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A Project Report Submitted in Partial Fulfillment of Bachelor of Information Technology degree. Designing a Library Management System.

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Kasonde Moses
moseskasonde@gmail.com
Student:
Information and Communications University Zambia
Supervisor: Dr. Mupala C. John

ABSTRACT

One of the most important issues in most organizations is data and information management. Most organizations/institutes have not taken the advantage of various Information Technologies available on the market today to help them manage their information system efficiently. Libraries in Zambia to be particular manually record data about their Librarians, Patrons and the general Users. Therefore, a Library Management System has been proposed as a solution for managing Library activities. Library Management Systems are becoming very popular in institutions as well as in organization. These systems deal with the process of maintaining data about the books and many other things as well as transactions, which are taking place in the library with respect to the issue and return of the books. Studies have shown to prove that such systems really reduce the work load of library professional as well as non-professional staff. Therefore, with that mentioned, this report focuses on the development of a Library Management System. The report also explains how making use of a Library Management System enables the processes involved in a Library to be more efficient, accurate and retrieving of a book(s) easier than manually managing them.

DEDICATION

I would like to dedicate this project thesis to the Almighty Father for he has always been with me throughout my life despite the difficulties I went through during my primary and high school education. I would like to dedicate this work and present it to my family too, being the first child to go through the university in my family is a big achievement and my parents have always been there to pray for me and be supportive at all times. To all the people who have told me to be strong in my work, my life and everything I do; I say thank you very much for believing in m

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I shall always remain thankful to my wife Angela Bwalya for her unending financial, moral and spiritual support. My siblings Kasonde, lubuto and Chengelo deserve an acknowledgement for their unwavering support during my period here at ICU. To all my classmates and friends from ICU, I thank you very much for be there throughout.

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CHAPTER 1.

1.1 Aim.

The aim of designing this system is to be able to handle and manage the activities involved in a library in an efficient and reliable way. Less managing personnel and easy searching availability and user profile managing are major goals in this project.

1.2 Scope.

The scope of the project is as follows:

- Searching for a book in the library system.
- Loaning and returning of books to the library.
- The Library Patron deleting a book from the library system.
- Add, edit or delete a new user of the system.
- Charging a user for a book which is overdue.
- Cataloging of the books in the Library System.

1.3 Justification.

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 I'm doing a project that will replace the current manual library system being mostly used in higher institutions of learning in Zambia e.g. University, Colleges etc. with an automated library management system. Therefore the system which will be implemented will be more efficient and will use fewer resources than the manual one.

The other reason for developing such a system is to easy the amount of work that the library patrons doing while using the manual system. The system being implemented will make it easier for user to search for a book that they are looking for when they are not sure where exactly the book is found.

Another motivation for pursuing such a project is based on the Survey of the Status and Use of ICTs in Public Libraries including the Zambia Library Service. This survey showed that Zambia is not using a lot of Automated Library Systems.

The mission of the ZLS is to inculcate a culture of reading and using information for personal and national development through the provision of library and information services to the public, schools, colleges, and Teachers Resource Centers (TRC) throughout the country. The objectives of the organization are to:

- ❖ Establish and manage a public library network throughout Zambia.
- ❖ Ensure the establishment and co-ordination of libraries in schools, colleges and TRCs in Zambia.
- ❖ Provide timely and relevant information in various formats, including ICTs.
- ❖ Assist other organizations providing library and information services to the public.
- ❖ Offer training in basic library skills.

The ZLS is the only organization in Zambia that provides library services to both urban and rural areas. At present, ZLS has six provincial libraries, located in Chipata in Eastern Province, Choma in Southern Province, Kasama in Northern Province, Mansa in Luapula Province, Mongu in Western Province, and

Solwezi in Northwestern Province. There are no provincial libraries in Central, Copperbelt and Lusaka Provinces.

However, these are catered for by the ZLS headquarters in Lusaka, which has a stock of 30,000 books,meant for library centres in these provinces. The library at headquarters, which is open to the public, has a collection of 4,000 books. Each provincial library has over 10,000 books of all kinds for use by residents of the town and surrounding areas.

Apart from provincial libraries, there are ninteen branch libraries in the following districts: Mumbwa (Central Province), Chadiza, Chama, Lundazi and Petauke (Eastern Province), Kawambwa, Mwense and Samfya (Luapula Province), Chinsali and Luwingu (Northern Province), Kabompo, Mwinilunga and Zambezi (Northwestern Province), Kalomo, Maamba and Pemba (Southern Province), and Kalabo, Kaoma and Senanga (Western Province). These branch libraries each have a collection of between 2,000 and 5,000 books. In addition to provincial and branch libraries, the ZLS also has units called library centres at institutions which are run by people who want to read and are loaned a collection of up to 250 books. There are hundreds of library centres in all the country's nine provinces in institutions such as forest stations, refugee camps, prisons and other places.

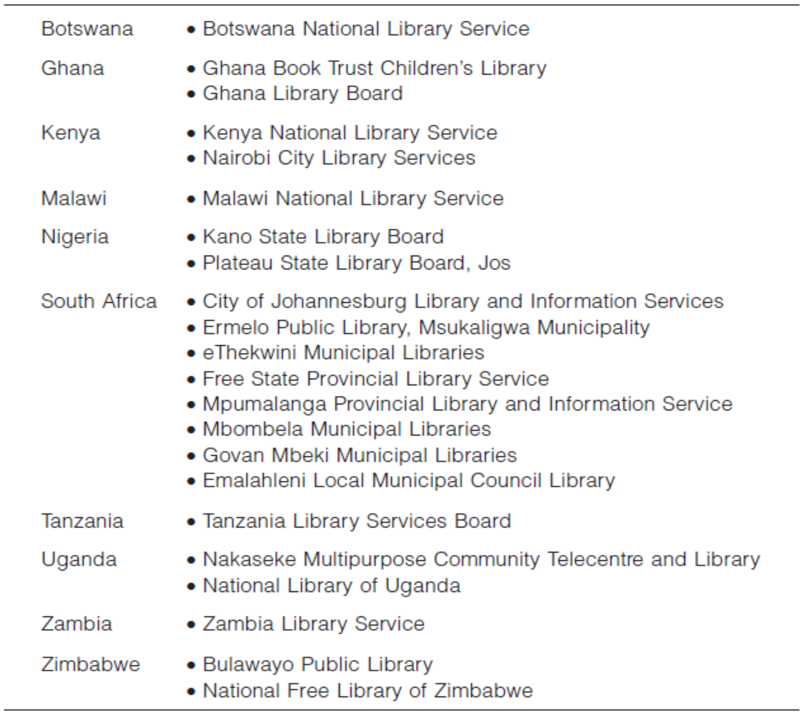
1.3.1 Library Automation.

The Zambia Library Service is not yet automated. However, for quite some time, the ZLS has intended to acquire computers with a view to automating library operations, information storage and retrieval, networking, online access to information, and many other activities.

1.3.2 Barriers to the use of ICTs.

The major barriers to the use of ICTs in the ZLS public library system are insufficient funding from government and a lack of appropriate training of staff. ICT equipment is expensive, making it difficult for ZLS to budget for its purchase from its own funds; for this reason, ZLS has failed to purchase a single computer from its own funds. Although many members of staff are professionally qualified, they lack training in ICT skills.

Below are the public library services which took part in the survey:



Botswana	• Botswana National Library Service
Ghana	• Ghana Book Trust Children's Library • Ghana Library Board
Kenya	• Kenya National Library Service • Nairobi City Library Services
Malawi	• Malawi National Library Service
Nigeria	• Kano State Library Board • Plateau State Library Board, Jos
South Africa	• City of Johannesburg Library and Information Services • Ermelo Public Library, Msukaligwa Municipality • eThekwini Municipal Libraries • Free State Provincial Library Service • Mpumalanga Provincial Library and Information Service • Mbombela Municipal Libraries • Govan Mbeki Municipal Libraries • Emalahleni Local Municipal Council Library
Tanzania	• Tanzania Library Services Board
Uganda	• Nakaseke Multipurpose Community Telecentre and Library • National Library of Uganda
Zambia	• Zambia Library Service
Zimbabwe	• Bulawayo Public Library • National Free Library of Zimbabwe

Figure 1: Public Library Services in Africa.

From the study of the surveys taken and read, it is clear that more automated Library Systems are necessary and so is the use of ICT in Zambian libraries.

1.4 Objectives.

The objective of this project is:

- To design and develop a Library Management System that reliable, scalable, secure, efficient as well as dynamic so that the library processes can be accomplished with great easy.
- To deliver a fully functional system that users will make use of to search for library books.
- To develop a Library Management System that will meet the user requirements fully by 10th May, 2013.

1.5 Organization.

The following is how this project proposal will be organized. The project proposal will be arranged into chapters with each chapter addressing a different part of the project.

1.5.1 Chapter 1 Summary.

This chapter will basically outline the following:

i. The aim of the project.

ii. The scope of the project.

iii. The reason why this project is being done i.e. Justification.

iv. The objectives of the project.

1.5.2 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 after available. The history of how the library systems have developed ever since the 1990s to date. This chapter will also address some new developments in of library systems from 1991 to 2000.

1.5.3 Chapter 3 Summary.

This chapter will outline the methods that are used to develop library system. This chapter will al+*so discuss how the project activities as well as the project deliverables (what we expect as the output of each objective) will be handled. Then in this chapter, the method that will be used to develop this particular Library system will be clearly stated.

1.5.4 Chapter 4 Summary.

This chapter will also discuss how the system was implemented as well as where the testing took place.

1.5.5 Chapter 5 Summary.

This chapter will focus on the conclusion and future works that will be done on the Library Management System.

CHAPTER 2.

2. LITERATURE REVIEW.

2.1 Introduction.

This section discusses the literature review of this project, and introduces some terms relevant to information systems in general. In this section a detailed discussion of existing system that are similar to LMS and the technology that is used in the implementation of LMS are discussed.

2.2 General Overview.

In one of the first papers on library management systems (LMS) in the UK to be published during the review period of 1991-2000, Arfield (1991) describes how the changing economics of computing resulted in staff at Reading University Library wishing to move away from a system shared between various libraries to an integrated library management system under local control. Reading had been a member of the SWALCAP (originally standing for the South Western Academic Libraries Co-operative Automation Project) which had provided shared cataloguing and circulation services to a number of academic libraries in the UK since 1979. However, ageing equipment was becoming increasingly unreliable and staff at Reading felt that the SWALCAP service was unable to cope with the increasing number of terminals that were required for the users.

This situation was replicated in other academic and public libraries at the start of the 1990s and many moved over, or migrated, to integrated library management systems (in Reading's case the LIBS 100 system from CLSI was chosen). Jones (1993), of the House of Lords Library, describes how the decline in the number of customers of the shared services resulted in the decision by SLS (SWALCAP Library Services) to withdraw this service. Following a study undertaken by an external consultant (when it was recommended that a multi-user integrated LMS be chosen) a decision was made to implement the ADVANCE system from the company Geac in the House of Lords. Another reason for libraries choosing to replace their LMS during this period was the fact that some LMSs were not designed to cope with dates in the 2000s –i.e. they were not Year 2000 (or Y2K) compliant.

Many of the integrated LMSs, such as CLSI's LIBS 100 and Geac's ADVANCE, were developed during the 1980s so that by the 1990s these comprised a number of modules to cover the general library housekeeping functions of:

- **Cataloguing** – creating records for material held in the collection.
- **Circulation** – keeping track of who has what item from the collection on loan.
- **Providing access to the catalogue** – via an Online Public Access Catalogue (OPAC).
- **Acquisitions** – selecting and ordering items for the collection and maintaining the accounts.
- **Serials control** –managing the acquisition of serial publications and so dealing with challenges such as claiming for missing issues.
- **Interlibrary lending** – to enable books and serials to be borrowed from different libraries.

Most LMSs are now integrated; i.e. data is only held once by the system and is then used by all the modules and functions. This has an obvious benefit as a search of an OPAC can inform the user as to the number of copies of the title are held, where they are housed, as well as whether or not they are out on loan, and if so when they are likely to be returned.

The libraries of the early 1990s; be they public, university, college, medical, government, legal, industrial, or school, dealt primarily with printed materials such as books, reports, scholarly journals and so on, as well as what were referred to as non-book materials, such as films, videos, tape-slide productions, CD-ROMs and so on. However, by the end of the 1990s the huge impact of the Internet and the World Wide Web meant that staff in libraries increasingly were involved in not just managing the collections housed physically within the four walls of their library building but were also involved in providing access to a vast range of digital information sources of potential relevance to their users which were housed out with the library building. This mixture of providing access to print and digital collections caused some writers, e.g. Oppenheim and Smithson (1999), to refer to the development of the hybrid library.

For staff working in libraries in the early 1990s the LMSs were, for many, their first experiences in using computers. By the end of the 1990s though, following much training in Information and Communications Technology (ICT) as part of the Electronic Libraries Programme (eLib) in the UK's academic libraries (Rusbridge, 1998) and the People's Network in public libraries (Library and Information Commission, 1997) staff became much more familiar with using computer systems. The functionality required by LMSs inevitably evolved during the 1990s and some suppliers kept pace with technological developments whereas others failed. Another development of the 1990s was that many smaller libraries were able to afford to buy LMSs as systems began to cost thousands (or in some cases hundreds) of pounds rather than hundreds of thousands of pounds.

A number of books appeared during the decade providing, inter alia, advice to librarians involved in selecting and managing LMSs. Examples include Clayton with Batt (1992), Harbour (1994), Rowley (1993) (1997) and Tedd (1993). *Managing the Electronic Library* covers a wider area than LMS with 40 contributors, mainly from the UK academic community. The main theme of this book is change and how staffs in university libraries were responding in the 1990s to the rapidly changing higher education system in the UK with its increasing student numbers and greater diversity and requirement for flexibility of access to information. For many libraries the challenge relating to LMS was not necessarily choosing a new system 'from scratch' but migrating from one system to another as described earlier. Muirhead's book (1997) includes a number of case studies written by library staff from a range of different types of library describing their experiences in migration. Muirhead also edited the British version of a book (1998) on planning for library automation which was written in the US.

2.2.1 Some developments in LMS between 1991-2000.

Akeroyd (1999) provides an overview of integrated LMS towards the end of the decade in his introductory paper to a special issue of Vine on LMS in 1999. His developments have been used as a basis for this section although other aspects have also been added.

2.2.2 Technological developments.

Many of the early LMSs used their own specially developed operating systems. However, during the 1990s many suppliers moved to developing systems that ran on the UNIX operating system. Similarly many of the early LMSs were designed around specially developed database management systems. During the 1990s there was a move away from these to industry standard relational database management systems such as Ingres (used by Galaxy 2000), Informix (used by Unicorn), Oracle (used by ALEPH and Olib) and Sybase (used by Horizon and Talis). Another technological development of the 1990s was the adoption of the client-server architecture. In this model a split is made between the applications software (which runs on a computer known as the client) and the database software (which runs on a computer known as the server). The two communicate with each other over a network using a communications protocol (or set of rules). Processing which involves data manipulation or aspects of screen display can be carried out on the client computer and only database queries from the client and responses from the server need to be communicated across the network.

2.2.3 Self-service.

An important development during the 1990s was the installation of self-issue and self-renewal machines in libraries so that users can issue and return their own books. The library at the University of Sunderland was one of the first to use machines from the 3M Company for this purpose. Stafford (1996) describes this service and highlights the four Ps (preparation, publicity, position and persuasion) necessary for a successful implementation. In 1996 a conference was held at Sunderland on self-issue systems and its proceedings (1997) contain a number of case studies. A special issue of *Vine* was published in 1997 on self-service in libraries and Cookman (1997) describes the introduction of a 3M self-issue terminal at Maidenhead public library. The general experience was that library staff accepted the benefits of the new terminal and that on busy days queues had reduced noticeably. However, when the issue desk was quiet it appeared that users preferred the human approach to issuing and returning materials.

2.2.4 Messages to users by e-mail or text.

With many users having access to e-mail and/or mobile telephones some LMS have incorporated the facility to use these technologies for sending overdue notices, alerts for reserved items or other communications. Sudell and Robinson (1999) note that the reader record in the ALEPH 500 system at KCL can hold a variety of addresses. If an e-mail address is entered then that will be first in line, if not the system can handle multiple postal addresses so that an appropriate address may be used depending on whether it is term time or vacation.

2.2.5 Catalogue record provision.

Most LMS allow for original cataloguing of bibliographic records as well as for allowing the import of, usually MARC, records from external sources. Although not all LMSs use the MARC record for internal processing of records they usually do include the ability to input or output records in this format. The early UK co-operatives of BLCMP and SWALCAP developed large databases of MARC records which proved valuable to the cataloguers of their respective member libraries. Many of these records have now been incorporated into the OCLC database in the US and made available internationally. Retrospective cataloguing of materials held in libraries continues and Bryant’s report (1997) outlines the issues, opportunities and need for a national strategy in this area.

2.3 Some final thoughts.

Inevitably there have been many changes and developments related to the provision and availability of library management systems during the 1990s. Much appeared in the literature on experiences of libraries in choosing and implementing particular LMSs. One aspect that was promised in LMSs and that probably was not used greatly during the 1990s was the management information delivered from LMS. By the end of the 1990s some LMSs incorporated interfaces to standard tools such as Microsoft's Excel for the presentation of statistical data.

During the 1990s there was an almost total lack of reporting on ways of evaluating LMSs once they had been installed. Given the large amounts of resources, in terms of time and money, invested in procuring LMSs it is perhaps surprising that libraries have not carried out a post-implementation review, although there may well be reasons for this including, for instance:

- No-one requested it.
- Not enough time.
- No money.
- No suitable staff to carry out the evaluation
- Fear of drawing attention to an LMS's defects soon after large amounts of time, money and collective energy has been expended.
- Lack of a baseline for comparison of improved service.

However, there are many reasons why a post-implementation evaluation of an LMS should take place. Such reasons include to:

- Determine if the broader goals of the library are being met by the LMS.
- Determine if the particular goals of implementing the LMS have been met.
- Determine if the system as delivered satisfies the contract.
- Enable others to learn from the experience.

- Provide an account to the funding body of the money spent on the LMS.
- Investigate complaints from the staff or users about the system.
- Establish a benchmark showing at what level of performance the LMS is operating.

Akeroyd (1996) concluded his overview of LMSs with a description of some of the functionality required by future systems and which were beginning to be investigated in some research projects at the end of the 1990s. These included:

- The integration of multiple sources and systems, both of bibliographic information and the full-text of documents.
- The simplification of access to sources.
- The personalization of systems.
- A change in the way that software is created and maintained.

CHAPTER 3.

3. METHODOLOGY.

3.1 Introduction.

The purpose of this chapter is to propose a methodology for implementing effectively library management system projects. 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 will describe the Waterfall Methodology for information system development in terms of organization design, and its use in project management. After examining this methodology, I will then propose 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.

3.2.3 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.

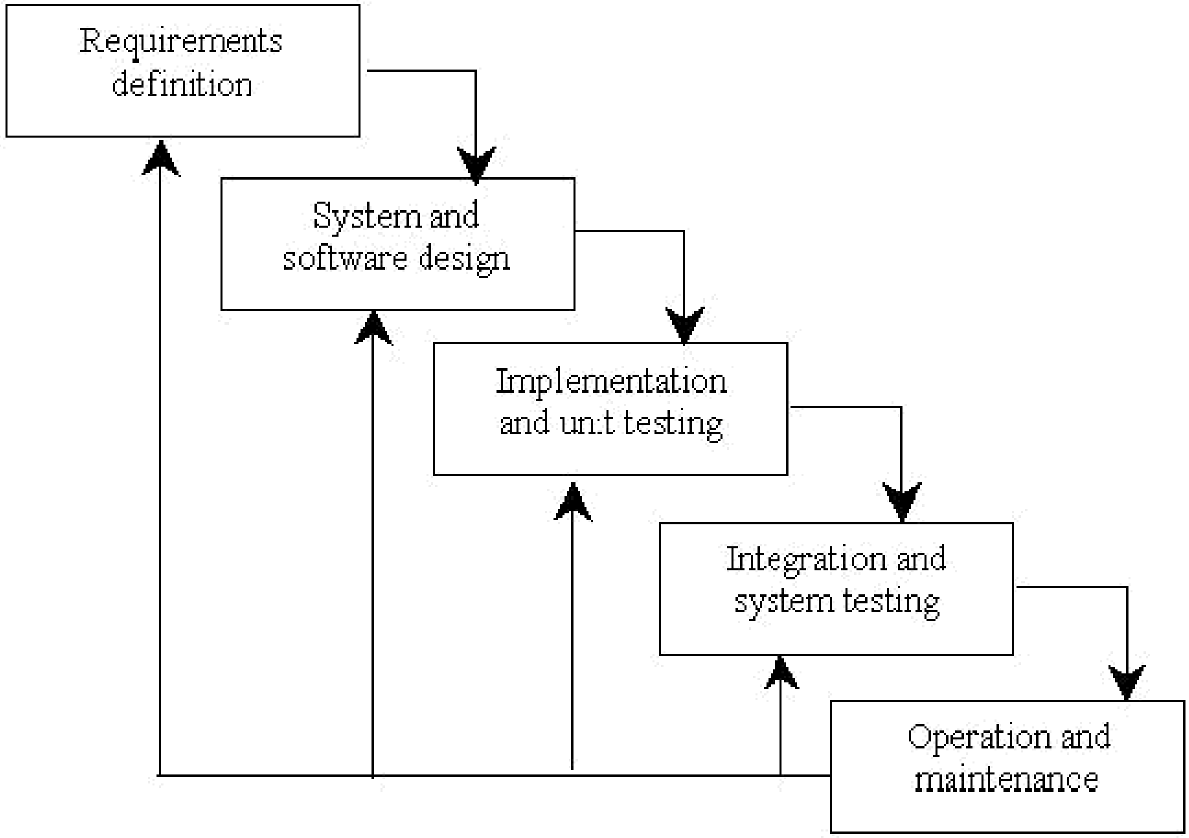

Requirements definition
System and software design
Implementation and unit testing
Integration and system testing
Operation and maintenance

Figure 2: The Waterfall Model - Inter-University Institute of Macau (Thota Neena Jawaharlal 2001)

3.3 Advantages.

- Simple and easy to use.
- Easy to manage due to the rigidity of the model – each phase has specific deliverables and a review process.
- Phases are processed and completed one at a time.
- Works well for smaller projects where requirements are very well understood or stable.

3.4 Disadvantages.

- It's difficult to respond to changing customer requirements.
- Adjusting scope during the life cycle can kill a project.
- No working software is produced until late during the life cycle.
- High amounts of risk and uncertainty.
- Poor model for complex and object-oriented projects.
- Poor model for long run and ongoing projects.

3.5 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:

- ❖ Initiating processes which focus on gaining authorization of a project or one of its phases.
- ❖ Planning processes that define objectives and select courses of action that will be used to effect project goals.
- ❖ Executing processes used to coordinate activities, staff, and other resources in order to put the plan into action.
- ❖ 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.

3.6 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 an 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 followers. 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 (p. 12).

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 are 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 has to be done in order to establish why scholars are not taking advantage of project management methods in the academy.

3.7 <u>Utilities to be used to develop the System.</u>

❖ Development Language

✓ Structured and Object-Oriented PHP Language.

❖ Database Management Tool:

✓ MySQL Database.

❖ Development Platform:

✓ NetBeans IDE 7.0.1.

✓ Visual Paradigm for UML 8.3 Community Edition.

❖ Graphic Usual Interface Tools:

✓ Adobe Photoshop CS6.

✓ Gimp 8.02.

CHAPTER 4.

4. IMPLEMENTATION.

4.1 Introduction.

This chapter explains in detail the implementation of the LMS system in MySQL Database. It describes in details the tables which were created the purpose of each table. It also defines some of the implemented user interfaces of the Library Management System.

4.2 Requirements Specification.

4.2.1 Functional Requirements.

Functional requirements define a function of a software system or its component. A function is described as a set of inputs, the behavior, and outputs. Functional requirements may be calculations, technical details, data manipulation and processing and other specific functionality that define what a system is supposed to accomplish (Wiegers & Karl, 2003).

The Library Management System is required to do the following functional requirements:

- ❖ A non-registered user must be able to search for a book in the library system.
- ❖ The Library Patron must be able to add, edit and delete a book in the library system.
- ❖ The Library Patron must be able to search for a book from the library system.
- ❖ The Library Patron must be able to add, edit or delete a new user of the system.
- ❖ The system must be able to produce a Charge to a user for a book which is overdue according to the number of days after the Due Date.

❖ The Library Management System must be able to distinguish between a Patron and a User at Login and must therefore redirect each person to the appropriate page.

- The system must be able to validate that the details entered where required for the Patron or User to enter is valid.
- The system must populate the Due date automatically by adding a specified number of day(s) to the current date **e.g. 7 days**.
- Cataloging of the books in the Library System.
- The system user must be able to edit their own personal details when they login into the system as user.
- The system user must be able to change their personal password when they login into the system as user.
- The system must be able to produce reports which will be used for analysis when needed to by the Library Patrons.

4.2.2 Non-functional Requirements.

Non-functional requirements are requirements that specify criteria that can be used to judge the operation of a system, rather than specific behaviors. The plan for implementing non-functional requirements is detailed in the system architecture (Wiegers & Karl, 2003). Non-requirements can be divided into two main categories:

- Execution qualities, such as security and usability, which are observable at run time.
- Evolution qualities, such as testability, maintainability, extensibility and scalability, which are embodied in the static structure of the software system (Wiegers & Karl, 2003).

For this Library Management System, there are no non-functional requirements described.

4.2.3 Hardware Requirements.

The Library Management System should be able to work on computer with the following system specifications:

- **OS**: Windows 2000/ XP/ Vista/ 7/ 8, Windows 2003 Server compatible.
- **CPU**: Pentium III (700MHz) and above for Windows Vista/ 7/ 8 to operate correctly.
- **Memory**: 128 MB and above. For Windows Vista or above; at least 512MB minimum.
- **Capacity**: 20 GB of hard drive. At least 40GB for Windows Vista and above.
- **Others**: Keyboard, Mouse, Monitor and a Network interface Card.

4.2.4 Performance Requirements.

The server will be running at all times, therefore making the system available to users all the time. The system must also try as much as possible to be able to accept requests from many users and should be able to have more users logged at the same time without reducing in performance.

4.3 System and Software Design.

4.3.1 System Actors.

This system has three types of actors, namely the **Admin**, **Patron** and the **User**.

Actor	Description
Administrator	The Admin is responsible for adding, deleting and editing a book in the library system. They are also responsible for registering new patrons and new users into the system as well as edit and deleting them.
Patron	The Patron is responsible for adding, deleting and editing a book in the library system. They are also responsible for registering new users into the system as well as edit and deleting a user. The patron also does the issuing and returning

	process of a book.
User	The User of the system is one who borrows and returns a book to the library. They can also edit there personal details as well as be able to see the book they owe the library.

Table 1: The Library Management System Actors.

4.3.2 Use Cases.

Use Case	Description	Actor
Add Book	Adding a new book to the library system.	Admin & Patron
Delete Book	Deleting a book from the system.	Admin & Patron
Edit Book	Editing of a library book and then saving it with the new details.	Admin & Patron
Add User	Adding a new user into the library system and so doing an account is also opened.	Admin & Patron
Edit User	Editing of a library book and then saving it with the new details.	Admin & Patron
Delete User	Deleting a user from the library management system.	Admin & Patron
Issue Book	Issuing a library book to a user who has borrowed that particular book.	Patron
Return Book	Enter back the library book into the library system.	Patron
Edit Personal Details	Editing your personal details and saving them when you are finished	User

Add Patron	Adding a new Patron to the library system.	Admin
Generate Report	Generate a report for a particular Category e.g. User Table, Accounts etc.	Admin & Patron
Generate Charge	Generate a charge if any for a particular book in the system	Patron
Search Book	Search for a book in the library system.	Admin, Patron & User
Delete Patron	Deleting A Patron from the system	Admin
Edit Patron	Editing a Patron who is in the library system	Admin

Table 2: The Library Management System Use Case Descriptions.

4.3.3 Use Cases Conditions.

Use Case	Pre-Condition	Post-Condition
Add Book	Book must be nonexistent in the system.	Book information is now available in the system.
Delete Book	Book must be existent in the system.	Book has been removed from the list of books.
Edit Book	Book must be existent in the system.	Book information successfully updated.
Add User	User must be nonexistent in the system.	User information is now available in the system.
Edit User	User must be existent in the system.	User information successfully updated.
Delete User	User must be existent in the system.	User has been removed from the list of users.

Issue Book	Book must be existent in the system.	Book is not available in the system.
Return Book	Book must be issued from the system.	Book is now available in the system.
Edit Personal Details	User must be registered and logged into the system.	User information successfully updated.
Add Patron	Patron must be nonexistent in the system.	Patron information is now available in the system.
Generate Report	Book and User information must be existent in the system.	Reports now generate and available for viewing.
Generate Charge	Patron must be registered and logged into the system.	Patron now able to be generate a charge
Search Book	Book must be existent in the system.	Book information will be displayed
Delete Patron	Patron must be existent in the system.	Patron has been removed from the list
Edit Patron	Patron must be existent in the system.	Patron information successfully updated.

Table 3: The Library Management System Use Case Conditions.

4.3.4 Use Case Diagrams.

4.3.4.1 Administrator Use Cases.

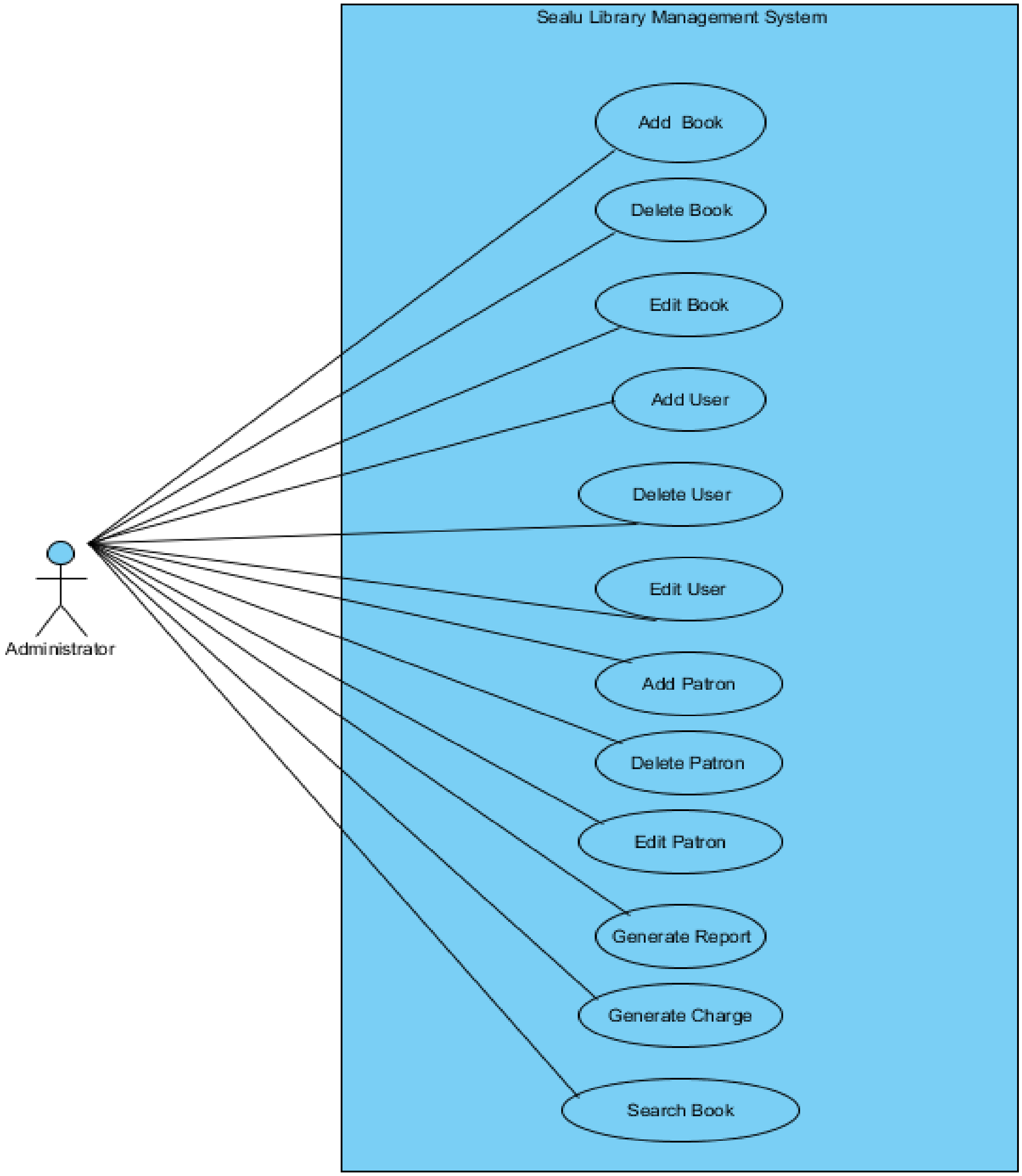


Figure 3: The Use Cases for the Administrator of the system.

4.3.4.2 Patron Use Cases.

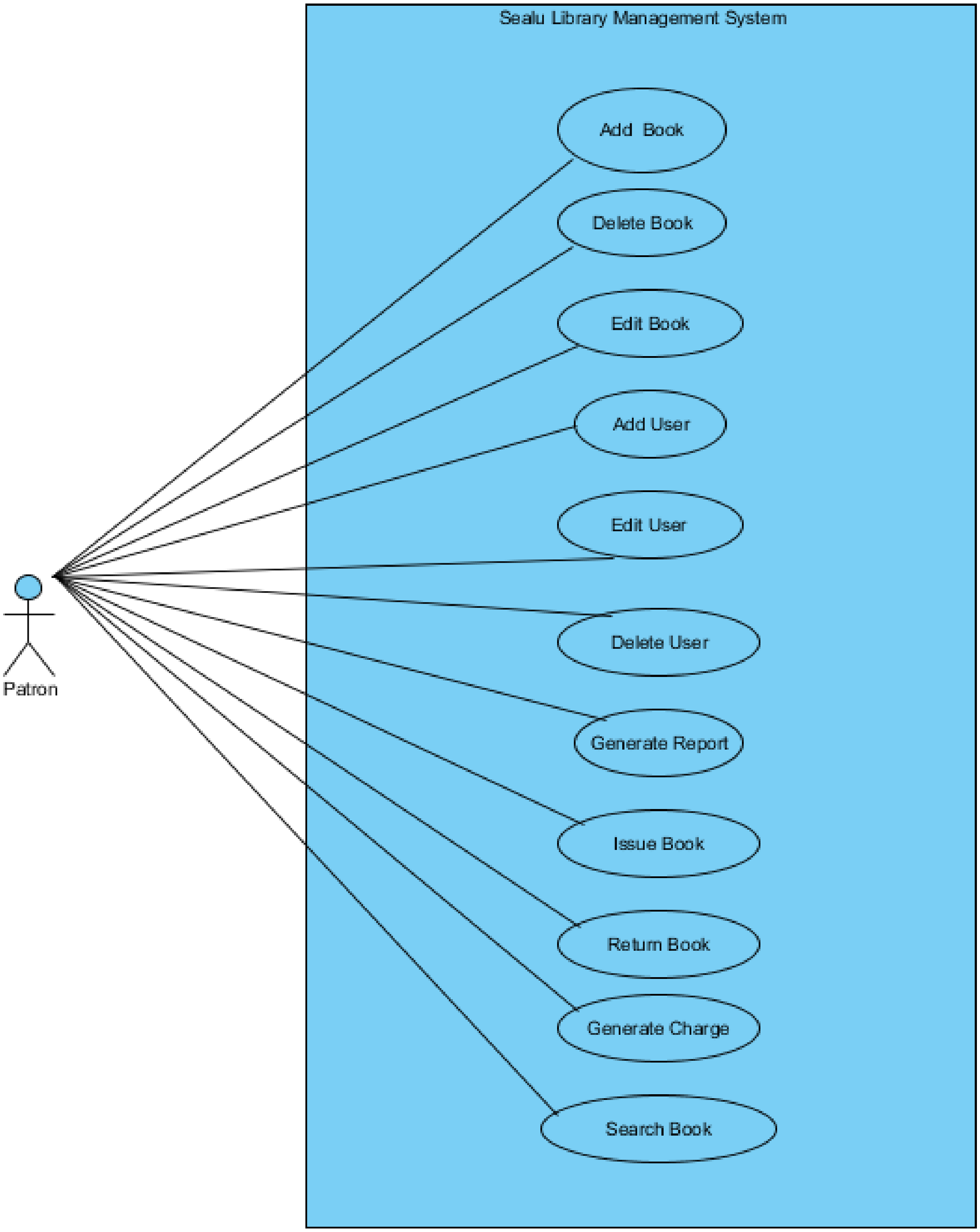


Figure 4: The Use Cases for the Patron of the system.

4.3.4.3 User Use Cases.

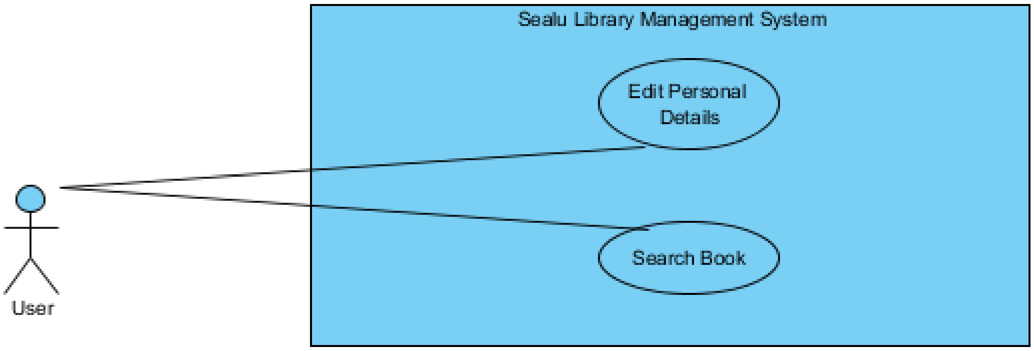


Figure 5: The Use Cases for the User of the system.

4.3.5 Relational Schema.

- Account_tb (*id**, Accno, Total_Limit, Books_Left, Status, ***UserId***)
- Book_tb (*id**, Bno, ISBN, Category, Name, Author, Publisher, Edition, Bstatus)
- Issue_return_tb (*id**, Bno, fName, Issue_date, Due_date, Return_date, Charge, **UserId**, ***BookId***)
- User_tb (*id**, username, password, user_type, Name, Gender, Email, Address, Telephone)

Note:

- ✓ The primary keys are the ones which are in italics, underlined and have an asterisk.
- ✓ The foreign keys are the ones which are in bold and italics.

4.3.6 Entity Relationship Diagram (ERD).

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.

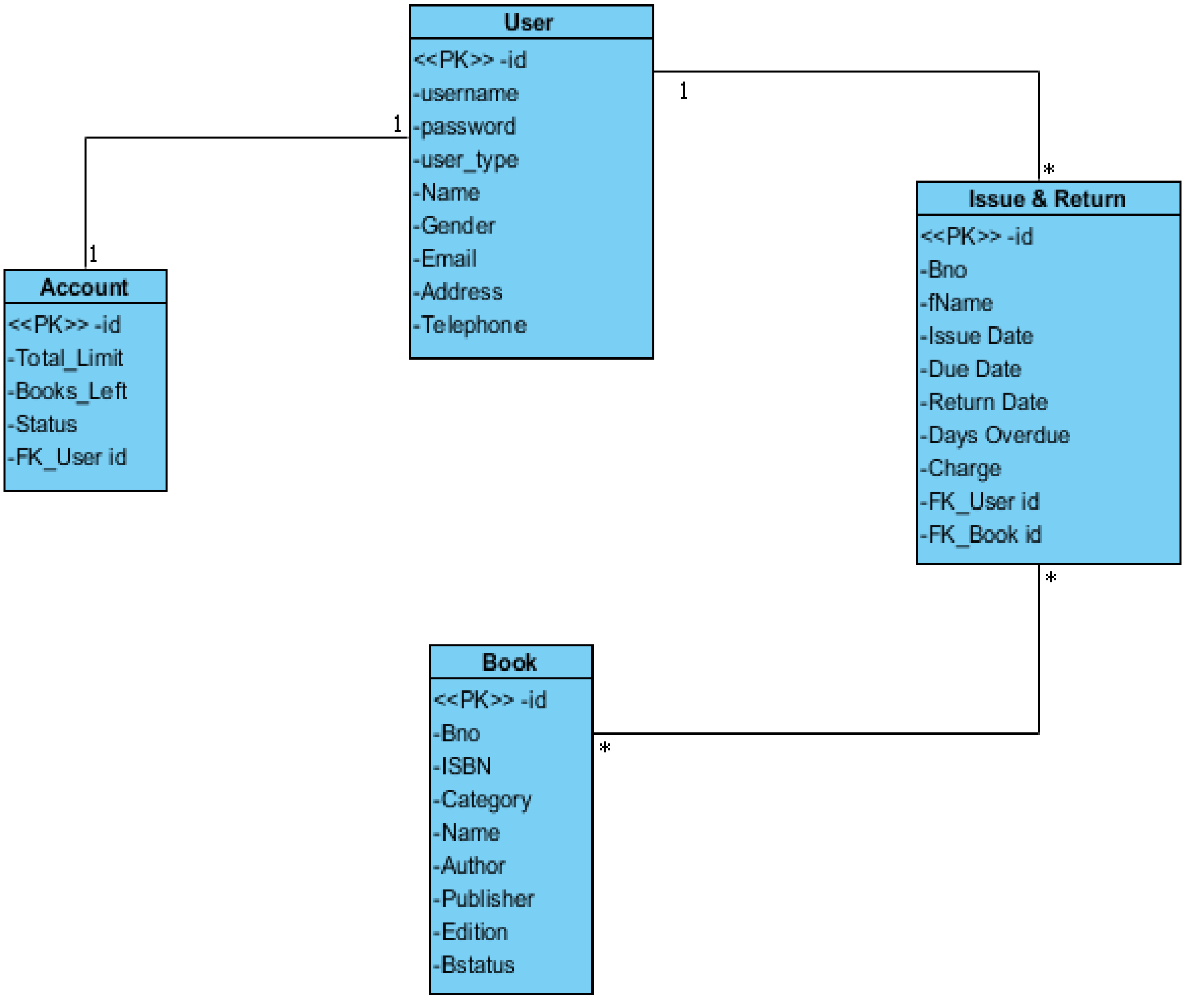


Figure 6: The ERD Diagram of the system.

4.3.7 Database Design.

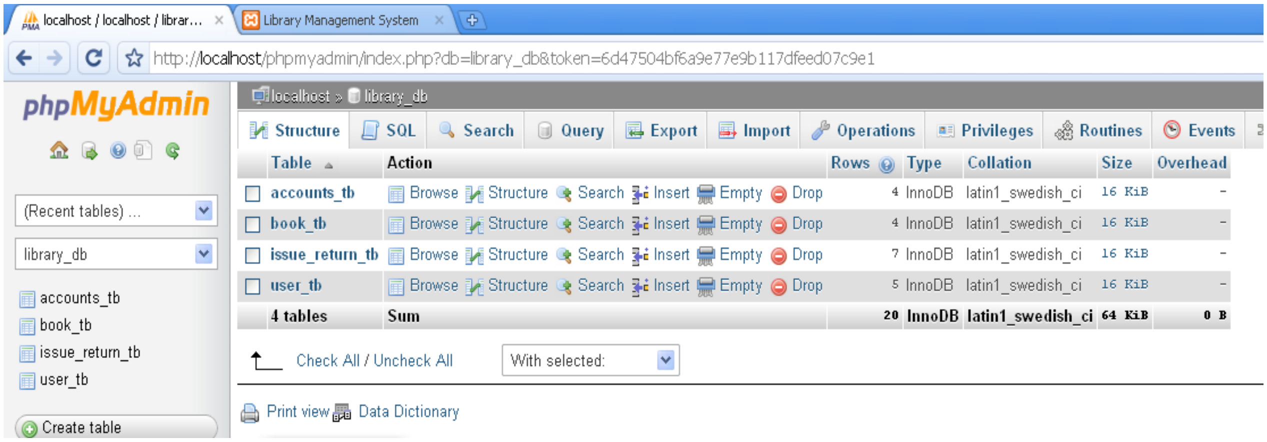


Table	Action	Rows	Type	Collation	Size	Overhead
accounts_tb	Browse Structure Search Insert Empty Drop	4	InnoDB	latin1_swedish_ci	16 KiB	-
book_tb	Browse Structure Search Insert Empty Drop	4	InnoDB	latin1_swedish_ci	16 KiB	-
issue_return_tb	Browse Structure Search Insert Empty Drop	7	InnoDB	latin1_swedish_ci	16 KiB	-
user_tb	Browse Structure Search Insert Empty Drop	5	InnoDB	latin1_swedish_ci	16 KiB	-
4 tables	Sum	20	InnoDB	latin1_swedish_ci	64 KiB	0 B

Figure 7: The Database Design of the Library Management system.

The database has been implemented and designed using MySQL Database. The name of the database is **library_db** and contains four (4) tables.

4.3.8 Class Diagram.

The class diagram below shows the **databaseObject** class which is a super class for the **account, book, issue** and **User** classes.

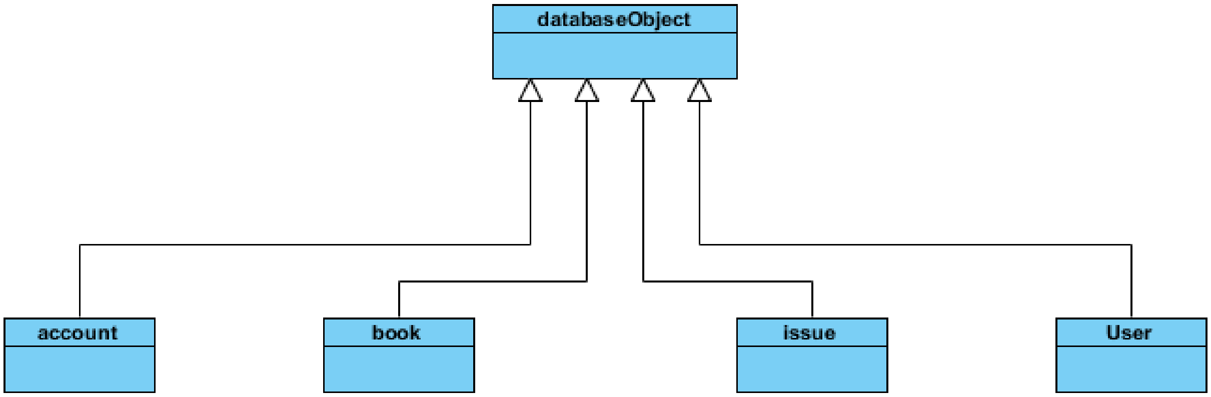


Figure 8: The Class Diagram of the system.

4.3.9 3-Tier Deployment Diagram.

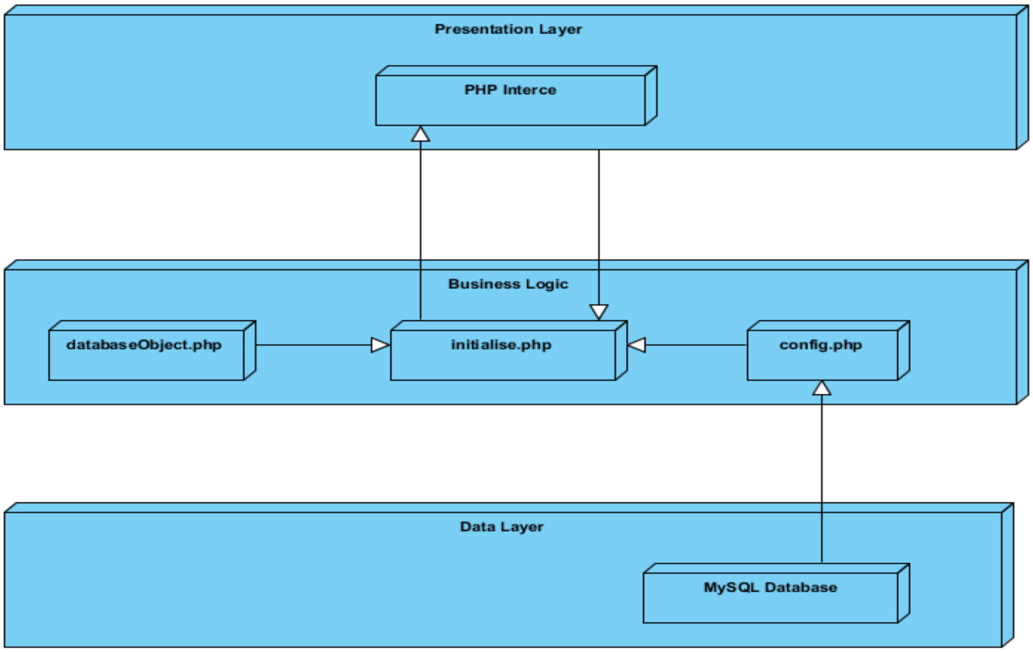


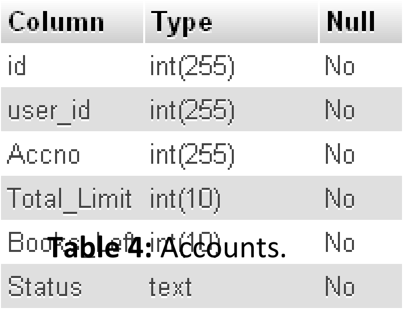
Figure 9: The 3-Tier Deployment Diagram of the system.

4.4 Implementation and Testing.

4.4.1 Database Tables.

❖ **Accounts Table.**

The name of this table is **accounts_tb** and the purpose of this table is to contain the Account Details of the system users when there are registered for the first time. The fields in this table are the Account Number, Total Book Limit, Books Left to reach limit and the status of the Account Holder, whether he or she owes the library a book(s) or not.

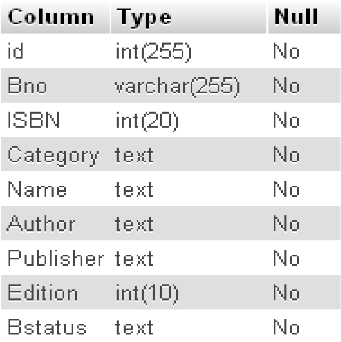


Column	Type	Null
id	int(255)	No
user_id	int(255)	No
Accno	int(255)	No
Total_Limit	int(10)	No
Books_Left	int(10)	No
Status	text	No

Table 4: Accounts.

❖ **Books Table.**

The name of this table is **books_tb** and the purpose of this table is to contain the details of the books that will be in the Library Management System.

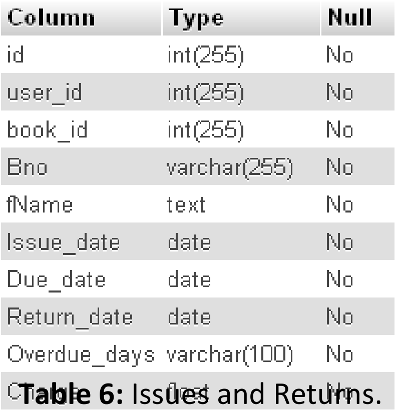


Column	Type	Null
id	int(255)	No
Bno	varchar(255)	No
ISBN	int(20)	No
Category	text	No
Name	text	No
Author	text	No
Publisher	text	No
Edition	int(10)	No
Bstatus	text	No

Table 5: Books.

- **Issue and Return Table.**

The name of this table is **issue_return_tb** and the purpose of this table is to contain the details of the books which are borrowed from the library as well as returned to the library.

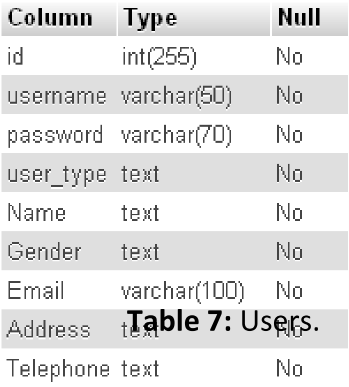


Column	Type	Null
id	int(255)	No
user_id	int(255)	No
book_id	int(255)	No
Bno	varchar(255)	No
fName	text	No
Issue_date	date	No
Due_date	date	No
Return_date	date	No
Overdue_days	varchar(100)	No
Charge	float	No

Table 6: Issues and Returns.

- **User Table.**

The name of this table is **user_tb** and the purpose of this table is to contain the details of the users of the Library Management System. Tis table has fileds such as the username and password to be used to login into the system by the user. The user type is a filed which contains types of users whether an **Admin**, **Patron** or just a **User.** The user's **Name, Gender, Email, Address and Telephone** are the fields.



Column	Type	Null
id	int(255)	No
username	varchar(50)	No
password	varchar(70)	No
user_type	text	No
Name	text	No
Gender	text	No
Email	varchar(100)	No
Address	text	No
Telephone	text	No

Table 7: Users.

4.4.2 Programming the System.

This section describes the programming involved in developing this system and the interfaces. The system's interfaces are simply abstractions that show how the system works with the users. Below are the interfaces that will be seen and used in the Library Management System. The system has a public section of it, where a user can just search for a book they what and are allowed only to use that particular book within the library. The system also has a login interface to the system which enables users to provide their details for authentication before allowing them to enter the system on condition that you are an authorized system user. The system has functions which authenticate users according to what type of user they are. The codes for the interfaces are added in the appendix.

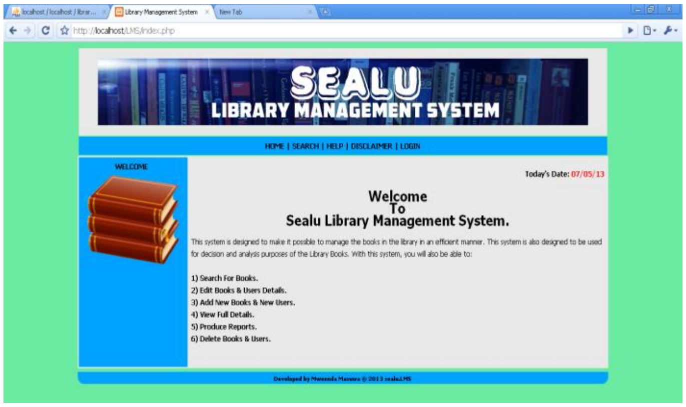
4.4.3 The User Interfaces of the System.

❖ **Welcome Page**.

The welcome page is the first page that opens when the system is

launched. There is a menu at the top of the page just under the picture.

There is also today's date displayed on the right of the page.


localhost / localhost / librar...
Library Management System
New Tab
http://localhost/LMS/index.php
SEALU
LIBRARY MANAGEMENT SYSTEM
HOME | SEARCH | HELP | DISCLAIMER | LOGIN
WELCOME

Today's Date: 07/05/13

Welcome
To
Sealu Library Management System.

This system is designed to make it possible to manage the books in the library in an efficient manner. This system is also designed to be used for decision and analysis purposes of the Library Books. With this system, you will also be able to:

1) Search For Books.
2) Edit Books & Users Details.
3) Add New Books & New Users.
4) View Full Details.
5) Produce Reports.
6) Delete Books & Users.

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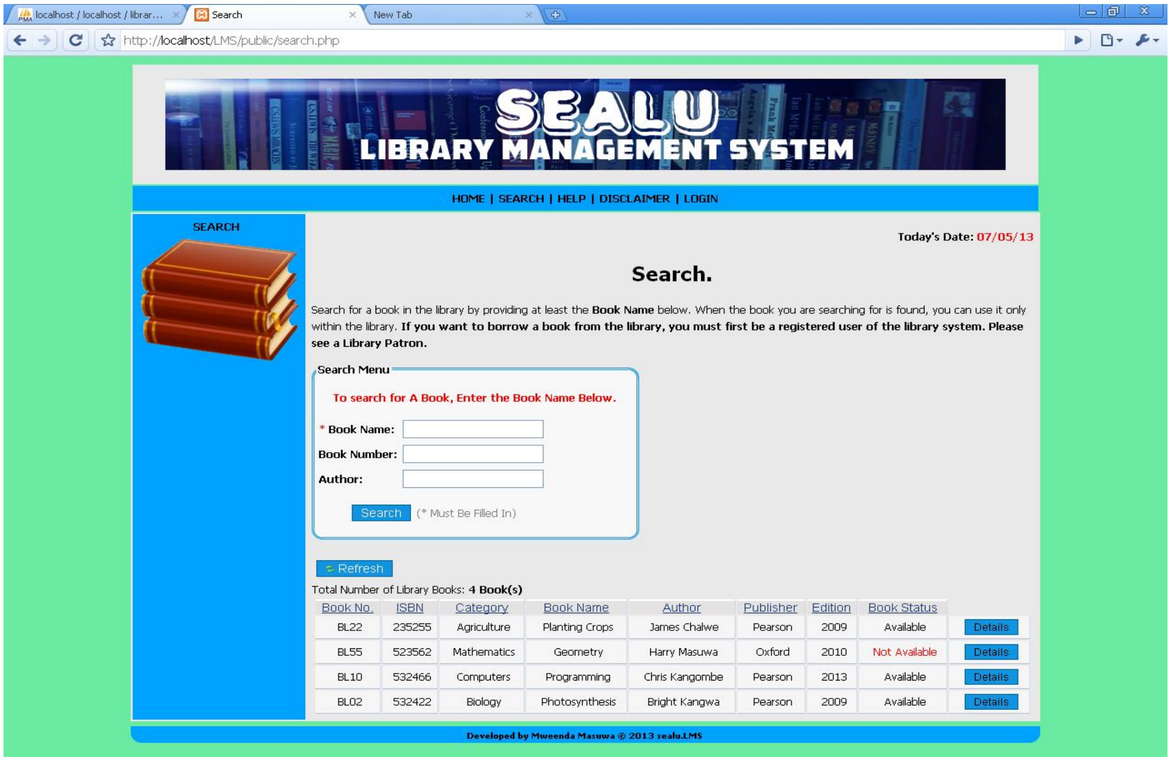
Figure 10: The system Welcome Page.

❖ **Pubic Search Page.**

The search page is a page where the user can search for a book in the library but if they user wants to borrow the book, they have to be a registered user. The registration is done by a Library Patron. On this page the user can also view the full details of a book. For a user to search for a book, they must provide the Name of the Book (mandatory), the Book Number (optional) and the author (optional).


localhost / localhost / librar...
Search
New Tab
http://localhost/LMS/public/search.php
SEALU
LIBRARY MANAGEMENT SYSTEM
HOME | SEARCH | HELP | DISCLAIMER | LOGIN
SEARCH

Today's Date: 07/05/13

Search.

Search for a book in the library by providing at least the **Book Name** below. When the book you are searching for is found, you can use it only within the library. **If you want to borrow a book from the library, you must first be a registered user of the library system. Please see a Library Patron.**

Search Menu

To search for A Book, Enter the Book Name Below.

* Book Name:

Book Number:

Author:

Search (* Must Be Filled In)

Refresh

Total Number of Library Books: **4 Book(s)**

Book No.	ISBN	Category	Book Name	Author	Publisher	Edition	Book Status	
BL22	235255	Agriculture	Planting Crops	James Chalwe	Pearson	2009	Available	Details
BL55	523562	Mathematics	Geometry	Harry Masuwa	Oxford	2010	Not Available	Details
BL10	532466	Computers	Programming	Chris Kangombe	Pearson	2013	Available	Details
BL02	532422	Biology	Photosynthesis	Bright Kangwa	Pearson	2009	Available	Details

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Figure 11: The System Search Page.

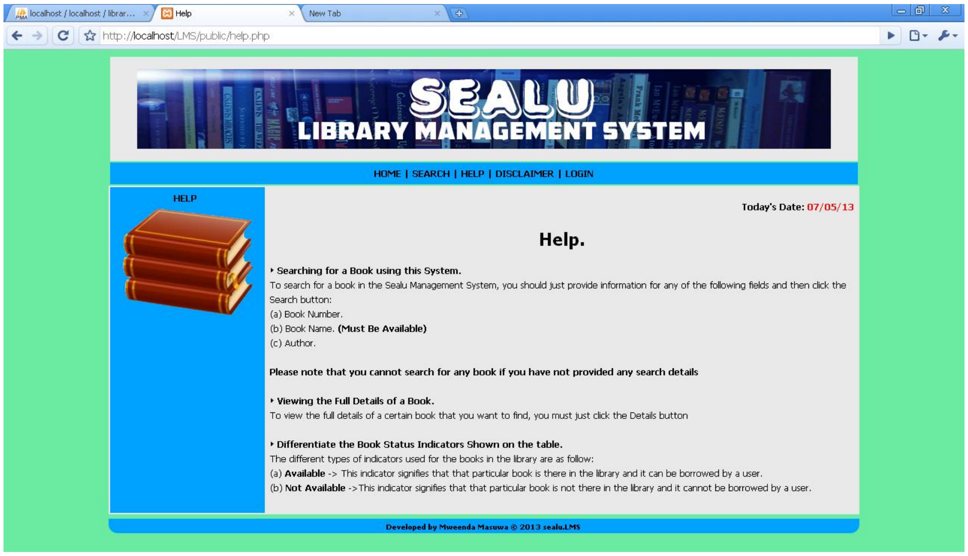
❖ **Help Page.**

The help interface describes how the system should be used by a person who is not familiar with the operations involved. The help page contains details such as the following:

- ✓ Searching for a Book using the System
- ✓ Viewing the full details of a particular book in the library system.

Differentiating the different type of book status:

- Available.
- Not Available.


localhost / localhost / librar...
Help
New Tab
http://localhost/LMS/public/help.php
SEALU
LIBRARY MANAGEMENT SYSTEM
HOME | SEARCH | HELP | DISCLAIMER | LOGIN
HELP

Today's Date: 07/05/13

Help.

Searching for a Book using this System.
To search for a book in the Sealu Management System, you should just provide information for any of the following fields and then click the Search button:
(a) Book Number.
(b) Book Name. **(Must Be Available)**
(c) Author.

Please note that you cannot search for any book if you have not provided any search details

Viewing the Full Details of a Book.
To view the full details of a certain book that you want to find, you must just click the Details button

Differentiate the Book Status Indicators Shown on the table.
The different types of indicators used for the books in the library are as follow:
(a) **Available** -> This indicator signifies that that particular book is there in the library and it can be borrowed by a user.
(b) **Not Available** ->This indicator signifies that that particular book is not there in the library and it cannot be borrowed by a user.

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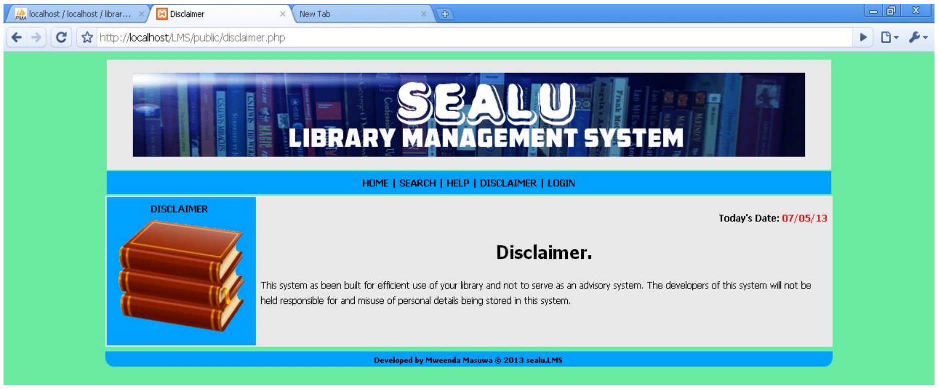
Figure 12: The Help Page.

- **Disclaimer.**

The disclaimer interface describes what the system has been designed and developed for.


localhost / localhost / librar...
Disclaimer
New Tab
http://localhost/LMS/public/disclaimer.php
SEALU
LIBRARY MANAGEMENT SYSTEM
HOME | SEARCH | HELP | DISCLAIMER | LOGIN
DISCLAIMER

Today's Date: 07/05/13

Disclaimer.

This system as been built for efficient use of your library and not to serve as an advisory system. The developers of this system will not be held responsible for and misuse of personal details being stored in this system.

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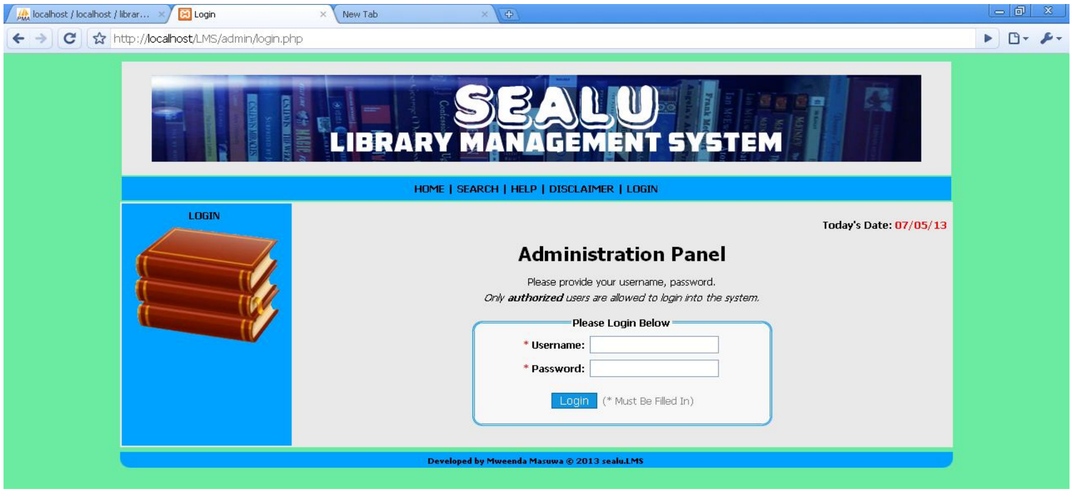
Figure 13: The System Disclaimer Page.

- **Login Page.**

The login interface allows user to login to the system. Once the user logs in, according to the privileges, the user will be redirected to the appropriate pages. This also allows the system to be secure in that users can't see what the administrator can see or what the patron sees. The login process has a authentication mechanism were is has to check if the user is authorized to login into the system.


localhost / localhost / librar...
Login
New Tab
http://localhost/LMS/admin/login.php
SEALU
LIBRARY MANAGEMENT SYSTEM
HOME | SEARCH | HELP | DISCLAIMER | LOGIN
LOGIN

Today's Date: 07/05/13

Administration Panel

Please provide your username, password.
*Only **authorized** users are allowed to login into the system.*

Please Login Below

* Username:

* Password:

Login (* Must Be Filled In)

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Figure 14: The Login interface.

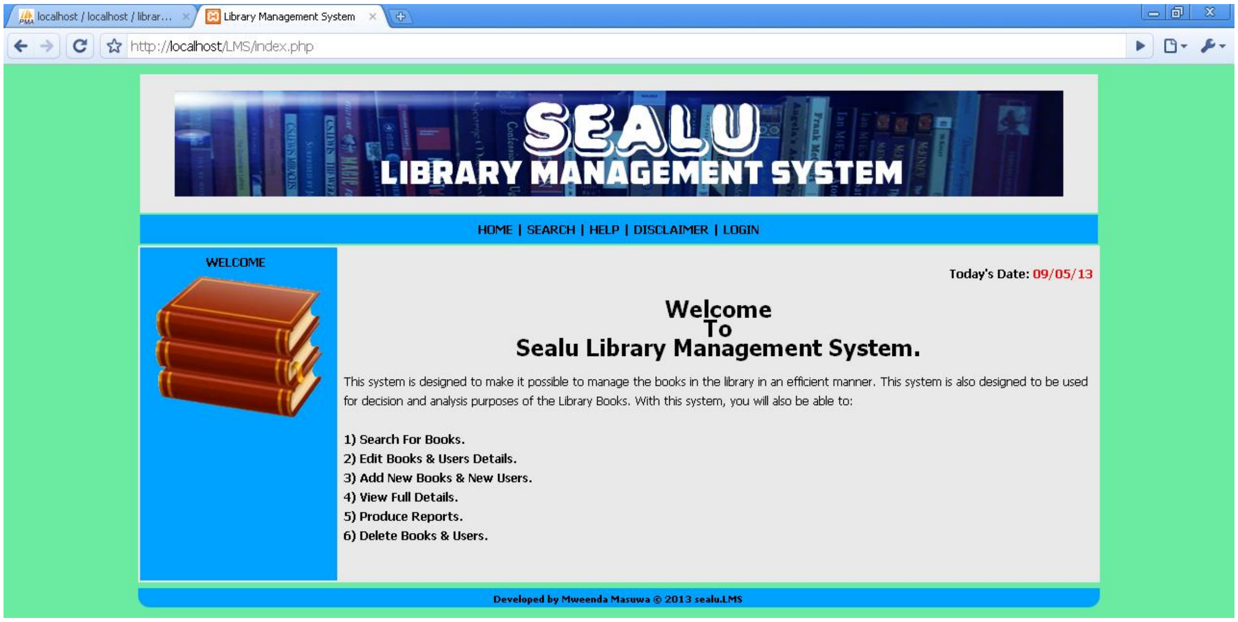
4.5 Testing.

This part of the project will focus on testing of the library management system so that it is available, reliable, secure, portable, efficient system. Testing of system before handing it over to the user is very important so that because if any errors are discovered, they can be solved immediately. Testing is important so that a developer is able to know how a system will performance when the volume has increased as well as the number of users accessing the system increases. The system testing will also test issues of usability to make sure that the system allows users to access the system from the

Internet using HTML or it's derivative technologies. The testing approach used is the Bottom-Top Approach.

- **Integration Testing.**

This is testing that seeks to verify the interfaces between components against a software design. Software components may be integrated in an iterative way or all together (big bang). Integration testing was done on the library system and it was successful. The figure below shows this:


localhost / localhost / librar...
Library Management System
http://localhost/LMS/index.php
SEALU
LIBRARY MANAGEMENT SYSTEM
HOME | SEARCH | HELP | DISCLAIMER | LOGIN
WELCOME

Today's Date: 09/05/13

Welcome
To
Sealu Library Management System.

This system is designed to make it possible to manage the books in the library in an efficient manner. This system is also designed to be used for decision and analysis purposes of the Library Books. With this system, you will also be able to:

1) Search For Books.
2) Edit Books & Users Details.
3) Add New Books & New Users.
4) View Full Details.
5) Produce Reports.
6) Delete Books & Users.

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Figure 15: The Library Management System Welcome Interface.

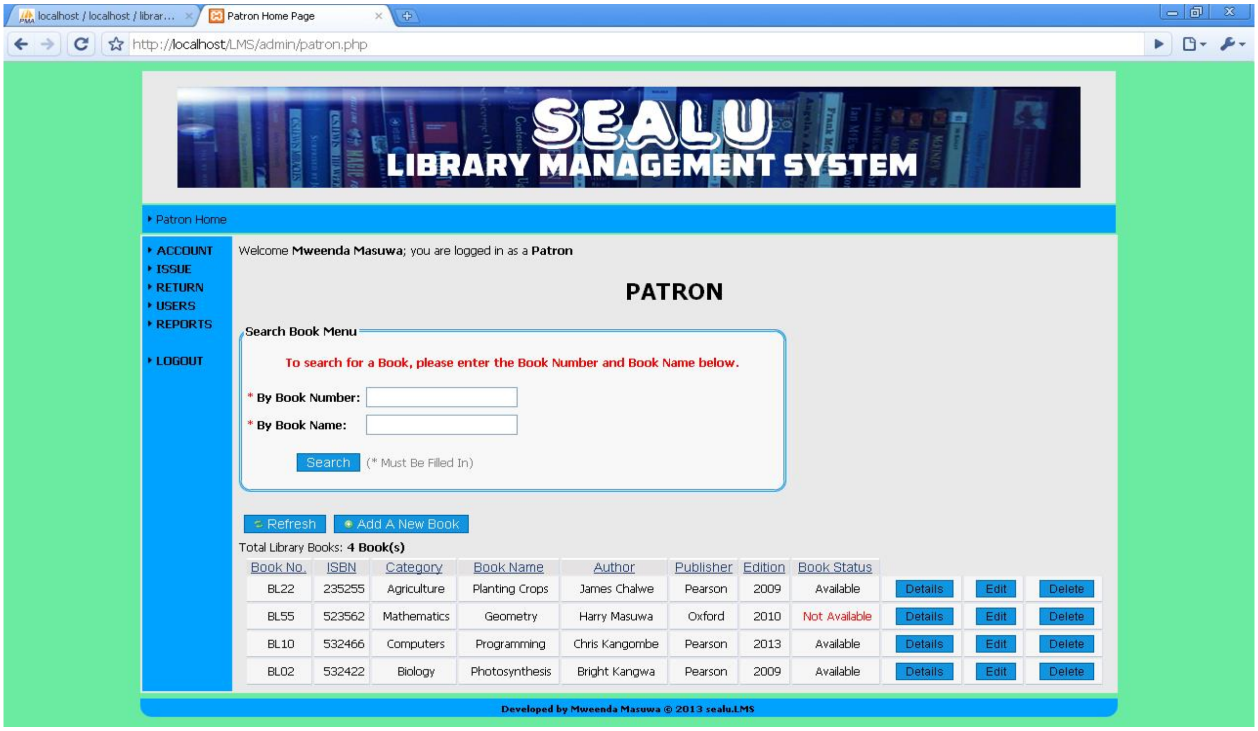
The figure above clearly shows that integration of the system was implemented properly without any errors and all the modules are working as expected.

- **Functional Testing.**

This is testing the system against the requirements the system has to achieve when fully implemented. The system was tested for functional requirements and worked accordingly as well as produced the required result. The following test cases were done on the system just to test the functionality.

- **Test Case 1**-The process of login into the system (Security Testing).

Expected Result: If the user login the correct credentials on the page, they will be redirected to the appropriate page.


localhost / localhost / librar...
Patron Home Page
http://localhost/LMS/admin/patron.php
SEALU
LIBRARY MANAGEMENT SYSTEM
Patron Home
ACCOUNT
ISSUE
RETURN
USERS
REPORTS
LOGOUT
Search
Refresh
Add A New Book

Welcome **Mweenda Masuwa**; you are logged in as a **Patron**

PATRON

Search Book Menu

To search for a Book, please enter the Book Number and Book Name below.

* By Book Number:

* By Book Name:

(* Must Be Filled In)

Total Library Books: **4 Book(s)**

Book No.	ISBN	Category	Book Name	Author	Publisher	Edition	Book Status			
BL22	235255	Agriculture	Planting Crops	James Chalwe	Pearson	2009	Available	Details	Edit	Delete
BL55	523562	Mathematics	Geometry	Harry Masuwa	Oxford	2010	Not Available	Details	Edit	Delete
BL10	532466	Computers	Programming	Chris Kangombe	Pearson	2013	Available	Details	Edit	Delete
BL02	532422	Biology	Photosynthesis	Bright Kangwa	Pearson	2009	Available	Details	Edit	Delete

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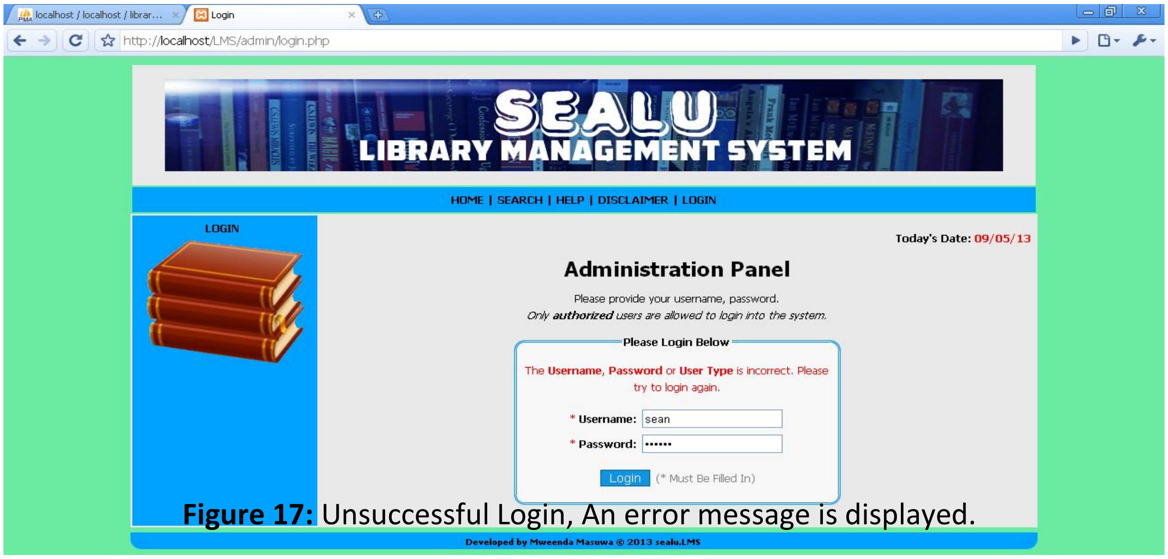
Figure 16: Successful Login, The Patron is redirected to the appropriate Page.

Error Result: If a user inputs the wrong credentials, the system will display and error message.


localhost / localhost / librar...
Login
http://localhost/LMS/admin/login.php
SEALU
LIBRARY MANAGEMENT SYSTEM
HOME | SEARCH | HELP | DISCLAIMER | LOGIN
LOGIN
Login
Developed by Mweenda Masuwa © 2013 sealu.LMS

Today's Date: 09/05/13

Administration Panel

Please provide your username, password.
*Only **authorized** users are allowed to login into the system.*

Please Login Below

The **Username**, **Password** or **User Type** is incorrect. Please try to login again.

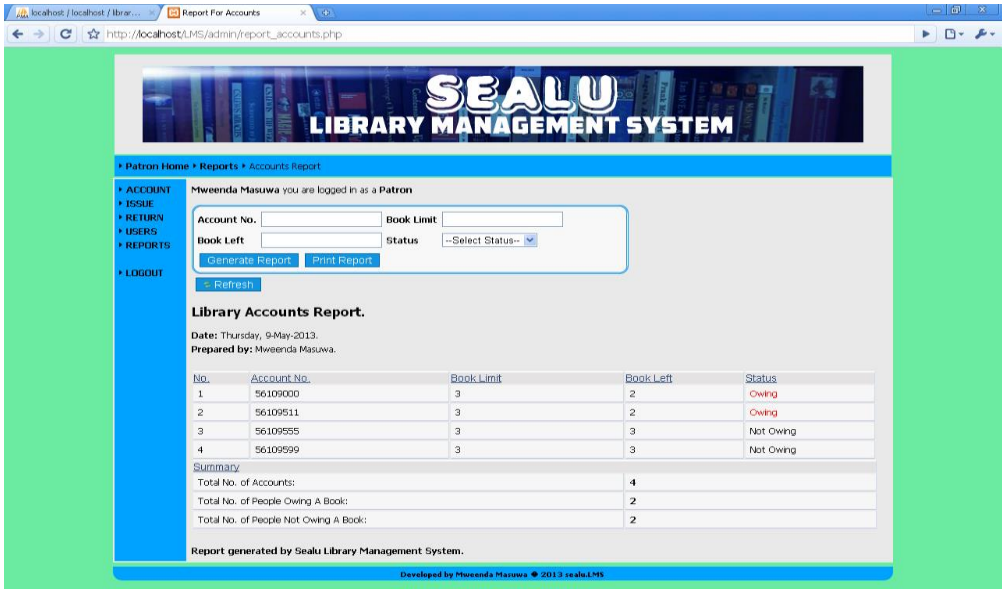
* **Username:** sean
* **Password:** ••••••

(* Must Be Filled In)

Figure 17: Unsuccessful Login, An error message is displayed.

Test Case 2: The process of printing a report.

Expected Result: The report is populated and ready for printing with the "Print Report" button is clicked.


localhost / localhost / librar...
Report For Accounts
http://localhost/LMS/admin/report_accounts.php
SEALU
LIBRARY MANAGEMENT SYSTEM
Patron Home ▸ Reports ▸ Accounts Report
ACCOUNT
ISSUE
RETURN
USERS
REPORTS
LOGOUT
Generate Report
Print Report
Refresh
Developed by Mweenda Masuwa © 2013 sealu.LMS

Mweenda Masuwa you are logged in as a **Patron**

Account No.
Book Limit
Book Left
Status --Select Status--

Library Accounts Report.

Date: Thursday, 9-May-2013.
Prepared by: Mweenda Masuwa.

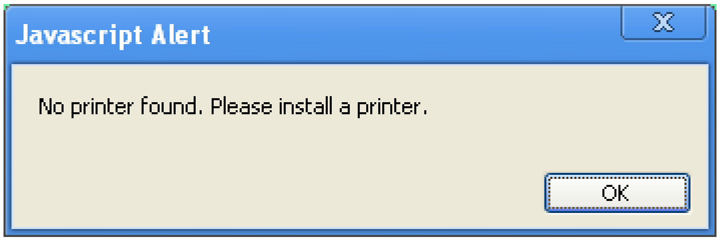
No.	Account No.	Book Limit	Book Left	Status
1	56109000	3	2	Owing
2	56109511	3	2	Owing
3	56109555	3	3	Not Owing
4	56109599	3	3	Not Owing

Summary	
Total No. of Accounts:	4
Total No. of People Owing A Book:	2
Total No. of People Not Owing A Book:	2

Report generated by Sealu Library Management System.

Figure 18: The Report is Generated by the System.

Error Result: The system will request for a printer to be connected first before printing the report.



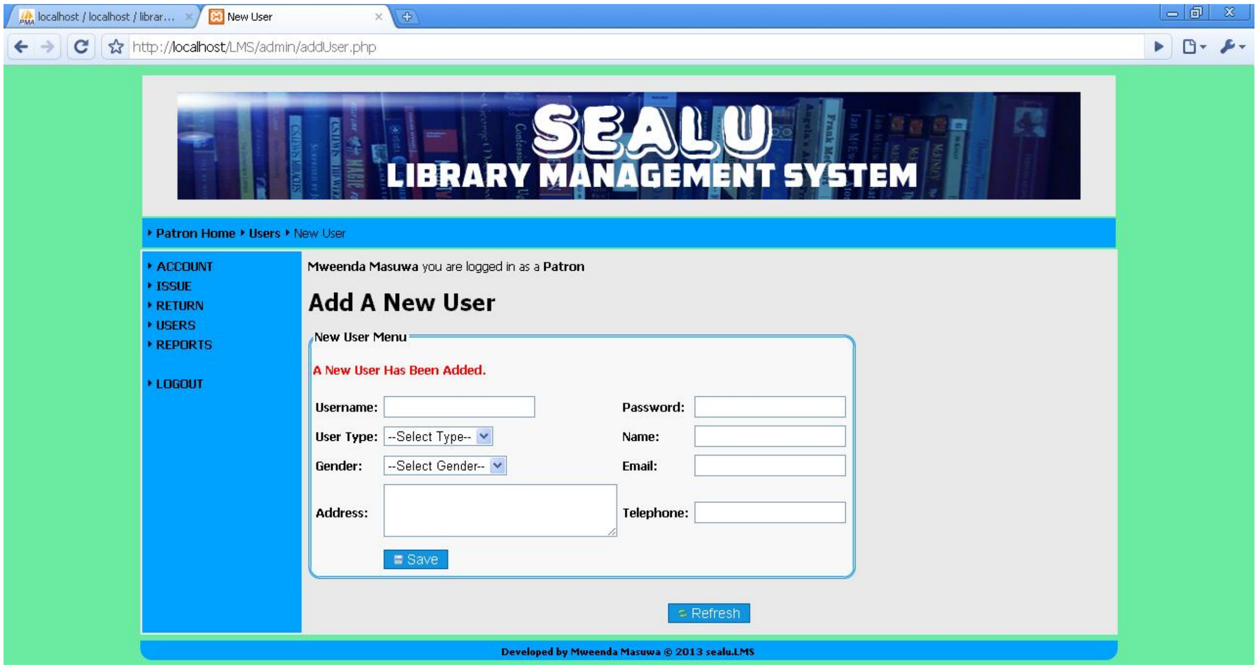
Javascript Alert

No printer found. Please install a printer.

Figure 19: No Printer Found Error Message.

Test Case 3: The process of Adding a User.

Expected Result: The system will add a new user if the requested details are entered properly after clicking the “Save” button.



http://localhost/LMS/admin/addUser.php

Mweenda Masuwa you are logged in as a Patron

Add A New User

New User Menu

A New User Has Been Added.

Username:

Password:

User Type: --Select Type--

Name:

Gender: --Select Gender--

Email:

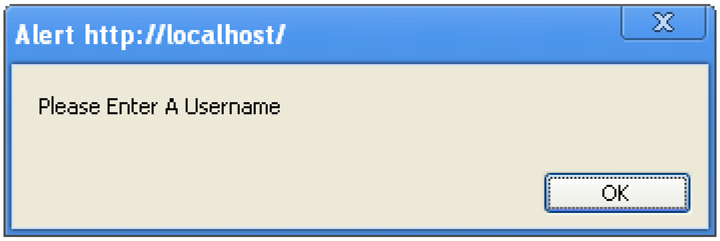
Address:

Telephone:

Developed by Mweenda Masuwa © 2013 sealu.LMS

Figure 20: A message is displayed to notify that a user has been added.

Error Result: If the required Information is not entered correctly, the system will prompt that information to be corrected or entered before saving. For example if the user name of a new user is not provided, the library system displays a message requesting for it to be provided.



Please Enter A Username

Figure 21: Error Message if Username is not entered.

- **Testing Table.**

<u>Class</u>	<u>What Was Tested</u>	<u>Test Result</u>
Data Validation	Adding a New User	Passed
	Adding a New Book	Passed
Error Testing	Entering wrong login credentials	Passed
Content Testing	Editing the information in the library system	Passed
Integration Testing	All the system modules together	Passed

Table 8: Testing Table.

4.6 Testing that was not done on the system.

Below is a list of testing which was not done on the system due to limited time in developing the system.

- Volume Testing.
- Stress Testing
- Reliability Testing
- Regression Testing
- Stress Testing.
- Acceptance Testing
- Compatibility Testing.
- Installation Testing.
- Maintenance Testing.

4.7 Discussion.

The implementation process of the Sealu Library Management System went on well despite a few challenges which were encountered during the phases. The major challenged that I faced in the implementation of this system was learning a lot of new things I didn't know about structured PHP and object-oriented PHP programming, as well as the JavaScript language and Cascaded Style Sheets. Regardless of it being a challenge, it has helped me learn a whole lot about Object-Oriented PHP programming apart from the usual HTML programming. Understanding the PHP language in great depth became easy eventually because of the use of the Internet and help here and there from my class mates. On the internet I used sources like YouTube for Tutorials, different forums also helped in understanding how to implement certain functions in PHP.

During the testing phases, the major testing challenges were the issue of compatibility and acceptance testing. The main reason for this was the limited amount of time which was there to do the project. On the other hand, the successful testing that happen was the data validation, error testing, content testing as well as integration testing. After doing a few security tests, I discovered that PHP has vulnerabilities as far as security is concerned. These involved SQL Injection, Source Code Revelation, Session Hijacking to name a few.

The Patron of the system performs most functions of the system. For example, the Patron adds users and books information to the system. The Patron can issue a book to a user and well as enter a returned book back into the library. The Report Generation section of the system, the Patron is able to generate as well as print reports for the user Accounts, Library Books, Users and Borrowed & Returned Books.

The login interface was implemented with no challenges at all. The help, disclaimers and welcome pages were the easiest to implement in this system. The process of Issuing and Returning a Book is the process that took the longest to implement because it involved a number of calculations to produce a Charge for a book overdue were applicable.

The library management system is web based designed for a number of reasons and these are as follows:

- The data of the system will be centralized and therefore will be quick to customize when required to.
- To work on the local intranet of an organization or an institution.
- To avoid the need to install it on each and every computer within an organization of institution.
- With the web-based approach, only one computer (the server) is required to have the application installed while all the other computers (the clients) had to access this computer on the LAN. This is the client-server architecture.

CHAPTER 5.

5. CONCLUSION AND FUTURE WORK.

5.1 Introduction.

Finally, the last part of this thesis is going to focus on the discussions, conclusion and future work regarding the activities that took place during the development of the project and the system as a whole. In this chapter, the challenges that were encountered during designing and implementing the system will be discussed in the conclusion section, and the last section will outline some of the future works that will be implemented on the system.

5.2 Conclusion.

The library system was implemented and the system met the requirements it had to implement. This system fulfilled the areas of data validation and error checking properly but otherwise due to time, the library system was not completely tested in all required testing areas of software engineering.

Even though the time to design and implement the system was not enough, I managed to the successfully complete the project and deliver a system that is working and meeting the system requirements. From a personal point of view, this project has really facilitated me to see the reality of the concepts and methods I learnt in class such as software engineering and programming. Furthermore, developing of this system has really helped me to have lots of self-confidence in PHP programming, JavaScript scripting as well as be very good at Project Management.

5.3 Future Work.

The library management system with time will have to be improved to include an E-mail notification module in the system. The system will also be worked on and be implemented in Java in the future so that it can be an executable file to be installable. The system will also include a section which will hold journals and research papers. The system will be improved to display a picture of the user who logs into the system as well as have a section for buying books online. This will be made possible by implementing a shopping cart in the library management system. The system will also be improved by making it possible to increase the number of times a book can be borrowed from the library system. This will enable users to borrow the same book more than once. Finally the future projects which will be done later on are as follows:

- A Student can develop a Generic Installation System that can be used for installing PHP/MySQL system such as the Library Management System.
- A Student can implement an Information Management System that can integrate PHP/MySQL systems such as the Library Management System.
- A Student can develop a Distributed Health Management System that can integrate PHP/MySQL systems such as the Library Management System.
- A Student can implement a Warehouse Management System that can integrate PHP/MySQL systems such as the Library Management System.

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7. APPENDIX.

7.1 Appendix 1.

This appendix shows code for some major pages of the system. All the system's code and database tables can will be included in the zip file accompanying the document to be handed in on 10th May, 2013.

7.1.1 Code connecting to MySQL database.

```
<?php

//Database Constants

defined('DB_SERVER')? NULL :   define("DB_SERVER","localhost");

defined('DB_USER')? NULL :     define("DB_USER", "root");

defined('DB_PASS')? NULL :     define("DB_PASS","");

defined('DB_NAME')? NULL :     define("DB_NAME", "library_db");

?>
```

7.1.2 Code to Login to System.

```
<?php

        require("../includes/initialise.php");

                include "dbLib.php";

                $message="";

                if (isset($_POST['submit']))

                { // Form has been submitted.

                  $username = trim($_POST['username']);

                  $password = trim($_POST['password']);

$sql="select user_type from user_tb where username= '$username' and password = '$password' ";

                  $dbConn = connectToDb();
                  $result = mysql_query($sql, $dbConn) or die(mysql_error());

                  $row = mysql_fetch_array($result);

                  $user_type = $row[0];

 // Check database to see if username/password exist.

$found_user = User: authenticate ($username, $password, $user_type);

 if ($found_user) {

                $_SESSION['username'] = $username;

                $_SESSION['password'] = $password;

                $session->login($found_user);

                if ($user_type=="User"){

                $_SESSION['user_type'] = "User";

                redirect_to("userpage.php");

                }

                else if($user_type=="Patron")

                {

                         $_SESSION['user_type'] = "Patron";

                         redirect_to("patron.php");

                }

                else if($user_type=="Admin")

                {

                         $_SESSION['user_type'] = "Admin";

                         redirect_to("admin_home.php");

                }
```

```
          }else {
        // username/password combo was not found in the database
$message = "<font color='red'>The <b>Username</b>, <b>Password</b> or <b>User Type</b> is incorrect.
        Please try to login again.</font>";
          }
         } else { // Form has not been submitted.
          $username = "";
          $password = "";
          $user_type = "";
         }
        ?>
```