An analytical study of open source library software and develop a library system.

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Declaration

We declare that this thesis is our own work and has not been submitted in any form for any other degree or diploma at any university or other institution of tertiary education. Information derived from the published or unpublished work of others has been acknowledged in the text and a list of references is given.

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Date :

Dedication

“To my loving Father, Mother, Husband Sanjaya & loving Sasath Putha, without them, this wouldn’t have been completed”

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Abstract

Many people like to use library with enough reading materials. Fulfilling all the user requirements is a difficult work and it may not be successful. If the library can manage their existing resources in proper way, that will be a better answer for the user problems. There are many library management software tools and if the library can use that kind of management system user can find metadata information with free accessing. Accessing to the information is not easy thing. Libraries are working as a welfare organization and they can provide proper access to information. User can get access from anywhere. When the computer invented and telecommunication technologies started all the sectors has begun to change. Geographical limitations and other barriers removed out and people started to going in a new way. Like all the other sectors library sector also started to working with computer and telecommunication technologies. That was the time information age started and all the people stand for the rights to information. In-library and information sector all the services are planning with the ICT and users also expecting easy access and portable reading with new telecommunication devices. As non-profitable organizations libraries have to select proper services for the user education and the society. So, they have to consider freely available resources and they have to provide smooth and effective services to the user. But if they know the free service providers, they can use those things & can provide user satisfied library service. There is much commercial & free open source software in library field. If librarian can choose better one, they can arrange their service in a user-friendly way. Users also may like to use that type of systems because present users are very much familiar with technological learning environment than paper-based reading. So, I decide to conduct this project to identify the suitable open source library software & develop new module for the selected system. Studying the all software system we can identify the best fit for our requirement. Otherwise, if we select software without doing a proper feasibility study, after it may not match with our requirements & new services. After acquiring a one system, it is very difficult to migrate into a new system. We need to select correct one first & then we can implement system with customized features.

Abbreviations.

GDLS -Greenstone Digital library software.

ILMS- Integrated library management system.

PMB - PhpMyBibli

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Chapter 1

1.1 Introduction.

There are many information resources everywhere. Individually or institutionally that cannot afford with financial problems. Fulfilling all the user requirements is a difficult work and it may not be successful. If the library can manage their existing resources in the proper way, that will be a better answer for the user problems. There are many library management software tools and if the library can use that kind of management system user can find metadata information with free accessing. Accessing the information is not an easy thing. Libraries are working as a welfare organization and they can provide proper access to information. The user can get access from anywhere. When the computer invented and telecommunication technologies started all the sectors has begun to change. Geographical limitations and other barriers removed out and people started to go in a new way. Like all the other sectors library sector also started to work with computer and telecommunication technologies. That was the time information age started and all the people stand for the rights to information. In-library and information sector all the services are planning with the ICT and user's also expecting easy access and portable reading with new telecommunication devices.

Development of the ICT sector made remarkable changes in all the information services & centers. Libraries started providing many information services upgrading day to day library activities and functions. Libraries started using computer software for library management. Traditional library works got feathers and done fast with minimum errors and low cost. In the library sector, there is two library software type.

- Commercial library management system.
- Open source library management systems.

Commercial software systems are highly cost, training and all the other upgrading, troubleshooting is handled by the vendor. And also annually renewal fees are there. Most

of the time contacting vendor is not an easy task. Because they are not living in the same country and they have only regional representatives in few locations.

1.2 Libraries and knowledge management centers

There are many definitions of the library.

"Library, traditionally collection of books use for reading or study or the building or room in which such a collection kept" (Britannica) 1

"A building or room containing collections of books, periodicals, and sometimes films and recorded music for use or borrowing by the public or the members of an institution." (Oxford Dictionaries) 2

"A building room, an organization that has a collection especially of books for people to read or borrow usually without payment." (Cambridge Dictionary) 3

"Library" is the word "library" seems to be used in so many different aspects now, from the brick-and-mortar public library to the digital library. Public libraries and indeed, all libraries--are changing and dynamic places where librarians help people find the best source of information whether it's a book, a website, or database entry". (ALA) 4

According to the Father of library science, "Library is a public institution or establishment charged with the care of a collection of books, the duty of making them accessible to those who require the use of them and the task of converting every person in its neighborhood into a habitual library user and reader of books. A modern library is regarded as a service institution. Its aim is to enable the users to make the most effective use of the resources and services of libraries" (Ranganathan, 1940).

The library is the word used for all the information centers and service providers. It has a gradually developed history and it is getting more developments every day. In traditional

Library system was a place where they kept the important book for users as a free service. Everything they handle manually and it was not easy to manage. Day to day with connecting to the ICT world it got more feathers and now it the palace with upgraded technologies.

Therefore, users can fetch relevant information from everywhere with the new devices. Connecting with the new technology library name also modified as a digital library, virtual library, and electronic library like that. Basic library functions started with new ways and it was easy to handle all the bibliographic details and users also can fetch relevant information with metadata. Author, publisher, book title, year of published, keywords so on. When the technology concerned with a lot of work including human interventions released and personal use to manage the devices. With connecting and using machines for work things completed fast and accurately with the technological infrastructure working environments get a new appearance. With the ICT infrastructure way libraries also started new services for users. Users are more compatible with the technological services. (Sonker, 2000-2001)

1.3 Project background & Motivation.

Open Source Software (OSS) first step started in 1984 by the Richard Stallman forming Free Software Foundation. Then 1991 Linux developed by the Linus Torvalds, 1994 Red Hat Company founded and then 1998 Open Source Initiative was founded. This is more about building community product without basing profit. Open source software is allowing to use, modify, develop and distribute to anywhere. It doesn't have any restrictions. Source code also available under GNU General public license Free Open Source software characteristics are, Free to run for any purpose, free to modify, free to redistribute & free to distribute modified versions for any purposes. Open Source software is a community product and most of the open source software project is running on the Internet. They have many services through the internet. Web-based information forums, discussions, documentation, bug fixing, releasing new modules are most famous information services based on open source software projects.

1.4 Aim and Objectives

1.4.1 Aim

Conduct an analytical study of open source library software with data gathering, analyzing & develop a library system with a new module.

1.4.2 Objectives.

* Explore library automation process.
* Study existing open source library software.
- Study features, technical situation & development process.
- Evaluation of the gathered information.
- Develop library system for the special library with new features.
- Production of the final documentation.

1.5 Brief of Solution

The data gathering process used secondary information source. After collecting information need to analyze data to identify best user-friendly library automation software. Evaluation of integrated library software. Develop a module and create a sample library system for the special library. Users of the system will be intellectual property educators and information seekers & other interested parties.

1.6 Deliverables & Structure.

The study is organized as the way Chapter one deals with the background of the study, objectives, scope, limitation, methodology and significance of study importance. Chapter two presents review of all of others works. Chapter three mainly focuses on the library automation and open source software technology. Chapter four describes the approach. Chapter five about design & Analysis. Chapter six focuses on Implementation, discussion and future work.

Chapter 2

Review of other's work

2.1. Introduction.

Open Source Software (OSS) is considered as an important resource for libraries. There are many studies under the OSS and among the very few amounts of studies can find under the library field. So, get a great opinion and understanding of the practical environment, this chapter focusing others research works associated with open source library software. Digital Library has mainly developed during the last years. They are not a digital part of traditional library systems. They are connected with the other systems and capable of providing different types of services for users around the world. [9]. DLMS provides the relevant features in production and administrative areas. Using Digital library software, we can provide a good quality of service. There are so many articles and other scholarly works in this field. The main aim of the library system is providing the very fast and quick results for users. It is a global concept and it can provide remote access without wasting user time and break physical barriers through the network. And also, some of the digital libraries can access through the compact disk. In 1945 Vannear bush focused the world attention on the information dissemination field. It was a big help to the scientific research. Future we have big responsibilities to do a research and making world closer to education and research field [10]

In the digital environment, thousands of printed pages contained in CD ROMs. They are more convenient for users. Further, according to Balasubramanian, [11] the user needs well-digitized information for their research and professional activities. In the traditional libraries have taken necessary steps to adopt the new information technologies to satisfy the user's needs. Since the library staff should be trained to use and get an update on the latest Technologies. Now, the library software has become part of our day to day professional activities. To face this challenge, the library and information professionals trained to provide digitized information of their respective fields. With this growing emphasis on technology, libraries have undergone a major structural change in terms of

their collection organization and services. The traditional concept of a library is becoming obsolete with the emergence of new digital means of storing and disseminating information over the internet.

Digital libraries are electronic libraries in which a large number of geographically distributed users can access the contents of large and diverse repositories of electronic objects in the form of text, images, maps, sounds, videos, catalogues, CD ROMs, online databases etc.

Krishnamurthy (2003) conducted a study in Indian Statistical Institute, Bangalore. The study exhibits the development & design of digital library in the institute using Greenstone Digital Library Software. The study outlines the practical issues and key stages involved in digitizing process. [12]

Sonkar et al. (2005) exhibited in their article about the development of a digital library of newspaper clippings using GSDL. The article also described the implementation process of GSDL and steps involved in the creation of digital library using the GSDL. [13]

Zhang (2006) conducted a case study on building digital library collections using Greenstone Digital Library Software and described that since 2002, Washington Research Library Consortium has created twenty-two digital collections using GSDL. The study also exhibits the reason why GSDL has been used for digital library development, salient features of software and usefulness of software for an organization. [14]

Jose (2007) conducted a survey on adoption of open source digital library software packages. The survey emphasized the need of making library professionals aware of the application of information technologies in library & information science. The survey reported that the DSpace is the most popular and used open source digital library software followed by Eprints and Greenstone. [15]

Satpathy (2007) in his study highlighted the National Institute of Technology Silchar Digital Library Project. The paper exhibits the objectives of the digital library project, the

methodology adopted for the implementation of the project and outcomes of the project. [16]

Sharma, Kumar and Kumar (2007) conducted a comparative study of open digital library software. The study compares the features of three mostly used open source digital library software viz. DSpace, Greenstone and Eprints. The results of the study showed that Greenstone has more features compared to other two open sources digital library software. [17]

Yadav and Chidambaram (2008) in their paper described the planning and development process of the digital library using GSDL at NIPFP library. The paper described the reason for why GSDL has been chosen as digital library initiative at NIPFP library. It also exhibits the main characteristics of the GSDL, architecture & key components and framework of guidance for Building good digital collections. [18]

In the library process, integrated library systems are the fundamental things in public and technical services. There are many ILSs for library field. They are helping to acquire more technical and flexible features to the libraries in an advanced manner. Most of the libraries are thinking about cloud hosting because of the information technology infrastructure, software, hardware and personal services. In this article Wale (2010) is talking about the trend of open source ILS and the cloud computing systems. [19]

According to Witten, Lan et.al Greenstone is an open source digital library tool for constructing and presenting information in electronic format. It has many searching features that can use for full-text searching, metadata browsing in an easy way. Greenstone is providing customizing interfaces that can help librarians to create their own user interfaces. [20]

Shuva is discussing the building of the Bangladesh digital library and the problems can have to face in the development. It is showing us existing conditions of the development

project and status of Bangladesh digitizing steps. Finally, the author has taken several steps for to develop an effective digital library. [21]

With digital archival images (2400) of several subject areas such as photographs, maps, manuscripts, postcards & other historically valuable images. Library learned a lesson about handling metadata and administering digital library project collaborating with local historical societies some other universities in Los Angeles. [22]

Vinson has explained about the historical foundations of the Digital library of South Carolina. That is a project. It has defined future status of the project and its infrastructure. It has created some scanning centres in the states and plans for combine state university collections together. That has met so many challenges when they were doing that project on both sides of financial and infrastructure. [23]

The free and open source is a new software development method. This has usability and power for the user. Usually, in Library field this is a very common and useful topic. Most of the libraries are using FOSS and provide a variety of user services for the society. In this article, Blast is explaining the history of FOSS and licenses & other needs. [24]

In this article discusses the digital library of Slovenia's website & projects. It has many reading materials and audiovisual resources like music scores, sound recordings, books and photographs. They are getting action for the preservation of national heritage and global access to the resources. [25]

Digital library is a very important offer for the creative community. It has the capability of using many forms of reading materials such as text, images, music, videos and other resources. Beginning of the Digital library technology, most of the information collections came out with the new face. Digital library is a very important tool for information retrieving and information dissemination. [26]

Digital libraries have a remarkable role to play in the information preservation and collection management. In this paper, Nicholos and others have talked about the building of digital libraries and software tool. They are describing things how is it important, how it can use for user services, how it can use the multilingual user interfaces. And also they are describing things under open source license. [27]

Libraries have to grow up with the future trend. Otherwise, they cannot go forward. Users are changing their reading, referencing and information seeking behaviour as much as the easy way. So libraries have to question their services and actions. In this article Law (2009) is talking about the status of the changes and challenges they have to face in higher education libraries and main areas of activities they have to expand for good future both side of them and user. [28]

Digital library concept gave big and important directions to the academic, school, public and special libraries. That was a big trend and it has increased in the past few years. A number of collections were digitized and a lot of libraries initiated their digital libraries expanding their traditional paper-based libraries. Most of the libraries have provided access to their collections without wall barriers. If the technology is available this is not a big task. They should have to think about the possibilities with their own resources. In this paper, Skekel (2008) is talking about the digital library trend and the future usability of the digital collection. [29]

With the Internet, most of the researcher have good and easy access to the newspaper archives and paper collections in digital format. This is a good sound for the researchers. From last few years, they can access past and current research publications without any wall barriers. In this article Patric. And Ochoa. (2009) is discussing the overview of the challenges of creating free digital newspaper library and provide good service for the users. This is a case study and they are considered some university libraries like National Digital Newspaper Project, Florida Digital Newspaper Library, Congress Chronicling America digital newspaper collection. This survey focused gathering information about the usability testing. [30]

Future of the library system is discussed by the Collins and Rathemacher (2010) in the open source forum. Most of the participant had some experience with digital library and future generation of the library system. Using open source software libraries can understand primary factors. Implementing a digital system with open source software, lack of technical support is the main challenge. Future library systems will discover some tools to manage the workflow. When libraries are thinking to acquire system, they have to plan for the future. [31]

In this paper, Stranack(2008) is talking about the importance of library open source software project of the university library of the Simon Fraser. Library collaboration with the researcher is the main point. History of that project, overview of each and every component, e-resource management, individual citation management, searching abilities are the main areas they consider. The success of the project, benefits and other participation and importance of working together were highly considered. [32]

A lot of academic libraries had traditional reference resource collection and now they are turning them into the Digital format. It is very easy for the educationally and financially. Sometimes library policies are making some limitations to that but they are overcoming them and making them in digital format. There are many issues other than the policies. They are intellectual and psychological reasons. In this paper they are discussing lifecycle of digital reference material with focusing subscription databases, acquiring, presenting on the web, managing and maintaining, preservation and archiving. This is a new and important topic to the reference librarians because they can have to think and make decisions for new trends. [33]

This paper is describing the things in Greenstone digital library tool. Using the Arabic language. What are the features and how it works? They have done an evaluation survey about greenstone software with special reference to design, methods and approach. In Iran, they are using this software for digital libraries but with the lack of programming

knowledge and other financial resources, they can use this without commercial software. [34]

Tebbells (1999) talk about Building the Digital libraries infrastructure with an overview of digital libraries. In that article, he was explaining the complex infrastructure needs to complete the successful implementation of DL. According to him Adding records, managing database in a variety of sources, electronic information sharing and browsing of the full-text document are very important. Database developments, online public access catalogue creation, licensing and authentication and planning and everything related to libraries are discussed by him. [35]

In resource sharing operation it is possible with the digital library open source software system. Resource sharing software applications are more useful for the librarians because they have to share information with the users. In this article is talking about resource sharing software tools and their abilities. [36]

In the early system, libraries have to do some services in a limited environment. But with the digital technologies I have changed widely and now it has so many features like analyze, interpret, combine, and sharing. In this paper has described two digital library programs and their initial approaches to information dissemination and knowledge citation. [37]

Digital libraries should think about on access to resource and services for users. Without that libraries may not use if they increased the collection of volumes and books. Libraries have to acquire more information sources for their services considering the user requirement. Libraries can be a useful location for users if they are providing big and useful user services. Otherwise, the library may not reflect with physical location and technologies they acquired. Libraries are not money makers. So they have to think about more useful low-cost resources. In that case, Digital library is the best solution for good and easy library service. [38]

According to Buttenfield (1999), he has evaluated library process from traditional library to digital era. He has explained usability evaluation with the system design, development and services. It has two evaluation strategies. One is evaluation throughout the system cycle interpretation result, system recommendations. The second method allowed to evaluators to find the assessment method for library solutions. It has drawn the user evaluation effort to the Digital library project conducted by the Alexandria digital library. [39]

Last few years many libraries try to build their collection with open source digital library software. Most of the software systems can use for information services beyond their traditional library walls for distance learning students. Here Cervone (2004) provides an overview of open source software and how it comes to library service portal. And also, he is describing some of subject related software systems and services for distance learning student. Also, we have to think about the best selection for the library among from the existing open source software. [40] Greenstone is an open source digital library tool that can use for creating, publishing and sharing information on the World Wide Web (WWW). It has started from 2002 and some of the Washington Research Library Consortium has built 22 digital collections with this software. In this article, they have described how they select the software, why and how to customize it for their requirement and environment. [41]

In this information age, Librarian has so many issues to answer. So as professionals they have to improve their skills for work with the new era. It is not like the traditional library system. This is very competitive and skilful service area. If they have some experience with digital libraries and advanced knowledge of the digital libraries, they can survive as a professional. The librarian should have good and clear knowledge of technologies utilized in libraries. Blummer (2005) has discussed the educational opportunities with related to the digital libraries. [33]

According to the above papers, all are working with selected digital library software. They are Open source software and other commercial software.

Open source is very simple and affordable things to the library. Programmers can read, modify, add, and distribute any time. There are no restrictions for that. Open source is a community developed product. There is no one owns. Many developers all around the world have contributed to developing it.

According to Sharma (2007), most of the Nepal academic libraries are using CDS/ISIS & its Windows version. It can get free of charge from the UNESCO. And another thing they can find many training programs related to the software. And also, many libraries have used some locally made software for automation. Some of the libraries they just have a system keeping matters and that also have done by some of the students as their project work. That can be a problem in future if lose any information.

According to Bhardwaj and Sukla (2000), they have identified library automation is the term for improved activities in the qualitative and advanced way of the information centres. It has considered speed, adequacy, and productivity and so on.

Muir (2005) he has discussed an introduction to the open source software issue. It has traced issues on open source software. He has described all the features and utilization of open source software and what is happening with OSS applications in universities and other libraries in the western world like the USA.

Randhawa (2008) has described how open source software and libraries are working together. And also he has mentioned how much it will be worthy of knowing OSS things of library professionals. Libraries can get many benefits and they can provide useful extended services to the users by using open source library software rather than using commercial software.

2.2 Summary

There are different kinds of library software systems. Most of the software has different types of aspect. Some of the libraries are using library software without doing any

evaluation process. After implementing and starting to provide user service, they cannot move to another system easily. Exchange data from the previous system to the new system also not a small task. If they couldn't transfer data with their requirement they have to go for another system from the beginning. Therefore, librarians have to get a suitable decision to select software. Considering previous literature, we can understand how they select system for user services. We have to follow proper method for that.

Chapter 3

Library Automation and automation Software.

3.1 Introduction

Library automation started since the 1970s and many of the libraries have done automation with different software systems. This is called information era and many of the information seeking behaviours have changed with personal needs. Most of the library users are familiar with the new technological devices. In traditional library system, the user has to go to the library and physically they are searching information with reading materials. They can't be away from the bookshelves. They have to spend some more time in the library place and have to find information related to their requirement. Now the time most of the libraries started working with Information Telecommunication and they started to use some software for library management and user services. And also, they started using digital library software tools for creating digital libraries. In that way, they can provide better service to the user minimizing the human errors. And also, user can search the library collection from anywhere and can get to know whether the required information source available or not. If it is not in the library user can make a request to the librarian asking help for finding the resources. Libraries also willing to provide better service to users and they are requesting resources from parallel library or information centres they can complete user requirement. *1

3.2 Need for Library Automation.

A major consideration for library automation is cost-effective benefits for user services. Administration, Operations, User awareness services and the current trend in ICT are the main thing behind the library automation. In an administration side, all the library activities such as acquisition, cataloguing, indexing, book processing, shelving and other library activities have completed the automation functions. All the manual works come in a different way and it was easier to library staff and user. In acquisition process verifying, ordering, reporting, completing orders are main duties and most of the things are financial deals. So, when it is handling manually human can make more mistakes. With the automation systems, they can prefix relevant criteria and process. Through this kind of

automated process, we can reduce human mistakes. And also, these works are time-consuming and the user does not like to waste more time for receiving relevant reading materials. Catalogue card preparing is not a very big task. But when the user comes to retrieve bibliographic information, surfing card catalogue is not much easy. If they can search for some keywords they do not want to spend more time with the card catalogue. Automation provides easy access to the library collections.

In-library day to day operations library staff has to maintain all the details manually. In circulation process, registration members, receiving details, borrowing details and all the other relevant information regarding circulations report manually. With an automated system, those things are done in an easy way. Most of the library report makings also could do proper way with more accuracy. Otherwise keeping track with user details are not easy to work. All the library operational works can manage the automation process. In traditional library system, the user has to come to the library to get their services. With the automation system, all the library user awareness services are extended and users can get services from anywhere they like to stay. Interlibrary loan system, OPAC searching, book request making, book holding, cancelling reservations and many more functions. Information Communication Technology gains a more power to the library. The library started service as a networked function and user get more benefits of ICT. Use can access library database from any workstations. Information sharing, multi-user access, email notifications started in an effective way.

3.3 Limitations of Library automation.

Mainly library sector they do not have the much technical manpower. When they plan to acquire new technologies to the library they have to face that problem. They have to get technical help from the outsiders and they have to train their employees for ongoing functions. Other side automation is an expensive work and they have to spend more money and allocate to more manpower to manage the process and also managerial level support is compulsory to continue to process. Data migration without any loss is compulsory. Those are the main limitations and difficulties in library automation.

3.4 Current Trend

Many software vendors have started making software for library works. They have included all the library functionalities for user services. Many software designing with lots of modules as the user can use them, for share information, store information and create private collections. OPAC, Online Public Access Catalogue is the famous library module and it is an easy module. Users can use it very easy way. Now it is also changing and web OPAC, Social OPAC (SOPAC) have come to the library world. OPAC is very interactive and useful module for information retrieval process.

3.5 Software

The software is an electronic application program that can use for controlling hardware to perform to the multi-functions in the library is using for the library functions such as circulation, cataloguing, periodical handling, acquisition and other library activities. A set of command is known as a program, and a set of programs is known as software. The hardware operates on the basis of a set of programs of software (Sharma, 1993).

Basically, software is the program that runs the computer to produce the required results. It is said that "A computer without software is similar to a man without his brain or a library with neither books nor librarians". Therefore, in principle, the selection of software comes before hardware. The author emphasized the software needed for library housekeeping routines and information retrieval services in detail (Malik, 1994).

The software is one of the main parts of the computer system. It is the main controller of the set of parts of the computer. Without software, the computer is not a valuable machine and it cannot process any work and cannot give any result. The software can make computer manipulating and it is the interface that making connections in between man and the machine.

There is much software for different types of task. In-library field we can use library software for the present library work and future services. Libraries are mainly providing information related works. Information services are typically different and institutionally they can create services according to the user requirements. The market we can find many library software packages and usually, they have basic functionalities. Some are there for specific functions. Basic software functions are data entering, validation, sorting, editing and retrieving relevant information. Basically, libraries start using some basic software application for internal services and the present they want to explore their information services at the global level. Using basic office software application to the library office work is not automation. If we are using special software for the special activities it is based on starting automation. Library software can categorize into three main group.

- Freeware (CDS/ISIS, WINISIS)
- Proprietary (SOUL, Voyager, Alice for Windows, LIBSYS, LiBSUITE, LoBiondo, LMS, Liberty etc.)
- Open Source Software (Koha, GSDL, OJS, Dspace etc.)

Free software doesn't have any restrictions. That can use, modified without any barriers. CDS/ISIS also a free software develops by the UNESCO and delivered among the libraries to manage their basic library functions. They provided some training programs also under UNESCO project. CDS/ISIS can use for basic bibliographical database creation, management and information retrieval. It has developed for use with Windows operating system and it's called WIN/ISIS.

Proprietary/Commercial software is a commercial product and that did not provide permission for use, modify, distribute. They have developed things only for commercial purposes. We can purchase that kind of software and when we are using that most of the time we have to contact them for the assistance several times. Because they are not providing permission to private modification or troubleshooting. Every Time we need to get their help.

Open Source Software (OSS) first step started in 1984 by the Richard Stallman forming Free Software Foundation. Then 1991 Linux developed by the Linus Torvalds, 1994 Red

Hat Company founded and then 1998 Open Source Initiative was founded. This is more about building community product without basing profit. Open source software is allowing to use, modify, develop and distribute to anywhere. It doesn't have any restrictions. Source code also available under GNU General public license. Free Open Source software characteristics are, Free to run for any purpose, free to modify, free to redistribute & free to distribute modified versions for any purposes. There is many Open source library software in current use. As an example, for example, the most used freeware CDS/ISIS & WINISIS, as OSS, Avanthi, FireFly, Emilda, PhpMylibrary, OpenBiblio, WEBSITES, NewGenLib, OpenILS, Evergreen, GNUTECA, PMB, PhpMyLibrary, Dspace, Greenstone, Fedora, Koha etc. can be noticed. When library accessing a software package for their services they have to consider usage history and functionalities of the software. Otherwise, they cannot select suitable software for the library.

3.5.1 CDS/ISIS and WINISIS

CDS/ISIS information system has been developed by the UNESCO. They are providing it to the libraries as a free software. Its Windows version is called WIN/ISIS. It is menu-based information retrieval system its first release came in 1985. It is a menu-driven generalized information storage and retrieval system; the first version of CDS/ISIS was released in 1985. Later after few versions 3.08 released. All the small type libraries started using this software because it came as a free. It can manage non-numerical bibliographic data and it is supporting multilingual. 16 million of records can store there and provide a variable length field, repeatable field, subfields, indexing and searching techniques are very strong and powerful. Pascal is the programming language and it is coming under ISO 2709 international standards. User documentation is available. It is not a very advanced library software but its usage was high in the library field. Software. It has many features that can use the library housekeeping works.

- It is Compatible with the DOS and windows both operating systems versions.
- Data can create and modify in data entry worksheet.
- Database can contain over 16 million records.

- Data can be imported and exported with the ISO 2709 format.
- Can handling of the repeatable field.
- Handling of variable length records, field and subfield.
- Use can create a database.
- Indexing technique is advance & fast
- Search techniques are simple, accurate, and rapid
- Powerful hypertext function.
- Sorting and printing facility in the desired format.

WIN/ISIS

This is window version of the CDS/ISIS and it released in 1997 by the UNESCO. It has some more additional features. The first window version was distributed for testing in May 1995 and the first WIN/ISIS version officially released in November 1998. WIN/ISIS uses the same database structure. Dos version users can easily shift to the new version. It has all the features of the CDS/ISIS and some new features. This is in C++ and facilitating the portability level. Main features of the WIN/ISIS are as follows.

- Use can build relational databases
- The graphical user interface (GUI)
- New numerical and string functions available.
- Compatibility between the DOS and Windows versions
- Powerful hypertext functions allow designing the complex user interface.

CDS/ISIS and WIN/ISIS are free library software delivered by UNESCO and most of the libraries started working with that at the beginning of the library automation. Open source library software is also free and we can download them from the internet.

3.5.2 Open source library software

Open source library-related software can divide into two main categories. They are Digital library software and Integrated library software.

3.5.2.1 Digital library software.

3.5.2.1.1 Greenstone Digital library software. (GSDL)

Greenstone is a digital library software tool that has develops by the Waikato University New Zealand with the association of UNESCO & Human Info NGO. This software system helps for university libraries & other public collection building individuals to providing better services for their users. This is a free and open source software tool that has distributed under GNU GPL license. For use, this software libraries no need to acquire more technical features. The only very low technical level is needed. It can run on many operating systems like Windows, Mac OS-X and Unix/Linux. And also, it can run on many computers like laptops and desktops. This has provided the new method of organizing information and also can publish through the Internet.

Data Exchange can do with exchange collections or other individual collections on space systems and METS formats. It has supported a variety of metadata systems like Dublin Core, OAI-PMH & some other indexing methods. Greenstone documentation is very rich and useful. They have created complete and detailed documentation and some other user-created wiki and blogs for the new information. Usually, it is supporting multilingual. They are four core languages and most of the resources are available in many languages. (English, Russian, French and Spanish) System user interface can translate into more than 50 languages. GSDL aims to provide ease of use in varying file formats, e.g. PDF, Postscript, MS-word and many more. GSDL is essentially suitable for managing the huge amount of information as information explosion is taking place. With the growing number of e-resources, it has become imperative for the information professional to redefine their role in disseminating information to the users. Institutional Repository is a new concept for collecting, managing, disseminating and preserving scholarly works created in digital form by faculty and students in individual universities and colleges. Therefore, creating an institutional repository GSDL is suitable.

Features of GSDL are as follows.

- Builds and distributes digital library collections

- Full-text document search and display
- Multi-platform support
- Web-based user interface
- Highly customizable
- Document collections can be exported to CD-ROMs
- Can be used for archiving

There are five stages of developing a digital library using GSDL. They are Collect information, Describe the data, Configure the collection, Build the collection, View the collection. Greenstone constructs full-text indexes from the document text, and from metadata elements such as title and author. Indexes can be searched for particular words, Boolean combinations, or phrases and results are ranked by relevance or sorted by a metadata element. Greenstone 3 is a complete redesign and reimplementation of the original Greenstone digital library software and incorporates all the features of the existing system. GSDL is backwards compatible, that is, it can build and run existing collections without modification. Written in Java, it is structured as a network of independent modules that communicate using XML (Witten et al., 2002). A number of examples of libraries around the world that have implemented GSDL are provided on the website (www.greenstone.org). These include Human Rights in Argentina, Kyrgyz Republic National Library, Philippine Research Library, Education and Government Information Network and the Sudan Open Archive (Krishnamurthy, 2007).

GSDL is a suite of software for building, publishing and distributing digital library collections, either on the Internet or on CD-ROM. It is compatible with many library standards such as SRU/W the, Z39.50 feature, MARC record import. These features of Greenstone make it a very good selection for integrating it with library automation package for full-text indexing and searching. It is produced by the New Zealand Digital Library Project at the University of Waikato and developed and distributed in cooperation with UNESCO and the Human Info NGO. This is a good software for the individual repository and organizational repositories also.

3.5.2.1.2 DSpace

DSpace can use to creating a digital repository in different kind of environments. Original authors MIT & HP labs and developed by DuraSpace. The initial release was done by November 2002. Written by Java programming languages. Operating System cross-platform. This is an institutional repository software. DSpace development state is inactive process. DSpace is freely available for research institutions. Open source software can customize and extended the services as they want. DSpace digital repository can capture, indexing, retrieving, store and distribution of digital content. DSpace also can use for institutional dissertation repository or publication portal. There are many DSpace users around the world and they are helping to develop the system in numerous ways. DSpace also distributed free, under a BSD license. Computer requirements are Unix/Linux s. Dublin Core and OAI-PMH Metadata supported. Data exchange also can-do exchange collections or individual records of DSpace systems and METS formats. Audio, Video and completed detailed documentation also provide enough support to the users. This is a good service model for open access and digital archival management. Using DSpace can make an institutional repository that can search & retrieve information over the Internet. Submission of the document to the DSpace is very easy and repository manager can arrange them in a proper way. Most of the DSpace users are academic and nonprofit organizations to manage digital content.

It is easy to install and customizable the way we want without any restrictions. DSpace preserves all the types of contents such as text, images, moving images, MPEG and data sets. DSpace in Java and it has asset store and association metadata store. The web application is providing interfaces to administration and all the other functions. Asset store is a file system like storage system. It has many important features. They are Free open source, completely customizable, manage with many formats, customizable searching facility, Unicode supporting, it can run on Linux and Windows based operating system platforms.

3.5.2.1.3 Eprint.

It is free software developed by the Southampton University of England. It can make a repository and preserve information in Digital formats. E-print also allows making a digital repository for institutes and information dissemination services. This is a very good and useful platform for organizing scholarly publications. This is supporting for the Metadata harvesting and open access repositories.

3.5.2.1.4 Fedora.

Free and open source software innovates by the Fedora community. This can run Linux based operating system. Information management and dissemination are very easy. This is a very effective way to store and preserve information in Digital way. This has flexible service-oriented architecture and it is supporting the managing and delivering digital content. All the object of the Fedora is exposed as web services and all the functions can be protected with control policies.

3.5.2.2 Integrated Library management Systems

3.5.2.2.1 KOHA

In 1999 using open source tools, New Zealand Katipo communications proposed a library system. It released under GPL. That was the world's first OSS integrated library management system. It has many versions and it is working properly with Linux based operating system platforms. Its programing language is Perl and runs on Apache web server. It is a relational database management system. It has many library standards such as MARK 21, Z39.50 etc.

Koha has a very powerful searching indexing system. It is called Zebra full-text searching. Information entries can be retrieved in MARCXML, Dublin Core, MODS, RSS, Atom, RDF-DC, SRW/DC, OAI-DC and Endnote standards. Koha OPAC is a powerful module and it can be used by Zotero citation tools. Koha is a full-featured OS ILS for library technology field. Now it is a community product and they are inviting all the members in library field to help them to develop it for creating and most user-friendly library

management system to the world. Koha can customize the way library services and requirements. Different libraries have different aspects and they like to extend their services to the society. Koha is full-featured library management software and it has many modules for library management. It has all the library modules Acquisition, Cataloguing, Circulation, WebOPAC, Patron Management, System Administration, and Serial Control. Most of the library software is not supporting with regional languages like Sinhala. But Koha is Unicode support software. Koha is supporting for importing bibliographic details from Congress library under the protocol of Z39.50. Koha runs on Linux and Windows-based platforms. Koha database in MySQL and Apache Web server.

3.5.2.2.2 NewGenLib

This is also an Integrated Library Automation and Networking software system. New Generation Library is its long name. It has developed by the Verus Solutions private limited company and Kesavan Institute of Information and Knowledge Management Company in India. In 2005 its 1.0 version was released and it has some more updated versions up to 2.0. This also comes under GNU public licensed. NewGenLib functional modules are completely web-based and using Java web start technology. It is compatible with many international standards like MARK21, MARK XML, Z39.50, SRU/W and OAI-PMH. This is scalable, manageable and efficient software system. Operating system independent and it has Z39.50 client federated searching facilities. This ILM is supporting for the Unicode 4.0 and it can use with other regional languages. In-library security side this is compatible with RFID integration. Networking side hierarchical and distributed networks can use with the system. Using NewGenLib user library administration process may need to use some document generation facilities. From this system, letters are configurable and use XML based OpenOffice letter templates. Can create different patron categories. This is supporting the multi-user and multiple security levels.

The acquisition, Serials management, Technical processing, Circulations, Administration process, Queries, Reports and end of the day process can manage the system. This is supporting Unicode 4.0 and 51 languages are covering for the data entering, storing, retrieving process. In hierarchical network process, everything depends on the main library

process and functionally they can perform autonomously in circulation process. All the other purchasing, cataloguing, classifications and technical process depend on the main library.

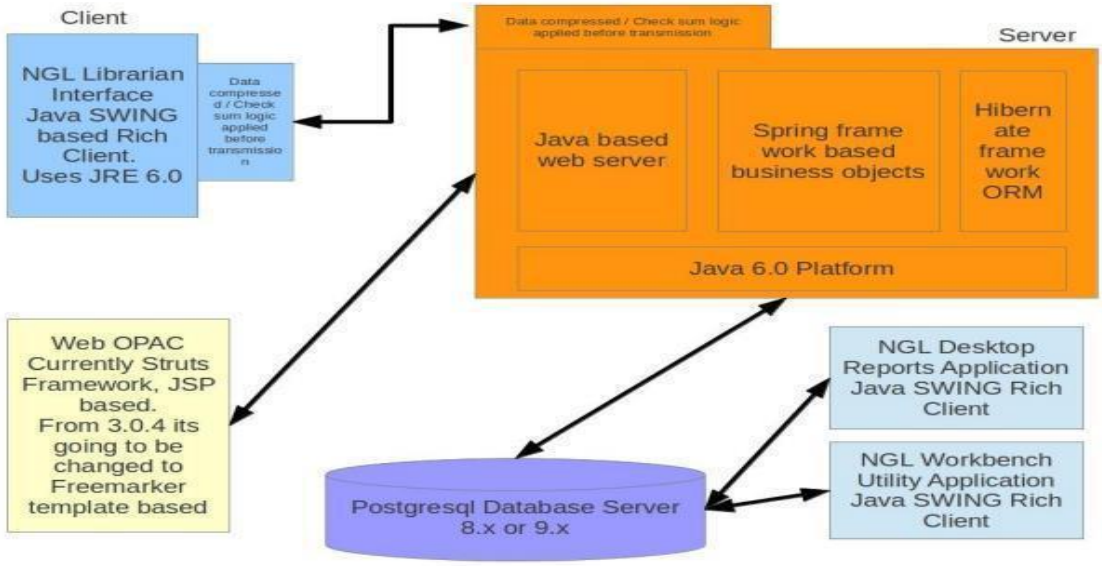

Figure 1: NewGenLib System architecture.
Source: http://www.verussolutions.biz/web

3.5.2.2.3 Evergreen

Evergreen ILS is another option when researching open source ILS options. Developed by Equinox Software, Evergreen is a robust, enterprise-level ILS solution developed to be capable of supporting the workload of large libraries in a fault-tolerant system. It too is standards compliant and uses the OPAC interface, and offers many features including flexible administration, workflow customization, adaptable programming interfaces, and because it's open source, cannot be locked away and can benefit from any community contributions. The evergreen software also a famous ILS around the world.

Evergreen is an open source library automation software designed to meet the needs of the very smallest to the very largest libraries and consortia. Through its staff interface, it facilitates the management, cataloguing, and circulation of library materials, and through

its online public access interface, it helps patrons find those materials. The Evergreen software is freely licensed under the GNU General Public License, meaning that it is free to download, use, view, modify, and share. It has an active development and user community, as well as several companies offering migration, support, hosting, and development services.

3.5.2.2.4 PMB PhpMyBibli

This is a fully featured open source integrated library system created by the PMB services SAS. This is also a cross-platform operating system support such as Mac, Windows and Linux based. Initially, this project started in October 2002 by Francois Lemarchand. It is a French Company. This has many functional modules for library management system. They are Circulation, Cataloguing, Reports, SDI services, Administration, Acquisition. Other features are a user-friendly web interface for the librarian and user side, UNIMARC, Z39.50 standards, barcode generation, detail document services for users and administrators. This is an inactive developing process and it has an interface for the database backups and bibliographical records. This is also a multi-language supporting system. Supporting with many international standards make library works easy and the library can import many bibliographic data records from many data formats and also this is supporting the protocol for metadata harvesting. PMB is covering four essential features like library management, documentary products, publication of editorial content, electronic document management. This is covering records up to 500000 records.

3.5.3 Summary

Considering library automation process in the library scenario we can use many library automation software with our capacity. Most of the open source library software basically can divide into two categories. Digital content management software and Integrated Library management software. Integrated library management software use for the day to day library operations handle the tangible reading materials.

Chapter 4

Open Source Library Software Evaluation

4.1 Introduction

Software evaluation is not an easy task. In this study, I have considered open source library-related software systems. It has divided into two categories. They are Digital content management software and Integrated library management software systems.

4.2 Evaluation of Digital library tools

Digital content management software features can evaluate in a table like below.

Software Features	Greenstone	DSpace	Eprint	Fedora
Developed by	University of Waikato, UNESCO & Human Info NGO	DuraSpace	School of Electronics & computer Science.UK.	Virginia University & Cornell University, USA.
Distributed	Free & Open Source	Free & Open Source	FOSS	Free
Stable release	2:2.86 /3:3.04	5.3		
Operating System	Cross platform	Cross platform		
License	GPL license	BSD	GNU GPL	Apache
Website	www.greenstone.org	www.dspace.org	www.eprints.org	www.fedora.info
Language	Multi Language (Over 50 languages)	Limited to non -English	15 non- English languages.	English
Metadata options	Dublin Core/ OAI-PMH & Indexing System.	Dublin Core/ OAI-PMH	Dublin Core/ OAI-PMH	Dublin Core/ OAI-PMH
Documentation	Completed & Detailed documentation	Detailed user guide and video guide	User created wiki & video guide	Limited documentations
Data Exchange	METS Formats	METS Formats	Bibliographic formats	Flexible.
Associate software	Apache Web server, Java 1.4.1 or above, Imagemagick Software and Web browser. Apache Tomcat	Java JDK 5 or later, Apache ant 1.6.2 or above, PostgreSQL 7.3 or later, Web browser, Tomcat		

4.3 Evaluation of Integrated Library management system.

In this study integrated library management system evaluation is the main process and objective. Analytical evaluation process makes analytical think deeply about the all the sides of the software system and its future development process.

4.3.1 Documentation.

Considering Documentation process of the ILM systems here, we have to consider Existing literature, Training, Manuals. Musts of the software systems selected here, they have proper documentation on the particular software. Koha, NewGenLib, Evergreen, PMB are the integrated library software. All the software has some level of proper documentation. A new user can follow directions and instructions given by the user manuals. And also, they have some developer's guide and other downloading and editing instructions.

4.3.2 General Features

Under general features cross-platform, multiple platform support, database capacity, speed, flexibility and standard data formatting support, user-friendliness is important. Compare to all the general features Koha is more compatible than other ILM systems.

4.3.3 Services.

All the software has covered basic library automation features such as Acquisition, Cataloguing, Classification bibliographic data supporting, Circulation, Serial control, OPAC (WEB & Intranet) Library administration process, International data standard supporting, updating with new technologies. Most of the system has covered circulation and bibliographic data standard supporting. Among the other, some have covered many options like Unicode supporting, acquisition all the functions from the beginning to end. In serial control process monitoring multiple issues of journal series and receiving, renewal, overdue alerts, abstract capturing are the main functions they have to cover.

OPAC is Online Public Access Catalogue and the user can search the database by using the OPAC. It has two modules. One is within the library premises use can use OPAC and get relevant bibliographic information. The other one is called as WEB OPAC and the user can search the bibliographic data without coming to the library from user's computer

with internet facilities. Most of the OPAC provide many searching facilities like Boolean search, keyword search like that. Some users are coming without knowing any information and having a basic idea of the book or relevant information source. Author, Title, subject keywords, ISBN, ISSN are the main access point for the users. Most of the software is not compatible with all the searching elements.

If the automation system is supporting the library administration process library can generate many reports. Collection statistics, circulation statistics and other reports relevant to the institutional level. If the system is more user-customizable, the library can manage report generation process and other administration work. Enhancing MARC data formats also very important to the library. Many software allows cataloguing all the reading materials.

Updates are very important for the system. Here we have to consider developers or developing company providing updates their own sites, help with installation and upgrading, bug fixing and other particular functions through the online basis.

Provision of handling union catalogue items is very important to capture other catalogue details. If the library does not have requested reading the material, they can find them from other libraries using union catalogue. New technologies are coming regularly to all the sectors like libraries. If the system can work with internet connectivity and email supporting are important to share information and user related information sharing. Libraries are not isolated working places and sometimes they can have branch libraries or regional information centres within the local Provincial area, country or regionally. The software should have facilities to manage all the areas or branches properly. Accessing information through the web browser is easy for the user. Without wall barriers, libraries have to arrange some access points the way is beneficial to the user. Library software keeping the pace with global technology and web enhancement, online information, virtual services, links to social networks is very important. With new technological improvements, Libraries are not an isolated place like early system.

Some latest software is hosting an application service (ASP) or by the web server. It is an advantage to all the libraries and cataloguers and works from remote locations and OPAC can be accessed from both the places in all the time. Library software should have to run with other software on the workstations. Otherwise, they have to keep separate computers allocating only for the Library management software.

Security is the main thing for the library. Past, present and future it can be a major problem librarian and staff has to find a solution. Library management software not for the security purposes but with the LMS we should have some futures supporting the library security works. Taking information as input from the user ID/Barcode/ RFID is main input method for tracking user details. All the circulation works it has to work properly. Other way libraries may have some special collections details and records. Records can be user details or another thing. Anyhow LMS have to have provisions for access restriction for those records. If the system has provision for the student, staff to log in, log off on their own, it is must for the library management system. Library management process, staff needed this kind of options for record management. LMS should have continuous development process. Then only libraries can add more features to their system. Power out feature also a very important thing for the library management software. Is there any power out feature, there should be offline circulation module to manage the library functions without breaking the process until power back and after connecting process again into the usual process. Cost if the other main point about the LMS. Using OSS library management software there is no cost at all for the purchasing. But after selecting we should have some consulting cost if we don't have IT advance knowledgeable human resources. Then we have to allocate few amounts of cost as consultation fee and we may have some agreements for that.

4.4 Summary.

Considering mostly use open source library management software, most of the software has many advanced features related to library functions & process. Among them, Koha has many features and user-friendly customizable options. Any library can start working with the Koha open source integrated library management software without any problem as its current mood. If someone wants to add some more features they can add without any barriers.

Chapter 5

Approach and Implementation

5.1 Introduction

Koha Integrated library management system has more user-friendly features. Librarian and staff can use those options for managing library works. Present Libraries are not like in traditional libraries. The old library system, users are coming to the libraries they don't have value. The use coming and getting reading materials and going. In that system, libraries did not try to promote libraries among the users. Then they didn't try to do any special thing for them. Now libraries are going to user's doorstep and providing services to them. Sometimes they are arranging many user motivational programs and library monthly statistic reports also can add this kind of details.

The top user option is the first option has added to the system. In that option, the tag is coming in the Koha home page. It has shown below figure 1.

Figure 2: Koha home page.

In the database, Borrowers table has book borrowers' details related to the users. In Issues table, it has issued details related to specific users regarding their borrowing details. Here I have joined that two table so that I want to use issuing details for the fetch. Borrower number is getting an as unique number. Grouping by borrower number and first name Here can take issue details. Same number repeating time is counting. Date, branch and the time period have to consider here. Only for 5 results, it has limited because if it is a long time period, it will be a long list. It is very hard to manage all the data. Branch code and issuing

details are related to relevant Branches. In the Issuing table, issue date is considering if they have returned. Otherwise catching non-return users is not easy. Using this Top User option last three month, last five months top user can find.

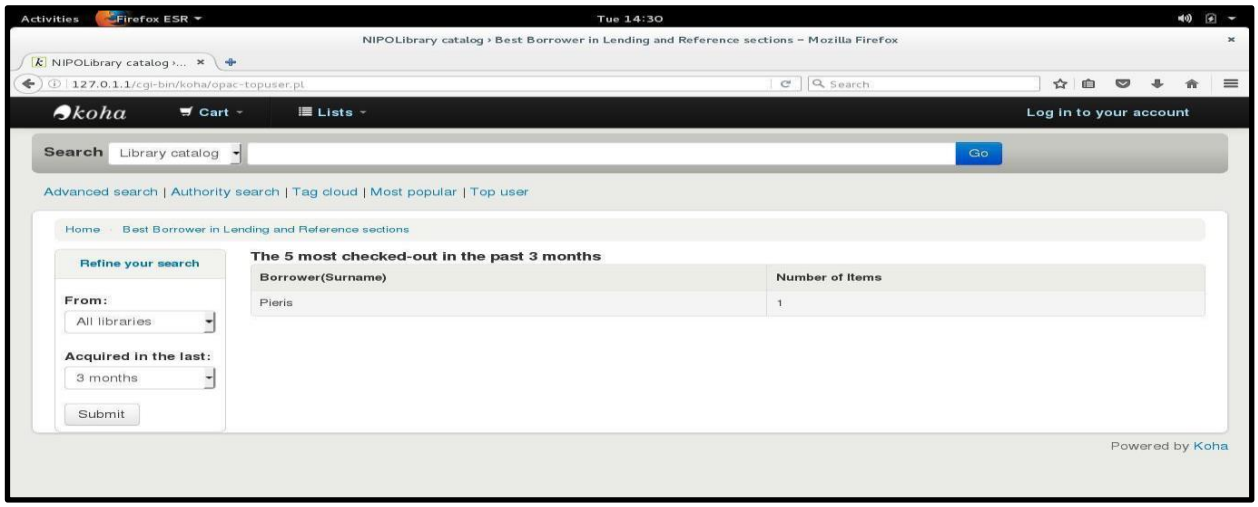

Figure 3: All library top users in last 3 months

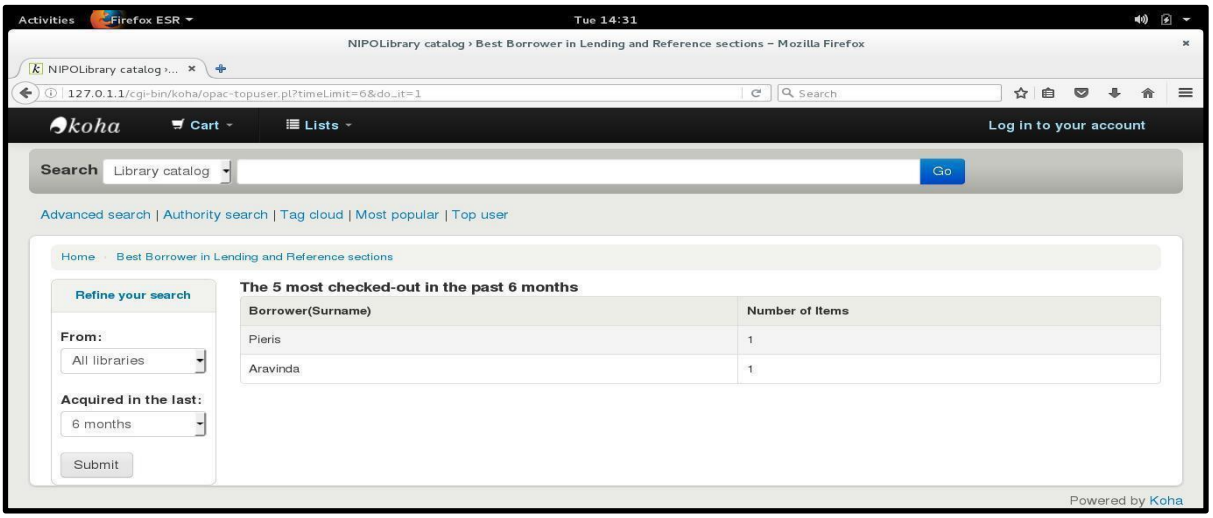

Figure 4. All library top users in last 6 months.

The library staff can find a top user for the specific time period and separately in different branches. Staff can fetch relevance information related to users.

As the second option of the development process, I have created a module for user book suggestions. In that module, the user can search books with subject related keywords. After that user is getting suggestions according to the highest transactions within the related subject category and out of that category. The Apriori algorithm has applied for data mining. In apriori algorithm transaction process working as follows.

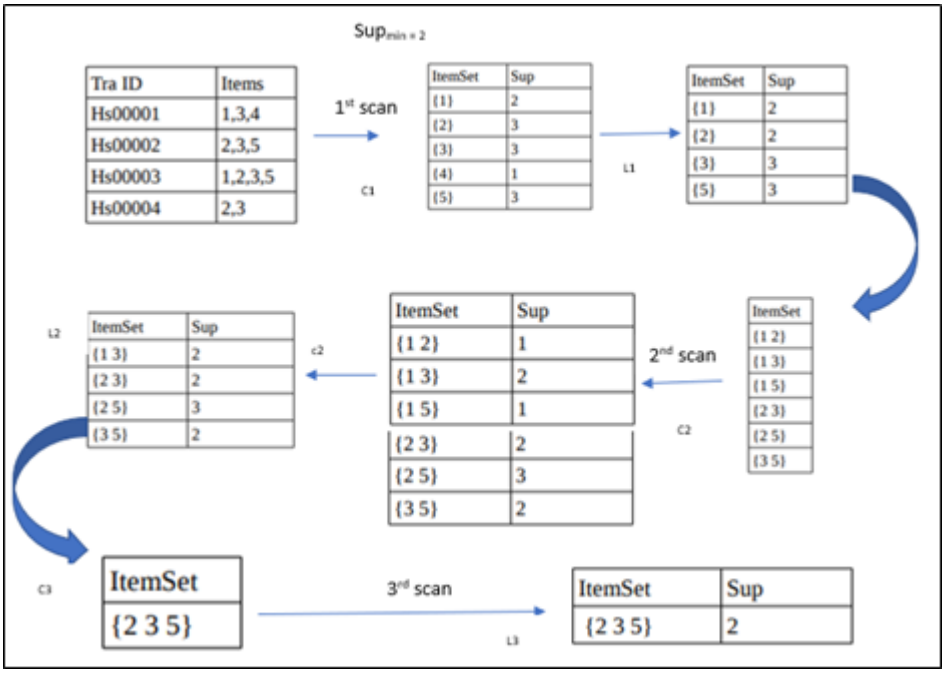

Figure 5: Apriori Algorithm.

In this development process, Apriori algorithm has applied to give book suggestions to users. The user can log in to the user account and can search the library book database with keywords. After that list of book display for user selection. The user may have to select some books with the mouse click. Then under the details of that booking system is giving some suggestions considering transactions history. Then the user can get an idea for other related books in the same subject category and among the other two or more categories. This association rule is working with the apriori algorithm. The user can check the transaction history too. Displaying one or more suggestions for the selected book is useful for the user.

Figure 6: searching book

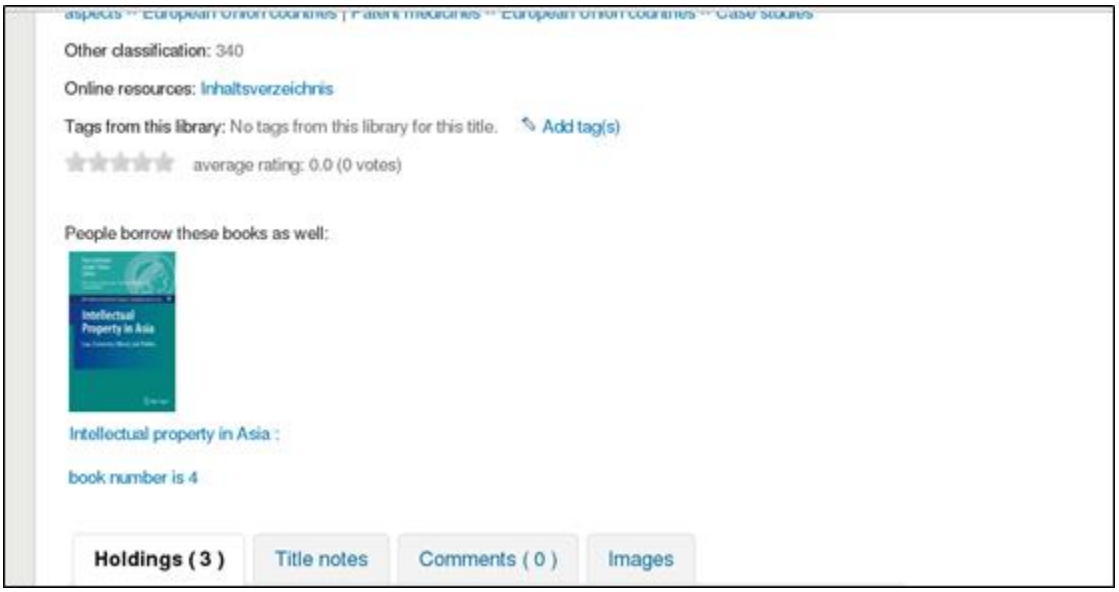

Figure 6: Book Suggestion.

Figure 7: Searched book

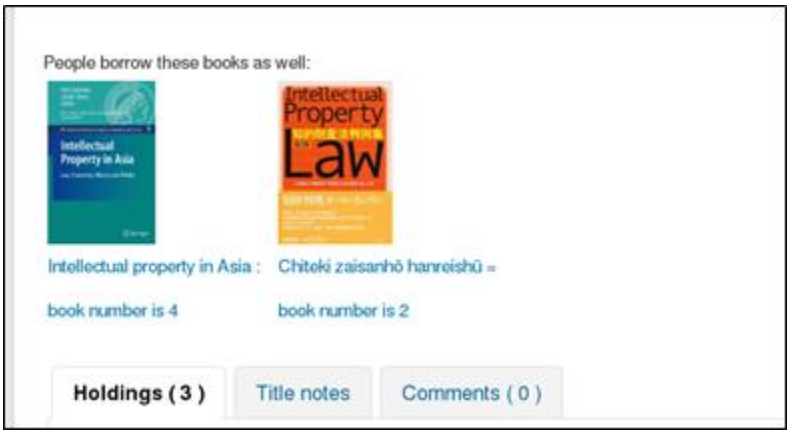

Figure 8: more book suggestions

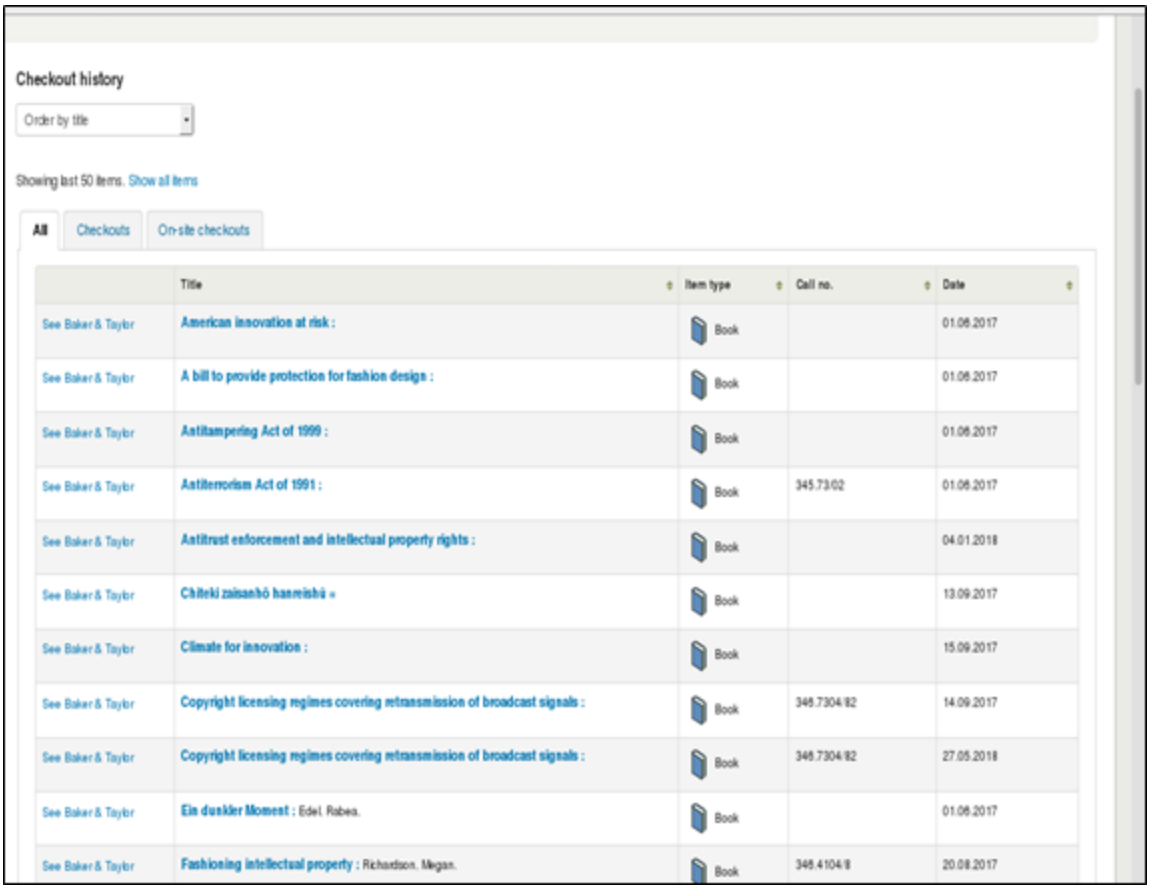

Figure 9: User Transaction history

5.2 Summary

Using this top user tag option module libraries can find top users in any time period. Libraries are starting information extended services and they can use this option.it is very easy. Fetching these information library staff can display statistical data for user motivation and as a library promotional activity. Book suggestions are important to new user to get an idea for relevant books and association of the related subject category.

Chapter 6

Discussion and Future Work.

6.1 Introduction.

Libraries are working with new technologies and they have added some software systems to the libraries. With ICT infrastructure library works has become easier and more valuable. And also, library can extend their services in many ways. As explained in previous chapter Koha library management software has many features and here I have added another new part as a top user. With this feature, the library can start user motivational programs. Within few second, they can find the top user, branches wise, within a time period like that. From a library, users are not expecting a more advanced functional thing. Because all the users have to use the library system and cannot expect same knowledge from each. Without waiting for the user, libraries have to extend their services and they have to go to the user. For that kind of extensional programs, they need this kind of options for identifying relevant users.

6.2 Future works

In this project work, I selected few of the digital library tools and integrated library management software for library works. Considering all the library software and digital library tool I used Koha for the final development process. Koha LMS have a different kind of user-friendly service options. And some tools are specializing in special subject areas. For the future work, I hope to implement this software in the library and use it for user services. Later considering future user requirements, planning to customize software the way the user can get more benefits and user-friendly way. Better to consider more digital library tools and have to create a checklist for evaluation. Then anybody can select a suitable tool for their library.

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Appendix 1 - topuser.tt

```
[% USE Koha %]
[% USE Branches %]
[% USE AuthorisedValues %]
[% USE ItemTypes %]
[% INCLUDE 'doc-head-open.inc' %]
<title>[% IF ( LibraryNameTitle ) %][% LibraryNameTitle %][% ELSE %]Koha online[% END %]
catalog &rsaquo; Best Borrower in Lending and Reference sections</title>
[% INCLUDE 'doc-head-close.inc' %]
[% BLOCK cssinclude %]
        <style type="text/css">
        #search-facets fieldset { border: 0; margin: 0;padding:.3em;}#search-facets
ol{padding:.3em;}#search-facets li {list-style-type:none;padding:4px 4px;}#search-facets
label{font-weight:bold;display:block;margin:.2em 0;}#search-facets fieldset.action
{padding-left:4px;margin:.3em;};
        </style>
[% END %]
</head>
[% INCLUDE 'bodytag.inc' bodyid='opac-topuser' bodyclass='scrollto' %]
[% INCLUDE 'masthead.inc' %]
        <div class="main">
        <ul class="breadcrumb">
        <li><a href="/cgi-bin/koha/opac-main.pl">Home</a> <span
class="divider">&rsaquo;</span></li>
        <li><a href="#">Best Borrower in Lending and Reference sections</a></li>
        </ul>
        <div class="container-fluid">
        <div class="row-fluid">
                <div class="span2">
                <div id="usertopuser">
                [% INCLUDE 'opac-topuser.inc' %]
                [% IF ( OpacNav || OpacNavBottom ) %]
                        [% INCLUDE 'navigation.inc' %]
                [% END %]
                </div>
                </div>
                <div class="span10">
                <div id="topuser" class="maincontent">
                [% IF ( results ) %]
                        <table id="topuser" class="table table-bordered table-striped">
                        <caption>
                        The 5 most checked-out
```

```
                        [% IF selected_itemtype %]
                                [% ItemTypes.GetDescription(selected_itemtype) %]
                        [% END %]
                        [% IF ( branch ) %]
                        at
                        [% Branches.GetName( branch ) %]
                        [% END %]
                        [% IF ( timeLimit != 999 ) %]
                        in the past [% timeLimit |html %] months
                        [% ELSE %] of all time[% END %]
                        </caption>
                        <thead>
                        <tr>
                                <th>Borrower(Surname)</th>
                                <th>Number of Items</th>
                        </tr>
                        </thead>
                        <tbody>
                        [% FOREACH result IN results %]
                                <tr>
                                <td><span>
                                [% IF ( result.surname ) %][% result.surname %][% END %]
                                </span>
                                </td>
                                <td>                                                [% IF ( result.Counts ) %][%
result.Counts %][% END %]</td>
                                </tr>
                        [% END %]
                        </tbody>
                        </table>
                [% ELSE %]
                        No results, try to change filters.
                [% END # / IF results %]
                </div> <!-- / #topissues -->
                </div> <!-- / .span10 -->
        </div> <!-- / .row-fluid -->
        </div> <!-- / .container-fluid -->
        </div> <!-- / .main -->
[% INCLUDE 'opac-bottom.inc' %]
[% BLOCK jsinclude %]
[% INCLUDE 'datatables.inc' %]
<script type="text/javascript">
//<![CDATA[
```

```
	$(function() {
	$("#topissuest").dataTable($.extend(true, {}, dataTablesDefaults, {
	"aaSorting": [ [2, "desc"], [0, "asc"] ],
	"aoColumnDefs": [
	[% IF ( opacuserlogin ) %]{ "aTargets": [ -1 ], "bSortable": false, "bSearchable": false }[%
END %]
	],
	"aoColumns": [
		{ "sType": "anti-the" },
		null,
		{ "sType": "title-numeric" },
		[% IF ( opacuserlogin ) %]null,[% END %]
	]
	}));
	});
function Dopop(link) {
	newin=window.open(link,'width=500,height=400,toolbar=false,scrollbars=yes');
}
//]]>
</script>
[% END %]
```

Appendix II Circulation.pm

```
sub GetTopUser {
 my ($params) = @_;
        my ($branch, $newness)
        = @$params{qw(branch newness)};
        my $dbh = C4::Context->dbh;
        my $query = q{
        select bo.surname,count(i.issue_id) as Counts from borrowers bo left join issues i on
(i.borrowernumber=bo.borrowernumber)
        };
        my (@where_strs, @where_args);
        if ($branch) {
        push @where_strs, 'i.branchcode = ?';
        push @where_args, $branch;
        }
        if ($newness) {
        push @where_strs, 'TO_DAYS(NOW()) - TO_DAYS(i.issuedate) <= ?';
        push @where_args, $newness;
        }
 if (@where_strs) {
        $query .= 'WHERE returndate is not null and ' . join(' AND ', @where_strs);
        }
        $query .= q{
        GROUP BY bo.borrowernumber,bo.firstname
        ORDER BY Counts DESC
        };
 $query .= "LIMIT 5";
        my $rows = $dbh->selectall_arrayref($query, { Slice => {} }, @where_args);
        return @$rows;
}
```

Appendix III opac-topuser.pl

```
use strict;
use warnings;
use CGI qw ( -utf8 );
use C4::Auth;
use C4::Context;
use C4::Languages;
use C4::Search;
use C4::Output;
use C4::Koha;
use C4::Circulation;
use Date::Manip;
=head1 NAME
plugin that shows a stats on borrowers
=head1 DESCRIPTION
=cut
my $input = new CGI;
# if OpacTopuser is disabled, leave immediately
if ( ! C4::Context->preference('OpacTopissue') ) {
        print $input->redirect("/cgi-bin/koha/errors/404.pl");
        exit;
}
my $itemtypes = GetItemTypes();
my ($template, $borrowernumber, $cookie) = get_template_and_user(
        {
        template_name   => 'opac-topuser.tt',
        query           => $input,
        type            => "opac",
        authnotrequired => ( C4::Context->preference("OpacPublic") ? 1 : 0 ),
        debug           => 1,
        }
);
my $dbh = C4::Context->dbh;
# Displaying results
my $do_it = $input->param('do_it') || 0; # as form been posted
my $limit = $input->param('limit');
$limit = 10 unless ($limit && $limit =~ /^\d+$/); # control user input for SQL query
$limit = 100 if $limit > 100;
my $branch = $input->param('branch') || '';
if (!$do_it && C4::Context->userenv && C4::Context->userenv->{'branch'} ) {
        $branch = C4::Context->userenv->{'branch'}; # select user branch by default
}
```

```
my $itemtype = $input->param('itemtype') || '';
my $timeLimit = $input->param('timeLimit') || 3;
my $advanced_search_types = C4::Context->preference('AdvancedSearchTypes');
my @advanced_search_types = split /\|/, $advanced_search_types;
my $params = {
        count => $limit,
        branch => $branch,
        newness => $timeLimit < 999 ? $timeLimit * 30 : undef,
};
@advanced_search_types = grep /^(ccode|itemtypes)$/, @advanced_search_types;
foreach my $type (@advanced_search_types) {
        if ($type eq 'itemtypes') {
        $type = 'itemtype';
        }
        $params->{$type} = $input->param($type);
        $template->param('selected_' . $type => scalar $input->param($type));
}
my @results = GetTopUser($params);
$template->param(
        limit => $limit,
        branch => $branch,
        timeLimit => $timeLimit,
        results => \@results,
);
output_html_with_http_headers $input, $cookie, $template->output;
```

Appendix iv Apriori Algorithm

```
sub GetBiblioSuggestions{
   my ($biblionumber) = @_;
        my $dbh         = C4::Context->dbh;#Database handle object
                                # next line is Statement handle object
        my $sth         = $dbh->prepare("SELECT
iss.issue_id,iss.borrowernumber,DATE(iss.issuedate) FROM `issues` iss inner join `items` it on
iss.itemnumber=it.itemnumber where it.biblionumber=? ");
        # in issuees table we dont have biblionumber so inner join now we have
        my $count       = 0;
        my @results;
        $sth->execute($biblionumber);

   my @booksuggests;
   my $issue_id=0;
   my $borrowernumber=0;
   my $issuedate;
   my $booktitle="";
   my $booknumber=0;


   my @book_q;
        my @book_qTitle;

   while ( ($issue_id,$borrowernumber,$issuedate) = $sth->fetchrow_array( ) )
    {


       my $sth2             = $dbh->prepare("SELECT bb.biblionumber, bb.title FROM `issues` iss
inner join `items` it on iss.itemnumber=it.itemnumber inner join `biblio` bb on
it.biblionumber=bb.biblionumber where issue_id!=? and iss.borrowernumber=? and
DATE(iss.issuedate) =? ");



        $sth2->bind_param(1,$issue_id);
        $sth2->bind_param(2,$borrowernumber);
        $sth2->bind_param(3,$issuedate);
        $sth2->execute();
```

```
        while(($booknumber,$booktitle) = $sth2->fetchrow_array()){


                        push @book_q, $booknumber;
                       push @book_qTitle, $booktitle;


    }
                        my @uniqu;
                        my @dup;
                        my %seen;
                        @dup = map { 1==$seen{$_}++ ? $_ : () } @book_q;

                        my @uniquT;
                        my @dupT;
                        my %seenT;
                        @dupT = map { 1==$seenT{$_}++ ? $_ : () } @book_qTitle;
       }                        foreach my $i (0 .. $#dup) {


                                push(@booksuggests,{number=>$dup[$i],title=>$dupT[$i]});
                       }

          return @booksuggests;
}
```