

Design and Development of an Electronic Library Management System for Mufulira Skills Training Institute.

(Paper ID: CFP/1189/2019)

Author: Stephen Sikatema Masiye

Dept. of Information and Communications
Technology
School of Engineering
Information and Communications University,
Lusaka, Zambia
Email: stephenmasiye@gmail.com

Advisors: Mr Lameck Nsama and Ms Silvia

Nyangwe
Dept. of Information and Communications
Technology
School of Engineering
Information and Communications University,
Lusaka, Zambia

ABSTRACT

An Electronic Library Management System is a web-based application for assisting a librarian in managing a book library for any learning Institution. In many institutions of learning in Zambia, library management has become a problem due to the continued use of manually supported systems (Burke 2007). One such an institution is the Mufulira Skills Training Institute in the Copper belt of Zambia. The institution has been lacking an electronic library management system to properly manage its literatures and relies on a manual catalogue system for managing its books and other literatures, this process is tedious and time consuming. This is seen when students queue for a long time to borrow books from a librarian who has to register each student and the book borrowed manually, hence wasting a lot of time. In many cases these books are never returned due to lack of proper tracking system by the library hence loses of valuable books and other academic materials that are very important to library users.

A web-based library was designed and developed to address the problems faced by the institution. The system provides basic set of features to add/update members (these could be students or lectures/teachers), add/update books, or modify and delete system and also monitor other activities within the system like definition of book categories in the system, tracking of members who have not returned the books past due dates, archiving of old or stolen books for the sake of record keeping, categorization of books by status. i.e. new, old, stolen, damaged books etc. On the other hand, the librarian has the responsibilities of managing members, issuing books and keeping track of what's in the inventory, and manage check in specifications for the systems based on the client's statement of need. The system was developed using PHP for the server-side script, MySQL 5.3 for the database and Html for front end interface. Other tools that were used were: JavaScript, JQuery library, Cascading Style Sheets, database running on Wamp Server, Bootstrap, Microsoft Office 2007, Adobe Dreamweaver CS6, and Adobe Photoshop CS4. It's easy and flexible to use and easy to maintain and can be rolled out to other learning institutions. Its development includes the establishment and maintenance of back-end database and front-end application development aspects. For the former require the establishment of data consistency and integrity of the strong data security and good libraries. As for the latter requires the application fully functional, easy to use and so on. The system's performance met user's requirements.

KEY WORDS: *Electronic Library Management System, Institution, Literature, Web based lib*

CHAPTER ONE: INTRODUCTION TO THE RESEARCH

1.1 Introductions

Information Technology has revolutionized the life of human beings and has made lives easier by the various kinds of applications. In the light of the rapid changes with the use of Information Technology, there are many tools, technologies and systems that have been produced and invented. A library is an organized collection of information sources which is made accessible to the people. The library usually contains the information physically or in a digitized format. In the olden period the access was usually in the library room and as the technology grew up, the access was made online (Dinesh et al. 2015). Library is a fast-growing organism. The ancient methods to maintain it are no longer dynamic and efficient. For expeditious retrieval and dissemination of information and better service for the clientele, application of modern techniques has become absolutely indispensable (Neelakandan et al., 2010).

According to Sharma et al, 2005, Libraries can be divided into categories by several types, which are: Academic libraries, Corporate libraries, Government libraries such as national libraries, Historical society libraries, Private libraries, Public libraries, School libraries, Special libraries, Digital libraries, Picture (photograph) libraries, Slide libraries, Tool libraries, Architecture libraries, Fine arts libraries, Medical libraries, Theological libraries etc. Library management is a sub-discipline of institutional management that focuses on specific issues faced by libraries and library management professionals. Library management encompasses normal management tasks as well as intellectual freedom, anti-censorship, and fundraising tasks. Issues faced in library management frequently overlap those faced in management of non-profit organizations (Sharma et al, 2005). Library Management System is an application that portrays library system which could be generally small or medium in size. It is used by the librarian to categorically manage the library by the virtue of using a computerized system where he/she can record various transactions like issue of books, return of books, addition of new books, addition of new students etc. (Ashutosh and Ashish, 2011). Books and user maintenance modules are also included in this system which would keep track of the users using the library and also a detailed description about the books a library contains. With this computerized system there will be no loss of book record or member record which generally happens when a non-computerized system is used. In addition, report module is also included in Library Management System. If user's position is admin, the user is able to generate different kinds of reports like lists of users registered, list of books, issue and return reports. All these modules are able to help librarian to manage the library with more convenience and in a more efficient way as compared to library systems which are not computerized.

This project is concerned with the design and development of an Electronic Library Management System in order to make library management more efficient and easier to handle. The Electronic Library management system enables a fully automated library service. This System is an application which refers to library systems which are generally small or medium in size. For this project, an Electronic Library Management system is a web-based system that will be used to manage library books and members (users) of the library. The system will be ideal for use in secondary schools, colleges, public libraries and universities. The objective of the system is to help libraries manage the books and library users/members

in a more efficient and effective way, as opposed to maintaining the records in a manual log book. The system was developed using web technologies, which makes it possible to be hosted on the internet or intranet for easy access by the institutions.

1.2 Motivation and Significance of the study

In many of the learning institutions in Zambia today, the libraries are still operating manually and are not efficient enough in assisting their users. It's for this reason that the researcher came up with this project that will replace the current manual library system being mostly used in many institutions of learning in Zambia e.g. Mufulira Skills Training Institute, with an automated library management system. Therefore, the system that has been developed is more efficient, more user friendly, uses fewer resources than the manual one. The system is much more affordable to many users and suitable to the local environment. The other reason for developing such a system is to ease the amount of work that the library patrons do while using the manual system. The system developed will make it easier for users to search for a book that they are looking for when they are not sure where exactly the book is found.

Despite higher learning institutions such as Copperbelt University, University of Zambia, and Mulungushi University having set the standard through implementing some modern systems in managing their libraries, the problem of managing libraries at the lower level in public schools, colleges and public (council) libraries still remains a serious challenge due to a number of factors that include higher cost, lack of expertise,

poor infrastructure and inadequate support from stakeholders. For instance, at Mufulira Skills Training Institute library, the Librarian uses an exercise book to record library members and all library transactions.

1.3 Scope of work

The study was carried out at Mufulira Skills Training Institute to identify requirements of an Electronic Library Management System (ELMS). Respondents included librarians and students. Data sources were respondents, books, and internet. The project product produced is An Electronic Library Management System which will automate the major library operations. The first subsystem is the registration of the users to the system to keep track of authorized users to the system. The second subsystem is the registration of new books into the library management system to know when new books are brought into the library. The third subsystem is a borrower and return of books which is the major area needed by the user.

1.4 Problem statement

In many institutions of learning, library management has become a problem due to the continued use of manually supported systems (Burke 2007). Mufulira Skills Training Institute is among those affected by the above problem due to increased number of students. This is seen when students queue for more than 10 minutes to borrow books from a librarian who has to register each student and the book borrowed manually hence wasting a lot of time. In many cases these books are never returned due to lack of proper

tracking system by the library hence loss of valuable books and other academic materials that are very important to library users. It is this perceived inefficiency and its associated high cost of labor in hiring several library assistants that rendered this study important.

1.5 Aim

The main purpose of this project was to design and develop a web-based library management system that would be used in managing libraries in learning institutions in Zambia, in particular, Mufulira Skills Training Institute.

1.6 Objectives

The general objective of this project is to design and develop an Electronic Library Management System.

1.6.1 Specific Objectives

- i. To design an optimal Library Management system that monitors all the activities of library files.
- ii. To develop a flexible system that minimizes problems of a traditional library system.
- iii. To create an effective Electronic Library Management System that is simple, affordable and reliable among users.

1.7 Research questions

- i. What is the general function of an Electronic Library Management System (ELMS)?
- ii. What type of system should be developed to minimize problems of traditional Library System?
- iii. What are the general elements of an ideal Library Management System?

1.8 Organization of the article

The following is how this project report has been organized. The project report is arranged into chapters with each chapter addressing a different part of the project.

1.8.1 Chapter 1 Summary: Includes the introduction of the research in which is stated the purpose of this study and the objectives

1.8.2 Chapter 2 Summary. This chapter will address the literature review of the project. The review will discuss the area of Library System. This chapter will outline an overview of the type of library systems which are available.

1.8.3 Chapter 3 Summary. This chapter will outline the methods that were used to design and develop the electronic library management system. This chapter will also discuss how the project activities as well as the project deliverables (what we expect as the output of each objective) was handled. Then in this chapter, the method that was used to develop this particular Library system has been clearly stated.

1.8.4 Chapter 4 Summary. This chapter will also discuss the research results.

1.8.5 Chapter 5 Summary. This chapter will focus on the discussions, conclusion and future works that will be done on the Electronic Library Management System

1.9 Summary

The chapter has provided a background to the study and has as well justified the importance for undertaking this study not only to the institution mentioned in the scope but to others as well. The aim of this study has been presented in this chapter including well defined objectives. The chapter has also given the organization of this study.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introductions

This chapter summarizes ideas that were given by past researchers. A synthesis of those ideas has carefully been done and where possible a comparison was made. The literature was reviewed in line with the objectives of the study.

2.2 Review of the Literature

2.2.1 Library Systems

According to Stephen, Maeve & Philips (2007), in a traditional sense, a Library is a large collection of books, and can refer to the place in which the collection is housed. Today, the term can refer to any collection, including digital sources, resources, and services. The collections can be of print, audio, and visual materials in numerous formats, including maps, prints, and documents, microform, CDs, cassettes, videotapes, DVDs, video games, e-books, audio books and many other electronic resources. The places where this material is stored can range from public libraries, subscription libraries, private libraries, and can also be in digital form, stored on computers or accessible over the internet. The term has acquired a secondary meaning: "a collection of useful material for common use." This sense is used in fields such as computer science, mathematics, statistics, electronics and biology. They add that, a library is organized for use and maintained by a public body, an institution, a corporation, or a private individual. Public and institutional collections and services may be intended for use by people who choose not to or cannot afford to purchase an extensive collection themselves, who need material (Stephen, Maeve & Philips 2007). In addition to providing materials, libraries also provide the services of librarians who are experts at finding and organizing information and at interpreting information needs.

According Robertson (2007), libraries often provide a place of silence for studying, and they also often offer common areas to accommodate for group study and collaboration.

Libraries often provide public facilities to access to their electronic resources and the Internet. Modern libraries are increasingly being redefined as places to get unrestricted access to information in many formats and from many sources. They are extending services beyond the physical walls of a building, by providing material accessible by electronic means, and by providing the assistance of librarians in navigating and analyzing tremendous amounts of information with a variety of digital tools.

Library is regarded as the brain of any institute, of course many institutes understand the importance of the library to the growth of the institute and their esteem users which we categorically call the students. Un integrated library system, also known as a library management system (Adamson et al., 2008) is an enterprise resource planning system for a library, used to track items owned, orders made, bills paid, and users who have

borrowed. The Electronic Library Management System is Library Management software for monitoring and controlling the transactions in a library (Ashutosh and Ashish, 2012). Electronic Library Management System supports the general requirement of the library such as the acquisition, cataloguing, circulation and other sections.

The old way like searching for a book using manual work is hassle, fast report generation is not possible, information about issue/return of the books are not properly maintained, no central database can be created as information is not available in database. But by using the ELMS, user can overcome all the problems mentioned above. This system can manage all the happenings of the library. Book transactions including book searching, availability of the book, details and appearance of the book, personal book borrowing history and etc. can be very easily handled by this system. This system is suitable for small to big libraries including medical and legal libraries, colleges, schools, universities, corporate houses and other academic resource centres. the technical guidance in identifying the hardware system is essentials. However, I would like to focus on ELMS for schools, colleges or universities. Further this study is limited to one function as the similar procedure could be adopted for automating other functions and integrating the automated functions. A number of studies have reported on the application of information technology in libraries in Africa. These reports include that of Lawani, Azubike and Ibekwe (1992), Mosuro (1996), Idowu and Mabawonku (1999), Ogunleye (1997) Agboola (2000) and Ajala (2001) Nok (2006).

All of these studies have agreed that serious application of information technology to library processes started in Nigerian libraries in the early 1990s.

Prabhakak Kumar states that review of literature reveals that a computerized library management system helps to improve the library services and assists the Liberians with management of information. It also helps the librarian in reporting on the various operations of the library and increases the rate at which tasks are completed accurately. In addition, it obviates the need to hire additional staff with increased demand for services (Prabhakak Kumar 2014).

Nwalo (2003) posited that a computerized library management system involves the use of a computer application on computers in library. In 2014 Prabhakak Kumar and his team from Cochin University, India wrote a report titled 'Mini Report on a Library Management System'. The report justified the use of electronic Library Management system against manual systems (Kumar, 2014). Similarly, many other projects have supported this alternative and have proven that electronic Library Management Systems are more effective and efficient compared to Manual systems.

A study named design and implementation of digital libraries was conducted by (Xiuqi L, 2017). In this study designing digital libraries was discussed including the definition of libraries and the architecture of digital libraries. In another study relating to digital libraries (Ammas, 2008) discussed how is digital libraries are useful for higher education students as compared to the traditional manual library?" In this qualitative study, data had been collected (from three colleges of Foundation University, Islamabad) with face to face, semi-structured interviews from twelve students.

2.2.2 Manual Log Book

Under this system, the library transactions such as registration of library members, recording of new books, issuing out of books etc. is done using a manual log book which is usually under the custody of the librarian.

In a non-computerized Library management system, when a book is issued or returned, it is noted down in a register after which data entry is done to update the status of the books. This process takes some time and proper update of this information cannot be guaranteed. Anomalies in the update process can cause loss of books. So, a more user friendly interface which could update the database instantly has a great demand in libraries, hence the need for this project.

2.2.3 Disadvantages of Manual Library Management System

According to Burke (2007), Manual Library Management systems, operating systems are vulnerable to human error. For instance, a librarian who misfiles a borrower's records or indexes a book incorrectly slows down the process and wastes students' time. Manual systems are also slow to operate. Instead of using a computer to issue and take back books, locating and updating a card index is slow and laborious. Manual systems are unable to store large amounts of data efficiently. With manual systems Librarian spend a lot of their time on mechanical, clerical tasks rather than liaising with library visitors.

Wastage of time: searching for specific books is mostly done by users and it can be really cumbersome for researchers to look for a desired book in a long list of books on the book registration log. This can make the users exhausted and they may prefer to not use the library anymore (based on interviews with users).

Loss of books: Tracking of borrowed books is difficult. For example, a member borrows a book for a specific period of time and does not bring it back on time, so the book is somehow lost because there is no automation process available, and someone else can't use it anymore.

Usage limitation: Information regarding books (i.e. headings, labels and announcements) is limited to only one language either in Dari or Pashto; such a system is limited and can't be used by those who do not know the language.

Costly: Running and maintenance of such a system is very difficult and costly and requires many staff and expenses.

2.2.4 Electronic Library Systems

Under this system, the details of the books are captured using a bar code scanner which are later stored in a central database. Scanning of bar code for the books is done both at the time of entering the book in the system and during the time when the book is being lent out. This system is usually implemented by big universities because of its complexity and it being cash intensive during implementation.

In 2014 Prabhakak Kumar and his team from Cochin University, India wrote a report titled ‘Mini Report on a Library Management System’. The report justified the use of electronic Library Management system against manual systems (Kumar, 2014).

Similarly, many other projects have supported this alternative and have proven that electronic Library Management Systems are more effective and efficient compared to Manual systems.

2.2.5 Requirements of an Electronic Library Management System

Roitberg (2000) asserted that key requirements are manpower, technical support, organization and management, hardware, software, networking, training, etc. Determination of specific capacities is beyond this project.

2.2.6 Problems and Challenges of Library Professionals in Developing Countries

The roles and responsibilities of librarians in various institutions have been altered by the ever-developing technology. Various international studies have been dedicated to the challenges faced by librarians. Adomi (2006) in a research on computer literacy skills of professionals in Nigerian University libraries indicated that most of the professionals do not poses high level of computer skill and their use of computer and technology is still maturing. In the same study it was recommended that computer training programs for librarians should be organized and enough computers should be provided in this regard.

Johnson, (2007) viewed library and information science education in developing countries. He concluded that LIS programs in developing countries continue to suffer from lack of financial support by governments.

Rahman, Khatun and Islam, (2008) reviewed the library education in Bangladesh. The study found that majority of institutions in Bangladesh do not have well-equipped computer labs or sufficient numbers of computers for students. A sufficient number of classification and cataloguing tools (DDC, LC, Sears list of subject headings for practical were not present.

In Nepal, Siwakoti, (2008) found that there was no government agency to control, monitor and evaluate the school libraries activities. There was lack of awareness programs, budgetary constraints, inadequate space, inadequate library materials, lack of trained and skilled manpower and lack of appropriate government policy and lack of information literacy.

Ademodi and Adepoju, (2009) investigated the computer skill among librarians in academic libraries on Ondo and Ekiti State in Nigeria. It was found the shortage of computers and computer skills among professionals. The study recommended that more attention and funds should be provided for training and procurement of ICT infrastructure in Nigerian University libraries. For computerization purpose, library administration should solicit funds and assistant from foreign agencies and foundations who are interested for the cause.

Dasgupta, (2009) searched out that in India there is non-existent of norms and standards for education of librarians. Problems for Indian librarians discovered in his study were

emergence of new Library Integrated System schools, insufficient faculty strength, and lack of accreditation bodies, lack of proper library facilities, inadequate physical facilities, little attention for selection criteria, and lack of apprenticeship programs. Study suggested that the Government of India should play a leading role in promoting LIS education in India, by creating more job opportunities for LIS professionals and removing disparity in pay scales among LIS professionals.

In Iran Gavvani, Shokraneh and Shiramin, (2011) concluded that librarians do not have traditional skills and sufficient background knowledge to meet the changing needs of their customers. They need to be empowered by new skills and information before going to empower their patrons.

2.3 Information and Communication Technology (ICT)

Information and communications technology or information and communication technology (ICT), is often used as an extended synonym for information technology (IT), but is a more specific term that stresses the role of unified communications and the integration of telecommunications (telephone lines and wireless signals), computers as well as necessary software middleware, storage, and audio-visual systems, which enable users to access, store, transmit, and manipulate information (Adetayo, J.O.Sanni, S.A. and Ilori M.O, 1999). The term ICT is now also used to refer to the convergence of audio-visual and telephone networks with computer networks through a single cabling or link system.

There are large economic incentives (huge cost savings due to elimination of the telephone network) to merge the audio-visual, building management and telephone network with the computer network system using a single unified system of cabling, signal distribution and management. ICT is an acronym that stands for Information Communications Technology. There is not a universally accepted definition of ICT, because the concepts, methods and applications involved in ICT are constantly evolving on an almost daily basis. It is difficult to keep up with the changes - they happen so fast.

A good way to think about ICT is to consider all the uses of digital technology that already exist to help individuals, businesses and organizations to use information. ICT covers any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form (Chhatbar, 2017). For example, personal computers, digital television, E-mail, robots. So, ICT is concerned with the storage, retrieval, manipulation, transmission or receipt of digital data. Importantly, it is also concerned with the way these different uses can work with each other.

2.3.1 Application of Information Technology in Libraries

Information Technology is very useful for libraries in creating databases of their own and meeting them available to users through networks. It also enables libraries to provide effective and efficient services (Agboola, 2013). Most of the library operations like book acquisition, circulation, office management,

information services, etc. are inter-related, inter-dependent and mutually supportive for overall administration of library. The modern technologies, i.e. Information Technology gadgets which are convergent and highly relevant for application in modern library and information system can be grouped into four areas, as follows: Computer Technology, Communication Technology, Reprographic Technology, and Printing Technology.

2.3.2 Impact of ICT on Libraries

With the invention of Information and Communication Technology, libraries now use various types of technologies to aid the services they render (Adetayo, J.O.Sanni, S.A.and Ilori M.O, 1999). Everyday new technological advances affect the way information is handled in libraries and information centres. They further noted that the impacts of new technologies are felt by libraries in every aspect. Computing technology, communication technology and mass storage technology are some of the areas of continuous development that reshape the way that libraries access, retrieve, store, manipulate and disseminate information to users. The academic library has been from its inception an integral part of institutions of higher learning, rather than an appendix or adjunct.

The introduction of various information / communication technology (ICT) trends has led to reorganization, change in work patterns, demand for new skills, job retraining and reclassification positions. Technological advancement of the past twenty-five years, such as the electronic database, online services, CDROMs and introduction of internet has radically transformed access to information. ICT has impacted on every sphere of academic library activity especially in the form of the library collection development strategies, library building and consortia. ICT presents an opportunity to provide value-added information services and access to a wide variety of digital based information resources to their clients.

Furthermore, academic libraries are also using modern ICTs to automate their core functions, implement efficient and effective library cooperation and resource sharing networks, implement management information systems, develop institutional repositories of digital local contents, and digital libraries: and initiate ICT based capacity building programmes for library users. Information and Communication Technology (ICT) has brought unprecedented changes and transformation to academic library and information services, conventional LIS such as OPAC, users services, reference services, bibliographic services, current awareness services, Document delivery, inter library loan, Audio visual services and customer relations can be provided more efficiently and effectively using ICT, as they offer convenient time, place, cost effectiveness, faster and most-up-to-date dissemination and end users involvement in the library and information services process (Agboola, 2003).

The impact of ICT characterized on information services by changes in format, contents and method of production delivery of information products. Emergence of internet as the largest repository of information and knowledge, changed the role of library and information science professionals from intermediary to facilitator, new tools for

dissemination of information and shift from physical to virtual services environment and extinction of some conventional information services and emergence of new and innovation web-based services. The Exponential rise in generation of new information, especially Scientific and Technological information since World War II has gradually reduced the effectiveness of the traditional tools and retrieval aids used by librarians.

We are now in the age of information technology revolution along with information explosion. Due to information explosion, automation of library service is imperative for efficiency and effective working of library and information centre. The automation is defined as a technique of making a process or a system that operates automatically. Though generally library automation may mean use of suitable machines to perform the activities of library mechanically without much manual or mental efforts by human beings, today library automation signifies —mechanization of library housekeeping operations predominantly by computerization.

The most commonly known housekeeping operations are acquisition control, serials control, and cataloguing and circulation control. In recent times, even the related topics such as information retrieval, semi-automation, automatic indexing and networking of automated systems are also treated as part of library automation. Although computers have a major role in library automation, telecommunication and reprographic technology have an equally important role because of the extent of support they offer. Most of the Library and Information Centres (LICs) in Zambia have started using computers and Information Communication Technologies in organizing their collections, housekeeping operations, processing, retrieval and dissemination of information to the end users.

The use and impact of ICTs is now visible in libraries and information centres which may be due to the drastic reduction / escalation of the cost of hardware and software and their easy availability in the markets with service support from the suppliers or venders. The impact of IT is also evident on the activities of many LICs associated with universities and other institutions of the national importance. Thanks to stakeholders for establishing institutions which have been playing an important role since its inception for initiating the automation and networking activities of library and information centres of universities, colleges, R&D laboratories and various institutions of higher learning. So far lots of learning institutions have been covered under the technology development programs which enables the learning institutions' libraries to purchase computers, modem, printer, air –conditioner, software (Operating and application software) and get telephone connectivity, etc.

2.3.2.1 Library Automation

The automation is defined as the technique; a process or a system that operates automatically (Chhatbar, 2017). According to the Encyclopaedia of Information and Library Science, Automation is the technology concerned with a design and

development of the process and systems that minimizes the necessity of human intervention in their operation. Library automation may be defined in simple sense as a process of mechanization of library operations which are of a routine and repetitive nature.

This covers usually housekeeping operations such as acquisition, serial control, cataloguing, circulation, references and administration work. In a wider sense, it can be said that computerization of all library operations is known as Library Automation.

2.3.2.2 Need for Library Automation

Computers have revolutionized all fields of knowledge. It has been gradually weaving electronic webs in various parts of the globe for quite a few years now. Now it is being used extensively in libraries by developed countries and in a limited scale in the third world countries. Today, information technology coupled with computer technology has conquered even space and time with regard to dissemination of information. The word Automated Library is used to denote a library in which the collections of library materials are primarily on paper but in which the library 's procedures have been computerized (Noor, 2018).

Library Automation is required mainly for the following reasons: Obtain increased operational efficiencies; Relieve professional staff from clerical chores so that they are available for user oriented services; Improve the quality, speed and effectiveness of services; Improve access to remote users and other stakeholders (e.g., the general public); Improve access to resources on other networks and systems, including the Web; Provide new services not hitherto possible; Improve the management of their physical and financial resources; Facilitate wider access to information for their clients; Facilitate wider dissemination of their information products and services; Enable their participation in resource-sharing /library networks; and Enable rapid communication with other libraries (including libraries) and professional peers.

2.3.2.2.1 Areas of Library Automation

Following are the areas of Library Automation: Acquisition; Cataloguing and Indexing; Circulation; Serial Control; Library Administration and Management; On Line Public Access Catalogue; CDROM Database Searches; Resource sharing through Library; Network/INTERNET; Desktop Publishing (DTP); Office Automation; and Information Retrieval.

2.3.2.2.2 Attitudes of library staff to Technological change

Research, which explored the influence of the attitudes of library staff, found that attitudes towards computers were positively associated with computer use and were also predictive of the number of hours of work performed on a computer (Agboola, 2003). The authors suggest, Attitudes towards computers are an appropriate focus for organizations attempting to increase the number of hours that their employees use their computer. Focus group participants had expressed negative attitudes towards technology, whilst a review of the literature had suggested attitudes are important in relation to both ICT and to the success of training. It should be noted at this point that there are many variables which seem to have relations with or

influences on the attitude of the librarians towards the use of ICT. They are age, gender, prior knowledge and training, anxiety and educational qualification. Implementing information communication technology (ICT) in the library depends largely on the attitudes of library staff to its usage (Powell, 2017).

2.3.2.2.3 The application of ICT has caused significant changes in libraries; for Ex. automated cataloguing, circulation, information retrieval, electronic document delivery, and CD-ROM databases, for example.

The advent of the Internet, digitization, and the ability to access library and research materials from remote locations created dramatic changes by the end of the twentieth century. Expert systems, wireless networks, virtual collections, interactive Web interfaces, virtual reference services and personal Web portals have brought changes since the start of the new millennium. There have been fast and significant changes in librarianship, where digital and electronic libraries complement and, in some cases, replace traditional libraries (Adetayo, J.O.Sanni, S.A.and Ilori M.O, 1999). The Theory of Reasoned Action (TRA), looks at the relationship between attitudes and norms and their influence on behaviour.

Others have considered how people are influenced by peer opinions. Attitudes affect behaviour and must be considered in managing staff, especially during change and innovation. Using and implementing information communication technology in the library depends largely on the attitude of library staff toward this digital age. There is no doubt about the fact that significant changes have taken place in libraries in the developed world due to the application of information communication technology (ICT) in automated cataloguing, circulation systems, online information retrieval, electronic document delivery and CD-ROM databases.

The advent of the Internet, digitization, and the ability to access library and research materials from remote locations have also created dramatic changes by the end of the twentieth century. Developments like expert systems, wireless networks, virtual collections, interactive Web interfaces, virtual reference services, and personal Web portals bring about greater changes since the start of the new millennium (Naik, 2016). Attitude measurement in management information systems (MIS) research, for instance, has been shown to be informed by a specific understanding of the relationship between attitudes and behaviour as shown in the theory of reasoned action (TRA).TRA theory posited that an individual's behaviour is determined by his/her intention to perform that both behaviour and intention are influenced jointly by the individual's attitude and subjective norm – a measure of how people are influenced by their peer's opinions. Based on this reasoning, attitudes play important part in affecting behaviour and must, therefore, be taken into consideration in managing staff, especially during processes of change and innovation. According to these, the authors concludes that attitudes are also open to influence. The category of a member of staff in the library system, for example, might have some bearing on an individual's opinion of the efficacy of the Internet and subsequent decision of whether to use it at work.

It should be noted that the drastic change in library practices brought about by rapid changes in information communication technology is posing challenges to the Librarians in recent time, particularly in the developing countries (Noor, 2018). To cope with these challenges posed by ICT, Librarians in developed countries moved quickly to learn and adopt new information technologies. Computers,

software, CD-ROM, email, Internet, networks and other information management and communication technologies were introduced to perform different library functions and to provide innovative user services.

At the same time, library staff raised their level of knowledge of new information technologies through continuing education programs, professional training, and through revisions in their library and information school curriculums. This helped them to leverage the benefits of new technologies. Ultimately their libraries became well equipped with sufficient hardware, appropriate software and effective technology-based materials. Attitude is a learned emotionally toned disposition to react in a consistent way favourable or unfavourable towards a person, object or idea. Generally, attitude may be defined as the total of a man 's inclination and feelings, prejudices or bias, preconceived notions, ideas, fears and convictions about any specific topic. A person 's attitude prepares him to react to a given stimulus in one way rather than in another.

2.3.2.3 Training and Library staff

Training is generally acknowledged to be essential in introducing successful change in the workplace. Furthermore, it is a key strategy in overcoming any resistance to change and in providing staff with the requisite skills as both New Library and Building the New Library Network identified. Training appears to affect perceptions of technological change and attitudes to ICT and change. Good training is shown to have beneficial effects on staff and their reactions to new technologies. Respondents in a study of university library support staff saw training as a means of building staff morale, curing techno stress and reassuring them of their ability to do the job (Noor, 2018).

Training without the necessary skills or understanding of staff fears might reinforce anxieties about using ICT. Training, then, must not take place for the sake of training and must provide the necessary skills, be of the right amount, of good quality and may have to combat fears, as well as promote understanding and confidence in using ICT. Time is a vital for good training. It is important that staff have the opportunity for hands on practice during a training programme, such as taking time away from the desk to practice. Similarly, once staff have undergone training, they should be able to put their skills to use straight away. Different training methods suit different people. Library staff prefer training which includes self-teaching with support within a specific framework and training programme.

2.4 Current trends

Library is a vast storehouse of information. Emergence of Internet and Communication Technology (ICT), libraries have been acquiring different approaches of the same and mode of service is changed. Therefore, different types of libraries have born in society, such as:

Hybrid library: The hybrid library is a term used to describe libraries containing a mix of traditional print library resources and the growing number of electronic resources. Hybrid libraries are mixes of printed books and magazines, as well as electronic materials such as downloadable audio books, electronic journals, eBooks, etc. Hybrid libraries are the new norm in most public and academic libraries.

Automated library: A library where access points and housekeeping operations are computerized is called an automated library. The graphic records are still print-on-paper publication.

Digital library: A library in which a significant proportion of the resources are available in machine-readable format (as opposed to print or microform), accessible by means of computers. The digital content may be locally held or accessed remotely via computer networks. A digital library is popularly viewed as an electronic version of a library where storage is in digital form, allowing direct communication to obtain material and copying it from a master version. Digital library is not only digitization of physical resources, but also thoughtful organization of electronic collection for better access. Such organization provides coherence to a massive amount of shared knowledge base.

Virtual library: The access point as well as the graphic records are in electronic/digital form when these electronic/digital libraries are connected via various networks, particularly the INTERNET, this is called virtual library. A "library without walls" in which the collections do not exist on paper, microform, or other tangible form at a physical location but are electronically accessible in digital format via computer networks. Such libraries exist only on a very limited scale, but in most traditional print-based libraries in the United States, catalogues and periodical indexes are available online, and some periodicals and reference works may be available in electronic full-text. Some libraries and library systems call themselves "virtual" because they offer online services (example: Colorado Virtual Library).

2.4.1 Changing Concept of Libraries

The concept of Library and Library professionals has changed as changes takes places in the field. Some of the changes, for example has stated below for understanding of the changes.

Concept	Library science	Information science
1. Unit	Library centre	Information centre
2. Medium	Book	Data base
3. User	Reader	Recipient
4. Staff	Librarian	Information officer
5. Service	On demand	As & when needed
6. Tool	Catalogue	Controlled vocabulary

2.4.2 Changing Roles of LIS Professionals

Presently, librarians are playing an integrated role beyond their traditional job. In a fast-changing world, there are new demands and influences on libraries and information centres. Using modern technologies, libraries all over the world are now shifting their emphasis from traditional to multidimensional work force. As a corollary to this, LIS professionals are supposed to play versatile role in different areas of libraries and information centres to meet the expectations and needs of the present situation.

Advocate: LIS professionals act as lawyer when they deal with the issue relating to law such as copyright law, intellectual property right, etc. Librarian champion the cause of academic libraries through various advocacy programs to promote the library and resources. They can communicate news about the library through newsletters, web sites and memos to parents and staff. Their job is to keep principals and teachers up to date on what is happening in the library and to promote library activities and special projects. Schools are learning communities encompassing students, teachers, administrators and parents. Librarians must communicate the mission, goals and objectives of the resource centre to the entire user community.

Consortia manager: The LIS professional for Consortium operations is responsible for coordinating and overseeing consortium operations, including strategic planning, systems development and project management. Related responsibilities include facilitating communication among the participating libraries. In addition to these responsibilities, the Librarian for Consortium Operations acts as the consortium's representative with vendors for contracted products and services.

2.4.3 Skills Required for the New Age LIS Professionals

The electronic environment of the 21st century will demand a range of skills from Library and Information Science (LIS) professionals, including:

- i. Technical skills.
- ii. Information Technology (IT) skills.
- iii. Managerial skills.

Skills required fulfilling the changing role of libraries are:

- i. Library and information handling skills.
- ii. Service orientation.
- iii. ICT knowledge skills.
- iv. Communication and training skills.
- v. Marketing and presentation skills.
- vi. Understanding of cultural diversity.
- vii. Knowledge mapping skills

2.5 Future trends

Since past decade or so, many philosophers have predicted severe consequences resulting from an aging workforce and technological change. LIS professionals have done a commendable job in seizing new technology, but they will need to become much more

aggressive and proactive in the future as they face increased competition from a variety of groups who think they can do a better job in providing information to the user. So, in the near future, the LIS professionals should have to take necessary responsibilities in:

As providers of resources, they can help to enhance the amount of available resources by making stakeholders aware of the importance of sharing. In particular, as far as the sharing of content is concerned, they can operate by promoting digitization campaigns and the open access approach. These actions may result in a vast amount of new digital information accessible online which can be exploited by advanced services.

Within a digital framework, libraries are certainly the best carrying out content description, maintenance and preservation of resources. By exploiting their large experience acquired in the past, they can contribute to the long-term availability and to the quality of the resources disseminated by the digital libraries (DLs).

Long-term availability also requires the implementation of models able to support the sustainability of the resources provided. Libraries, either alone or as members of library consortia, can also act as the organisations deputed to define and put in place these models.

As main resource providers, libraries can work jointly on the definition of common policies and standards. An agreement on these aspects would strongly contribute towards facilitating the design and development of the new complex services required to fulfil the emerging user needs.

In the future libraries can also play an important role as mediators between the infrastructure and the user communities. In particular, they can proactively promote and facilitate the creation of DLs that respond to the needs of the user communities. They can also assist users by providing, if necessary, the skills required to select, update and exploit the DL content and services. It is not hard to realize that in near future library and information centres would be globalized and maximum services will be available from remote places.

In a nutshell, it can be said that the Library and information professional communities are being affected by a range of ICT developments and so find their roles changing worldwide. A librarian with diverse talents and training, and who is flexible, will be able to meet the challenges of future library scene. The container of information is not only the print materials but this is the age we are living where a huge rate of information born in digital format. Technology alone cannot help bring about the required changes. Attitudes, practices, and policies need to change if libraries in Zambia are to truly benefit themselves and their community of users by the application of new technologies; as the core objectives of LIS professionals are unchanged although the mode of services is changing to cope with paradigm shifts.

2.6 Integrated Library Systems and Digital Libraries

It is common, for some people, to confuse Integrated Library Systems with Digital Libraries. This kind of confusion happens specially, when an ILS is mentioned as a Library Management System (LMS). A Digital Library is a type of information retrieval systems, typically used to manage collections of documents in a digital format (Agboola, 2013).

CDS Invenio, Greenstone, Dspace and Eprints, among others, are examples of digital libraries.

According with the Digital Library Federation, “Digital libraries are organizations that provide the resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities”. With the development of BibCirculation, CDS Invenio will become an application 2 in 1, being a digital library providing, at the same time, ILS functions, such as those existent nowadays, for example, in Greenstone. This can be a big advantage for CDS Invenio in comparison with other digital library software. To have a better idea about digital libraries, let’s take a look to some examples.

2.7 Dspace

In the open source community, DSpace is a very popular system for digital libraries. It is written in Java and JSP, using the Java servlet API and supporting PostgreSQL and Oracle. The development of Dspace was started by the Massachusetts Institute of Technology (MIT) and Hewlett-Packard (Noor, 2018). The first release of Dspace was in 2002. The development and error reporting are hosted by SourceForge (sourceforge.net).

Nowadays, there are several universities and institutions, from countries all over the world, giving their contributions for this project. Its development is financially supported by DSpace Foundation. DSpace permits to create digital repositories. These repositories can contain several types of documents from institutions. The data is stored in the system with a unique identifier that contains metadata. Dspace has support for the metadata scheme Dublin Core and it uses the Corporation for National Research Initiatives (CNRI) system to assign the persistent identifiers. It supports the OAI-PMH 2.0 and OpenURL. With Dspace it is possible to export data to XML format or to the Metadata Encoding and Transmission Standard (METS) format.

2.8 Eprints

Eprints is a complex system, based on web technologies, widely used all over the world, developed by the University of Southampton in UK, and available under the GNU license. Its primary purpose is to build institutional repositories for various types of documents such as common literature, but its primary focus is on scientific data. The whole system is easy to configure and it also offers paid services, such as training, management of implementation project and technical support.

In terms of standards Eprints supports the system EPrints OAI-PHM and the metadata have their own inner format. Eprints allows the importation of data from documents on XML format and some external resources such as PubMed XML. The export of data is also possible in several formats, XML, RSS, DublinCore, and METS. Eprints provides administration of user accounts, but assigning of user rights is not very elaborated because initially it was aimed only at publishing scientists. It enables search using the interface as well as in the metadata.

Eprints indexes text files and other common formats such as PDF. It also allows browsing the logical tree structures, its intro structure is the same as in the Library of Congress, but it can be modified. The interface further enables registration of new users, to inform them about news and to provide them with feeds and

e-mail alerts to keep them up to date. Administrator interface allows configuration and control of the whole system. Eprints is very sophisticated system but the upload of individual items is very complex, sometimes difficult to use and time consumed is usually high.

2.9 Fedora

Fedora, like the two digital libraries mentioned before was also created in the university environment – at Cornell University and University of Virginia. It all started as a research project in 1997 which result was published on the web of Cornell University in 1998. In 2001 both universities started to cooperate and received financial contribution for further development from the Melon Foundation with the assignment to develop a universal digital library on the basis of the web services and XML. In 2007 both universities established an organization Fedora Commons, which now takes care of the development of the joint system.

The Fedora system supports various standards, OAI-PMH, exports to METS formats and its own internal format FOXML, the descriptive metadata are stored in the Dublin Core format. Although the core of Fedora system is very advanced, at present it is not a complex library system ready-to-use. It is only a platform that further has to be programmed at quite a higher cost and with great effort. When operated, the higher cost must be taken into account due to the platform independence of the system, because it is more demanding for hardware sources than other systems.

2.10 Greenstone

Greenstone is a software, published under the GNU/GPL license, for constructing and presenting collections. Each collection may have thousands or millions of documents, with different types: text, images, audio and video. Usually digital library created using Greenstone will contain many collections, individually organized. The maintenance process is easy and each collection can be augmented and rebuilt automatically. There are many ways to find information in Greenstone collections. It is possible to search for particular words that appear in the text, or within a section of a document. It is also possible to browse documents by title or by subject.

To see several examples of Greenstone collections, you can visit The New Zealand Digital Library website (www.nzdl.org). Greenstone constructs a full-text indexes from the document text. Indexes can be searched for particular words, combinations of words or phrases. The results are ordered according to how relevant they are to the query. In the majority of collections, associated with each document, we can find descriptive data like author, title, date and keywords. This descriptive information is called metadata. Metadata is used as the raw material for browsing indexes. It must be either provided explicitly or derivable automatically from the source documents.

The Dublin Core metadata scheme is used for most electronic documents; however, provision is made for other schemes. Greenstone creates automatically all index structures from the documents and supporting files. If a new document, with the same format, become available, it can be merged automatically into the collection. For several collections this is done by processes that awake regularly, search for new material

and rebuild the indexes. Documents come in a variety of formats and are converted into a standard XML form for indexing by “plugins”. Plugins distributed with Greenstone can process different types of formats: plain text, html, word and pdf documents, and e-mail messages.

New ones can be written for different document types. To build browsing structures from metadata, a similar scheme of “classifiers” is used. These create browsing indexes of different kinds: scrollable lists, alphabetic selectors, dates and arbitrary hierarchies. Unicode, which is a standard scheme for representing the character sets used in the world’s languages, is used on Greenstone. This allows any language to be processed and displayed in a consistent way. Greenstone collections are accessed over the Internet or published, in precisely the same form, on a self-installing Windows CD-ROM. Compression is used to compact the text and indexes. A Corba protocol supports distributed collections and graphical query interfaces.

2.11 Related Works

This section outlines works related to what we sought to design and develop. Each of the works presented here have their own candid strengths and weaknesses and in light of this fact, our system design and development rode on what is already existent.

Koha

Koha is the first Open Source Integrated Library System in the world. It is distributed under the GNU General Public License. Koha was initially developed, in 1999, in New Zealand, by Katipo Communications and his first deployment took place in January of 2000, for the Horowhenua Library Trust. Its development, is currently maintained by a strong community of software developers and libraries, who are working together, in order to achieve, their goals. Koha is written in PERL and requires MySQL database, Apache HTTP Server and can run with Linux or Windows. It provides different functional modules like acquisition, cataloguing, serial control, OPAC and circulation. It is also possible to find other features like MARC support, Z39.50, barcode, RSS feeds, web interface and multi branch library support. In 2006, Koha was updated 3 times with significant changes. User support for Koha is available on the documentation website (www.kohadocs.org), Wiki, mailing lists and open source vendors. Koha has nowadays more than 100 users registered.

Autolib

A user friendly, fully integrate/multi-use library automation software package, designed and development by a team of experienced library & Information Science and Computer professionals to automate various activities of libraries in College, University, R & D organizations regardless of collection or size. It is developed using Visual Basic as a front-end tool and Microsoft Access as back end and is available on various platforms like Windows 95, Windows NT and LAN version. Versions module of Auto-lib consists of Circulation Search, (Books and Journal articles) and Database Administration, Serials Control, Acquisition control are additional modules.

The additional modules help automating many activities of book ordering, printing catalogue cards, journal subscription, monitoring journals issues, bill processing, generating and printing various orders and reports, statistics, budgetary control etc. **SEARCH (OPAC)** module is designed to search book database and journal article database using any word/truncated term in single field/multiple fields. It allows downloading and saving the search result in different formats. Boolean search is also provided. The search window provided will allow the user to formulate any type of query using the optional logical search. The search output can be displayed / printed in any desired order.

OpenBiblio

OpenBiblio is an automated library system written in PHP, using the LAMP stack. It provides several functional modules such as OPAC, circulation, cataloguing and staff administration and support for UNIMARC. It is also possible to find an online demo of OpenBiblio. The last release was in 2007, since then, there was no significant development. OpenBiblio needs the contribution from users and developers, to assure the survival of the project.

PMB – PhpMyBibli

PMB (PhpMyBibli) was created in France, in 2002, by Francois Lemarchand. It provides several modules like circulation, acquisition, cataloguing with UNIMARC support, OPAC and a SDI15 system. The installation process and the maintenance of PMB is easy in Windows and Linux in comparison with other open source ILS. It is written in PHP, using Apache HTTP Server and MySQL database.

PMB provides also, for the library staff, a friendly graphical interface for database back up, system maintenance and import and export of bibliographic records. With this complete set of tools, it is possible to librarians to maintain the ILS without the help of system administrator. Other important features are the import and export of bibliographic records using different formats, Z39.50 support for ILL, barcode generator, serial control, multi-language support and detailed documentation for users and administrator.

Ever Green

Evergreen is an Integrated Library System, licenced under the GNU General Public License, and initially developed and maintained by the Georgia Public Library Service for the PINES16 Program, a consortium of 270 public libraries. The development of Evergreen started in 2005 and it appears as the answer for the specific needs of PINES. At this time, any kind of ILS (proprietary or open source) was good enough to cover all the requirements and achieve all the objectives of PINES. For that reason, Evergreen was one of the first Open Source Library Automation System conceived from scratch for a large-scale deployment in a public library consortium.

Nowadays, Evergreen is maintained by Equinox Software, a company formed by the original development team of Evergreen. This new company provides services like development, migration, support, training and consultation. Evergreen provides several modules like cataloguing, circulation, statistical reporting and OPAC. Modules for acquisitions, reserves and serials are on development. It has also support for Z39.50 and MARC. Evergreen is mainly written Perl and some few sections were

rewritten in C. The OPAC module was developed using JavaScript and XHTML and the interface (for library staff and users) was written in Mozilla XUL (XML + JavaScript). Python was also used for the internationalization. It runs on Windows and Linux, using PostgreSQL as database.

ALEPH 500

ALEPH500 is integrated library system created by ExLibris. It is a market leader in the automation of libraries and research centres providing the efficient, user-friendly tools and workflow support they need. Based on industry standards such as OpenURL, XML, OAI, LDAP, ISOILL, and RFID, offers the ultimate in resource-sharing capabilities, full connectivity, and seamless interaction with other systems and databases. Built on an Oracle database, ALEPH 500 offers full Unicode support, employs system-wide XML technology, and offers third-party integration through an XML gateway as well as standard protocols such as Z39.50 and ODBC.

GNUTECA is an Open Source ILS, published under the GNU General Public License, and developed since 2001. It is highly popular among public and academic libraries, in Brazil. It has modules for circulation, cataloguing, serial control, ILL and OPAC. GNUTECA supports MARC21 and CDS/ISIS17 conversion. The documentation of this project is available on Portuguese and French. GNUTECA runs only Linux, using Apache HTTP Server, PHP and PostgreSQL.

Emilda

Emilda is developed, since 2000, by CompanyCube14, a Finish software company, under the GNU General Public License. The initial system was conceived and developed, in PHP, with the assistance of many school libraries. Since 2003, Emilda is supporting typical standards, including MARC and Z39.50 protocol for ILL. It is XML-based and can be run on Windows and Linux. The circulation module and patron access catalogue modules were introduced on June 29, 2005. Emilda uses the Zebra Server from Index data as a backend server. The source code and documentation are available online in English. It is also possible to experiment an online demo. Emilda was in use at 14 finish school libraries in 2008.

2.6 Summary

This chapter considered lots of literature in the quest of bringing to light some of the details of the research project under investigation in relationship with the research objectives.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter outlines the methodological approach taken in complimenting the research project. The primary emphasis of the methodology is to provide a project management strategy that will fit most library projects. The basis of the methodology will be based on the Waterfall Method for information system development and organizational design, created by Winston W. Royce in 1970 (Royce, 1970, p. 328).

Today, librarians implement better services for providing resources through the internet and on-site physically to their users. In traditional and digital libraries, services include access to informational resources like books, journals, magazines, videos, audio media, maps and historical archives (Digital Libraries, 2003). Also, services like electronic reference, e-reserves and electronic interlibrary loans are becoming increasingly implemented by libraries. Furthermore, the need to market those services and resources has turned them to social networks by using Web 2.0 tools for help. Libraries can manage the implementation of new procedures and projects by using project management methodologies. According to Winston and Hoffman (2005) project management methods can help libraries administrators to ensure the most efficient and effective use of resources and the completion of projects (p. 60). The completion of project activities requires a series of different and diverse skills, and having a structured methodology is necessary for setting the project environment (Cerrone, 2007, p. 23).

This chapter describes the Waterfall Methodology for information system development in terms of organization design, and its use in project management. After examining this methodology, the researcher proposed a library system project management strategy based on the Waterfall Methodology.

3.2 Waterfall Methodology for Information Systems Development.

The design of an information or computer system requires considerable organization and management; a planned approach needs to be taken to define how the development and implementation needs to be performed ('Systems design and life cycle', 2008). Winston and Hoffman (2005) explain the Waterfall Methodology applies the principle

that the development process should be divided into phases to provide clarity of content. Results of each phase are documented and the next phase only begins when all pre-requisites are satisfied. It is not permitted to return to a previous phase, once another has started unless the implementation requirements change. The project is completed when all phase gate reviews are satisfied. Requirements change must be tracked and controlled so as to reduce scope creep.

The phases for a development of a system using the Waterfall Method are typically as follows (Systems design and life cycle, 2008):

3.2.1 Requirements Specification.

This is the most crucial phase for the whole project; here project team along with the customer makes a detailed list of user requirements. The project team chalks out the functionality and limitations (if there are any) of the software they are developing, in detail. The document which contains all this information is called SRS and it clearly and unambiguously indicates the requirements. A small amount of top-level analysis and design is also documented. This document is verified and endorsed by the customer before starting the project. SRS serves as the input for further phases.

3.2.2 System and Software Design.

Using SRS as input, system design is done. System design included designing of software and hardware i.e. functionality of hardware and software is separated-out. After separation design of software modules is done the design process translates requirements into representation of the software that can be assessed for quality before generation of code begins. At the same time test plan is prepared, test plan describes the various tests which will be carried out on the system after completion of development.

Software that can be assessed for quality before generation of code begins. At the same time test plan is prepared, test plan describes the various tests which will be carried out on the system after completion of development.

3.2.4 Implementation and Unit Testing.

Now that we have system design, code generation begins. Code generation is conversion of design into machine-readable form. If designing of software and system is done well, code generation can be done easily. Software modules are now further divided into units. A unit is a logically separable part of the software. Testing of units can be done separately. In this phase unit testing is done by the developer itself, to ensure that there are no defects.

Prototype Model

Due to changing business and product requirement, tight market deadlines completion of software product is almost impossible, but a limited version of software can be introduced to meet competitive or business pressure. So, when set of core product requirements are well understood, but details are yet to be defined then evolutionary models are used (Sahil Barjtya, Ankur Sharma and Usha Rani, 2017). A set of general objectives are taken from customer, but detailed input, processing and output requirements are not known to customer. In other cases, the developer is unsure of the efficiency of an algorithm, the adaptability of an operating system etc., then prototyping is the best approach.

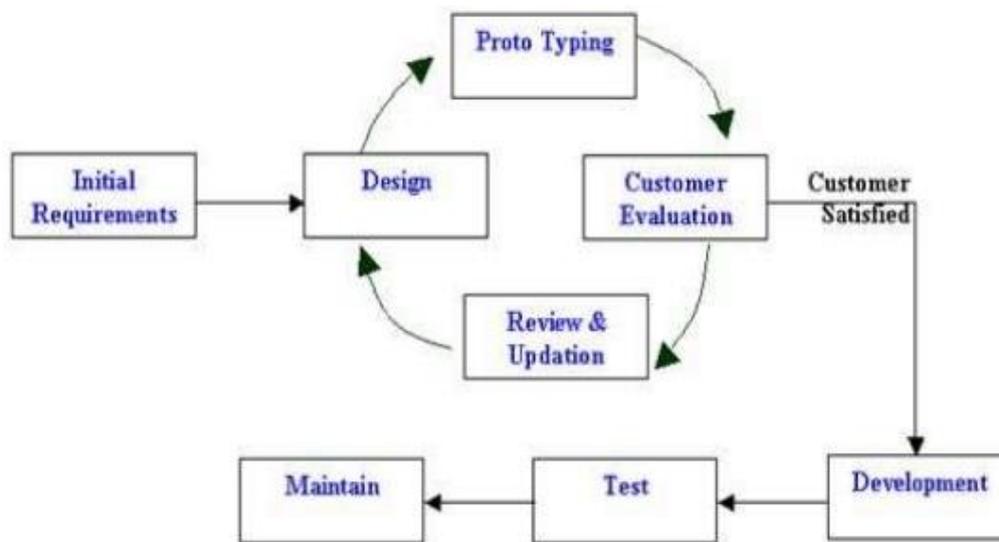


Figure 3: Prototype Model (Sharma, 2017)

The first phase is communication in which requirements are gathered by having communication with the customer. Then quick plan is developed to implement the stated requirements. Further, modelling and quick design is made. After this phase the actual construction of prototype is done which is then deployed and delivered to customer. The feedback is taken from customer; changes are made into software and software development is carried out. It also allows the software engineer some insight into the accuracy of initial project estimates and whether the deadlines and milestones proposed can be successfully met (Supriya Madhukar Salve, Syed Neha Samreen & Neha Khatri-Valmik, 2018). The limitation of this model is that the developers may lose focus on the real purpose of the prototype and compromise the quality of the product (Scroggins, 2017). For example, they may employ some of the inefficient algorithms or inappropriate programming languages used in developing the prototype.

Spiral Model

It is invented by Dr. Barry Boehm in 1988 while working at Thompson Ramo Wooldridge (TRW) Automotive (Sahil Barjtya, Ankur Sharma and Usha Rani, 2017). This model follows an iterative nature of prototyping model and systematic approach of waterfall model (Sahil Barjtya, Ankur Sharma and Usha Rani, 2017). To (Sharma, 2017), this is used when requirements are not well understood and risks are high. Outer spiral takes on a classical waterfall model approach after requirements are defined, but permit iterative growth of the software. It operates as a high risk-driven model. A go/ no-go decision occurs after each complete spiral in order to react to risk determination. It requires considerable expertise in risk assessment. This model serves as realistic model for large scale projects. Each cycle follows same sequence of steps as waterfall model.

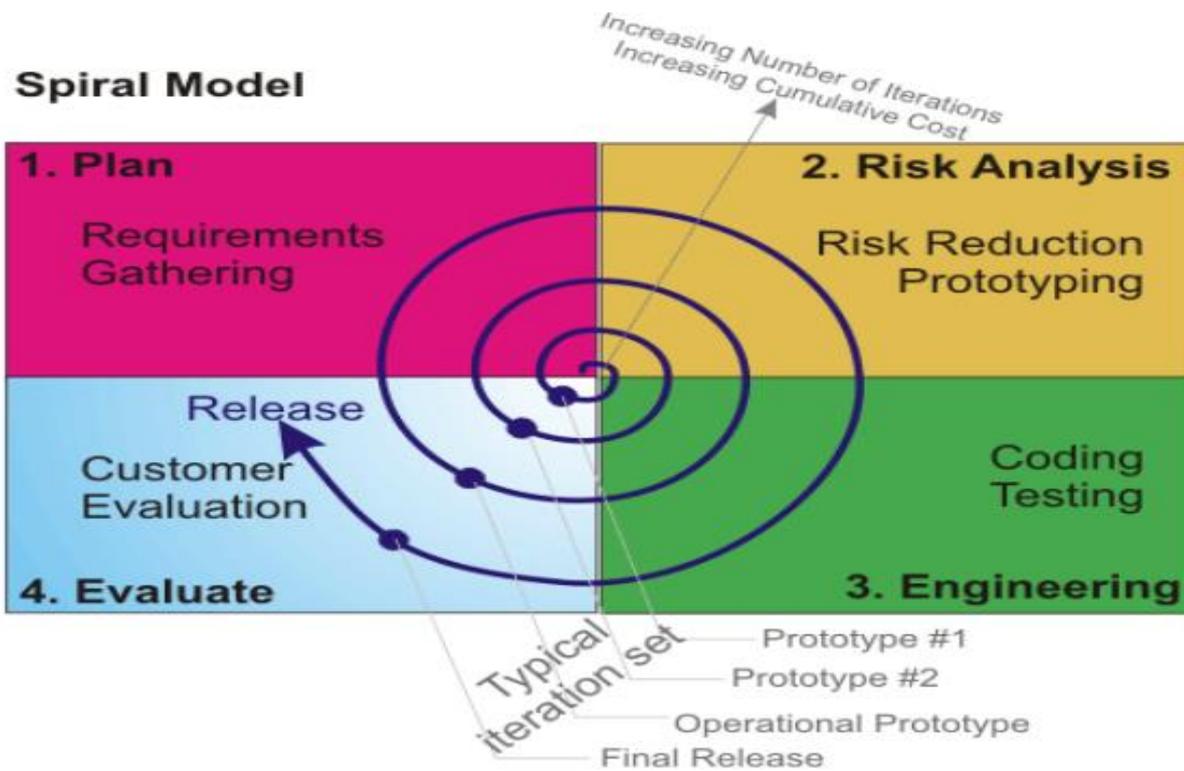


Figure 4: Spiral Model (Yu, 2018)

Comparison of the three SDLC Models

SDLC Model	Advantages	Disadvantages
i. Waterfall Model	<ol style="list-style-type: none"> 1. Easy to understand, easy to use. 2. Plan and Do Model. 3. Provide structure to inexperienced staff. 4. Milestones are well understood. 5. Sets requirement stability. 6. Suitable for smaller projects where requirements are well understood. 	<ol style="list-style-type: none"> 1. Once an application is in testing phase, it is very difficult to go back and change something that was not correct. 2. No working software is produced until late during the life cycle. 3. High amount of risk and uncertainty. 4. Poor model for large projects. 5. Not suitable for unclear and changing requirements. 6. Lack of involvement of customer.

		<p>7. Accuracy of estimation.</p> <p>8. Unable to accommodate iteration.</p>
ii. Prototyping Model	<p>1. It follows an evolutionary and iterative approach.</p> <p>2. Used when requirements are not well understood.</p> <p>3. Serves as a mechanism identifying software requirements.</p> <p>4. Focuses on those aspects of software that are visible to customer/user.</p> <p>5. Feedback is used to refine the prototype.</p>	<p>1. The customers see a “working version” of software and buy the prototype after few fixes are made.</p> <p>2. Developers often make implementation compromises to get the software running quickly. E.g. language choice, user interfaces, operating system choice, inefficient algorithm.</p> <p>3. Increases complexity of the overall system.</p> <p>4. Lesson learned</p> <p>a. Define the rules for prototype before it is built.</p> <p>b. Plan to discard the prototype and engineer the actual production software with a goal toward quality.</p>
iii. Spiral Model	<p>1. High amount of risk analysis is done. Hence, avoidance of risk is enhanced.</p> <p>2. Good for large and mission critical projects.</p> <p>3. Strong approval and documentation control.</p> <p>4. Additional functionality added in later date.</p> <p>5. Software is produced early in software life cycle.</p>	<p>1. Can be costly model to use.</p> <p>2. Risk analysis requires highly specific expertise.</p> <p>3. Project success is highly dependent on risk analysis phase.</p> <p>4. Doesn't work well for smaller projects.</p>

Table 1: SDLC Models Comparison (Author Compilation)

Based upon the need of the software project suitable software development lifecycle model can be used. The Waterfall life cycle model is very simple and easy to use model which can be used for smaller projects. Prototyping is very effective in the analysis and design of on-line systems. Systems with little user interaction, such as batch processing or systems that mostly do calculations benefit little from prototyping. The Spiral life cycle model builds upon the Waterfall and Incremental models and focuses on risk analysis. Spiral model is used when cost and risk evaluation is important.

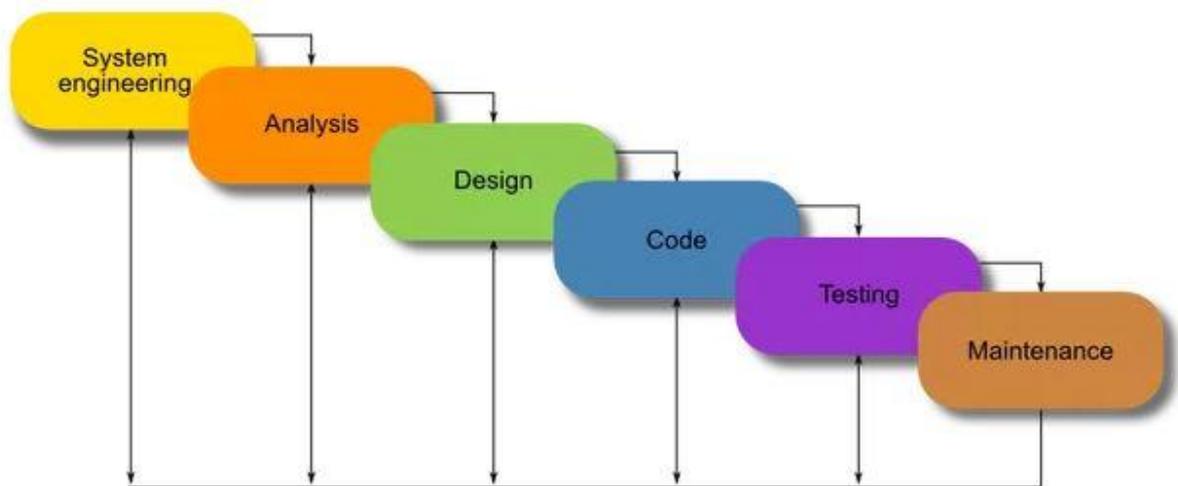


Figure 1:

The Waterfall Model - Inter-University Institute of Macau (ThotaNeena Jawaharlal 2001)

Advantages.

3.3 Why use the Waterfall Method instead of other methods for Library Projects?

According to Cerrone (2007), the Project Management Body of Knowledge (PMBOK) developed by the Project Management Institute approximately 20 years ago, is the definitive methodology for theory and practice. Adherence to the PMBOK method assures a successful implementation. The PMBOK method establishes that during the course of a project, activities occur within the following five process groups:

1. Planning processes that define objectives and select courses of action that will be used to effect project goals.
2. Executing processes used to coordinate activities, staff, and other resources in order to put the plan into action.
3. Controlling processes which provide the context for measurement and monitoring of project results in order to prevent variance from the plan or correct the course of action when a variance occurs.

Closing processes that formalize the acceptance of the project and end the project activities. The detailed activities that fall within the five process groups are 44 different in total. Furthermore, detailed tasks can be applied differently depending on the objective. The biggest difference between PMBOK and the Waterfall method is complexity. PMBOK is better suited for large scale projects and requires experience and the ability to apply specific activities to diverse processes in order to manage the project efficiently (Cervone, 2007). On the other hand, the Waterfall Method is simple and convenient while allowing the

flexibility for managing both, large scale and small-scale projects. Oura and Kijima (2001) explain that the waterfall method is employed top down in the sense that the development process can only proceed if management approves each phase. This could be an issue if the organization is a bottom-up and changes come from lower level personnel. The simple process that the Waterfall method provides makes it ideal for libraries project management.

3.4 Waterfall Method for Library Project Management

The Waterfall Method divides the development process by phases. The proposed adaptation of the method for library projects will be presented in the following stages:

plan, design, implementation and operations. Each stage has a set of activities that produce deliverables that serve as evidence documentation for management or governing agencies. The stages are given a percentage to establish relevance and a basis to inform progress to upper management.

In the Plan Stage, the scope of the library's project is discussed and analyzed. There is a need to establish the project feasibility, user requirements, map the current process, establish the team charter and get the buying from management. This stage corresponds to the Feasibility Phase and Requirements Specification described in the Waterfall Methodology.

As we can see, the Waterfall method is very simple. It can be applied to every project and discipline, including education. The technique itself is so flexible that it could be used to manage research proposals, investigations, and even operational plans, but as in library sciences, the lack of information in the educational area present some challenges to this method follower. Koskela and Howell (2002) present that: The lack of theory has rendered education and training more difficult and has hampered effective professionalization of project management. Lacking theory, project management cannot claim, and will not be granted a permanent and respected place in higher education institutions. Also, the lack of an explanation of project management, to be provided by a theory, has slowed down the diffusion of project management methods in practice.

There is a vast amount of information of project management methods, especially in the areas of engineering, software development, construction, architecture and telecommunications. Project management itself has been transformed through the decades by these disciplines, but the application of project management methods is more used in the industry by practitioners, rather than by educators (Hoon-Kwal & Anbari, 2009; Koskela & Howell, 2002). This presents a dichotomy between practice and scholarship because practitioners are using project management methods on a daily basis but higher education institutions are not using it as much as we expect. Further research and analysis have to be done in order to establish why scholars are not taking advantage of project management methods in the academy.

3.2 Baseline Study

3.2.1 Data Collection

Before setting up the system by software development tools, information was obtained from the staff about the need for the users of the system like the staff of library and those readers. The following are ways through which information was gathered;

(i) **Literature review:** Review of documentation and literature on similar projects was done in order to compare the project to already existing ones.

(ii) **Interviews:** Before starting to implement the system, interviews were conducted with the library users by using qualitative gathering techniques (oral interviews)

The interviews were of open-ended questions. The interviews were used to investigate and identify the scenario that libraries were going through in embarking on automation projects having embraced library automation.

(iii) **Observation:** Another method that was employed by the researcher to gather information regarding this research was the observation method via observing the staff and operation of the library by using qualitative gathering techniques (oral interviews). Before starting to implement the system, interviews were conducted with the library users.

The use of the qualitative gathering technique i.e. the survey method, using oral interviews was prompted by the nature of the research. Another method that was employed by the researcher to gather information regarding this research was the observation method via observing the staff and operation of the library.

(iv) **Internet search:** Internet research on similar systems and related concepts was conducted in order to develop a broader understanding of the system

3.2.2 Research Approach

This study was a qualitative kind of a study as it involved obtaining written information during the interviews. It was also a survey which involved exploring the thoughts of the respondents.

3.2.3 Development of the application

The project development stage involved coding of the program. This stage began immediately after the approval of the project design.

3.2.4 System development tools

The following tools were used for developing the system:

- i. **PHP:** for web server scripting
- ii. **HTML5, CSS, JQUERY:** for user interface
- iii. **MYSQL:** for database manipulation Personal computer running windows 7 operating system or better Wamp server: for executing server-side code.
- iv. **Web browser:** for testing/running the system.

- v. **Other Development Tools:** The E LMS was developed using Adobe Dream Weaver CS6 which enables Rapid Application Development. Adobe Photoshop

CS4 was used to make the systems banner and customize all the images. Microsoft Word2007 was used to do all the documentation. Online references and tutorials were also used for developing programs in PHP, JavaScript scripting languages and HTML.

3.3 System Design

The requirements collected in the requirements specification stage was used to design the logic and required interfaces of the system. This gave an overview of how the system modules were interacting with each other.

System

feasibility

A system undergoes a number of feasibility analyses to ascertain if it can be acquired and eventually adopted. It involves a continuous process that looks at the operational, technical, economic, cultural, legal feasibility of a system among other factors.

Operational feasibility

Operational feasibility evaluates whether a system is relevant to operate in a particular environment. This Library Book Management System presents a number of features making it operationally feasible. The system was easy to use and navigate hence enables any user with minimal computer skills to use it. It incorporated the use of security features and access levels that allow only authorized users to login. The system was navigable since it presented users with a number of options to click on and accomplish their functions. It presented an easier way to capture user input for eventual processing. End users don't need to have technical skills to use the system.

Technical feasibility

The system was technically feasible in a number of ways. It was developed using a number of readily available web development tools. Coding was done using PHP server-side scripting language, JavaScript, Bootstrap, CSS, JQuery, and HTML5. The system made use of MySQL database and Wamp Server which are open source and cross platform independent.

Economic Feasibility

This feasibility looks at the costs incurred in operating the system versus the revenue and accumulated returns. This Library Book Management Systems was economically feasible in the sense that; it's cheaper to acquire, it saves on the cost spend on paper since it operates automatically, the number of employees needed to operate the system is reduced hence lowering labor costs, and it saves time by facilitating quicker services to the end users.

Legal Feasibility

This system has minimal licensing issues since it was developed using open source software. This system meant to operate in the library, hence it's subject to the rules and regulations governing the institution performance

Response Time

The respond time to a user was to be within one to two seconds from the request time.

Throughput

The ES LMS was to enable many users to access it concurrently. The volume of transactions will depend directly on the number of users.

Utilization of Resources

the ESLMS shall made use of a MySQL database that can handle close to 5000 records. The system resources were modified in accordance with user requirements.

Reliability

The LMS was to operate 99% of the time. This system has to be reliable due to the important role it plays and the crucial data it handles.

Accuracy

This environment via the Wamp Server. The codes can be moved from this environment to other platforms like UNIX and Mac OS supporting other servers like IIS, Apache with PHP scripts and ODBC modules installed. ELMS accuracy was determined by the speed of use executed by its users.

Portability

The ES LMS has been developed and coded using PHP scripts. These scripts run on windows

Usability

The ESLMS has a user-friendly interface which is self-explanatory and easy to use. It supports any web browser as an interface making it easily accessible and usable. It requires no specific training on the user's part.

Friendliness: The ESLMS was made to have a simple look and feel with highly contrasting colors.

Privacy: The LMS user privacy has to be secured and protected

Extensibility: The LMS can be expanded in the future to handle more users and books.

Table 2.1: System Specifications

3.4.6.1. Hardware Specification	3.4.6.2. Software Specification
Processor: Intel Pentium IV and above.	Operating System: Window XP, 7, 8
RAM: At least 1GB	Language: PHP
Hard Disk: At least 80 GB	Database: MySQL 5.3
Monitor: 17-inch Color Monitor.	Server: Wamp Server
Processor: 3.0 GHz Processor	Browser: Mozilla Firefox, Internet Explorer,
Peripheral's: Mouse and Keyboard	Google Chrome.

3.4 System Design

3.4.1 Data flow diagrams

Context diagram

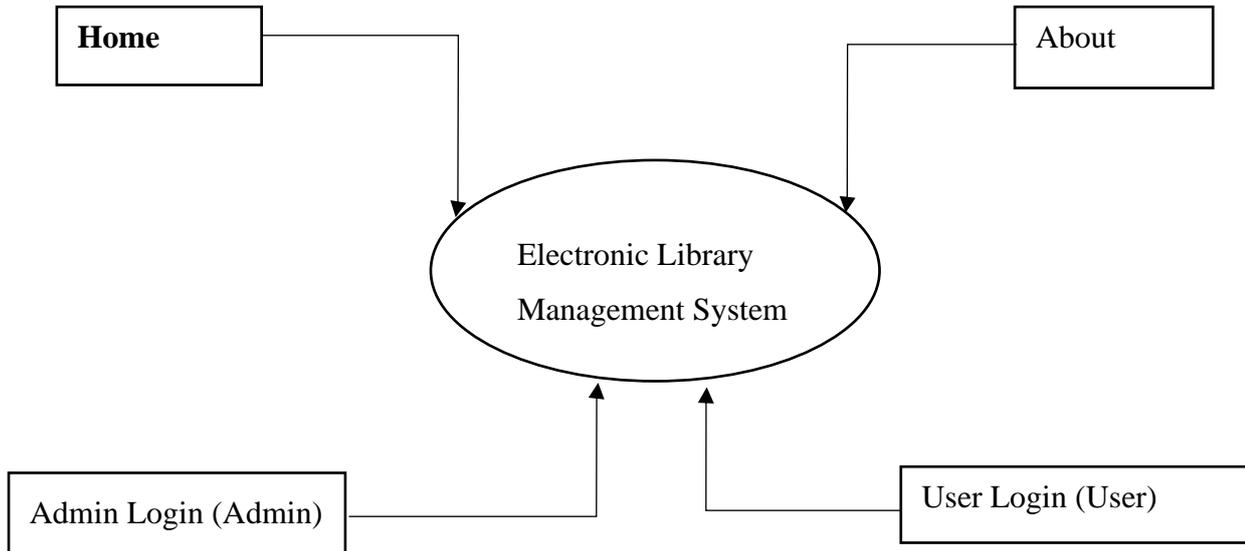


Figure 3.1: Context diagram

Author: 2019

Admin login.

After entering to the home page of the website, librarian can choose the ADMIN LOGIN option where they are asked to enter username and password, and if he/she is a valid user then a login page will be displayed.

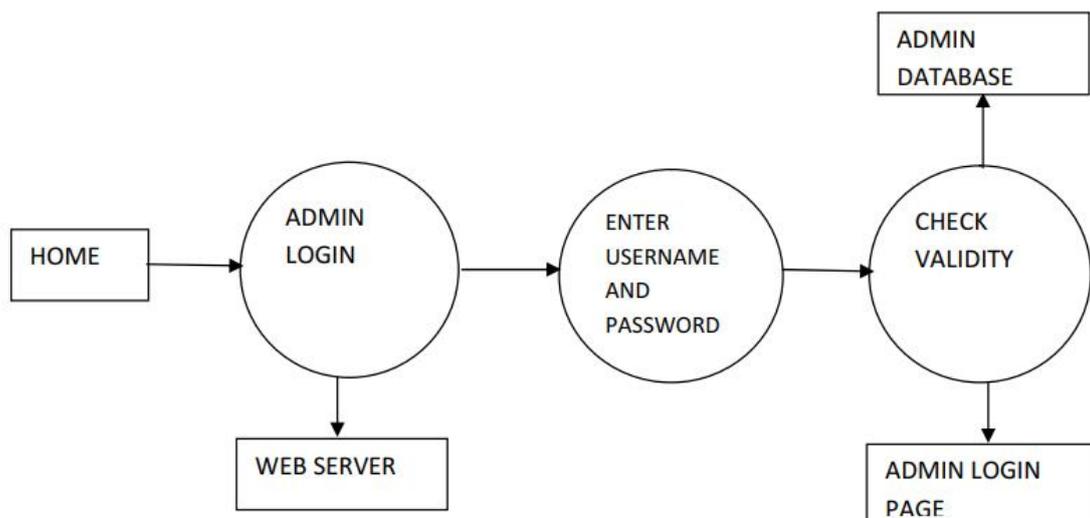


Figure 3.2: Data Flow Diagram for Admin Log in.

Author: 2019

User login

After entering to the home page of the website, user can choose the USER LOGIN option where they are asked to enter username and password, and if he/she is a valid user then a user login page will be displayed.

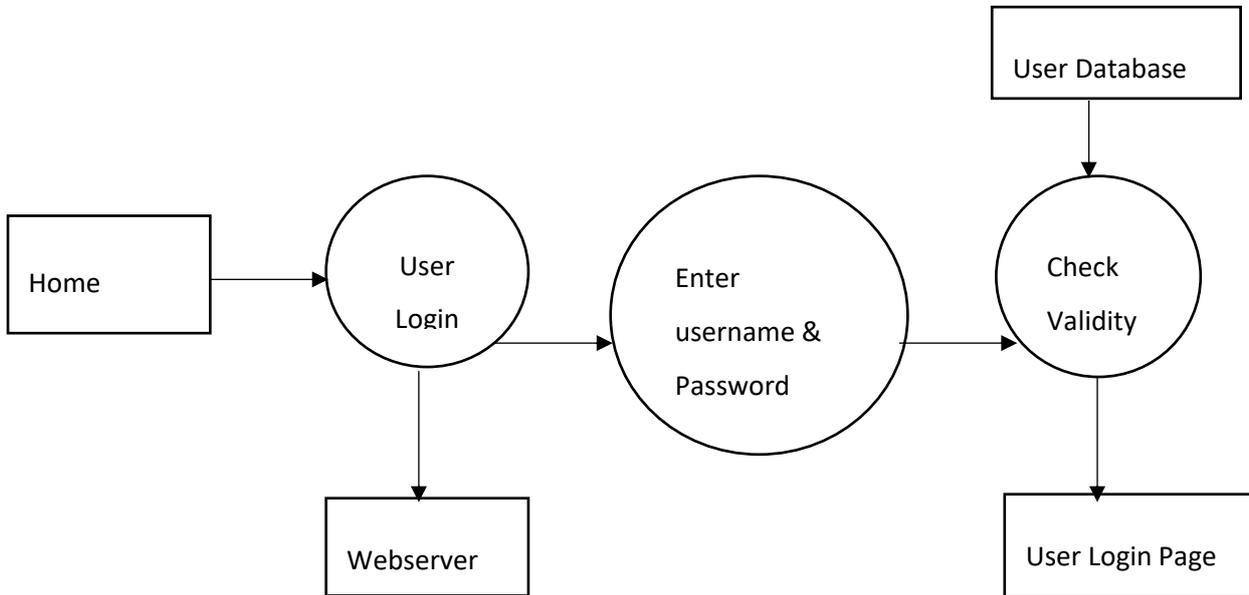


Figure 3.3: Dataflow diagram for user login

(Author: 2019)

Book borrowing

The book borrow Data Flow Diagram is the one where after entering USER LOGIN page he / she can select a book borrow option where after entering the book detail, he/she can select the book borrow option and if the maximum no of books borrowed limit is not crossed then a book can be borrowed. A certain user is entitled to borrow three maximum books at a time else the user cannot borrow more than. In the borrowing of books, a user will be prompt with the due date.

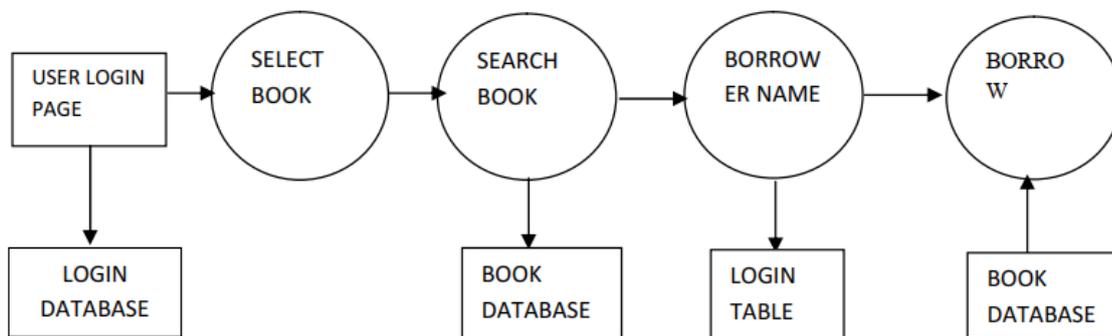


Figure 3.4: dataflow diagram for book borrow

Author: 2019

Book search

After the home page login there will be an option of the book search where after entering book detail like author name, publication, book name etc. book details will be displayed.

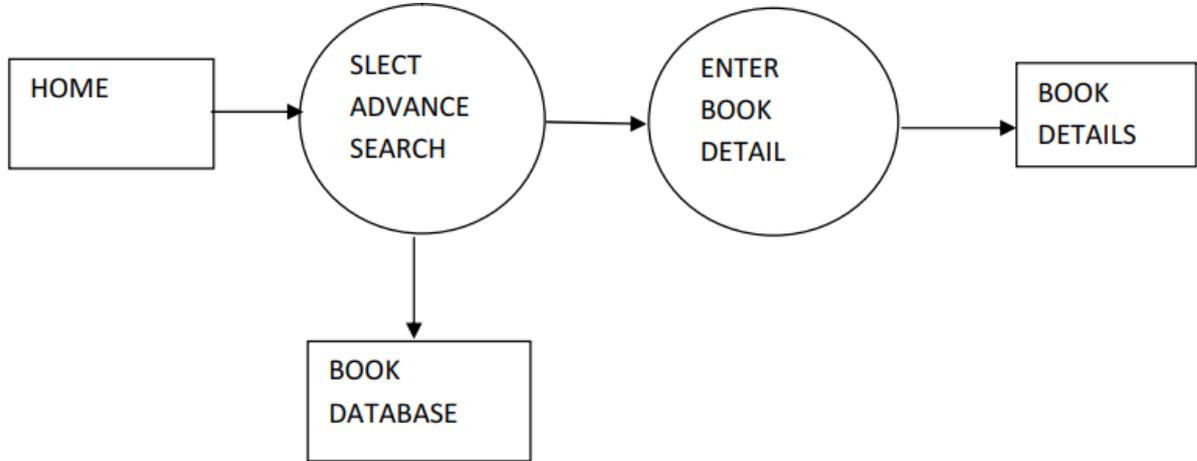


Figure3.5: Dataflow diagram for book search

Account creation

After the home page login there will be an option of CREATE AN ACCOUNT where after entering student detail, if all the fields are filled then a request will be sent to the librarian who will approve him as a registered member of the library.

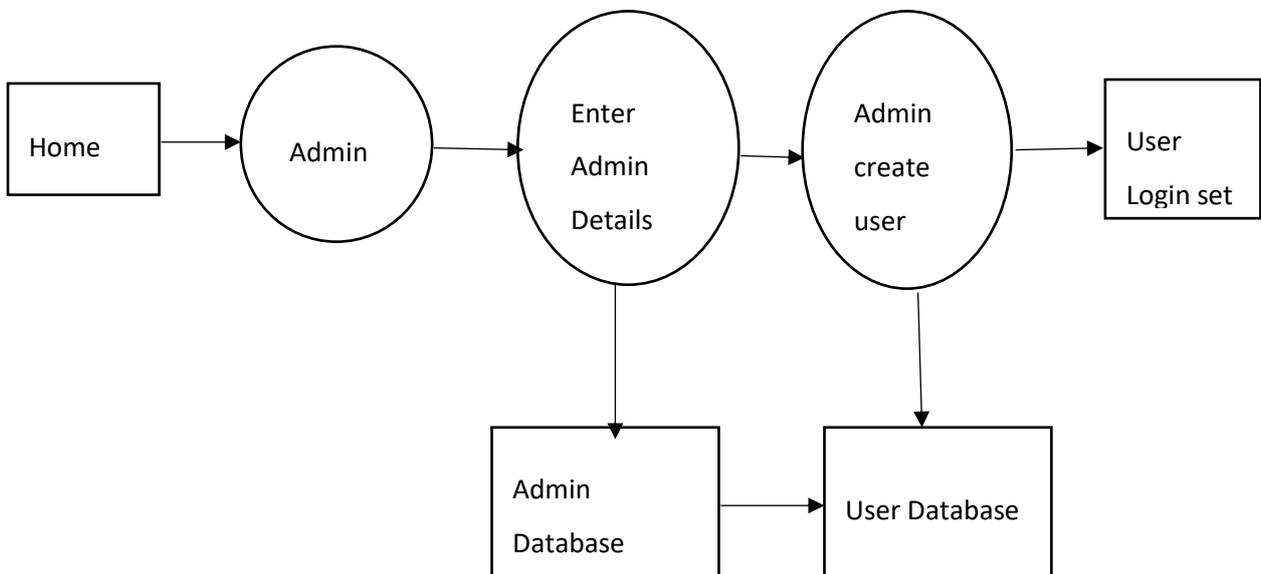


Figure 3.6: Dataflow diagram for account creation

Author: 2019

3.4.2 System Software Level architectural design

System Architecture

The Library Book Management System makes use of a Layered Architecture. Architectural designs have to incorporate the concept of independence and separation. This allows any changes taking place to be localized. A layered architecture applies this notion of independence and separation. The systems functionality is organized and divided into separate layers. Each layer depends on the services offered by the immediate layer beneath it. The system was developed incrementally allowing users to access some services provided by the layers as they underwent development. This architecture is also portable and it can be changed easily. This systems architecture is divided into a number of layers including the web browser, user interface, core functionality, and the operating system/database.

Operating System, Servers and Database Layer

This layer comprises of the database and operating system which basically acts as the support software for the system. This system can run on any operating system including Window, Linux, and Mac OS. It makes use of MySQL database running on Wamp Server. PHP server-side scripting language was used to code the system.

Core functionality Layer

This layer houses the application layer which has all the application functionality and the data access layer which facilitates access to the MySQL database.

User Interface Layer

This layer contains the user interface management. It incorporates the login functionality that authenticates and verifies the system users.

Web Interface Layer

This layer contains the various web browser applications that provide an interface between the clients and the inner layer. The fig 1 shows the Architecture diagram for the Library Book Management System.

Modular design of the system function

Library Book Management System is separated into a number of modules. Each module has an interface within which a number of functions are enabled. The system has access rights to control access to the modules.

Modular design of the system function

The sub-systems that make up the ELMS is as shown in the figure below. The subsystems of the system are the Library Management, the login, and menu

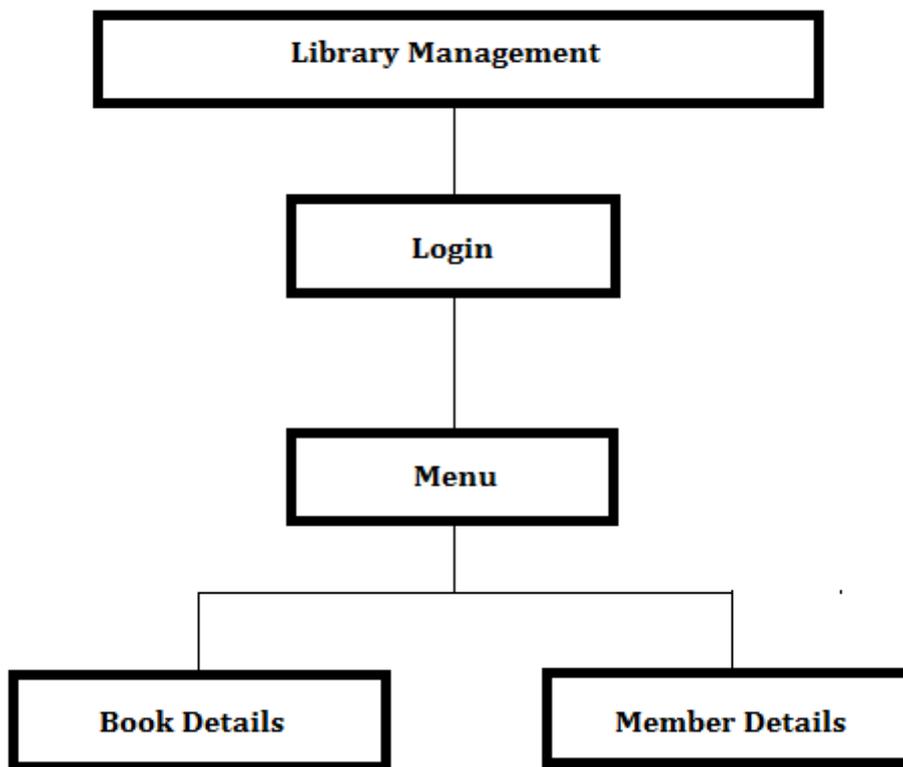


Figure: Modular design of the system

The library management module is actually the actual system as installed and running. The user will need to request for login and be authenticated. After successful login, the user will then carry out the activities on the system in accordance with their privileges.

Circulation Module

This module has functionality to enable the borrowing and return of books. Fines are also automatically calculated through this module. It enables easy retrieval of information concerning available, overdue, lost, returned, damaged, and issued books. It displays information about a member alongside the books they borrow. It notifies a member if the book in their possession is overdue.

Cataloging Module

This module enables the librarian to capture a book details in the most appropriate manner. This enables ease of retrieval of information concerning the book to the end users. With regard to this module, the system captures all the book details, the respective authors, publishers, category, and its section within the library. This module

Online Public Access Catalogue (OPAC) Module

This module enables members to access books from the convenience of their location. A number of search criteria are presented to the users where one can search a book by its category, the author, the publisher, the book code, or the title of the book.

Reservation Module

This module enables a member to reserve a book and check the status. It enables librarian to respond to reservations.

Reports Module

This module enables the librarian to generate reports from the system using the reports functionality. The reports are then displayed in Microsoft Excel formats.

User Management Module

using this module, a librarian can create new users to the system. It also enables them to update the user details.

System Class Diagram

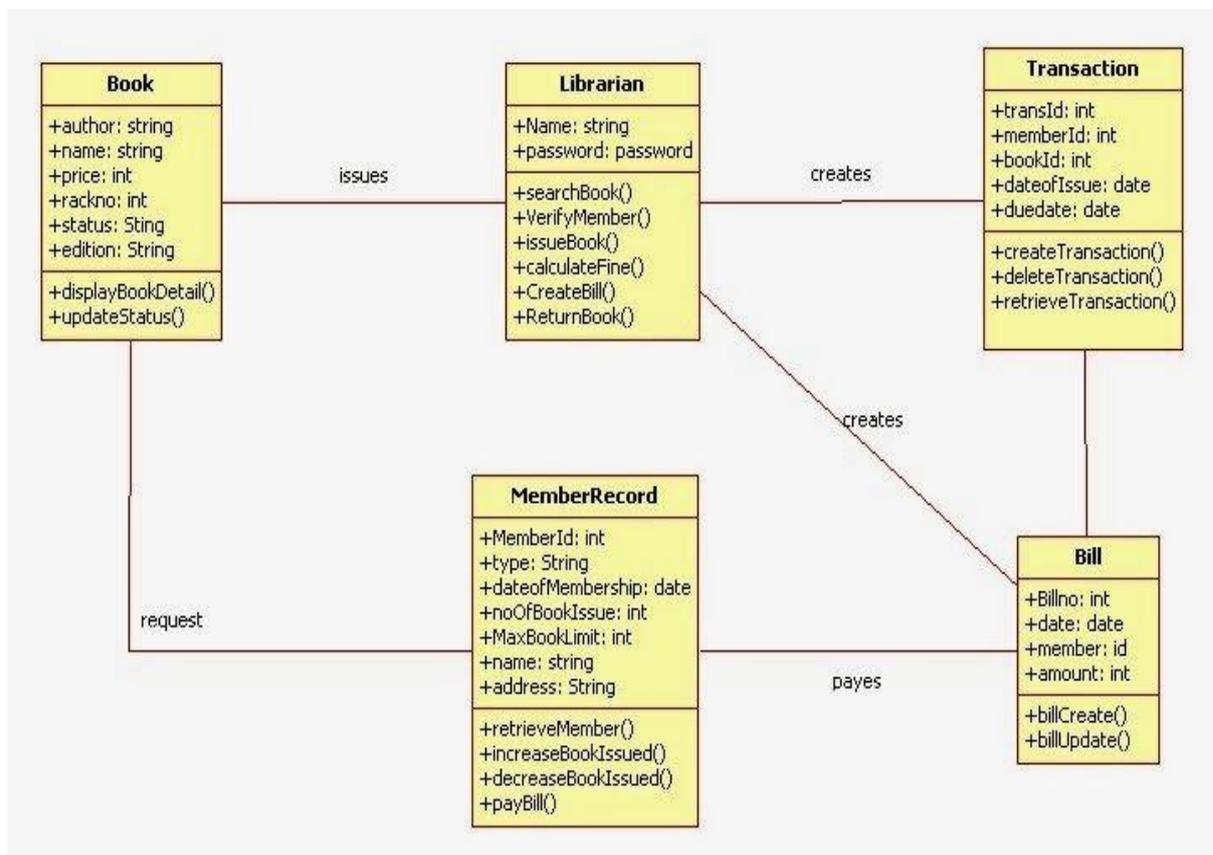


Fig 3.7: System class diagram

System Data Model Design

Login module

The login module controls access to the system and what privileges one can have on the system. For a user to have access to the system he or she will provide the correct Username, password. If wrong information is provided against these requirements, access to the system will not be granted.

Sign-up module

The sign-up module allows prospective users to register with system, and then they are directed to where they can log in to check for the books available.

Logout module

The logout module which is existent in both the employee and the administrator modules allow individuals to sign out after login.

Administrator module

The administrator module is meant for the administrator, this allows the administrator to manage details of users and books.

Reservation Module

This module enables a member to reserve a book and check the status. It enables librarian to respond to reservations.

Reports Module

This module enables the librarian to generate reports from the system using the reports functionality. The reports are then displayed in Microsoft word/pdf formats.

User Management Module

Using this module, a librarian can create new users to the system. It also enables them to update the user details.

3.4.3 User Interface Design

The user interface facilitates communication between the computer system and its users. In simple terms, such an interface can be considered as the meeting point for the user and the computer system. Because of this point, the interface was designed to accommodate the most aspect of a user machine conversation, in a friendly manner. The user interface allows the users to have access to all the facilities offered by the system, in this case the Electronic library management system.

The system makes use of a user-friendly graphical user interface (GUI) making it easy to use and understand. This interface acts as a link between the system users and the software. It's made up of Screen Formats: The first screen to be displayed is the LBMS home page. This web page contains a login form

where all the users have to be authenticated for them to have full access to the system. The web page has tabbing capability allowing users to open other related links in other tabs, hence enabling multiple windows to be visible. This way user can easily switch between multiple pages displayed on the screen.

Entity Relationship diagram

The diagram below represents the relationships that is there between different entities of this project but does not represent the actual schema for the system to be used in the implementation of this database

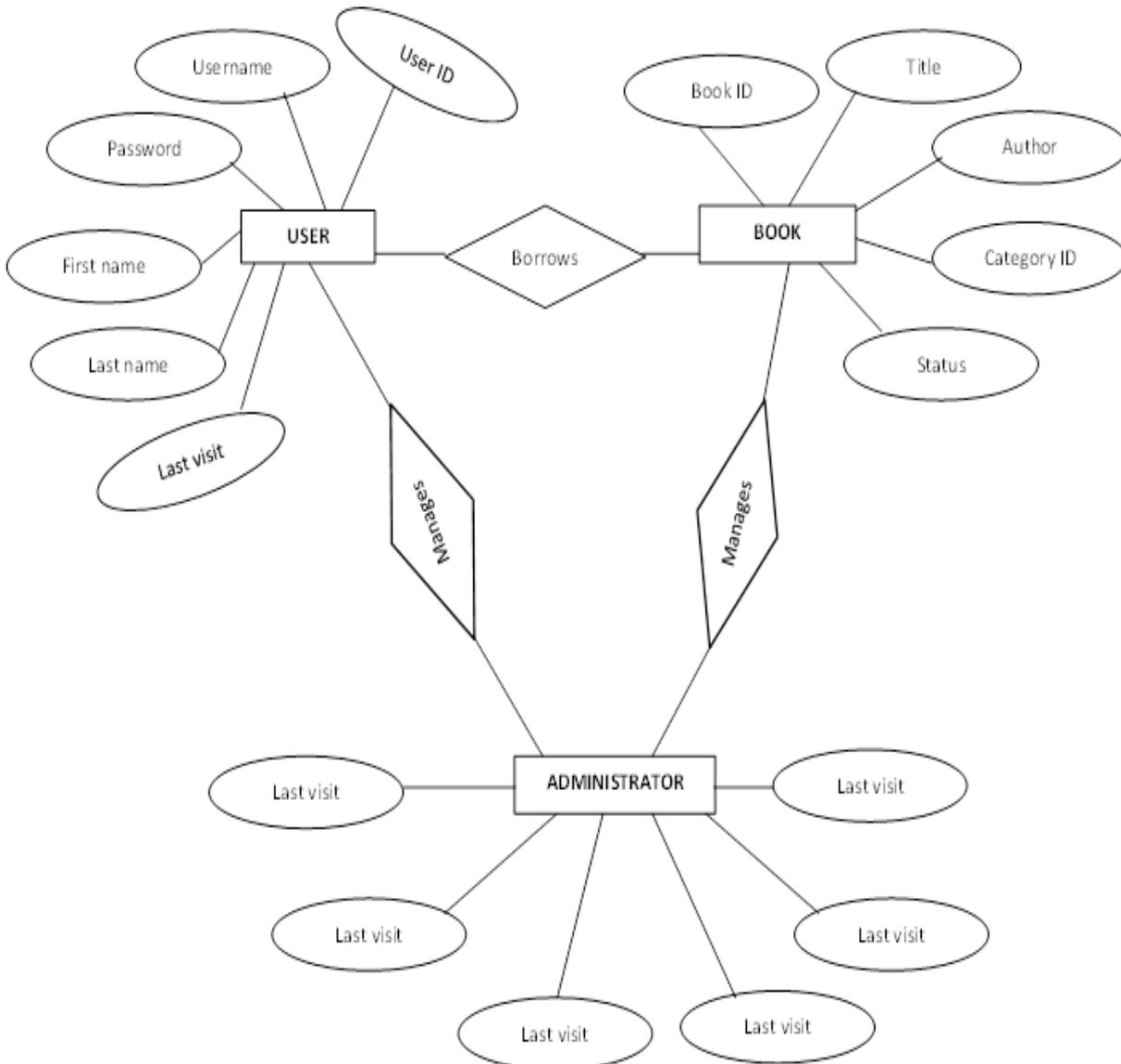


Fig 3.8

3.4.4 Summary

In this chapter, the methods of data collection for the study and the research approach have been outlined. It has as well explained how the applications for the system were developed and the system design has been elaborated.

CHAPTER FOUR: RESULTS

4.1 Introduction

This chapter covers the system tests and results of the survey that was carried out. The system tests are demonstrated using a number of screen shots. The Library Management System aimed at accomplishing a number of tasks. The system met its accomplishments and the following section looks at this task and how they are accomplished.

4.2 Baseline study results

4.2.1 Survey results and Discussion

Using different source available on internet as well as information available in literature and detailed information about each open source library management systems has been collected, the researcher carried out a survey of library management systems. In order to obtain detailed information about each system different sources were consulted. Following are some of prominently used sources for the survey being presented in this section.

- Sourceforge.net (<http://sourceforge.net/>)
- Github (<http://Github.com>)
- FOSS4LIB (<https://foss4lib.org/>)
- OSS4Lib (<http://www.oss4lib.org/>)
- Savannah (<http://savannah.gnu.org/>)
- Free software directory etc.
- Infolibrarian.com
- Library and information science literature
- Internet search using search engine

4.3 System implementation results

Home Page

This is the first interface of the Electronic library management system; it provides the basic page where user and admin can click on to access the library system. The home, about, admin user sections are entailed in this page. Both the admin and the users of the library can access the home page of the library as it has been authorized and authenticated for use.

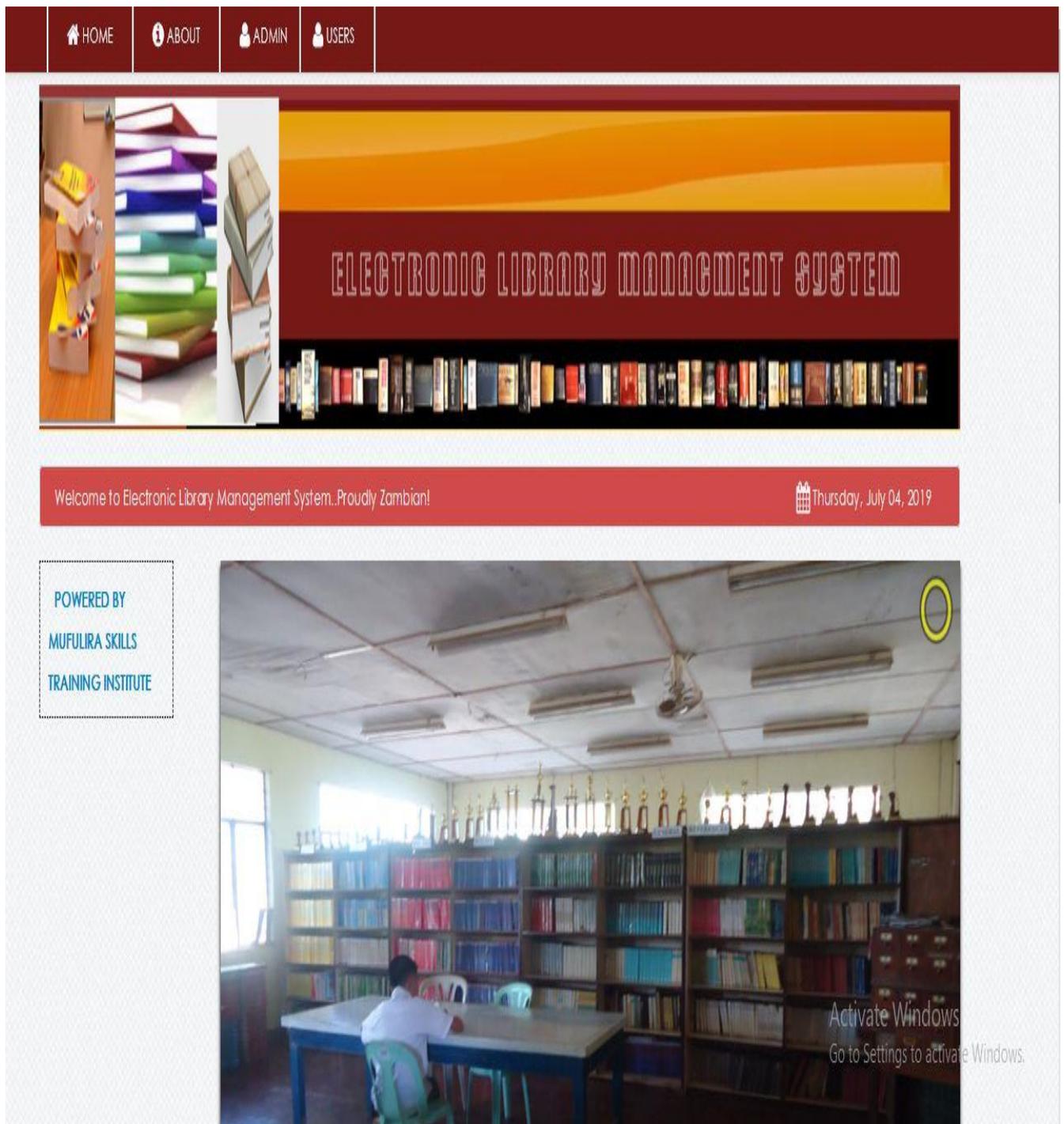


Figure 3.3: 1 Screen short for Home page

Admin/User Login

For the admin login, the admin can log in with his /her own username and password while for the user login, a given user must have to be registered before getting the access to have the username and password to use the library

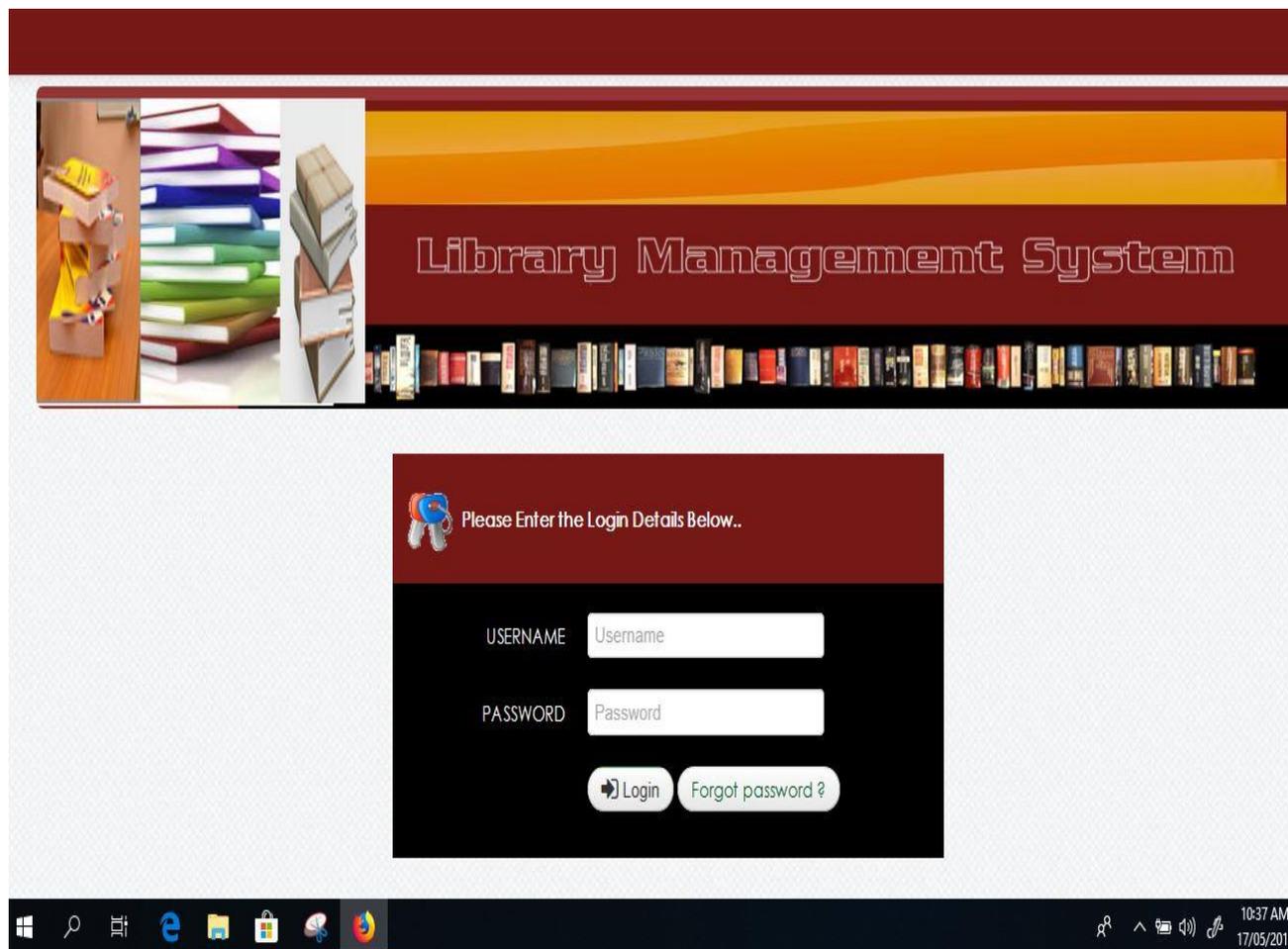


Figure 3.3.2: screenshot for admin/user login

Add Books

Here both the admin and user have the authorized access to add a particular book to the library shelf. A member has no access to this. The library admin /user more like the librarian can add new books to the library as much as possible for the members to borrow and use.

Please Enter Details Below

BOOK_TITLE:	<input type="text" value="Book Title"/>
CATEGORY:	<input type="text" value=""/>
AUTHOR:	<input type="text" value="Author"/>
BOOK COPIES:	<input type="text" value=""/>
BOOK PUBLICATION:	<input type="text" value="book_pub"/>
PUBLISHER NAME:	<input type="text" value="Publisher Name"/>
ISBN:	<input type="text" value="ISBN"/>
COPYRIGHT YEAR:	<input type="text" value="Copyright Year"/>
STATUS:	<input type="text" value=""/>

Figure 3.3.3: screenshot for add books

Add User

Here the admin can add a new user of the library, by registering the user needed information to use the library. Information such as the user name, First Name, last name, required password, are required by the admin from the user to get registered as a library user. After being added as a user, the user can then have his/her login such as the username and password so as to get access to the library system.

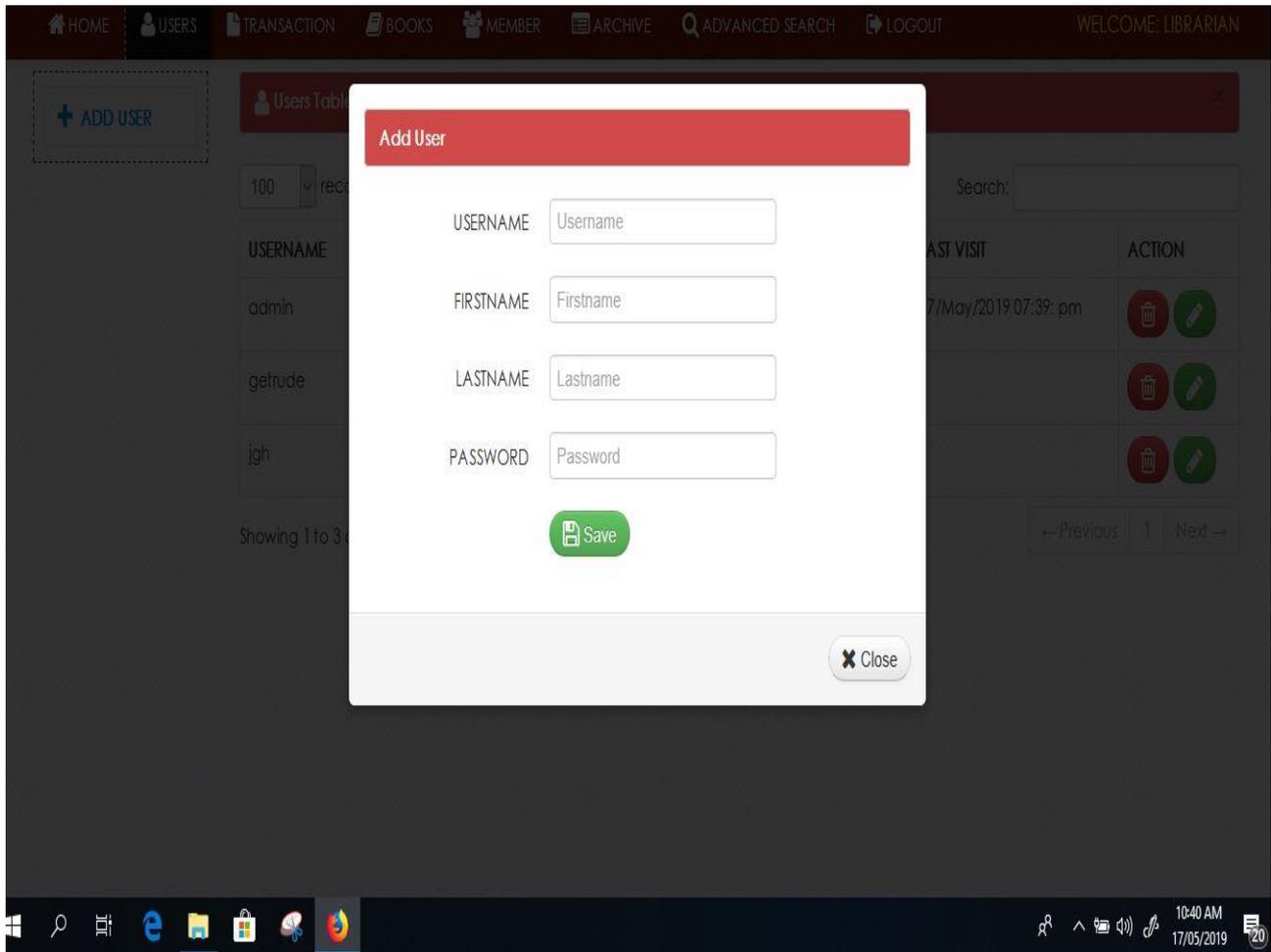


Figure 3.3.4: screenshot for add user

Book Borrow

Here the user of the library/librarian after being registered can lend a particular book in the library to a member. A member of the library is restricted to borrowing only three books at a time. The user can click on transaction menu and select on borrow. Under Transaction menu, the user/librarian is able to view borrowed books and returned books

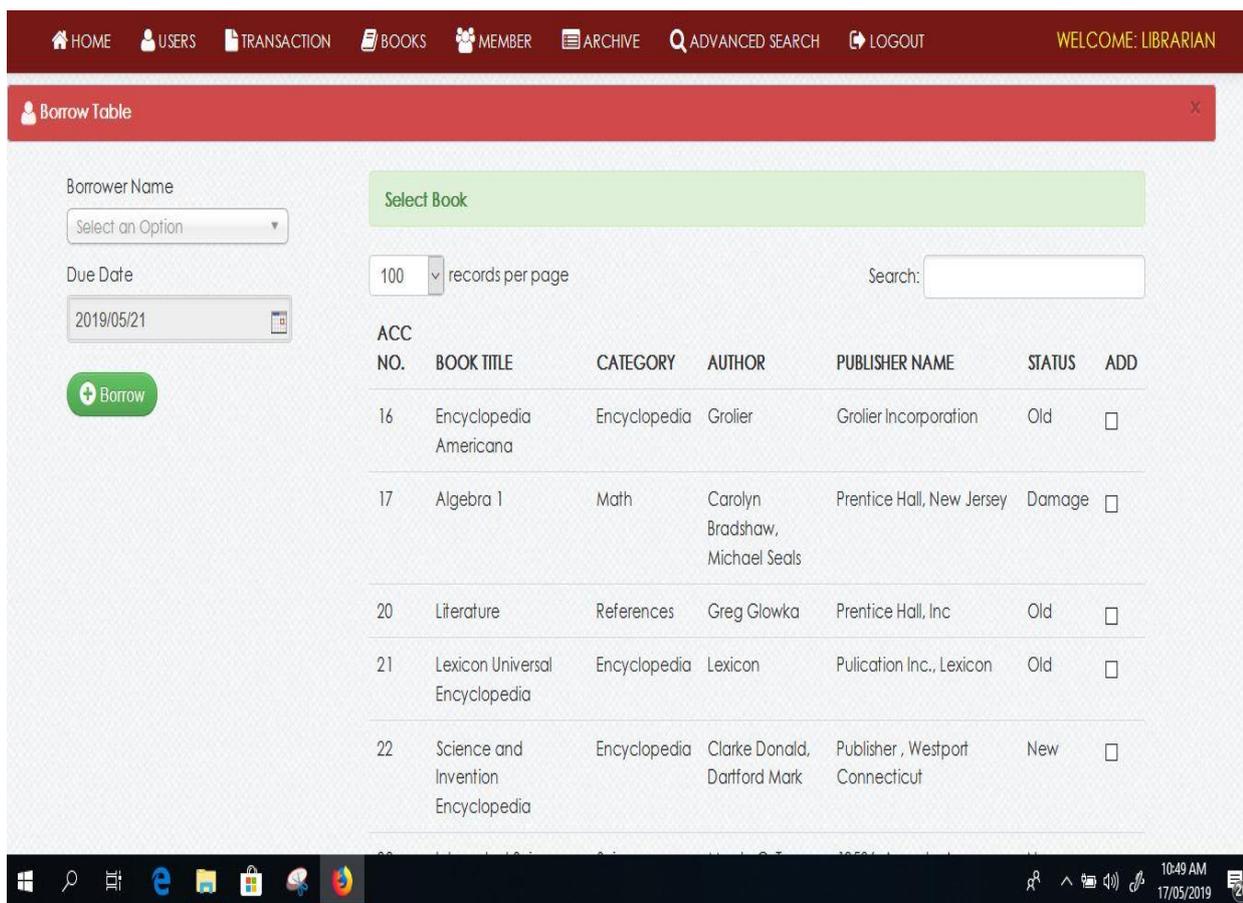


Figure 3.3.5: Screenshot for book borrow.

Add Member

Here the user/librarian, can add members by registering the member needed information for him/her qualify to borrow books from the library. Information such as the First Name, last Name, Gender, Address, Cell phone number, Year, level, etc. are required by the user/librarian from the member to get registered as a library member. After being added as a member, the user can then have his/her login such as the username and password so as to get access to the library system.

HOME USERS TRANSACTION BOOKS MEMBER ARCHIVE ADVANCED SEARCH LOGOUT WELCOME: LIBRARIAN

Add Member

← Back

Please Enter Details Below

FIRSTNAME:

LASTNAME:

GENDER:

ADDRESS:

CELLPHONE NUMBER:

TYPE:

YEAR LEVEL:

Save

Activate Windows
Go to Settings to activate Windows.

Fig 3.3.6: add Member

4.4 Summary

This section is a presentation of information obtained from the survey including the means through which the survey was conducted. It also illustrates the system implementation process.

CHAPTER FIVE: DISCUSSION AND CONCLUSION

5.1 Introduction

This chapter will present the discussion of the technology used to and the study results

5.2 Discussion

5.2.1 The baseline study

5.2.2 Use of technology: Software Language used

The languages used for coding the LMS are PHP, JavaScript, JQuery Library, Bootstrap, CSS, Ajax, and HTML5. Wamp Server needs to be installed for working on the coding phase.

5.2.3 Web Development Tools

The ES LM was developed using Adobe Dream Weaver CS6 which enables Rapid Application Development. Adobe Photoshop CS4 was used to make the systems banner and customize all the images. Microsoft Visio 2010 was used to reverse engineer the ERD, and to draw all the analysis diagrams. Microsoft Word 2010 was used to do all the documentation. Online references and tutorials were also used for developing programs in PHP, JavaScript scripting languages and HTML5.

5.2.4 Development of the system as a solution

This system improves services delivered to end users. Information can be searched from the system and the results displayed in a timely manner. Costs incurred are reduced by cutting down the number of library workforce. Data is saved in the most appropriate manner eliminating duplication and redundancy.

Multiple users can access the system at the same time. The system operates electronically hence ensures less space is occupied and also presents a paperless working environment. The system has access control limiting access to restricted areas. User privacy is ensured by providing login functionality which verifies them to determine their authenticity to access the system. Library staff members are motivated by the system since it makes work easier. The system has a friendly user interface which is attractive and easy to use. Information concerning all the library activities is stored in the most secure manner. The system's database is password protected preventing unauthorized access and it can also be backed up easily.

5.2.5 Comparison with other similar works

The library management system in this study is similar to one developed in a study by (Kweingoti, 2014) entitled Library Book Management System. The tools used to implement the system in his study are similar to the ones in this research which are PHP scripting language, HTML5, JavaScript, JQuery library, Cascading Style Sheets, MySQL 5.3 database running on Wamp Server, Bootstrap, Microsoft Visio 2010, Microsoft Project 2007, Microsoft Office 2010, Adobe Dreamweaver CS6, and Adobe Photoshop CS4. However, the system in Kweingoti's study aimed at automating the processes of cataloging, book circulation, fine calculation, card processing, member details maintenance, and reports generation.

Another similar study is one conducted by (Noor, A Java based University Library Management System, 2018). However, in his designed system, the second module helps students to find out

books by searching by title, author's name, subject, publication, series, ISBN/ISSN, etc. and in the last module, librarian can issue and fine for books received after due date.

5.2.6 Possible application

This Electronic library management system can be applied to all learning institutions, big and small enterprise, Council libraries, Universities, Hospital, etc

5.2.7 Summary

The quest to make life easier and processing faster has led to computerization of various processes. Computer technology has transformed so many sectors especially the Educational sector in no small measure. In an effort to foster technology driven education, an Electronic Library Management System has been developed to manage all library operations such as borrowing, returning of books etc. This website provides a computerized version of library management system which will benefit the students as well as the staff of the library

It makes entire process online where student can search books; staff can generate reports and do book transactions. It also has a facility for student login where student can login and can see status of books issued as well request for book add info about workshops or events happening in at the institution or nearby School in the online notice board

6.0 Conclusion

In conclusion, from proper analysis and assessment of the designed system it can be safely concluded that the system is an efficient, usable and reliable Electronic Library Management System. It is working properly and adequately meets the minimum expectations that were for it initially. The new system is expected to give benefits to the users and staff in terms of efficiency in the usage of library system. Library management system has gained significance not only from the management staff but also from the student's point of view. For the management, library system generates new books opportunities and for the student, it makes comparative selecting possible. As per a survey, most students of online library system are impulsive and usually make a decision to stay on a site within the first few seconds. Website design is like a management interior. If the management looks poor or like hundreds of other managements the student is most likely to skip to the other site. Hence, the project has been designed to provide the user with easy navigation, retrieval of data and necessary feedback as much as possible

7.0 Future works

In future, the researcher hopes to delve more into the integration of payments system in case one lost a book after borrowing. This is because the payment aspect of the system does not offer this to the user. The hope is to expand the choices available to the library management. Also, the researcher hopes to add multiple currency to make users choose the currency of their choice before they start any payment.

ACKNOWLEDGEMENT

Firstly, and foremost I want to thank the Almighty God for the blessing of life He has continued to give me. He has always been there for me in thin and thick, I appreciate you my God. Secondly, may I acknowledge the services of my supervisors, Sir/Madam, I will always be indebted to you for the guidance you provided throughout this project. To all the lecturers from the School of engineering under the department of Information and Communications Technology, I say thumbs up to you for the noble work that you have always been doing.

Secondly to my family, I want to acknowledge my wife Mrs. Mulima Sililo Masiye for the support she has rendered from the start to the end of my Course. Dear, I always cherish you and may the good Lord bless you abundantly. To my children, Joyce Limpo Masiye, Hope Sepiso Masiye and my young brother, John Sililo Masiye, I say thank you for believing in me. I know it has not been easy for you since most of the finances used to be channeled towards my tuition fees but you were able to understand why I couldn't provide certain needs to you.

Lastly, I want to salute the current and former command of School of Military Engineering for allowing me time to come to the Information and Communications University to pursue my dreams. I am especially indebted to Col Issac Phiri (psc) for being magnanimous enough by granting me permission to study at the Information and Communications University, being the School commandant by then of the School of Military Engineering, when I started the program in 2015.

To my work mate, SSgt Katyamba Siandeke, whom I used to work with in the Comms department, my friends Ssgt Mulunda Richard, Mr. Mufalari Liyungu, Prareen Chisanga, WOI Abel Makalicha, Mr. Kunda Barnabas, Church mates and many others, too numerous to mention, I say to you that I cherished your encouragement and support.

REFERENCES

- [1] ABCD (n.d.). Retrieved from <http://reddes.bvsaude.org/projects/abcd>
- [2] Adamson and Veronica. (2008). *JISC & SCOUNL Library Management Systems Study. Sheffield, UK: Sero Consulting. p. 51.*
- [3] Adamson and Veronica. (2008). *JISC & SCOUNL Library Management Systems Study. Sheffield, UK: Sero Consulting. p. 51.*
- [4] Ademodi, D.T., & Adepaju, E. O. (2009). *Computer skill among Librarians in Academic Libraries on Ondo and Ekiti States, Nigeria. Library Philosophy & Practice.*
- [5] Adomi, E. E., & Annie, S. O. (2006). An Assessment of Computer Literacy Skills of Professionals in Nigerian University libraries. *Library Hi Tech News, Vol.23 (2) pp.10-14.*
- [6] Ammas. (2008). Usefulness of digital and traditional libraries in higher. *International Journal of Services Technology and Management, 148-161.*
- [7] Ashutosh, T and Ashish, S. (2012). *Online Library Management System. IOSR Journal of Engineering (IOSRJEN). Vol. 2 (2), pp. 180- 186.*
- [8] Avanti (n. d). Retrieved July 5, 2014, from <http://www.avantilibrarysystems.com/manual/introduction.html>
- [9] BiblioteQ (n. d.). Retrieved from <http://sourceforge.net/projects/biblioteq/>
- [10] Biblioteqonline (n. d.). Retrieved from <http://code.google.com/p/biblioteqonline/>
- [11] Boss, R. W. (2005). *Open Source Integrated Library System Software.* Retrieved from <https://alair.ala.org/bitstream/handle/11213/258/Open%20Source%20ILS%20Software.pdf?>
- [12] Dinesh, R., Pravin, S., Aravindhan, M and Rajeswari, D. 2015. *Library access system Smartphone Application using Android. International Journal of Computer Science and Mobile Computing. Vol.4 (3), pp. 142-149.*
- [13] Dinesh, R., Pravin, S., Aravindhan, M and Rajeswari, D. 2015. *Library access system Smartphone Application using Android. International Journal of Computer Science and Mobile Computing. Vol.4 (3), pp. 142-149.*
- [14] Emilda (n. d.). Retrieved from: <http://sourceforge.net/project/emilda/files/?source=navbar>
- [15] Espabiblio (n.d.). Retrieved from <http://espabiblio.sourceforge.net/front/>
- [16] Evergreen (n. d.). Retrieved from http://evergreen-ils.org/egdo_wnloads/
- [17] Firefly (n. d.). Retrieved <http://savannah.nongnu.org/projects/firefly/>

- [18]Gavvani, V. Z., Shokraneh, F. and Shiramin, A. R. (2011). *Need for content Re-engineering of the medical library and information science curriculum in Iran. Library Philosophy & Practice*. Available: <http://unllib.unl.edu/LPP/gavvani-shokraneh-shiramin.html>.
- [19]Glibms (n. d.). Retrieved <http://sourceforge.net/projects/glibms/>
- [20]Johnson, C.A. (2007). Library and information science education in developing countries. *The International Information & Library Review, Vol. 39, pp. 64-71*.
- [21]Librarianship & Information Management, Vol.1 (1), pp.13-19. Available: <http://www.cmb.ac.lk/academic/institutes/nilis/reports/Nepal.pdf>
- [22]Neelakandan, B., Duraisekar, S., Balasubramani, R and Srinivasa, S. 2010. Implementation of Automated Library Management System in the School of Chemistry Bharathidasan University using Koha Open Source Software. *International Journal of Applied Engineering Research, Dindigul, Vol. (, pp. 149-167*.
- [23]Prabhakar Kumar, Rahul Kumar, Rajat Singh and Vikram Singh. (2014). *Library Management System. Division of Computer Science School of Engineering Cochin University of Science & Technology Kochi-682022*.
- [24]Ramaiah, L. S. (1987). *National Seminar on Modernization of Libraries*.
- [25]Sharma, C.K., Singh and Khiran. (2005). *Library Management System*. Available: [en.wikipedia.org/wiki/Library management](http://en.wikipedia.org/wiki/Library_management)
- [26]Siwakoti, S. (2008). *Status of school library development in Nepal's Lanka Journal of 52*
- [27]SOLIS (n.d.) Retrieved January 2, 2015, from <http://www.solis.com.br/gnuteca>
- [28]Xiuqi L, B. F. (2017). Design and imlementation of digital librarie