OPAC user interface of Alexandria. Similarly, responses of inexperienced participants indicated that users were comfortable and satisfied with the number of steps required for searching library book(s) and searches were performed in a straightforward manner. This means that both participants were satisfied with the OPAC user interface interaction. This is contrary to the finding of Welchen *et al.* (2022) who observed that users were not satisfied using health information system. Findings from interview also indicated that both participants were frustrated because the OPAC was slow to load and respond to search queries.

The findings from the results also revealed that both experienced and inexperienced participants agreed with all the statements regarding satisfaction derived from using NewGenLib OPAC module (see Table 4.40 and appendix K11). The findings revealed that both experienced and inexperienced participants were comfortable and satisfied with the

steps required for searching library materials indicating that the search process was pleasant. Both participants also enjoyed OPAC module when using it to search for library books with high values, as such noted that NGL OPAC module was well designed to use and the interaction with the user interface was satisfying. This could be attributed to the limited number of steps required to search for book(s) and the straightforward nature of the interaction with the OPAC user interface (Gohain & Saikia, 2013). Findings from the interview and close observation showed that some inexperienced participants could not differentiate between title and subject options while searching for library materials. This implies that users needed more time to be familiar with each search option.

Findings from the results further showed that both experienced and inexperienced participants agreed with all the statements regarding satisfaction (see Table 4.40 and appendix K12)) derived from using Koha OPAC module. The findings indicated that experienced as well as inexperienced participants were comfortable and satisfied with the steps required to search for book(s). This could be attributed to limited number of template, steps and the straightforward manner in which searches are performed. Both participants were also satisfied with the amount of bibliographic information displayed, terms used, help messages on the OPAC users' interface. Hence, noted that interaction with the OPAC interface of Koha LMS was satisfying with good mean values indicating that Koha OPAC interface is user friendly. These results are similar to the finding obtained for user satisfaction of Koha OPAC interface by Khatun and Ahmed (2018) and interface usability of learning applications for smart phones by Ali *et al.* (2015). Their results discovered that users were satisfied with the use of OPAC interface and learning applications for smart phones.

4.4.5 Challenges encountered while using library management software in service delivery

4.4.5.1 Challenges encountered while using cataloguing module of library management software in service delivery

Table 4.41 presented the challenges users encountered while using LMS cataloguing module in service delivery in federal university libraries. Finding from the results revealed that both experienced and inexperienced participants disagreed with all statements on challenges encounter when using SLAM cataloguing module with low mean values (see Table 4.35 and appendix L1). The low values indicated that SLAM cataloguing module provides limited steps to catalogue library materials, used term that were familiar and not confusing. The values also indicated that SLAM cataloguing module was not difficult to use, not cumbersome to use and had no extraneous elements; indicating that usability issues associated with use of SLAM cataloguing module were not identified. This could be attributed to one page template and few data entry elements required to be filled. Interview with both experienced and inexperienced users revealed that all bibliographic information of an item was entered on a single SLAM cataloguing module template. This finding agreed with the finding of Purnomo *et al.* (2020) who discovered that disaster information systems were usable, and usability issues were not clearly identified in the system. Interview with an experienced participant also revealed that “you can catalogue as much materials as possible in a day”, however, SLAM cataloguing module “is not detailed, it has no z39.50 or MARC feature and it is not web base’. This means that cataloguers cannot share bibliographic information of library materials with other libraries. Therefore, the

participants did not recommend cataloguing module of SLAM LMS to other university libraries for use.

Findings from the result also revealed that experienced participants disagreed with majority of the statement regarding challenges encounter when using Alexandria cataloguing module with mean values ≤ 2.40 . This implies that the terms used in Alexandria cataloguing module are not confusing, not difficult to use, has no extraneous elements and the templates are not many. Further finding from the results showed that experienced users agreed that the number of steps required to catalogue library materials were many and cataloguing module is cumbersome to use. On the contrary, the finding from the responses of inexperienced participants revealed that participants agreed with most of the statements on challenges encounter when using Alexandria cataloguing module. The finding showed that the steps required to catalogue library materials were many, the cataloguing module is difficult to use, the cataloguing module is cumbersome to use, the cataloguing module has many extraneous elements and users find it difficult to catalogue library materials because the templates are many. This means that users' (cataloguers) efficiency will be slowed down and effectiveness will decrease due to issues identified when cataloguing library materials. This finding is in agreement with the finding of Aishamari (2016) that health information systems had issues with the response time which affected and slow down their efficiency.

Result from the interview revealed that cataloguing module of Alexandria is not straightforward, lock and unlock features of the cataloguing process slowed down the work and makes navigating from one template to another difficult, templates were many with a lot of data elements that made the process of cataloguing complicated for users; the inability of the module to identify items that have been catalogue without duplication made

it not appealing to users (cataloguers). Interview with participants also suggested that subject template be moved to title template and the module should be flexible to allow librarians to customize certain features for easy use. This negates the finding of Nugraheni *et al.* (2019) that different sets of users were satisfied with the use of the system because issues with the system usage were not there.

Further finding from the results revealed that experienced participants disagreed with majority of the statements on challenges encounter when using NewGenLib cataloguing module (appendix L3). This implies that the terms used were familiar, not confusing, not difficult to use and the templates were not many. The result also showed that experienced participants agreed that the number of steps required to catalogue library materials were many, the cataloguing module was cumbersome to use and had many extraneous elements. On the contrary, the results revealed that inexperienced participants agreed with majority of statements regarding challenges encounter when using NewGenLib cataloguing module. The responses of the inexperienced users indicated that, the number of steps required to catalogue library materials were many, cataloguing module was difficult and cumbersome to use; NewGenLib cataloguing module had extraneous elements and users found it difficult to catalogue library materials using NewGenLib. This could make users to be confused thereby making it difficult for users to successfully complete cataloguing task. This finding is contrary to the study of Purnomo *et al.* (2020) who reported that disaster information systems were usable as such issues were not identified

The responses of inexperienced participants on the use of NewGenLib cataloguing module also indicated that the terms used in the NewGenLib cataloguing module were familiar and there was consistency in the use of terms throughout the cataloguing module. Interview with both experienced and inexperienced participants revealed that navigating was a

problem to them. A participant further explained that users could ‘not move easily without clicking on each cell to type or input data’. That is, users could not use ‘tap arrow key’ to move quickly and easily from one cell to another except they use the mouse to click in the cell. In addition, inexperienced participants commented that cataloguing process was difficult because the templates and data entering elements were many resulting to low efficiency and effectiveness of cataloguing process. The findings on NewGenLib are in line with the finding of Hassan (2019) that usability issues were identified on moodle interface of Zarqa University in Jordan.

Results obtained revealed that both experienced and inexperienced participants agreed with majority of the statements regarding challenges encountered when using Koha cataloguing module (appendix L4). The responses of experienced as well as inexperienced participants indicated that Koha cataloguing module was difficult and cumbersome to use, had many steps and templates required to catalogue library materials and had extraneous elements, these made it difficult to catalogue library materials easily thereby affecting the effectiveness and efficiency of users (cataloguers) which resulted to low performance by the users. Further finding from the results revealed that both experienced and inexperienced participants disagreed that Koha cataloguing module used terms that are unfamiliar and confusing, implying that Koha cataloguing module provides terms that are familiar and not confusing to Library staff. But closed observation and interview with inexperienced participants revealed that participants were confused on how to enter multiple authors. There was also consistency in the use of terms throughout the cataloguing module.

Result from interview indicated that it was difficult for both experienced and inexperienced users to learn and use Koha cataloguing module. An experienced participant

expressed his feeling as ‘it is not possible to use Koha cataloguing module if you have not learnt it very well’. This indicates how difficult cataloguing library materials with Koha cataloguing module could be. The difficulty could be attributed to the number of fields (templates) needed to be filled. Participants commented that going through one to nine (1-9) fields (templates) was frustrating and cumbersome to use. The interview further indicated that Koha cataloguing module does not provide option for other languages. The findings agreed with the study of Caro-Alvaro *et al.* (2018) that usability issues such as difficulty to perform tasks were identified with the system. Bouraghi *et al.* (2022) and Ratwani *et al.* (2019) also discovered poor usability with information systems that contributed to errors and spending much time on tasks.

4.4.5.2 Challenges encountered while using circulation module of library management software in service delivery

The results in Table 4.42 showed the challenges encountered while using LMS circulation module in service delivery in federal university libraries in Nigeria. Finding from the results revealed that both experienced and inexperienced participants disagreed with all the statements regarding challenges (see Table 4.42 and appendix L5) encountered while using SLAM circulation module with good values. The disagreement could be attributed to the ease with which both experienced and inexperienced users achieve their goal. This indicated that usability issues were not identified when SLAM circulation module was used to register and circulate library materials. Also, interview with both experienced and inexperienced participants indicated that users can easily register library users, charge and discharge library materials and do other circulation tasks without confusion or frustration. The finding of this study is contrary to the findings of Salmanizadeh *et al.* (2023) and Mattias and Stagger (2016). Salmanizadeh *et al.* (2023) reported 40 usability issues

identified with the system. Mattias and Stagger (2016) also discovered usability issues with the information system, as such some tasks were difficult to be performed.

Also, finding from the result showed that experienced as well as inexperienced participants disagreed with majority of the statements regarding challenges encountered while using Alexandria circulation module (see Table 4.42 and appendix L6). Experienced and inexperienced participants disagreed that the number of steps required to circulate library materials were many, terms used were unfamiliar and confusing, Alexandria circulation module was complex to use, there was inconsistency in the use of terms and users find it difficult to circulate library materials because the templates/steps are many. This could be attributed to the ability of users to perform circulation tasks without being confused. Result further indicated that both experienced and inexperienced participants were of the opinion that Alexandria circulation module had extraneous elements. Experienced participants opined that it was not difficult to register library users but inexperienced participants noted how difficult it was to register library users due to the templates/steps and the information required to be filled. This means that inexperienced users would need more time to be familiar and be able to perform registration tasks easily with Alexandria circulation module. Finding from interview further revealed that some data entering elements in registration templates such as Graduation data, yearly status, suspension and lost were not necessary because they were not used. Furthermore, reading level feature in Alexandria circulation module was not necessary because it was difficult to determine library users reading level. This finding aligned with the finding of Ali *et al.* (2015) and Aishamari (2016). Ali *et al.* (2015) identified usability issues with learning applications interface and the findings of Aishamari (2016) discovered that health information systems had issues with the response time, which resulted in slowing down their efficiency.

The result also showed that experienced participants disagreed with all the statements regarding challenges encountered when using NewGenLib circulation module (see Table 4.32 and appendix L7). The responses of experienced participants indicated that NewGenLib circulation module has limited number of steps required for circulating library materials and terms used were familiar and not confusing, not complex and cumbersome to use and had no extraneous elements. Furthermore, the result also revealed that it was not difficult to register library users, and to circulate library materials. This means that experienced users easily perform and achieve circulation tasks with NewGenLib.

The finding from the result further revealed that inexperienced participants disagreed with majority of the statements regarding challenges encountered when using NewGenLib cataloguing module. The inexperienced users disagreed that, the number of steps required for circulating library materials were many, the terms used were unfamiliar, the circulation module was complex to use and it was difficult to circulate library materials. The inexperienced participants also agreed with some of the statement on challenges encountered while using NewGenLib cataloguing module. The result indicated that NewGenLib circulation module use terms that are confusing, the module is cumbersome to use and has extraneous elements, therefore, find it difficult to register library users. This implies that inexperienced users are likely going to find registration activity of library users difficult to perform thereby influencing the effectiveness and efficiency of new circulation staff. Furthermore, interview with experienced and inexperienced participants revealed the presence of some data entry elements in the registration templates that made the registration process cumbersome and confusing. This finding is in agreement with the finding of Mattias and Stagger (2016) who discovered that mHealth information system was difficult for novices to use and perform tasks, so they committed many errors which affected their effectiveness.

Furthermore, the results revealed that both experienced and inexperienced participants agreed with majority of the statements regarding challenges encounter while using Koha circulation module (see Table 4.42 & appendix L8). The responses of both experienced and inexperienced participants indicated that, the terms used in the Koha circulation module are confusing and cumbersome to use. The result also indicated that Koha circulation module has extraneous elements and it is difficult to register library users because of the templates/steps and the information required to be filled. This implies that users' effectiveness and efficiency could be affected, as user encountered difficulty in registering library users. The findings on Koha module is contrary to the findings of Purnmo *et al.* (2020) study that due to simplicity, disaster information systems were found to be usable.

The result further showed that both experienced and inexperienced participants disagreed with the statements that, the number of steps required to circulate library materials were many, terms used were unfamiliar and it is difficult to circulate library materials because the templates were many (appendix L8). This implies that, usability issues were not identified in charging and discharging templates of Koha circulation module. Hence, there was ease of charging and discharging of library items to users which is attributed to the single template for each of the function.

Finding from interview further revealed that, the number of fields to be filled were 'confusing and similar, almost like repetition of what was filled, phone number and email on different section of the field and there were alternate contact numbers and one may not know which one to fill or use'. Also, generation of student number seems difficult. This could have affected the use of circulation module to register library users, thereby, abandoning the registration process for manual registration by circulation staff.

4.4.5.3 Challenges encountered while using online public access catalogue module of library management software in service delivery

The result in Table 4.43 presented the challenges encountered while using LMS OPAC module in service delivery in federal university libraries in Nigeria. The finding from the result indicated that all the LMS OPAC under study were user friendly, though some inexperienced participants made spelling mistakes when typing the search query and could not clearly differentiate between title and subject option in order to enter search query correctly across all the software.

Findings from the result revealed that both experienced and inexperienced participants disagreed with all the statements regarding challenges encountered while using SLAM OPAC module with low values (see Table 4.43 & appendix L9). The low values indicate that both experienced and inexperienced participants did not encounter usability issues while using OPAC module of SLAM LMS. This could be attributed to the simplicity of the single template with few data elements used for search queries. Also, careful observation revealed that some inexperienced participants could not clearly differentiate between title and subject option in order to enter search query correctly. The finding on SLAM OPAC module agreed with the finding of Purnomo *et al* (2020) and Eltabir *et al* (2019) that disaster information systems were simple and elearning system had user-friendly interface.

The result also revealed that both experienced and inexperienced participants disagreed with all statements on challenges encountered while using Alexandria OPAC module to search for availability of resources. This is indicated by the low values obtained for challenges encountered when using Alexandria OPAC (see Table 4.42 & appendix L10).

Responses of the experienced and inexperienced participants indicated that the terms used in Alexandria OPAC module were not confusing, not cumbersome to use and had no extraneous elements. This result also indicated that Alexandria OPAC was not difficult to use, as participants noted that it was not difficult to use the search options to search for availability of books in the library. Interview with participants also revealed that it took a long time for OPAC to load, as such the delay frustrated their search effort. This could be attributed to network problem. The finding on Alexandria OPAC is contrary to the finding of Shin (2022) that usability issues were common with electronic information system of medical record as users could not navigate easily to generate required information on the screen due to poor visibility and lack of distinctiveness of information.

It was also revealed from the result (see Table 4.43 & appendix L11) that both experienced and inexperienced participants disagreed with all the statements regarding challenges encountered while using NewGenLib OPAC module to search for availability of books in the library. The responses of both experienced and inexperienced participants indicated that the terms used in NewGenLib OPAC module were familiar. It was also revealed that NewGenLib had no extraneous elements and was not cumbersome and difficult to use. So it was not difficult for inexperienced users to use the search options to search for books in the library collection. This could be due to prior knowledge of the use of electronic devices. Result from the interview also reveal that some users complained that they were not allow access to OPAC but the inexperienced were impressed about the use of OPAC to search for book from the library collection. The finding on NewGenLib OPAC concurred with the finding of Eltabir *et al.* (2019) who discovered that e-learning system interface was user friendly.

The result on Koha OPAC module (see Table 4.43 & appendix L10) showed that both experienced and inexperienced participants disagreed with all the statements regarding challenges encountered while using Koha OPAC to search for availability of books in the library. The result indicated that Koha OPAC is not difficult to use, as such both participants noted that the steps required to search for books were not many, terms used were familiar and not confusing; and the module has no extraneous element, therefore, new users find it easy to use the search options to search for availability of books in the library collection. This ability of the inexperienced participants to search for books could also be attributed to participant's familiarity with the use of electronic devices such as laptops and smart phones to search for information online. The result of the interview revealed that inexperienced participants were impressed with the use of Koha OPAC. The findings on OPAC modules are contrary to the findings of Ratwani *et al.* (2019), Caro-Alvaro *et al* (2018) and Ali *et al.* (2015). Caro-Alvaro *et al* (2018) discovered that participants found the system difficult to use and Ratwani *et al.* (2019) and Ali *et al* (2015) discovered usability issues with the system when participants were performing tasks.

4.4.6 Hypotheses testing of library management software

The result of hypothesis testing of both experienced and inexperienced participants as observed in hypotheses 1 and 2 revealed that the effectiveness of cataloguing module differs significantly among LMS used. So, there is significant difference in the effectiveness of cataloguing module among LMS. This means that the extent of effectiveness achieved when describing library materials depend on the type of LMS the library is using. This finding is contrary to the findings of Abifarin *et al.* (2019). The result of the hypothesis testing indicated that there was no significant difference in the design effectiveness between the library websites.

Results of hypothesis testing of both experienced and inexperienced participants as showed in hypotheses 3 and 4 revealed that the effectiveness of circulation module differs significantly among LMS used. So, there was significant difference in the effectiveness of circulation module among LMS. This implies that the level of effectiveness achieved when performing circulation tasks depend on the registration feature of LMS a library is using. This result negated the findings of Muqtadiroh *et al.* (2017) that there was no significant difference in the effectiveness among wikiBudaya websites.

The results of hypothesis testing of both experienced and inexperienced participants as indicated in hypotheses 5 and 6 revealed that the effectiveness of OPAC module differs significantly among LMS used. So, there is significant difference in the effectiveness of OPAC module among LMS used. This could be attributed to poor network service and the errors some participants committed. This result corroborated the findings of Khatun and Ahmed (2018) that there were significant differences in the tasks completion time and errors committed.

The results of hypothesis testing of both experienced and inexperienced participants as observed in hypotheses 7 and 8 revealed that the efficiency of cataloguing module differs significantly among LMS used. Therefore, there is significant difference in the efficiency of cataloguing module among LMS. This implies that effort put to catalogue resources depend on the type of LMS the library is using. The result of this finding is contrary to the findings of Azizz *et al.* (2020). The findings of Azizz *et al.* (2020) indicated that there was no significant difference in the efficiency among the four Webusa websites tested.

Results of hypothesis testing of both experienced and inexperienced participants as observed in hypotheses 9 and 10 also revealed that the efficiency of circulation module differs significantly among LMS used. So, there was significant difference in the

efficiency of circulation module among LMS. This implies means that the effort and used when performing circulation tasks depend on the registration feature of LMS used. This finding was supported by the study of Mujinga *et al.* (2018) that online banking services were significantly different among various age groups.

Results of hypothesis testing of both experienced and inexperienced participants as observed in hypotheses 11 and 12 revealed that the efficiency of OPAC module differs significantly among LMS used. Therefore, there was significant difference in the efficiency of OPAC module among LMS. This result agrees with the findings of Khatun and Ahmed (2018) that there were significant differences in the tasks completion time.

4.5 Summary of the Findings

4.5.1 Effectiveness of library management software

- i. There was difference between experienced and inexperienced participants in the number of cataloguing, circulation and OPAC tasks completed. Experienced participants completed all predetermined tasks across LMS under study.
- ii. The inexperienced participants could not complete all the predetermined tasks. SLAM, Alexandria and NewGenLib cataloguing modules were effective within the acceptable region of adequate but Koha cataloguing module is considered not effective.
- iii. The inexperienced participants could not complete all circulation predetermined tasks. Errors committed on registration templates affected the level of completion rate across the LMS, yet, the LMS circulation modules were at acceptable region, therefore, effective for use.

- iv. Finding from OPAC module also revealed that OPAC modules were within the acceptable region of good (SLAM, Koha, and NewGenLib) and adequate (Alexandria), therefore, effective for use.

4.5.2. Efficiency of library management software

- i. There was difference between experienced and inexperienced participants in the time taken to successfully complete cataloguing, circulation and OPAC tasks. The overall relative efficiency of experienced participants for tasks successfully completed was good across LMS under study.
- ii. The overall relative efficiency of inexperienced participants for cataloguing tasks successfully completed with SLAM, Alexandria and NewGenLib were within the acceptable region, of good and adequate, therefore, considered efficient. However, Koha cataloguing module was not within the acceptable region, hence, may not be considered efficient.
- iii. The overall relative efficiency of inexperienced participants for SLAM, Alexandria, NewGenLib and Koha circulation module for tasks successfully completed were within the acceptable region, of good and adequate, hence, efficient for use but Koha circulation module may not be considered efficient for use because it was below the acceptable region.
- iv. The overall efficiency of inexperienced participants for search tasks successfully completed with SLAM, Alexandria, NewGenLib and Koha were within the acceptable region of good, therefore, considered to be efficient.

4.5.3 Ease of use of library management software

4.5.3.1: *Cataloguing module*

- i. Both experienced and inexperienced participants agreed that SLAM, Alexandria and NewGenLib cataloguing modules were easy to learn, but inexperienced participants indicated that the modules were not easy to use.
- ii. Experienced and inexperienced participants indicated that, it was not easy to learn and use Koha cataloguing module.

4.5.3.2: *Circulation module*

- i. It was easy for experienced and inexperienced participants to learn and use SLAM, Alexandria and NewGenLib circulation modules.
- ii. Both experienced and inexperienced participants indicated that it was not easy to use Alexandria, NewGenLib and Koha registration templates to register library users, however it was easy to use the modules to charge and discharge library materials to library users.

4.5.3.3: *OPAC module*

The experienced and inexperienced participants agreed that it was easy to learn and use OPAC modules to search for library materials across all the LMS under study.

4.5.4 Satisfaction derived from using library management software

4.5.4.1 *Satisfaction derived from using cataloguing module of LMS*

- i. Both experienced and inexperienced participants enjoyed and were comfortable and satisfied with SLAM cataloguing module but noted that the module was not well designed due to lack of z39.50 feature.
- ii. Majority of experienced and inexperienced participants indicated that they were not comfortable with the steps required in cataloguing library materials, therefore, could not enjoy using the modules to describe library materials

- iii. Both experienced and inexperienced participants indicated that all the LMS cataloguing module were appealing however interaction with Alexandria, NewGenLib and Koha cataloguing user interface were not satisfying.

4.5.4.2.1 Satisfaction derived from using circulation module of library management software

- i. Majority of experienced and inexperienced participants were comfortable and satisfied with circulation modules, however
- ii. Majority of experienced and inexperienced participants were satisfied with Koha circulation module but were not comfortable with the steps required for registering library users

4.5.4.3 Satisfaction derived from using OPAC module of library management software

Both experienced and inexperienced participants indicated that users were comfortable and satisfied with OPAC module across the LMS under study.

4.5.5 Challenges encountered while using library management software

Usability issues were identified with SLAM, Alexandria, NewGenLib and Koha LMS. One issue that frustrated task performance with both experienced and inexperienced participants was bad network service across all LMS under study.

4.5.5.1 Challenges encountered while using cataloguing module

SLAM

There were no issues with this module however users could not recommend the use of SLAM because of the absence of Z39.50 feature in the cataloguing module.

Alexandria

- i. The number of templates and steps required to catalogue library materials were many. This made cataloguing difficult to inexperienced participants.
- ii. The module was not flexible to allow customization of certain features for easy use.
- iii. Lock and unlock features of the cataloguing process affected and frustrated their effort when cataloguing and navigating from one template to another.

NewGenLib

- i. The number of templates and steps required to catalogue library materials were many. This made cataloguing process difficult to inexperienced participants.
- ii. The module was cumbersome and had many extraneous elements
- iii. Navigating issues such as inability of users to move easily without clicking on each cell to type or input data also made cataloguing process difficult.

Koha

- i. The number of templates and steps required to catalogue library materials were many. This made cataloguing of books difficult to participants
- ii. The cataloguing module was cumbersome to use and had many extraneous elements
- iii. Participants were confused on how to enter multiple authors

4.5.5.2 *Challenges encountered while using circulation module of Library Management*

Software

SLAM: There were no usability issues with SLAM as participants performed circulation tasks easily with SLAM LMS

Alexandria: Extraneous data elements (such as graduation data and yearly status) were identified in the templates. This affected the registration process of many participants.

NewGenLib: Extraneous data elements were identified in the templates. Therefore, participants found it difficult to register library users

Koha

- i. Terms used in registration templates were confusing
- ii. The registration templates had extraneous elements that were not used. Data elements such as phone number and email on different sections of the field and alternate contact numbers and addresses were similar and repetitive on every field.
- iii. Generation of student number seemed difficult.

4.5.5.3 Challenges encountered while using OPAC module

SLAM, NewGenLib, Alexandria and Koha OPAC modules were user friendly, but participants made spelling mistakes and could not differentiate between title and subject option.

4.5.6 Hypothesis Testing of Library Management Software

1. There was significant difference in the effectiveness of cataloguing, circulation and OPAC modules among library management software used in service delivery in federal university libraries in Nigeria, so, the null hypotheses was rejected
2. There was significant difference in the efficiency of cataloguing, circulation and OPAC modules among library management software used in service delivery in federal university libraries in Nigeria. So, the null hypotheses was rejected

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

From the analysis of the results, the study concluded that usability of library management software cataloguing and circulation modules are difficult. Thus, it can be said that, all LMS under study have usability issues which affected users' effectiveness, efficiency and satisfaction of cataloguing and circulation modules. Also, there is difference in the number of tasks and time spent to complete the tasks between experienced and inexperienced users of LMS. Due to usability issues, Strategic Library Automation Management, Alexandria and NewGenLib effectiveness and efficiency of cataloguing, circulation and OPAC modules were low and effectiveness and efficiency of Koha cataloguing and circulation modules were not within acceptable limit.

SLAM, Alexandria, NewGenLib and Koha cataloguing and circulation modules are not very easy to use, as such, users are not comfortable and satisfied with the modules due to usability issues which included lack of z39.50 feature, number of steps required to catalogue library materials; cataloguing module was cumbersome to use, lock and unlock features, navigation issues and many extraneous with confusing data elements in the templates. Due to discomfort encountered while registering library users, the study

concluded that library staff are not satisfied using SLAM, Alexandria, NewGenLib and Koha circulation module of LMS. OPAC module was not very easy to use. Spelling suggestion, difficulty in differentiating between title and subject search options and poor network service were usability issues identified that frustrated the search process.

5.2 Recommendations

The following recommendations were made based on the findings of the study.

1. Library management software (modules) interfaces should be improved by software designers and developers to allow new users to use the modules with effectiveness, efficiency and satisfaction.
2. Extraneous data elements should be minimised when developing newer version(s) to avoid confusion and frustration when cataloguing and registering library users.
3. To enhance the effectiveness and efficiency of use, the number of templates and steps required to catalogue library materials should be minimised software developers.
4. Registration templates of circulation modules should be minimised, alternate contact addresses, phone numbers, yearly registration and suspension of users should be reduced to only the information that is needed.
5. LMS developers should improve on OPAC interface, spelling suggestion should be included in the interface, and good network service should be provided by libraries.

5.3 Contribution to Knowledge

The research presented experimental and empirical results on the usability of library management software used in service delivery in federal university libraries in Nigeria.

The outcome of this research outlines three contributions to knowledge:

1. The study provided empirical evidence on usability of cataloguing, circulation and OPAC modules of Alexandria, Koha, NewGenLib and SLAM library management software in service delivery in selected federal university libraries in Nigeria.
2. The study also provided librarians with an insight for selecting the appropriate library management software that is usable or user-friendly in service delivery in selected federal university libraries in Nigeria.
3. The study also provided knowledge of quasi experiment on usability of cataloguing, circulation and OPAC modules of Alexandria, Koha, NewGenLib and SLAM library management software in selected service delivery in federal university libraries in Nigeria.
4. The use of this methodology enable librarians to compare the usability of cataloguing, circulation and OPAC modules of Alexandria, Koha, NewGenLib and SLAM library management software used in service delivery in selected federal university libraries in Nigeria.
5. The study contributed to the body of knowledge in the area of usability of cataloguing, circulation and OPAC modules of Alexandria, Koha, NewGenLib and SLAM library management software service delivery in selected federal university libraries in Nigeria.

5.4 Suggestions for Further Study

The following were suggested for further studies.

1. A comparative evaluation of LMS should be carried out using classic method of usability testing in computer laboratory in university libraries in Nigeria.
2. Similar research can be carried out on library concourse, Virtua library management software and other LMS with different group of users.
3. Usability evaluation of LMS with variation in terms of participants' demographic and individual characteristics should be carried out in university libraries in Nigeria.

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APPENDICES

APPENDIX A

Department of Library and Information Technology

School of Information and Communication Technology

Federal University of Technology, Minna

25th June, 2019

Dear Respondent,

I am a postgraduate student of Library and Information Technology in the above named University. Presently, I am conducting a research on Assessment of the Usability of Library Management Software (LMS) in Service Delivery in Federal University Libraries in Nigeria.

I hereby solicit for your kind cooperation to participate in this usability experiment. All the information requested from you is purely for academic research purpose and shall be treated in strict confidentiality. Please help complete the predetermine tasks and thereafter respond to the questions since your identity is not required.

Thank you in anticipation of your kind cooperation.

Yours sincerely,

Akawu, Lami

Ph.D/SICT/2016/902

APPENDIX B

PART ONE: Cataloguing Module

Use the staff interface of the cataloguing module to catalogue and classify the following library

1. Section A: Effectiveness of Library Management Software

- i. English Grammar By Evelyn P. Altenberg Hofstra and Robert M. Vago. Cambridge: University Press Cambridge, 2010. Pp. xiv, 246: illustration. Includes bibliographical references. ISBN-978-0-521-73216-1. Subject – English Language- Grammar – PE112;
- ii. Educational Research: Basic issues and methodology. 2nd Edition. By Boniface G. Nworgu. Nsukka, University Trust Publishers, 2006. xiv, 398P. Illustration. References p353-355. ISBN: 978295585-X. Subject – Education- LB1028
- iii. Administrative map of Nigeria. Federal Government, Nigeria. 1985. Notes, 500/492/7-85; medium:- 1 map: 114x138cm. Subject: Nigeria-Administrative and political divisions-Maps- G8841.F7.N5

3. Section B: Efficiency of Library Management Software

- iv. Chemicals, Environment, Health: A global management perspective. Edited by Philip Wexler, Jan-van Der Kolk, Asish Mohaparra and Ravi Agarwal. London: CRC Press, 2012. Pp.783: xxvi, illustration, References and or Bibliography. ISBN: 978-1-4200-8470-2. Subject – Chemical Engineering –TC 11

- v. English Grammar By Evelyn P. Altenberg Hofstra and Robert M. Vago. Cambridge: University Press Cambridge, 2010. Pp. xiv, 246: illustration. Includes bibliographical references. ISBN-978-0-521-73216-1. Subject – English Language- Grammar – PE112.
- vi. Educational Research: Basic issues and methodology. 2nd Edition. By Boniface G. Nworgu. Nsukka, University Trust Publishers, 2006. xiv, 398P. Illustration. References p353-355. ISBN: 978295585-X. Subject – Education- LB1028

APPENDIX C

PART ONE: Circulation Module

Use the staff interface of the circulation module to perform circulation tasks/function

1. Section A: Effectiveness of Library Management Software

- i. Register a user using this information: Name: Serah Samuel Koro; Reg. No: U16/LIS/1051; Faculty: Education; Department: Library and information Science; Entry year: 2016/2017; Graduation Year: 2021; Next of kin: Samuel Musa Koro
- ii. Charge this book-English Grammar By Evelyn P. Altenberg Hofstra and Robert M. Vago. Cambridge: University Press Cambridge, 2010. Pp. xiv, 246: illustration. ISBN- 978-0-521-73216-1. Subject – English Language- Grammar – PE112; to the user just registered (that is ‘i’ above)
- iii. Discharge the book from the library user using the information in ‘i’ above

2. Section B: Efficiency of Library Management Software

- iv. Register a new library user using this information: Name: Chioma Ugo. Reg. No: **U17/Med/1034**; Faculty: Education; Department: **Mathematics Education**; Entry year: **2018/2019**; Graduation Year: **2022**

- v. Charge this book: Concise Physical Chemistry by Dr. Donald W. Rogers. New Jersey: John Wiley & Sons, Inc., 2011. ISBN 978-0-470-52264-6. Subject – Chemistry –QD45; to ‘vii’ above (Chioma Ugo. Reg. No: **U17/LIS/1034**)
- vi. Discharge the book from the library user using the information in ‘viii’ above

APPENDIX D

PART ONE: Online Public Access Catalogue (OPAC) Module

Use the OPAC (user interface) to search for the following items in the library.

Section A: Effectiveness of Library Management Software

1. Find a book by Christina Quinlan on Business Research Methods and collect its class number
2. Find out the number of books the library has by the author “Wole Soyinka”

Section B: Efficiency of Library Management Software

3. From the OPAC, find out the location of the book titled Research Methodology by C.R. Kothari in the library collection and retrieve the classification number
4. Find out the number of books the library has by the author “Wole Soyinka”

APPENDIX E

Participants Observation and Recording Form (PORF) for the assessment of the performance of library management software in service delivery federal university libraries in Nigeria.

Tasks	Scenario	P1	P2	P3	P4	P4	P5	P6	P7	P8	P9	P10	P11	P12
Task 1	TC													
	TCH													
	TNC													
	TCT													
Task 2	TC													
	TCH													
	TNC													
	TCT													
Task 3	TC													
	TCH													
	TNC													
	TCT													
Task 4	TC													
	TCH													
	TNC													
	TCT													
Task 5	TC													
	TCH													
	TNC													
	TCT													
Task 6	TC													
	TCH													
	TNC													
	TCT													
Task 7	TC													
	TCH													
	TNC													

	TCT													
Task 8	TC													
	TCH													
	TNC													
	TCT													
Task 9	TC													
	TCH													
	TNC													
	TCT													

P- Participant; TC- Task completed; TCH- Task completed with help; TNC- Task not completed; TCT - Task completion time.

APPENDIX F

PART TWO:

Cataloguing Module of Library Management Software (LMS)

Questionnaire for the Assessment of the Usability of Library Management Software in Service Delivery in Federal University Libraries in Nigeria (QAULiMSDFUN)

Instruction: Kindly tick the appropriate box that reflect your impression about the use of Library Management Software

Section A: Demographic information

1. Indicate your unit: Cataloguing unit () Circulation () Serial unit ()
Reference unit () Acquisition () others -----
2. Indicate the years of your working experience: 1 year () 2-5years () 6-10
years () 11-15 years () 16 years and above
3. Indicate the type of library management software (LMS) used in your library.
Alexandria () SLAM () Koha () NewGenLib ()
4. How long have you been using this LMS to catalogue library materials? Never
used () 1-5 years () 6-10 years () 11-15 years () 16 years and above ()

Section B: Determining the ease of use of Library Management Software

1. Indicate the ease with which you learn and use Library Management Software to perform cataloguing and classification functions of the library. Please rate appropriately:

Strongly Agreed (SA) =4; Agreed (A) =3; Disagreed (D) =2; and Strongly Disagreed (SD) = 1

S/N	Statements on ease of use	SA 4	A 3	D 2	SD 1
1	It is easy to learn to operate the cataloguing module of LMS in my library				
2	It is easy to explore the features / cataloguing module of LMS in my library				
3	It is easy to learn to describe/catalogue library materials with LMS in my library				
4	It is easy to describe/catalogue library materials with LMS after learning to use cataloguing module				
5	It is easy to use z39.50 to import or MARC to catalogue library items				
6	It is easy to use the characters on the cataloguing module of the LMS interface				
7	It is easy to return to the previous or home page				
8	It is easy to navigate through cataloguing module				
9	It is easy to access help messages				
10	There is clarity in accessing help messages				
11	There is clarity of the organization of information on the interface				
12	The sequence of the appearance of template (field) is logical				
13	The cataloguing module is designed to allow only experienced users to catalogue library materials				

Section C: Determining Satisfaction derived from using Library Management Software.

Which of the following describes your feelings/satisfaction towards the use of cataloguing module of LMS in cataloguing library materials? Please rate appropriately: (Strongly Agreed (SA) =4; Agreed (A) =3; Disagreed (D) =2; and Strongly Disagreed (SD) = 1)

	Statements on satisfaction derived from using the cataloguing module of LMS	SA 4	A 3	D 2	SD 1
1	I am comfortable with steps required in cataloguing library materials				
2	Cataloguing library materials are performed in a straightforward manner				
3	I am satisfied with the amount of information displayed in the cataloguing module of LMS				
4	I am satisfied with the help received through the help mode of the LMS				
5	The user interface messages that appear on the cataloguing module are appropriate				

6	The terms used in the cataloguing module are appropriate				
7	I find the cataloguing module of the LMS enjoyable when using it				
8	I find the cataloguing module of the LMS well designed to use				
9	The cataloguing module of LMS is colourful and appealing				
10	My overall impression about the interaction with the LMS user interface is satisfying				

Section D: Challenges encountered while using cataloguing module of Library Management Software.

Which of the following describes the challenges you encountered while using the cataloguing module of LMS? Please rate appropriately: (Strongly Agreed (SA) =4; Agreed (A) =3; Disagreed (D) =2; and Strongly Disagreed (SD) = 1)

S/N	Statements on challenges encountered	SA 4	A 3	D 2	SD 1
1	The number of steps required to catalogue library materials with LMS are many				
2	The terms used in the LMS cataloguing module are unfamiliar				
3	The terms used in the LMS cataloguing module are confusing				
4	The LMS cataloging module is difficult to use				
5	The LMS cataloging module is cumbersome to use				
6	There is inconsistency in the use of terms throughout the cataloguing module				
7	The cataloging module of the LMS has many extraneous elements				
8	I find it difficult to catalogue library materials because the templates are many				

APPENDIX G

PART TWO

Circulation module of Library Management Software (LMS)

Questionnaire for the Assessment of the Performance of Library Management Software in Service Delivery in Federal University Libraries in Nigeria (QAULiMSDFUN)

Instruction: Kindly tick the appropriate box that reflect your impression about the use of library management software

Section A: Demographic information

1. Indicate your unit: Cataloguing unit () Circulation () serial unit () Reference unit () Acquisition () E-Library () others -----

2. Indicate your years of your working experience: 1 year () 2-5years () 6-10 years () 11-15 years () 16 years above
3. Indicate the type of library management software (LMS) used in your library. Alexandria () SLAM () Koha () NewGenLib ()
4. How long have you been using this LMS to register and deliver library service to users? Never used () 1-5 years () 6-10 years () 11-15 years () 16 years above ()

Section B: Determining the ease of use of Library Management Software

Indicate the ease with which you learn and use library management software to perform circulation functions of the library. Please rate appropriately. (Strongly Agreed (SA) =4; Agreed (A) =3; Disagreed (D) =2; and Strongly Disagreed (SD) = 1)

S/N	Statements on ease of use	SA 4	A 3	D 2	SD 1
1	It is easy to learn to operate the circulation module of LMS				
2	It is easy to explore the features / circulation module of LMS				
3	It is easy to use circulation module to register library users after learning				
4	It is easy to charge and discharge library materials to users				
5	It is easy to navigate through circulation module				
6	It is easy to return to the previous or home page				
7	It is easy to access help messages				
8	There is clarity in accessing help messages and organization of information on the interface				
9	The sequence of the appearance of template (field) is logical				
10	The LMS circulation module is designed to allow only experienced users perform circulation task with it				

Section C: Determining Satisfaction derived from using Library Management Software

Which of the following describe your feelings or satisfaction toward the use of LMS to circulate and manage patrons' records? Please rate appropriately: (Strongly Agreed (SA) =4; Agreed (A) =3; Disagreed (D) =2; and Strongly Disagreed (SD) = 1)

S/N	Statements on satisfaction	SA 4	A 3	D 2	SD 1
1	I am comfortable with the steps required in registering library users				
2	I am comfortable with the steps required in charging and discharging library materials to users				
3	Registration of library users are perform in a straightforward manner with LMS				
4	Charging and discharging of library materials are perform in a straightforward manner with circulation module of LMS				
5	I am satisfied 5 with the amount of information displayed on circulation module of the LMS				
6	I am satisfied with the appropriateness of terms used in the				

	circulation module				
7	I am satisfied with the messages that appear on the circulation module of the LMS				
8	I find the circulation module of the LMS enjoyable when using it				
9	I find the circulation module of the LMS well designed to use				
10	The circulation module of LMS is colourful and appealing when am using it				
11	My overall impression 11 about the interaction with circulation module of the LMS user interface is satisfying				

Section D: Challenges encountered while using circulation module of LMS

Which of the following describe the challenges you encountered while using circulation module of LMS? Please rate appropriately: (Strongly Agreed (SA) =4; Agreed (A) =3; Disagreed (D) =2; and Strongly Disagreed (SD) = 1)

S/N	Statements on challenges encountered	SA 4	A 3	D 2	SD 1
1	The number of steps required to circulate library materials are many				
2	The terms used in the LMS circulation module are unfamiliar				
3	The terms used in the LMS circulation module are confusing				
4	The LMS circulation module is difficult to use				
5	The LMS circulation module is cumbersome to use				
6	There is inconsistency in the use of terms throughout the circulation module				
7	The circulation module 7 of the LMS has many extraneous elements				
8	I find it difficult to register library users because the information/steps required on the templates are many				
9	I find it difficult to circulate 9 library materials because the template are many				

APPENDIX H

PART TWO:

Online Public Access Catalogue (OPAC) of Library Management Software (LMS)

Questionnaire for the Assessment of the Performance of Library Management Software in Service Delivery in Federal University Libraries in Nigeria (QAULiMSDFUN)

Instruction: Kindly tick the appropriate box that reflect your impressions about the use of the library management software

Section A: Demographic information

1. Name_ of your department -----
2. Indicate your sex: Male Female
3. Indicate your level: 100L 200L 300L 400L 500
4. Indicate the type of library management software used in your library
Alexandria **SLAM** **NewGenLib** **Koha**
5. How long have you been using OPAC?: Never used
1 month - 1 year 2 years 3 years 4 years and above
6. How often do you use the library OPAC?: very often often not often
rarely Never used

Section B: Determining the ease of use of Library Management Software

Indicate the ease with which you learn and use library management software to perform circulation functions of the library. Please rate appropriately: (Strongly Agreed (SA) =4; Agreed (A) =3; Disagreed (D) =2; and Strongly Disagreed (SD) = 1)

S/N	Statements on ease of use	SA 4	A 3	D 2	SD 1
1	It is easy to learn to operate the OPAC module of the LMS in my library				
2	It is easy to explore the features of OPAC module of LMS in my library				
3	It is easy to use OPAC module to search for books in my library				
4	It is easy to use the characters on the LMS OPAC interface				
5	It is easy to navigate through OPAC module to search for books				
6	It is easy to return to the previous or home page				
7	It is easy to access help messages				
8	There is clarity in accessing help messages				
9	There is clarity in the organization of information on the screen				
10	The sequence of the appearance of template (field) is logical in OPAC module				
11	The OPAC module of LMS is designed to allow only experienced users to search for books in the library				

Section C: Determining the satisfaction derived from using Library Management Software

Which of the following describe your feelings or satisfaction toward the use of LMS to circulate and manage patrons' records? Please rate appropriately: (Strongly Agreed (SA) =4; Agreed (A) =3; Disagreed (D) =2; and Strongly Disagreed (SD) = 1)

S/N	Statements on satisfaction	SA 4	A 3	D 2	SD 1
1	I am comfortable with the steps required in searching for book(s)				
2	I am satisfied with the number of steps required in searching for book(s)				
3	I can search for book(s) in a straightforward manner				
4	I am satisfied with the amount of bibliographic information displayed in the OPAC module				

5	I am satisfied with the appropriateness of terms used in the OPAC module				
6	I am satisfied with the help messages that appear on the OPAC module of the LMS				
7	I find the OPAC module enjoyable when I am using it				
8	The OPAC module of LMS is colourful and appealing when I am using it				
9	The OPAC module of the LMS is well designed to use				
10	My overall impression about the interaction with the OPAC interface of the LMS is satisfying				

Section D: Challenges encountered while using Library Management Software (LMS)

Which of the following describe the challenges you encountered while using Online Public Access Catalogue module? Please rate appropriately: (Strongly Agreed (SA) =4; Agreed (A) =3; Disagreed (D) =2; and Strongly Disagreed (SD) = 1)

S/N	Statements on challenges	SA 4	A 3	D 2	SD 1
1	The number of steps required to search library materials with OPAC module of LMS are many				
2	The terms used in the OPAC module of the LMS are unfamiliar				
3	The terms used in the OPAC module of LMS are confusing				
4	The OPAC module of the LMS is difficult to use				
5	The OPAC module of the LMS is cumbersome to use				
6	There is inconsistency in the use of terms throughout the OPAC module				
7	The OPAC module of the LMS has many extraneous elements				
8	I find it difficult to use the search options in the OPAC module of the LMS to search for books				

APPENDIX I

Interview schedule on the assessment of the usability of library management software in service delivery in federal university libraries in Nigeria.

1. How easy do you find and use the library management software your library installed?
2. What do you like about the library management software your library is using?
3. What do you find frustrating about the library management software?
4. If you can change one thing about the software, what would it be?
5. From your experience of using this software, would you recommend this software to another university library?

APPENDIX J1

Ease of use of cataloguing module of SLAM library management software

S/ N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		n		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	It is easy to learn to operate the cataloguing module of LMS in my library	2	0	3	5	0	0	0	0	17	15	5	5	3.40	3.00	A	A
2	It is easy to explore the features / cataloguing module of LMS in my library	1	0	3	3	1	2	0	0	15	13	5	5	3.00	2.60	A	A
3	It is easy to learn to describe/catalogue library materials with LMS in my library	2	0	3	3	0	2	0	0	17	13	5	5	3.40	2.60	A	A
4	It is easy to describe/catalogue library materials with LMS after learning to use cataloguing module	3	0	2	4	0	1	0	0	18	14	5	5	3.60	2.80	A	A
5	It is easy to use z39.50 to import or MARC to catalogue library items	0	0	0	0	0	1	5	4	5	6	5	5	1.00	1.20	D	D
6	It is easy to use the characters on the cataloguing module of the LMS interface	1	0	3	4	1	1	0	0	15	14	5	5	3.00	2.80	A	A
7	It is easy to return to the previous or home page	1	0	4	5	0	0	0	0	16	15	5	5	3.20	3.00	A	A
8	It is easy to navigate through cataloguing module	2	0	3	3	0	2	0	0	17	13	5	5	3.40	2.60	A	A
9	It is easy to access help messages	0	0	5	4	0	1	0	0	15	14	5	5	3.00	2.80	A	A
10	There is clarity in accessing help messages	0	0	4	2	1	3	0	0	14	12	5	5	2.80	2.40	A	D
11	There is clarity of the organization of information on the interface	0	0	5	4	0	1	0	0	15	14	5	5	3.00	2.80	A	A
12	The sequence of the appearance of template (field) is logical	0	0	5	4	0	1	0	0	15	13	5	5	3.00	2.60	A	A
13	The cataloguing module is designed to allow only experienced users to catalogue library materials	0	0	0	0	3	5	2	0	8	10	5	5	1.60	2.00	D	D

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; X = mean

APPENDIX J2

The ease of use of cataloguing module of Alexandria library management software

S/N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	It is easy to learn to operate the cataloguing module of LMS in my library	0	0	4	0	6	9	0	1	24	19	10	10	2.40	1.90	D	D
2	It is easy to explore the features / cataloguing module of LMS in my library	0	0	2	0	8	7	0	3	22	17	10	10	2.20	1.70	D	D
3	It is easy to learn to describe/catalogue library materials with LMS in my library	0	0	4	3	6	5	0	2	24	21	10	10	2.40	2.10	D	D
4	It is easy to describe/catalogue library materials with LMS after learning to use cataloguing module	0	0	5	3	5	5	0	2	25	21	10	10	2.50	2.10	A	D
5	It is easy to use z39.50 to import or MARC to catalogue library items	3	0	7	6	0	4	0	0	33	26	10	10	3.30	2.60	A	A
6	It is easy to use the characters on the cataloguing module of the LMS interface	3	0	5	7	2	3	0	0	31	27	10	10	3.10	2.70	A	A
7	It is easy to return to the previous or home page	4	1	6	9	0	0	0	0	34	31	10	10	3.40	3.10	A	A
8	It is easy to navigate through cataloguing module	1	0	8	6	1	4	0	0	30	26	10	10	3.00	2.60	A	A
9	It is easy to access help messages	0	0	10	5	0	5	0	0	30	25	10	10	3.00	2.50	A	A
10	There is clarity in accessing help messages	0	0	9	6	1	4	0	0	29	26	10	10	2.90	2.60	A	A
11	There is clarity of the organization of information on the interface	0	0	10	6	0	4	0	0	30	26	10	10	3.00	2.60	A	A
12	The sequence of the appearance of template (field) is logical	1	0	9	8	0	2	0	0	31	28	10	10	3.10	2.80	A	A

13	The cataloguing module is designed to allow only experienced users to catalogue library materials	0	0	7	5	3	5	0	0	27	25	10	10	2.70	2.50	A	A
----	---	---	---	---	---	---	---	---	---	----	----	----	----	------	------	---	---

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX J3

The ease of use of cataloguing module of NewGenLib library management software

S/N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	It is easy to learn to operate the cataloguing module of LMS in my library	0	0	4	2	6	6	0	2	24	20	10	10	2.40	2.00	D	D
2	It is easy to explore the features / cataloguing module of LMS in my library	0	0	2	1	8	7	0	2	22	19	10	10	2.20	1.90	D	D
3	It is to learn to describe/catalogue library materials with LMS in my library	0	0	4	0	6	5	0	5	24	15	10	10	2.40	1.50	D	D
4	It is easy to describe/catalogue library materials with LMS after learning to use cataloguing module	0	0	5	3	5	7	0	0	25	23	10	10	2.50	2.30	A	D
5	It is easy to use z39.50 to import or MARC to catalogue library items	4	0	6	6	0	4	0	0	34	26	10	10	3.40	2.60	A	A
6	It is easy to use the characters on the cataloguing module of the LMS interface	3	0	7	8	0	2	0	0	33	28	10	10	3.30	2.80	A	A
7	It is easy to return to the previous or home page	5	2	5	8	0	0	0	0	35	32	10	10	3.50	3.20	A	A
8	It is easy to navigate through cataloguing module	2	0	6	7	2	3	0	0	30	27	10	10	3.00	2.70	A	A
9	It is easy to access help messages	1	0	7	5	2	5	0	0	29	25	10	10	2.90	2.50	A	A
10	There is clarity in accessing help messages	1	0	6	5	3	5	0	0	28	25	10	10	2.80	2.50	A	A
11	There is clarity of the organization of information on the interface	2	0	8	6	0	4	0	0	32	26	10	10	3.20	2.60	A	A
12	The sequence of the appearance of template (field) is logical	1	0	9	5	0	5	0	0	31	25	10	10	3.10	2.50	A	A
13	The cataloguing module is designed to allow only experienced users to catalogue library materials	0	2	6	6	4	2	0	0	26	20	10	10	2.60	3.00	A	A

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX J4

The ease of use of cataloguing module of Koha library management software

S/ N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	It is easy to learn to operate the cataloguing module of LMS in my library	0	0	2	0	7	6	1	4	21	16	10	10	2.10	1.60	D	D
2	It is easy to explore the features / cataloguing module of LMS in my library	0	0	0	0	8	5	2	5	18	15	10	10	1.80	1.50	D	D
3	It is easy to learn to describe/catalogue library materials with LMS in my library	0	0	2	0	7	8	1	2	21	18	10	10	2.10	1.80	D	D
4	It is easy to describe/catalogue library materials with LMS after learning to use cataloguing module	0	0	3	0	5	7	2	3	22	17	10	10	2.20	1.70	D	D
5	It is easy to use z39.50 to import or MARC to catalogue library items	0	0	7	2	3	8	0	0	27	22	10	10	2.70	2.20	A	D
6	It is easy to use the characters on the cataloguing module of the LMS interface	0	0	8	7	2	3	0	0	28	27	10	10	2.80	2.70	A	A
7	It is easy to return to the previous or home page	3	0	7	10	0	0	0	0	33	30	10	10	3.30	3.00	A	A
8	It is easy to navigate through cataloguing module	0	0	9	6	1	4	0	0	29	26	10	10	2.90	2.60	A	A
9	It is easy to access help messages	0	0	7	5	3	5	0	0	30	25	10	10	3.00	2.50	A	A
10	There is clarity in accessing help messages	0	0	9	6	1	4	0	0	29	26	10	10	2.90	2.60	A	A
11	There is clarity of the organization of information on the interface	0	0	6	5	4	5	0	0	26	25	10	10	2.60	2.50	A	A
12	The sequence of the appearance of																

	template (field) is logical	1	0	9	5	0	5	0	0	31	25	10	10	3.10	2.50	A	A
13	The cataloguing module is designed to allow only experienced users to catalogue library materials	0	3	6	7	4	0	0	0	26	33	10	10	2.60	3.30	A	A

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX J5

The ease of use of circulation module of SLAM library management software

S/ N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	It is easy to learn to operate the circulation module of LMS	3	1	2	3	0	1	0	0	18	15	5	5	3.60	3.00	A	A
2	It is easy to explore the features / circulation module of LMS	1	0	3	3	1	2	0	0	15	13	5	5	3.00	2.60	A	A
3	It is easy to use circulation module to register library users after learning	2	0	2	3	1	2	0	0	16	13	5	5	3.20	2.60	A	A
4	It is easy to charge and discharge library materials to users	3	0	2	4	0	1	0	0	18	14	5	5	3.60	2.80	A	A
5	It is easy to navigate through circulation module	2	0	3	4	0	1	0	0	15	13	5	5	3.40	2.60	A	A
6	It is easy to return to the previous or home page	3	1	2	4	0	0	0	0	18	15	5	5	3.60	3.00	A	A
7	It is easy to access help messages	1	0	4	4	0	1	0	0	16	14	5	5	3.20	2.80	A	A
8	There is clarity in accessing help messages	2	0	3	3	0	2	0	0	17	13	5	5	3.40	2.60	A	A
9	The sequence of the appearance of template (field) is logical	1	0	3	3	1	2	0	0	15	13	5	5	3.00	2.60	A	A
10	The LMS circulation module is designed to allow only experienced users perform	0	0	0	0	2	4	3	1	7	9	5	5	1.40	1.80	D	D

circulation task with it																	
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Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX J6

The ease of use of circulation module of Alexandria library management software

S/N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	It is easy to learn to operate the circulation module of LMS	0	0	3	1	2	4	0	0	13	11	5	5	2.60	2.20	A	D
2	It is easy to explore the features / circulation module of LMS	0	0	1	0	4	5	0	0	11	10	5	5	2.20	2.00	D	D
3	It is easy to use circulation module to register library users after learning	0	0	2	1	3	4	0	0	12	11	5	5	2.40	2.20	D	D
4	It is easy to charge and discharge library materials to users	2	0	3	4	0	1	0	0	17	14	5	5	3.40	2.80	A	A
5	It is easy to navigate through circulation module	2	0	2	3	1	2	0	0	16	13	5	5	3.20	2.60	A	A
6	It is easy to return to the previous or home page	2	1	3	4	0	0	0	0	17	16	5	5	3.40	3.20	A	A
7	It is easy to access help messages	1	0	4	3	0	2	0	0	16	13	5	5	3.20	2.60	A	A
8	There is clarity in accessing help messages	1	0	4	3	0	2	0	0	16	13	5	5	3.20	2.60	A	A

9	The sequence of the appearance of template (field) is logical	1	0	3	3	1	2	0	0	15	13	5	5	3.00	2.60	A	A
10	The LMS circulation module is designed to allow only experienced users perform circulation task with it	0	0	0	2	5	3	0	0	10	12	5	5	2.00	2.40	D	D

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX J7

The ease of use of circulation module of NewGenLib library management software

S/N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	It is easy to learn to operate the circulation module of LMS	1	0	2	3	2	2	0	0	14	13	5	5	2.80	2.60	A	A
2	It is easy to explore the features / circulation module of LMS	0	0	1	0	4	5	0	0	11	10	5	5	2.20	2.00	D	D
3	It is easy to use circulation module to register library users after learning	0	0	2	1	3	4	0	0	12	11	5	5	2.40	2.20	D	D
4	It is easy to charge and discharge library materials to users	2	0	3	4	0	1	0	0	17	14	5	5	3.40	2.80	A	A
5	It is easy to navigate through circulation module	2	0	3	3	0	2	0	0	17	13	5	5	3.40	2.60	A	A
6	It is easy to return to the previous or home page	3	1	2	4	0	0	0	0	18	16	5	5	3.60	3.20	A	A
7	It is easy to access help messages	2	0	3	3	0	2	0	0	16	14	5	5	3.20	2.80	A	A

8	There is clarity in accessing help messages	2	0	3	3	0	2	0	0	16	14	5	5	3.20	2.80	A	A
9	The sequence of the appearance of template (field) is logical	1	0	3	3	1	2	0	0	15	13	5	5	3.00	2.60	A	A
10	The LMS circulation module is designed to allow only experienced users perform circulation task with it	0	0	0	2	5	2	0	1	10	11	5	5	2.00	2.20	D	D

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX J8

The ease of use of circulation module of Koha library management software

S/ N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	It is easy to learn to operate the circulation module of LMS	0	0	1	0	4	4	0	1	11	9	5	5	2.20	1.80	D	D
2	It is easy to explore the features / circulation module of LMS	0	0	0	0	5	2	0	3	10	7	5	5	2.00	1.40	D	D
3	It is easy to use circulation module to register library users after learning	0	0	2	0	3	4	0	1	12	9	5	5	2.40	1.80	D	D
4	It is easy to charge and discharge library materials to users	1	0	3	4	1	1	0	0	15	14	5	5	3.00	2.80	A	A
5	It is easy to navigate through circulation module	0	0	4	3	1	2	0	0	14	13	5	5	2.80	2.60	A	A
6	It is easy to return to the previous or home page	2	0	3	5	0	0	0	0	17	15	5	5	3.40	3.00	A	A

7	It is easy to access help messages	0	0	4	3	1	2	0	0	14	13	5	5	2.80	2.60	A	A
8	There is clarity in accessing help messages	0	0	4	3	1	2	0	0	14	13	5	5	2.80	2.60	A	A
9	The sequence of the appearance of template (field) is logical	0	0	5	3	0	2	0	0	15	13	5	5	3.00	2.60	A	A
10	The LMS circulation module is designed to allow only experienced users perform circulation task with it	0	0	2	0	3	5	0	0	12	10	5	5	2.40	2.00	D	D

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX J9

The ease of use of OPAC module of SLAM library management software

S/ N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		FX		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	It is easy to learn to operate the OPAC module of the LMS in my library	4	3	8	6	0	3	0	0	40	36	12	12	3.33	3.00	A	A
2	It is easy to explore the features of OPAC module of LMS in my library	2	2	8	6	2	4	0	0	36	34	12	12	3.00	2.83	A	A
3	It is easy to use OPAC module to search for books in my library	4	2	8	7	0	3	0	0	40	35	12	12	3.33	2.91	A	A
4	It is easy to use the characters on the LMS OPAC interface	2	0	10	12	0	0	0	0	38	36	12	12	3.17	3.00	A	A
5	It is easy to navigate through OPAC module to search for books	3	1	7	8	2	3	0	0	37	34	12	12	3.08	2.83	A	A

6	It is easy to return to the previous or home page	5	5	7	7	0	0	0	0	41	41	12	12	3.42	3.42	A	A
7	It is easy to access help messages	4	3	8	7	0	2	0	0	40	37	1	12	3.33	3.08	A	A
8	There is clarity in accessing help messages	4	2	7	7	1	3	0	0	41	35	12	12	3.42	2.91	A	A
9	There is clarity in the organization of information on the screen	4	3	8	7	0	2	0	0	40	37	12	12	3.33	3.08	A	A
10	The sequence of the appearance of template (field) is logical in OPAC module	5	2	7	10	0	0	0	0	41	38	12	12	3.42	3.17	A	A
11	The OPAC module of LMS is designed to allow only experienced users to search for books in the library	0	0	0	0	5	8	7	4	17	20	12	12	1.42	1.67	D	D

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX J10

The ease of use of OPAC module of Alexandria library management software

S/ N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		FX		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	It is easy to learn to operate the OPAC module of the LMS in my library	4	1	8	9	0	2	0	0	40	35	12	12	3.33	2.91	A	A
2	It is easy to explore the features of OPAC module of LMS in my library	3	1	9	8	0	3	0	0	39	34	12	12	3.25	2.83	A	A
3	It is easy to use OPAC module to search for books in my library	5	2	7	8	0	2	0	0	41	36	12	12	3.41	3.00	A	A
4	It is easy to use the characters on the LMS OPAC interface	4	2	8	10	0	0	0	0	40	38	12	12	3.33	3.17	A	A
5	It is easy to navigate through OPAC module to search for books	4	3	7	7	1	2	0	0	39	37	12	12	3.25	3.08	A	A

6	It is easy to return to the previous or home page	4	1	8	11	0	0	0	0	40	37	12	12	3.33	3.08	A	A
7	It is easy to access help messages	2	2	10	8	0	2	0	0	38	36	12	12	3.17	3.00	A	A
8	There is clarity in accessing help messages	3	0	9	10	0	2	0	0	39	34	12	12	3.25	2.83	A	A
9	There is clarity in the organization of information on the screen	4	2	8	8	0	2	0	0	40	36	12	12	3.33	3.00	A	A
10	The sequence of the appearance of template (field) is logical in OPAC module	3	1	9	11	0	0	0	0	39	37	12	12	3.25	3.08	A	A
11	The OPAC module of LMS is designed to allow only experienced users to search for books in the library	0	0	0	0	8	10	4	2	20	22	12	12	1.67	1.83	D	D

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX J11

The ease of use of OPAC module of NewGenLib library management software

S/ N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		FX		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	It is easy to learn to operate the OPAC module of the LMS in my library	5	2	7	8	0	2	0	0	41	36	12	12	3.42	3.00	A	A
2	It is easy to explore the features of OPAC module of LMS in my library	3	1	9	9	0	2	0	0	39	35	12	12	3.25	2.92	A	A
3	It is easy to use OPAC module to search for books in my library	5	3	7	8	0	1	0	0	41	38	12	12	3.42	3.17	A	A
4	It is easy to use the characters on the LMS OPAC interface	6	5	6	7	0	0	0	0	42	41	12	12	3.50	3.42	A	A

5	It is easy to navigate through OPAC module to search for books	6	4	6	6	0	2	0	0	42	38	12	12	3.50	3.17	A	A
6	It is easy to return to the previous or home page	6	6	6	6	0	0	0	0	42	42	12	12	3.50	3.50	A	A
7	It is easy to access help messages	5	4	7	8	0	0	0	0	41	40	12	12	3.42	3.33	A	A
8	There is clarity in accessing help messages	6	3	6	8	0	1	0	0	42	38	12	12	3.50	3.17	A	A
9	There is clarity in the organization of information on the screen	5	4	7	7	0	1	0	0	41	39	12	12	3.42	3.25	A	A
10	The sequence of the appearance of template (field) is logical in OPAC module	6	5	6	7	0	0	0	0	42	41	12	12	3.50	3.42	A	A
11	The OPAC module of LMS is designed to allow only experienced users to search for books in the library	0	0	0	0	4	9	8	3	16	21	12	12	1.33	1.75	D	D

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX J12

The ease of use of OPAC module of Koha library management software

S/ N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		FX		N		X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	It is easy to learn to operate the OPAC module of the LMS in my library	4	3	8	8	0	1	0	0	40	38	12	12	3.33	3.17	A	A
2	It is easy to explore the features of OPAC module of LMS in my library	3	2	8	7	1	3	0	0	38	35	12	12	3.17	2.92	A	A
3	It is easy to use OPAC module to search for books in my library	6	4	6	8	0	0	0	0	42	40	12	12	3.50	3.33	A	A

4	It is easy to use the characters on the LMS OPAC interface	6	5	6	7	0	0	0	0	42	41	12	12	3.50	3.42	A	A
5	It is easy to navigate through OPAC module to search for books	5	3	7	7	0	2	0	0	41	37	12	12	3.42	3.08	A	A
6	It is easy to return to the previous or home page	5	6	7	6	0	0	0	0	41	42	12	12	3.42	3.50	A	A
7	It is easy to access help messages	5	4	7	8	0	0	0	0	41	40	12	12	3.41	3.33	A	A
8	There is clarity in accessing help messages	6	4	6	8	0	0	0	0	42	40	12	12	3.50	3.33	A	A
9	There is clarity in the organization of information on the screen	4	1	8	11	0	0	0	0	40	37	12	12	3.33	3.08	A	A
10	The sequence of the appearance of template (field) is logical in OPAC module	4	2	8	10	0	0	0	0	40	38	12	12	3.33	3.17	A	A
11	The OPAC module of LMS is designed to allow only experienced users to search for books in the library	0	0	0	0	2	7	10	5	14	19	12	12	1.17	1.58	D	D

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX K1

Satisfaction derived from using cataloguing module of SLAM library management software

S/ N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	I am comfortable with steps required in cataloguing library materials	3	0	2	5	0	0	0	0	18	15	5	5	3.60	3.00	A	A
2	Cataloguing library materials are performed in a straightforward manner	4	2	1	3	0	0	0	0	19	17	5	5	3.80	3.40	A	A

3	I am satisfied with the amount of information displayed in the cataloguing module of LMS	0	0	4	5	1	0	0	0	14	15	5	5	2.80	3.00	A	A
4	I am satisfied with the help received through the help mode of the LMS	0	0	4	3	1	2	0	0	13	13	5	5	2.60	2.60	A	A
5	The user interface messages that appear on the cataloguing module are appropriate	0	0	5	4	0	1	0	0	15	14	5	5	3.00	2.80	A	A
6	The terms used in the cataloguing module are appropriate	0	1	5	4	0	0	0	0	15	16	5	5	3.00	3.20	A	A
7	I find the cataloguing module of the LMS enjoyable when using it	3	1	2	4	0	0	0	0	18	16	5	5	3.60	3.20	A	A
8	I find the cataloguing module of the LMS well designed to use	0	0	1	3	4	2	0	0	11	13	5	5	2.20	2.60	D	A
9	The cataloguing module of LMS is colourful and appealing	0	0	5	5	0	0	0	0	15	15	5	5	3.00	3.00	A	A
10	My overall impression about the interaction with the LMS user interface is satisfying	2	0	3	5	0	0	0	0	17	15	5	5	3.40	3.00	A	A

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX K2

Satisfaction derived from using cataloguing module of Alexandria library management software

S/ N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	I am comfortable with steps required in cataloguing library materials	1	0	2	2	7	6	0	2	24	20	10	10	2.40	2.00	D	D
2	Cataloguing library materials are																

	performed in a straightforward manner	1	0	6	4	3	6	0	0	28	24	10	10	2.80	2.40	A	D
3	I am satisfied with the amount of information displayed in the cataloguing module of LMS	3	0	6	5	1	5	0	0	32	25	10	10	3.20	2.50	A	A
4	I am satisfied with the help received through the help mode of the LMS	0	0	9	5	1	5	0	0	29	25	10	10	2.90	2.50	A	A
5	The user interface messages that appear on the cataloguing module are appropriate	2	0	7	6	1	4	0	0	31	26	10	10	3.10	2.60	A	A
6	The terms used in the cataloguing module are appropriate	2	0	7	7	1	3	0	0	31	27	10	10	3.10	2.70	A	A
7	I find the cataloguing module of the LMS enjoyable when using it	1	0	6	4	3	6	0	0	28	24	10	10	2.80	2.40	A	D
8	I find the cataloguing module of the LMS well designed to use	0	0	5	3	5	7	0	0	25	23	10	10	2.50	2.30	A	D
9	The cataloguing module of LMS is colourful and appealing	2	1	7	7	1	2	0	0	31	29	10	10	3.10	2.90	A	A
10	My overall impression about the interaction with the LMS user interface is satisfying	0	0	4	2	6	8	0	0	24	22	10	10	2.40	2.20	D	D

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX K3

Satisfaction derived from using cataloguing module of NewGenLib library management software

S/ N	Statements	Strongly Agreed	Agreed	Disagree d	Strongly Disagree d	Total (FX)	N	- X	Decisio n
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		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	I am comfortable with steps required in cataloguing library materials	0	0	4	1	6	8	0	1	24	20	10	10	2.40	2.00	D	D
2	Cataloguing library materials are performed in a straightforward manner	2	0	6	2	2	8	0	0	30	24	10	10	3.00	2.40	A	D
3	I am satisfied with the amount of information displayed in the cataloguing module of LMS	2	0	8	10	0	0	0	0	32	30	10	10	3.20	3.00	A	A
4	I am satisfied with the help received through the help mode of the LMS	3	0	6	6	1	4	0	0	32	26	10	10	3.20	2.60	A	A
5	The user interface messages that appear on the cataloguing module are appropriate	3	0	7	9	0	1	0	0	33	29	10	10	3.30	2.90	A	A
6	The terms used in the cataloguing module are appropriate	2	0	8	7	0	3	0	0	32	27	10	10	3.20	2.70	A	A
7	I find the cataloguing module of the LMS enjoyable when using it	2	0	5	3	3	7	0	0	29	23	10	10	2.90	2.30	A	D
8	I find the cataloguing module of the LMS well designed to use	0	0	4	2	6	8	0	0	24	22	10	10	2.40	2.20	D	D
9	The cataloguing module of LMS is colourful and appealing	2	0	7	10	1	0	0	0	27	30	10	10	2.70	3.00	A	A
10	My overall impression about the interaction with the LMS user interface is satisfying	1	0	3	2	5	8	1	0	24	22	10	10	2.40	2.20	D	D

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX K4

Satisfaction derived from using cataloguing module of Koha library management software

S/	Statements	Strongly	Agreed	Disagree	Strongly	Total	N	-	Decisio
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N		Agreed		d		Disagree		(FX)		X		n					
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp				
1	I am comfortable with steps required in cataloguing library materials	0	0	2	0	4	4	4	6	18	17	10	10	1.80	1.70	D	D
2	Cataloguing library materials are performed in a straightforward manner	0	0	3	0	7	6	0	4	23	16	10	10	2.30	1.60	D	D
3	I am satisfied with the amount of information displayed in the cataloguing module of LMS	0	0	5	3	5	7	0	0	25	23	10	10	3.50	2.30	A	D
4	I am satisfied with the help received through the help mode of the LMS	0	0	7	5	3	5	0	0	27	25	10	10	2.70	2.50	A	A
5	The user interface messages that appear on the cataloguing module are appropriate	0	0	9	10	1	0	0	0	29	30	10	10	2.90	3.00	A	A
6	The terms used in the cataloguing module are appropriate	0	0	9	7	1	3	0	0	29	27	10	10	2.90	2.70	A	A
7	I find the cataloguing module of the LMS enjoyable when using it	0	0	1	0	8	7	1	3	20	17	10	10	2.00	1.70	D	D
8	I find the cataloguing module of the LMS well designed to use	0	0	2	2	7	5	1	3	21	19	10	10	2.10	1.90	D	D
9	The cataloguing module of LMS is colourful and appealing	4	3	6	6	0	1	0	0	34	32	10	10	3.40	3.20	A	A
10	My overall impression about the interaction with the LMS user interface is satisfying	0	0	2	0	6	5	2	5	20	15	10	10	2.00	1.50	D	D

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX K5

Satisfaction derived from using circulation module of SLAM library management software

S/	Statements	Strongly Agreed	Agreed	Disagree	Strongly Disagree	Total (FX)	N	X	Decision
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N								d									
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	I am comfortable with the steps required in registering library users	0	0	5	4	0	1	0	0	15	14	5	5	3.00	2.80	A	A
2	I am comfortable with the steps required in charging and discharging library materials to users	2	0	3	5	0	0	0	0	17	15	5	5	3.40	3.00	A	A
3	Registration of library users are perform in a straightforward manner with LMS	2	0	3	5	0	0	0	0	17	15	5	5	3.40	3.00	A	A
4	Charging and discharging of library materials are perform in a straightforward manner with LMS	3	1	2	4	0	0	0	0	18	16	5	5	3.80	3.20	A	A
5	I am satisfied with the amount of information displayed on circulation module of the LMS	0	0	5	5	0	0	0	0	15	15	5	5	3.00	3.00	A	A
6	I am satisfied with the appropriateness of terms used in the circulation module	1	0	4	5	0	0	0	0	16	15	5	5	3.20	3.00	A	A
7	I am satisfied with the messages that appear on the circulation module of the LMS	0	0	5	3	0	2	0	0	14	13	5	5	2.80	2.60	A	A
8	I find the circulation module of the LMS enjoyable when using it	0	0	5	4	0	1	0	0	15	14	5	5	3.00	2.80	A	A
9	I find the circulation module of the LMS well designed to use	1	0	4	4	0	1	0	0	16	14	5	5	3.20	2.80	A	A
10	The circulation module of LMS is colourful and appealing when am using it	0	0	5	5	0	0	0	0	15	15	5	5	3.00	3.00	A	A
11	My overall impression about the interaction with circulation module of the LMS user interface is satisfying	1	0	4	5	0	0	0	0	16	15	5	5	3.20	3.00	A	A

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX K6

Satisfaction derived from using circulation module of Alexandria library management software

S/ N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	I am comfortable with the steps required in registering library users	1	0	4	2	0	3	0	0	16	12	5	5	3.20	2.40	A	D
2	I am comfortable with the steps required in charging and discharging library materials to users	2	0	3	4	0	1	0	0	17	14	5	5	3.40	2.80	A	A
3	Registration of library users are perform in a straightforward manner with LMS	1	0	4	3	0	2	0	0	16	13	5	5	3.20	2.60	A	A
4	Charging and discharging of library materials are perform in a straightforward manner with LMS	1	0	4	4	0	1	0	0	16	14	5	5	3.20	2.80	A	A
5	I am satisfied with the amount of information displayed on circulation module of the LMS	1	0	3	4	1	1	0	0	15	14	5	5	3.00	2.80	A	A
6	I am satisfied with the appropriateness of terms used in the circulation module	1	0	4	4	0	1	0	0	16	14	5	5	3.20	2.80	A	A
7	I am satisfied with the messages that appear on the circulation module of the LMS	1	0	4	3	0	2	0	0	16	13	5	5	3.20	2.60	A	A
8	I find the circulation module of the LMS enjoyable when using it	0	0	4	3	1	2	0	0	14	13	5	5	2.80	2.60	A	A
9	I find the circulation module of the LMS well designed to use	1	0	4	2	0	3	0	0	16	12	5	5	3.20	2.40	A	D
10	The circulation module of LMS is colourful and appealing when am using it	2	1	3	4	0	0	0	0	17	16	5	5	3.40	3.20	A	A
11	My overall impression about the interaction with circulation module of the LMS user interface is satisfying	2	0	3	3	0	2	0	0	17	13	5	5	3.40	2.60	A	A

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX K7

Satisfaction derived from using circulation module of NewGenLib library management software

S/ N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		– X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	I am comfortable with the steps required in registering library users	1	0	2	2	2	3	0	0	14	13	5	5	2.80	2.60	A	A
2	I am comfortable with the steps required in charging and discharging library materials to users	2	0	3	5	0	0	0	0	17	15	5	5	3.40	2.80	A	A
3	Registration of library users are perform in a straightforward manner with LMS	1	0	2	3	2	2	0	0	14	13	5	5	2.80	2.60	A	A
4	Charging and discharging of library materials are perform in a straightforward manner with LMS	2	0	3	5	0	0	0	0	17	15	5	5	3.40	3.00	A	A
5	I am satisfied with the amount of information displayed on circulation module of the LMS	0	0	5	5	0	0	0	0	15	15	5	5	3.00	3.00	A	A
6	I am satisfied with the appropriateness of terms used in the circulation module	0	0	5	5	0	0	0	0	15	15	5	5	3.00	3.00	A	A
7	I am satisfied with the messages that appear on the circulation module of the LMS	0	0	3	3	2	2	0	0	13	13	5	5	2.60	2.60	A	A
8	I find the circulation module of the LMS enjoyable when using it	1	0	2	3	2	2	0	0	14	13	5	5	2.80	2.60	A	A
9	I find the circulation module of the LMS well designed to use	0	0	3	3	2	2	0	0	13	13	5	5	2.60	2.60	A	A
10	The circulation module of LMS is colourful and appealing when am using it	0	1	5	4	0	0	0	0	15	16	5	5	3.00	3.20	A	A

11	My overall impression about the interaction with circulation module of the LMS user interface is satisfying	1	0	2	3	2	2	0	0	14	13	5	5	2.80	2.60	A	A
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Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX K8

Satisfaction derived from using circulation module of Koha library management software

S/ N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	I am comfortable with the steps required in registering library users	0	0	1	0	4	5	0	0	11	10	5	5	2.20	2.00	D	D
2	I am comfortable with the steps required in charging and discharging library materials to users	0	0	5	4	0	1	0	0	15	14	5	5	3.00	2.80	A	A
3	Registration of library users are perform in a straightforward manner with LMS	0	0	2	0	3	5	0	0	12	10	5	5	2.40	2.00	D	D
4	Charging and discharging of library materials are perform in a straightforward manner with LMS	0	0	5	5	0	0	0	0	15	15	5	5	3.00	3.00	A	A
5	I am satisfied with the amount of information displayed on circulation module of the LMS	0	0	4	5	1	0	0	0	14	15	5	5	2.80	3.00	A	A
6	I am satisfied with the appropriateness of terms used in the circulation module	2	0	3	5	0	0	0	0	17	15	5	5	3.40	3.00	A	A
7	I am satisfied with the messages that appear on the circulation module of the LMS	0	0	3	3	2	2	0	0	13	13	5	5	2.60	2.60	A	A
8	I find the circulation module of the LMS enjoyable when using it	0	0	2	0	3	5	0	0	12	10	5	5	2.40	2.00	D	D
9	I find the circulation module of the	0	0	2	1	3	4	0	0	12	11	5	5	2.40	2.20	D	D

	LMS well designed to use																
10	The circulation module of LMS is colourful and appealing when am using it	0	2	5	3	0	0	0	0	15	17	5	5	3.00	3.40	A	A
11	My overall impression about the interaction with circulation module of the LMS user interface is satisfying	0	0	1	0	4	5	0	0	11	10	5	5	2.20	2.00	D	D

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX K9

Satisfaction derived from using OsPAC module of SLAM library management software

S/N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	I am comfortable with the steps required in searching for book(s)	5	4	7	8	0	0	0	0	41	40	12	12	3.42	3.33	A	A
2	I am satisfied with the number of steps required in searching for book(s)	5	4	7	8	0	0	0	0	41	40	12	12	3.42	3.33	A	A
3	I can search for book(s) in a straightforward manner	4	3	8	7	0	2	0	0	40	37	12	12	3.33	3.08	A	A
4	I am satisfied with the amount of bibliographic information displayed in the OPAC module	4	2	8	8	0	2	0	0	40	36	12	12	3.33	3.00	A	A
5	I am satisfied with the appropriateness of terms used in the OPAC module	4	0	8	10	0	2	0	0	40	34	12	12	3.33	2.83	A	A
6	I am satisfied with the help messages that appear on the OPAC module of the LMS	2	0	8	9	2	3	0	0	36	33	12	12	3.00	2.75	A	A
7	I find the OPAC module enjoyable when I am using it	6	3	6	7	0	2	0	0	42	37	12	12	3.50	3.08	A	A

8	The OPAC module of LMS is colourful and appealing when I am using it	3	1	5	6	4	5	0	0	35	32	12	12	2.92	2.67	A	A
9	The OPAC module of the LMS is well designed to use	3	0	7	8	2	4	0	0	37	32	12	12	3.08	2.67	A	A
10	My overall impression about the interaction with the OPAC interface of the LMS is satisfying	4	3	8	7	4	2	0	0	40	37	12	12	3.33	3.08	A	A

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX K10

Satisfaction derived from using OPAC module of Alexandria library management software

S/ N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	I am comfortable with the steps required in searching for book(s)	4	1	5	7	3	4	0	0	37	33	12	12	3.08	2.75	A	A
2	I am satisfied with the number of steps required in searching for book(s)	4	1	6	7	2	4	0	0	38	33	12	12	3.17	2.75	A	A
3	I can search for book(s) in a straightforward manner	3	2	7	6	2	4	0	0	37	34	12	12	3.08	2.83	A	A
4	I am satisfied with the amount of bibliographic information displayed in the OPAC module	5	3	6	6	1	3	0	0	40	36	12	12	3.33	3.00	A	A
5	I am satisfied with the appropriateness of terms used in the OPAC module	3	0	9	10	0	2	0	0	39	34	12	12	3.25	2.83	A	A
6	I am satisfied with the help messages that appear on the OPAC module of the LMS	1	0	8	6	3	6	0	0	34	30	12	12	2.83	2.50	A	A

7	I find the OPAC module enjoyable when I am using it	4	2	8	10	0	0	0	0	40	38	12	12	3.33	3.17	A	A
8	The OPAC module of LMS is colourful and appealing when I am using it	3	2	7	6	2	4	0	0	37	34	12	12	3.08	2.83	A	A
9	The OPAC module of the LMS is well designed to use	2	0	7	7	3	5	0	0	35	31	12	12	2.92	2.58	A	A
10	My overall impression about the interaction with the OPAC interface of the LMS is satisfying	5	2	7	10	0	0	0	0	41	38	12	12	3.42	3.17	A	A

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX K11

Satisfaction derived from using OPAC module of NewGenLib library management software

S/N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	I am comfortable with the steps required in searching for book(s)	3	2	8	7	1	3	0	0	38	35	12	12	3.17	2.92	A	A
2	I am satisfied with the number of steps required in searching for book(s)	3	2	8	7	1	3	0	0	38	35	12	12	3.17	2.92	A	A
3	I can search for book(s) in a straightforward manner	4	2	7	8	1	2	0	0	39	36	12	12	3.25	3.00	A	A
4	I am satisfied with the amount of bibliographic information displayed in the OPAC module	5	3	7	9	0	0	0	0	41	39	12	12	3.42	3.25	A	A
5	I am satisfied with the appropriateness of terms used in the OPAC module	4	1	8	11	0	0	0	0	40	37	12	12	3.33	3.08	A	A

6	I am satisfied with the help messages that appear on the OPAC module of the LMS	2	0	8	10	2	2	0	0	36	34	12	12	3.00	2.83	A	A
7	I find the OPAC module enjoyable when I am using it	5	3	7	9	0	0	0	0	41	39	12	12	3.42	3.25	A	A
8	The OPAC module of LMS is colourful and appealing when I am using it	4	2	6	7	2	3	0	0	38	35	12	12	3.17	2.92	A	A
9	The OPAC module of the LMS is well designed to use	2	0	7	8	3	4	0	0	38	32	12	12	3.17	2.67	A	A
10	My overall impression about the interaction with the OPAC interface of the LMS is satisfying	4	0	8	12	0	0	0	0	40	36	12	12	3.33	3.00	A	A

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX K12

Satisfaction derived from using OPAC module of Koha library management software

S/N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	I am comfortable with the steps required in searching for book(s)	4	3	8	7	0	2	0	0	40	37	12	12	3.33	3.08	A	A
2	I am satisfied with the number of steps required in searching for book(s)	5	3	7	7	0	2	0	0	41	37	12	12	3.42	3.08	A	A
3	I can search for book(s) in a straightforward manner	4	3	6	7	2	2	0	0	38	37	12	12	3.17	3.08	A	A
4	I am satisfied with the amount of bibliographic information displayed in the OPAC module	5	0	7	12	0	0	0	0	41	36	12	12	3.42	3.00	A	A

5	I am satisfied with the appropriateness of terms used in the OPAC module	5	2	7	10	0	0	0	0	41	38	12	12	3.42	3.17	A	A
6	I am satisfied with the help messages that appear on the OPAC module of the LMS	3	0	7	9	2	3	0	0	37	33	12	12	3.08	2.75	A	A
7	I find the OPAC module enjoyable when I am using it	5	3	7	8	0	1	0	0	41	38	12	12	3.42	3.17	A	A
8	The OPAC module of LMS is colourful and appealing when I am using it	6	4	6	8	0	0	0	0	42	40	12	12	3.50	3.33	A	A
9	The OPAC module of the LMS is well designed to use	5	2	6	7	1	3	0	0	40	35	12	12	3.33	2.92	A	A
10	My overall impression about the interaction with the OPAC interface of the LMS is satisfying	5	4	7	8	0	0	0	0	41	40	12	12	3.42	3.33	A	A

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX L1

Challenges encountered while using cataloguing module of SLAM library management software

S/N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	The number of steps required to catalogue library materials with LMS are many	0	0	0	0	1	3	4	2	6	8	5	5	1.20	1.60	D	D
2	The terms used in the LMS cataloguing module are unfamiliar	0	0	0	0	2	5	3	0	7	10	5	5	1.40	2.00	D	D
3	The terms used in the LMS cataloguing module are confusing	0	0	0	0	1	2	4	3	6	7	5	5	1.20	1.40	D	D
4	The LMS cataloging module																

	is difficult to use	0	0	0	0	1	2	4	3	6	7	5	5	1.20	1.40	D	D
5	The LMS cataloging module is cumbersome to use	0	0	0	0	0	3	5	2	5	8	5	5	1.00	1.60	D	D
6	There is inconsistency in the use of terms throughout the cataloging module	0	0	0	0	2	5	3	0	7	10	5	5	1.40	2.00	D	D
7	The cataloging module of the LMS has many extraneous elements	0	0	0	0	1	4	4	1	6	9	5	5	1.20	1.80	D	D
8	I find it difficult to catalogue library materials with LMS because the templates are many	0	0	0	0	0	2	5	3	5	7	5	5	1.00	1.20	D	D

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX L2

Challenges encountered while using cataloguing module of Alexandria library management software

S/N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	The number of steps required to catalogue library materials with LMS are many.	0	0	5	7	5	3	0	0	25	27	10	10	2.50	2.70	A	A
2	The terms used in the LMS cataloguing module are unfamiliar	0	0	0	0	3	6	7	4	13	16	10	10	1.30	1.60	D	D
3	The terms used in the LMS cataloguing module are confusing	0	0	0	2	10	8	0	0	20	22	10	10	2.00	2.20	D	D
4	The LMS cataloguing module																

	is difficult to use	0	2	4	4	6	4	0	0	24	28	10	10	2.40	2.80	D	A
5	The LMS cataloging module is cumbersome to use	1	0	5	7	4	3	0	0	27	27	10	10	2.50	2.70	A	A
6	There is inconsistency in the use of terms throughout the cataloging module	0	0	0	0	3	6	7	4	13	18	10	10	1.30	1.80	D	D
7	The cataloging module of the LMS has many extraneous elements	0	2	4	3	6	5	0	0	24	27	10	10	2.40	2.70	D	A
8	I find it difficult to catalogue library materials with LMS because the templates are many	0	0	2	6	8	4	0	0	22	26	10	10	2.20	2.60	D	A

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX L3

Challenges encountered while using cataloguing module of NewGenLib library management software

S/N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	The number of steps required to catalogue library materials with LMS are many.	1	3	6	5	3	2	0	0	28	31	10	10	2.80	3.10	A	A
2	The terms used in the LMS cataloguing module are unfamiliar	0	0	0	0	4	7	6	3	14	17	10	10	1.40	1.70	D	D
3	The terms used in the LMS cataloguing module are confusing	0	0	0	3	6	7	4	0	16	23	10	10	1.60	2.30	D	D
4	The LMS cataloging module																

	is difficult to use	0	0	4	7	6	3	0	0	24	27	10	10	2.40	2.70	D	A
5	The LMS cataloging module is cumbersome to use	0	1	6	8	4	1	0	0	26	30	10	10	2.60	3.00	A	A
6	There is inconsistency in the use of terms throughout the cataloging module	0	0	0	0	5	7	5	3	15	17	10	10	1.50	1.70	D	D
7	The cataloging module of the LMS has many extraneous elements	0	1	5	8	5	1	0	0	25	30	10	10	2.50	3.00	A	A
8	I find it difficult to catalogue library materials with LMS because the templates are many	0	2	4	5	6	3	0	0	24	29	10	10	2.40	2.90	D	A

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX L4

Challenges encountered while using cataloguing module of Koha library management software

S/N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	The number of steps required to catalogue library materials with LMS are many.	4	6	5	4	1	0	0	0	31	36	10	10	3.10	3.60	A	A
2	The terms used in the LMS cataloguing module are unfamiliar	0	0	0	0	6	5	4	5	16	15	10	10	1.60	1.50	D	D
3	The terms used in the LMS cataloguing module are confusing	0	0	3	3	7	7	0	0	23	23	10	10	2.30	2.30	D	D

4	The LMS cataloging module is difficult to use	1	4	7	5	2	1	0	0	29	33	10	10	2.90	3.30	A	A
5	The LMS cataloging module is cumbersome to use	1	4	8	6	1	0	0	0	30	34	10	10	3.00	3.40	A	A
6	There is inconsistency in the use of terms throughout the cataloguing module	0	0	0	0	6	8	4	2	16	18	10	10	1.60	1.80	D	D
7	The cataloging module of the LMS has many extraneous elements	2	5	7	5	1	0	0	0	31	35	10	10	3.10	3.50	A	A
8	I find it difficult to catalogue library materials with LMS because the templates are many	0	2	6	6	4	2	0	0	26	30	10	10	2.60	3.00	A	A

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX L5

Challenges encountered while using circulation module of SLAM library management software

S/ N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	The number of steps required to circulate library materials are many	0	0	0	0	2	5	3	2	7	10	5	5	1.40	2.00	D	D
2	The terms used in the LMS circulation module are unfamiliar	0	0	0	0	1	4	4	1	6	9	5	5	1.20	1.80	D	D
3	The terms used in the LMS																

	circulation module are confusing	0	0	0	0	2	3	3	2	7	8	5	5	1.20	1.60	D	D
4	The LMS circulation module is difficult to use	0	0	0	0	2	5	3	0	7	10	5	5	1.20	2.00	D	D
5	The LMS circulation module is cumbersome to use	0	0	0	0	1	4	4	1	6	9	5	5	1.20	1.80	D	D
6	There is inconsistency in the use of terms throughout the circulation module	0	0	0	0	2	5	3	0	7	10	5	5	1.40	2.00	D	D
7	The circulation module of the LMS has many extraneous elements	0	0	0	0	0	5	5	0	5	10	5	5	1.00	2.00	D	D
8	I find it difficult to register library users because the information/steps required on the templates are many	0	0	0	0	0	3	5	2	5	8	5	5	1.00	1.60	D	D
9	I find it difficult to circulate library materials because the template are many	0	0	0	0	1	3	4	2	6	8	5	5	1.20	1.60	D	D

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX L6

Challenges encountered while using circulation module of Alexandria library management software

S/ N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	The number of steps required to circulate library materials are many	0	0	0	2	5	3	0	0	10	12	5	5	2.00	2.40	D	D
2	The terms used in the LMS circulation module are unfamiliar	0	0	0	0	3	5	2	0	8	10	5	5	1.60	2.00	D	D
3	The terms used in the LMS																

	circulation module are confusing	0	0	1	2	4	3	0	0	11	12	5	5	2.20	2.40	D	D
4	The LMS circulation module is difficult to use	0	0	1	2	4	3	0	0	11	12	5	5	2.20	2.40	D	D
5	The LMS circulation module is cumbersome to use	0	0	0	2	5	3	0	0	10	12	5	5	2.00	2.40	D	D
6	There is inconsistency in the use of terms throughout the circulation module	0	0	0	0	0	5	5	0	5	10	5	5	1.00	2.00	D	D
7	The circulation module of the LMS has many extraneous elements	0	0	3	4	2	1	0	0	13	14	5	5	2.60	2.80	A	A
8	I find it difficult to register library users because the information/steps required on the templates are many	0	0	2	4	3	1	0	0	12	14	5	5	2.40	2.80	D	A
9	I find it difficult to circulate library materials because the template are many	0	0	0	0	1	3	4	2	6	8	5	5	1.20	1.60	D	D

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX L7

Challenges encountered while using circulation module of NewGenLib library management software

S/ N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	The number of steps required to circulate library materials are many	0	0	0	1	5	4	0	0	10	11	5	5	2.00	2.20	D	D
2	The terms used in the LMS circulation module are	0	0	0	1	5	4	0	0	10	11	5	5	2.00	2.20	D	D

	unfamiliar																
3	The terms used in the LMS circulation module are confusing	0	0	2	3	3	2	0	0	12	13	5	5	2.40	2.60	D	A
4	The LMS circulation module is difficult to use	0	0	0	2	5	3	0	0	10	12	5	5	2.00	2.40	D	D
5	The LMS circulation module is cumbersome to use	0	0	2	3	3	2	0	0	12	13	5	5	2.40	2.60	D	A
6	There is inconsistency in the use of terms throughout the circulation module	0	0	0	0	3	5	2	0	8	10	5	5	1.60	2.00	D	D
7	The circulation module of the LMS has many extraneous elements	0	0	2	3	3	2	0	0	12	13	5	5	2.40	2.60	D	A
8	I find it difficult to register library users because the information/steps required on the templates are many	0	0	2	4	2	1	1	0	11	14	5	5	2.20	2.80	D	A
9	I find it difficult to circulate library materials because the template are many	0	0	0	0	3	5	2	0	8	10	5	5	1.60	2.00	D	D

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX L8

Challenges encountered while using circulation module of Koha library management software

S/N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	The number of steps required to circulate library materials are many	0	0	2	2	3	3	0	0	12	12	5	5	2.40	2.40	D	D

2	The terms used in the LMS circulation module are unfamiliar	0	0	0	0	3	5	2	0	8	10	5	5	1.60	2.00	D	D
3	The terms used in the LMS circulation module are confusing	1	0	3	5	1	0	0	0	15	15	5	5	3.00	3.00	A	A
4	The LMS circulation module is difficult to use	0	0	4	5	1	0	0	0	14	15	5	5	2.80	3.00	A	A
5	The LMS circulation module is cumbersome to use	0	1	5	3	0	1	0	0	15	15	5	5	3.00	3.00	A	A
6	There is inconsistency in the use of terms throughout the circulation module	0	0	0	0	3	5	2	0	8	10	5	5	1.60	2.00	D	D
7	The circulation module of the LMS has many extraneous elements	2	0	2	5	1	0	0	0	16	15	5	5	3.20	3.00	A	A
8	I find it difficult to register library users because the information/steps required on the templates are many	0	1	5	4	0	0	0	0	15	16	5	5	3.00	3.20	A	A
9	I find it difficult to circulate library materials because the template are many	0	0	0	0	2	5	3	0	7	10	5	5	1.40	2.00	D	D

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX L9

Challenges encountered while using OPAC module of SLAM library management software

S/ N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	The number of steps required to search library	0	0	0	0	6	8	6	4	18	20	12	12	1.50	1.67	D	D

	materials with OPAC module of LMS are many																	
2	The terms used in the OPAC module of the LMS are unfamiliar	0	0	0	0	5	9	7	3	17	21	12	12	1.42	1.75	D	D	
3	The terms used in the OPAC module of LMS are confusing	0	0	0	0	5	7	7	5	17	19	12	12	1.42	1.58	D	D	
4	The OPAC module of the LMS is difficult to use	0	0	0	0	6	8	6	4	18	20	12	12	1.50	1.67	D	D	
5	The OPAC module of the LMS is cumbersome to use	0	0	0	0	4	7	8	5	16	19	12	12	1.33	1.58	D	D	
6	There is inconsistency in the use of terms throughout the OPAC module	0	0	0	0	4	6	8	6	16	18	12	12	1.33	1.50	D	D	
7	The OPAC module of the LMS has many extraneous elements	0	0	0	0	5	9	7	3	17	21	12	12	1.42	1.75	D	D	
8	I find it difficult to use the search options in the OPAC module of the LMS to search for books	0	0	0	0	3	6	9	6	15	18	12	12	1.25	1.50	D	D	

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX L10

Challenges encountered while using OPAC module of Alexandria library management software

S/N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp

1	The number of steps required to search library materials with OPAC module of LMS are many	0	0	0	0	8	10	4	2	20	22	12	12	1.67	1.83	D	D
2	The terms used in the OPAC module of the LMS are unfamiliar	0	0	0	0	7	11	5	1	19	23	12	12	1.58	1.92	D	D
3	The terms used in the OPAC module of LMS are confusing	0	0	0	0	7	9	5	3	19	21	12	12	1.58	1.75	D	D
4	The OPAC module of the LMS is difficult to use	0	0	0	0	6	9	6	3	18	21	12	12	1.50	1.75	D	D
5	The OPAC module of the LMS is cumbersome to use	0	0	0	0	8	11	4	1	20	23	12	12	1.67	1.92	D	D
6	There is inconsistency in the use of terms throughout the OPAC module	0	0	0	0	6	7	6	5	18	19	12	12	1.50	1.58	D	D
7	The OPAC module of the LMS has many extraneous elements	0	0	0	0	7	9	5	3	19	21	12	12	1.58	1.75	D	D
8	I find it difficult to use the search options in the OPAC module of the LMS to search for books	0	0	0	0	7	11	5	1	19	23	12	12	1.58	1.92	D	D

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX L11

Challenges encountered while using OPAC module of NewGenLib library management software

S/N	Statements	Strongly Agreed		Agreed		Disagreed		Strongly Disagreed		Total (FX)		N		- X		Decision	
		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp		
1	The number of steps required																

	to search library materials with OPAC module of LMS are many	0	0	0	0	6	9	6	3	18	21	12	12	1.50	1.75	D	D
2	The terms used in the OPAC module of the LMS are unfamiliar	0	0	0	0	5	8	7	4	17	20	12	12	1.42	1.67	D	D
3	The terms used in the OPAC module of LMS are confusing	0	0	0	0	5	9	7	3	17	21	12	12	1.42	1.75	D	D
4	The OPAC module of the LMS is difficult to use	0	0	0	0	4	6	8	6	16	18	12	12	1.33	1.50	D	D
5	The OPAC module of the LMS is cumbersome to use	0	0	0	0	6	8	6	4	18	20	12	12	1.50	1.67	D	D
6	There is inconsistency in the use of terms throughout the OPAC module	0	0	0	0	7	9	5	3	19	21	12	12	1.58	1.75	D	D
7	The OPAC module of the LMS has many extraneous elements	0	0	0	0	5	7	7	5	17	19	12	12	1.42	1.58	D	D
8	I find it difficult to use the search options in the OPAC module of the LMS to search for books	0	0	0	0	6	8	6	4	18	20	12	12	1.50	1.67	D	D

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX L12

Challenges encountered while using OPAC module of Koha library management software

S/N	Statements	Strongly Agreed	Agreed	Disagreed	Strongly Disagreed	Total (FX)	N	\bar{X}	Decision
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		Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp	Exp	Inexp
1	The number of steps required to search library materials with OPAC module of LMS are many	0	0	0	0	5	8	7	4	17	20	12	12	1.42	1.67	D	D
2	The terms used in the OPAC module of the LMS are unfamiliar	0	0	0	0	6	8	6	4	18	20	12	12	1.50	1.67	D	D
3	The terms used in the OPAC module of LMS are confusing	0	0	0	0	5	6	7	6	17	18	12	12	1.42	1.50	D	D
4	The OPAC module of the LMS is difficult to use	0	0	0	0	4	6	8	6	16	18	12	12	1.33	1.50	D	D
5	The OPAC module of the LMS is cumbersome to use	0	0	0	0	5	8	7	4	17	20	12	12	1.42	1.67	D	D
6	There is inconsistency in the use of terms throughout the OPAC module	0	0	0	0	5	8	7	4	17	20	12	12	1.42	1.67	D	D
7	The OPAC module of the LMS has many extraneous elements	0	0	0	0	4	6	8	6	16	18	12	12	1.33	1.50	D	D
8	I find it difficult to use the search options in the OPAC module of the LMS to search for books	0	0	0	0	5	7	7	5	17	19	12	12	1.42	1.58	D	D

Note: Exp=Experienced; Inexp= Inexperienced; FX= Total score, n = number of responses; x = mean

APPENDIX M

Ease of use of Library Management Software			
Correlation			
		Score	Time Elapsed
Score	Pearson correlation	1	0.082
	Sig (2-tailed)		.000
	N	30	30
Time Elapsed	Pearson correlation	0.082	1
	Sig (2-tailed)	.000	
	N	30	30

Satisfaction derived from using of Library Management Software			
Correlation			
		Score	Time Elapsed
Score	Pearson correlation	1	0.091
	Sig (2-tailed)		.000
	N	30	30
Time Elapsed	Pearson correlation	0.091	1
	Sig (2-tailed)	.000	
	N	30	30

Challenges of using Library Management Software			
Correlation			
		Score	Time Elapsed
Score	Pearson correlation	1	0.084
	Sig (2-tailed)		.000
	N	30	30
Time Elapsed	Pearson correlation	0.084	1
	Sig (2-tailed)	.000	
	N	30	30

APPENDIX N

Federal Universities in Nigeria with the types of LMS Use in their Libraries

S/N	Federal university, Nigeria	LMS
1	Abubakar Tafawa Balewa University, Bauchi	Koha
2	Ahmadu Bello University, Zaria	Koha
3	Bayero University, Kano	VIRTUA
4	Federal University of Petroleum Resources, Effurun	Koha
5	Federal University of Technology, Akure	SLAM
6	Federal University of Technology, Minna	Koha
7	Federal University of Technology, Owerri	Alexandria
8	Federal University, Birnin Kebbi	Koha
9	Federal University, Dutse	Koha
10	Federal University, Dutsin-Ma	Koha
11	Federal University, Gashua	Koha
12	Federal University, Gusau	Koha
13	Federal University, Kashere	Koha
14	Federal University, Lafia	Koha
15	Federal University, Lokoja	Koha
16	Federal University, Ndufu-Alike	Koha
17	Federal University, Otuoke	Koha
18	Federal University, Oye-Ekiti	Koha
19	Federal University, Wukari	NewGenLib
20	Michael Okpara Univ. of Agric., Umudike	Koha
21	Modibbo Adama University of Technology, Yola	Koha
22	National Open University of Nigeria, Lagos	Koha
23	Nigerian Defence Academy, Kaduna	Koha
24	Nnamdi Azikiwe University, Awka	Koha
25	Obafemi Awolowo University, Ile-Ife	VIRTUA
26	The Police Academy, Wudil	Koha

APPENDIX N (Cont.)

Federal Universities in Nigeria with the types of LMS Use in their Libraries (Cont.)

S/N	Federal university, Nigeria	LMS
28	University of Agriculture, Abeokuta	Koha
29	University of Agriculture, Makurdi	Koha
30	University of Benin, Benin	NewGenLib
31	University of Calabar, Calabar	Koha
32	University of Ibadan, Ibadan	Koha
33	University of Ilorin, Ilorin	Koha
34	University of Jos, Jos	Koha
35	University of Lagos, Lagos	Millennium
36	University of Maiduguri, Maiduguri	Library concourse
37	University of Nigeria, Nsukka	Koha
38	University of Port-Harcourt, Port-Harcourt	Koha
39	University of Uyo, Uyo	Koha
40	Usumanu Danfodiyo University, Sokoto	Koha

