A WEB-DRIVEN CIRCULATION CONTROL SYSTEM FOR MAKERERE LAW SCHOOL LIBRARY

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A PROJECT REPORT SUBMITTED TO THE EAST AFRICAN SCHOOL OF LIBRARY AND INFORMATION SCIENCE IN PARTIAL FULLFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF BACHELOR OF LIBRARY AND INFORMATION SCIENCE OF MAKERERE UNIVERSITY

JULY, 2018
DECLARATION

I hereby wish to declare that this work entitled “A Web-Driven Circulation Control System for Makerere Law School Library” is written by me and is the record of my research. I wish to further state that the work has never been presented either partly or wholly for the award of any degree or diploma in any institution of learning to the best of my knowledge. All citations in the work were dully acknowledged in the references.

____________________  ______________________

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APPROVAL

This project report has been submitted for examination under my approval as university supervisor.

_______________________   ______________________
MR. BATTE RICHARD     DATE

SUPERVISOR
DEDICATION

This work is dedicated to my mum Ms. Kisomose Annet for her financial support and encouragement in the course of my study while at the University. It is also dedicated to my siblings; Gerald, Isaac, Julius and Mariam and all my friends at Makerere University for their endless support in academics.

May God bless you!!
ACKNOWLEDGEMENT

I wish to express my sincere gratitude to Almighty God for his mercies and for granting me the opportunity to complete the work. I am grateful to my supervisor, Dr. Kiiyingi, G.W. who tolerated my ignorance.

Indeed, he demonstrated to me what it takes to be a leader. Special thank you goes to all the members of staff in the Department of Library and Information Science, especially Dr. Bukirwa Joyce and Dr. Sarah Kaddu. I am also grateful to all my friends at Makerere University who assisted me in one way or the other.

I extend my sincere thanks to my dear Ms. Kisomose Annet for the encouragement and prayers. Finally, my thanks go to all the members of my family and friends who had prayed for the successful completion of the work. I thank them and pray that God bless them abundantly, Amen.
# LIST OF ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
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<tr>
<td>CD</td>
<td>Compact Disk</td>
</tr>
<tr>
<td>EASLIS</td>
<td>East African School of Library and Information Sciences</td>
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<tr>
<td>I.T</td>
<td>Information Technology</td>
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<tr>
<td>ICTs</td>
<td>Information Communication Technologies</td>
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<tr>
<td>ID</td>
<td>Identification</td>
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<tr>
<td>MLSL</td>
<td>Makerere Law School Library</td>
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ABSTRACT

The purpose of this project was to design a Web Driven Circulation Control System for Makerere Law School Library that provides a convenient, easy-to-use, internet-based application for librarians and users to track and manage the library resources. The objectives of the study were to: examine the current Browne circulation system used at Makerere Law School Library, establish the challenges of Browne circulation system at Makerere Law School Library, establish the necessary requirements in designing a Web Driven Circulation Control System at Makerere Law School Library, design and implement a web driven circulation system at Makerere Law School Library that has an improved inventory control of resources at the University.

The study employed a case study research design since the study targeted a particular institution that is Makerere Law School Library. The study adopted a qualitative research approach in collecting data. Purposive sampling was used to select 18 respondents who participated in the study.

The study found out that majority of library users at Makerere Law School Library were University students. Majority of the information resources in the Makerere Law School Library were text books accessed by the users to meet their learning teaching and research needs. Library staff use counter books and registers in the management of the information resources and users’ details. The major challenge faced with the library circulation system is the inadequate information resources caused by inadequate funding in the Makerere Law School Library. It was there needful to design a library circulation in order to support the staff in delivering resources to the users of the Makerere Law School Library.

The study concluded that a Web Driven Circulation Control System would help the library staff provide library resources to the users, inadequate Information Resources and inadequate funds as the major challenges would be solved by increasing the library funding so as to support the library users meet their needs. The study recommended that the library staff should increase on the library funding, develops a library circulation policy, acquire more computers for the users to access and more staff with technical IT skills, should digitize all Information Resources to promote the access and provision.
CHAPTER ONE

INTRODUCTION TO THE STUDY

1.1 Introduction

This chapter presents the background of the project, background of the study area, statement of the problem, purpose of the project, objectives of the project, significance and justification of the study, scope of the study and definition of key terms.

1.2 Background to the Project

University libraries are essential contributors to knowledge generation and serve a wide spectrum of knowledge seekers (Nwachukwu & Adamu, 2016). In fact, university libraries have been described as the "heart" of the university because they provide a place for students and faculty to do their research and advance their knowledge. The fundamental role of any Makerere Law School Library is to collect, process, store, disseminate and utilize information to provide services to the academic and research community. Nwachukwu & Adamu, (2016) notes that librarians and library staff provide numerous services, ranging from acquisition, cataloguing, circulation serial and reference services to their users in order to address their diverse needs and interests. Both the faculty and students depend heavily on the library for information that is necessary in pursuing their individual and collective goals (Agyen-Gyasielal, 2010).

It is no secret that academic libraries have been and currently are experiencing a decline in traditional book circulation (Holderman, 2018). The Academic Libraries survey by the U.S. National Center for Education Statistics reported that 3793 libraries held just under 1.1 billion books, serial backfiles, and other tangible materials; these libraries circulated approximately 154.4 million items in 2012 (Phan, Hardesty& Hug, 2014) which means approximately 14% of library materials circulated. Owning 1.1 billion tangible items is not cheap; libraries paid over $503.8 million in 2012 alone for printed materials, which seem staggering when viewed in light of 14% circulation. Individual academic libraries will certainly see circulation numbers lower or
higher than 14%, but monograph circulation for most libraries has been decreasing since the mid-1990s (Martell, 2008).

Kurt (2012) compared circulation data and enrollment data to demonstrate the rate of this decline. Application of the linear regression model suggested circulations per user would reach zero by 2020. Being just three years away, that now seems unlikely to occur; libraries are not on this exact trajectory five years after Kurt’s modeling (Holdeman, 2018). This suggests a simple reason for declining circulation: libraries are not offering what patrons need. Users will seek non-library sources 90% of the time when digital media entities such as Google, Netflix, Amazon, and HathiTrust have resources that are instantaneously available (Attis, 2013).

The application of computer technology into the library system has revolutionized the operations and use of libraries (Nwachukwu & Adamu, 2016). With this technology, material resources needed for teaching and research become easy to access, more than ever before, Nigerian university libraries have developed interest in the use of modern technology to enhance their productivity and improve their services. Faisal and Surendan (2008) itemized the Advantages of Library software as follow: it provides users with timely access to library materials; it eliminates routine tasks or performs them more efficiently; it reduces the amount of time spent on material acquisition, serials management, budget administration and record keeping; it supports new means of information retrieval by introducing patrons to global information; it allows patrons to use search strategies that exceed those that can be used with card catalogue; it allows patrons to search library’s collection from locations outside the Library’s walls; it motivates users, equips them with problem solving and information retrieval skills, and provides them with lifelong learning experiences.

The School of Law has since evolved from what started as a school of law in 1968, the School has sought to provide quality education in study of Law and Legal Sciences, and to promote the development of a well-rounded scholar and advocate. Over the thirty years of its existence, the School has expanded tremendously. While the fast graduating class (1968-71) was made up of 17 male students and 6 women, the Class of 1997-2001 boasts a total of nearly 300, with a female enrollment of nearly 40 percent. Whereas the Faculty opened with only 6 teachers,
today it is made up of a teaching staff of over thirty, comprising 24 men and 8 women. All of them are Ugandan academics who have distinguished themselves in their respective disciplines.

The school of law is poised to enter the 21st Century as a trail-blazer in the arena of legal teaching scholarship and practice, providing personnel for traditional law practice, non-governmental service, international diplomacy and academia. Not only has it strengthened the traditional areas of teaching such as Legal methods, Land law and Civil Procedure, but it is introducing new areas that meet the challenges of the new millennium, such as Legal informatics, Gender and the Law, and Clinical Legal Education. All these developments have projected the Faculty back into the international arena, drawing student applications from within the Greater Eastern Africa region, and further afield.

The decision was made to move the Law School from Entebbe to Kampala because it was believed that the Law School was academically and professionally isolated from the mainstream of events. The Uganda Government therefore proposed to transfer the School to Kampala where it might be attached to Makerere University College and thus enable students to have academic intercourse with other students and also to give them more opportunities for mixing with members of the judiciary and the Bar. It was also desired to have the school near the Attorney General's Chambers under which it fell for administration. In being attached to Makerere, the Law School was, however, not to immediately exist as a school of law but rather as a nucleus for one, which was expected if and when the university of East Africa came to an end. Makerere was to act as an "Agent" for Government in running the school. The School was also to conduct pre-enrollment courses for LL. B graduates from Dar-es-Salaam.

These proposals culminated in the establishment of a Department of Law in Faculty of Social Sciences at Makerere University College in June 1968. In July 1968 the Law Development Centre was established as a separate institution, to take over, inter alia, the functions of the Law School at Entebbe, which ceased to exist. On July 1970, the Department of law became a Faculty.

Makerere Law School Library continues to embrace the manual system of using cards which is laborious at circulation due to challenges of untrained staff, and lack of library management /
data base systems. It is for this reason that the researcher decided to design a computerized circulation control system which is advantageous in the following ways;

Users will know what the library has: The library will have a web-based catalog. The catalog will display what the library owns and will indicate the availability of items. Users can access the catalog from their homes and as well on campus. They will be able to check their accounts: While at the library, or from home, they can enter the barcode on their library card and a PIN and see the items they have checked out, items they have requested, items that are overdue, and can renew items.

Be able to place and manage their holds: users may place requests, or holds, on a book that their library owns but is currently checked out. When the book is returned, the computer system gives an alert that there is a hold waiting and prints a slip with the person’s phone number. The system can automatically send emails to let users know when requested items become available. Users also enjoy the convenience of having the Web Driven Circulation Control System notify them about items before they become overdue and receiving overdue notices via email.

Be able to efficiently manage overdue items: The library can print reports of overdue items and have the ability to create pull-apart mailing forms similar to those used for bank statements. Reminder emails can be automatically sent two days before an item becomes overdue and another email can be sent when the item becomes overdue. The emails are sent automatically, with no time spent or involvement required by staff.

Be able to easily gather statistics and get reports: Statistics are automatically compiled as the library uses the system. The library will not just have numbers, they will have reports. Through these, the library will be able to see how the collection is being used and which sections are not being used. Use by age-group may also be tracked. This will help the library be more responsive to the patrons it serves.

In all, an automated system tracks the status of all the materials in the library. By contrast, using a manual card system, there is no way to answer people’s questions about items that are not on the shelf, such as: When can I have that book? When is that movie due to be returned?
1.3 Statement of the Problem

Makerere Law School Library continues to use the conventional library system where books are charged and discharged manually and records are maintained in manual circulation systems. The manual method of charging and discharging of library resources is poorly structured and characterized by long queues and unnecessary delays, the filling of users' cards and keeping of statistics is not only cumbersome but also getting out of control as filing cards spills over to the next day on several occasions. It is in view of the foregoing that the researcher intends to develop and implement a user-friendly circulation system for Makerere Law School Library so as to fill the gap that exists in this area.

1.4 Project Objectives

1.4.1 Overall Objective

The overall project objective was to design a Web-Driven Circulation Control System to meet the needs of library users at Makerere Law School Library.

1.4.2 Specific Objectives

The project sets outs to achieve the following objectives:

1. To analyze the existing library circulation system in Makerere Law School Library and establish the effects of the Manual circulation system in Makerere Law School Library.
2. Identify requirements for a web-driven circulation control system for Makerere Law School Library
3. Design and Implement a web-driven circulation control system for Makerere Law School Library

1.5 Research Questions

The project was guided by the following questions:

1. What is the existing circulation system in Makerere Law School Library in order to establish the effects of the manual circulation system?
2. What are the requirements for a circulation control system for Makerere Law School Library?

3. How can a web-driven circulation control system be designed and implemented at Makerere Law Society Library?

1.6 Project Scope

The scope of the study limited to the design and implementation of a Web-driven Circulation Control System for Makerere Law School Library. The operations of the system are more elaborated in the contextual diagram of the database system below;

**Figure 1: System Contextual Diagram**

Source: Field Data (2018)

This is an overview of the system that shows the system boundaries, external entities, that interact with the system and major information flows between the entities and the system. From the figure above, the system allows the user and administrators of the system to login the system. It shows that the administrator logs into the system and can add, delete, or even edit user profile
into the system. Users can login, search, request, ask the librarian and retrieve information from the system.

1.7 Significance of the Project

The project will be useful to the following categories of people as described below;

**Library staff:** The project will promote service provisions by the librarians through effective use of new technology to offer library materials to the users. The system will enable Librarians to keep track of available books, Library users and makes it easier for the librarian to track those who have borrowed books and have not returned them.

**Library Users:** The study will be important to the students in searching, accessing and retrieving of information by use of the newly designed system. The project will help the library users to save their time in terms of accessing services from the library staff through the use of internet and a number of ICTs.

**Makerere Law School Library:** It will generate ideas about the usefulness of a modern computerized circulation system in improving charging and discharging of information to users. It will as well reduce costs, saves borrowers time, speed up charging and discharging, and allow circulation staff do professional work better. The study will also create an awareness that is likely to lead to enhanced cooperation between university libraries on how best computerized circulation systems can enhance service delivery to library patrons.

1.8 Definition of Key Operational Terms

**Library Circulation:** According to Battaile (2012), circulation in a library is the orderly movement through a circuit, as it applies to the process of lending books to borrowers and then accurately re-shelving them after they have been returned so that they will be retrievable by the next user. Library circulation or library lending comprises the activities around the lending of Library books and other materials to users of a lending Library.

**Circulation Control System:** Babafemi et al., (2018) defined a circulation system as the one which involves the mechanization of activities such as charging of books to users, renewing of
books, processing, reservation, monitoring of utilization of books, operating short term loans of
document processing, overdue notices and calculating fines, answering library queries,
discharging returned materials and checking for possible hold request.

**Library:** Ajmal (2016) defines a library as a collection of books, documents, newspapers, audio
visual materials kept and organized for people to read or borrow. This is because the definition
includes all the concepts necessary for the study.

**Academic Library:** Yusuf & Iwu (2010) stated that a well-stocked academic library is a
storehouse of information, or a record of human experience to which users may turn to for data
or information.
CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section reviews literature from books, journals, internet sources and other projects already done and which is related to circulation control systems. The literature review will be based on project objectives of the study.

2.2 Library Circulation Systems in Academic Libraries

In recognition of the importance services of the circulation section of the Library, Olamigoke (2009) affirm that the assertion that traditionally, the circulation and reference desks are Library patrons’ first points of call for information and enquiries. As the first port of call, the responsibility of projecting the image of the Library in good light rests squarely on the staff at the circulation desk. This requires excellent human relations service. Alokun, (2013) buttressed further the enormity of this responsibility when he expressed the opinion that a Library is supposed to be readers’ oriented and users’ friendly and that Library services are supposed to focus on users’ needs that it is the responsibility of the Library to strive and satisfy those needs promptly. The emphasis on “needs” above refers to information relevant to Library patrons contained in the resources of the Library. Madukoma (2011) described it as a powerful resource as equal to other natural resources.

Nwachukwu & Adamu (2016) argued that in many cases, it is more important than other resources. The choice of adequately delivering service as pointed out above commences from the circulation desk. It is often said that first impression lasts long; the circulation desk therefore, should be handled by competent staff that have good communication and human relation skills and a friendly disposition. The efficacy of service delivery at the circulation desk has been greatly enhanced by the presence of the current obtainable and available technologies.

Circulation of library materials: Circulation module has a database of users’ details necessary for circulation of materials, provides overdue list, charges, generates reminder notice on borrowed materials. Crosby (2010) stated that, years ago, paper cards and ink stamps were the primary way
books were tracked, now, most librarians use Web Driven Circulation Control Systems to simplify book management. Librarians also set policies about lending time and renewals and, in libraries that offer computer access, establish rules governing computer use. Materials are circulated electronically to users with the aid of hand held scanners and bar code labels. Request for materials, reservation and renewal are done online. Request/reservation slips are printed out to retrieve the material for the user. Request/reservation is cancelled if the user failed to turn up after some days.

The circulation desk is a hub of activity with people asking many questions and bringing up armloads of library materials. In fact, from the viewpoint of many library users, the circulation desk is the library. According to Rach (2008), there exists different types of circulation systems and the early circulation systems were manual requiring library staff to record and file information by hand. Later systems began to take advantage of technologies such as photography and punch cards that automated some circulation functions. The advent of the computer and more recently the microcomputer has meant that libraries could develop fully Web Driven Circulation Control Systems.

It is the main service point usually found near the main entrance of a library and provides lending services and facilities for return of loaned items, renewal of materials and payment of fines (Weingand, 2007). A circulation control system is a system that allows staff to determine, at a minimum, the location of each book in the collection and to administer the circulation policy fairly. Each system has unique characteristics that determine its value to a library Evans, (2009). Circulation systems can be categorized into four major groups based on the mode of operation: manual, semi-automated (non-computer), data collection (batch), and on-line (Surace, 2013). There are several types of circulation systems. Rach (2008) identifies the following:

**2.2.1 Manual systems**

While automated systems have become very common in libraries, manual and semi-automated systems are still used. Primarily these systems continue to be used in university libraries where the cost of investing in a computer and the necessary software may not be justifiable. The manual system can be convenient to staff and patrons where the number of library users is small.
The most common manual system in use is the Newark System and its variations. The Gaylord system and Transaction Systems are further developments in manual systems that attempt to mechanize some steps of the circulation process (Rach, 2008).

(a) The Newark System

The Newark System involves the insertion of a circulation card with the call number, author and title in a paper pocket in each item. A date due slip is pasted on the pocket. Each patron may also be issued some kind of borrower’s identification card that gives them a library identification number (Rach, 2008). Under this system, charging materials is a straightforward process with the following steps:

- The patron presents the items they would like to borrow and their identification card at the circulation desk. Library staff verify that the call number on the circulation card and the pocket match.
- The date material is due back in the library is stamped on the date due slip and on the book card.
- The borrower’s name or identification number is entered on the circulation card. There are two variations on this step: a.) self-charge, where the borrower writes his/her own name and/or identification number on the first available blank line, b.) staff-charge, where a library staff member writes the borrower’s identification number on the circulation card.
- The circulation card is placed in a tray for filing at the end of the day.
- At the end of the day, all circulation cards are arranged in the desired order. The recommended order is first by date due, and then by author or numerically by call number.

(b) The Gaylord system

Efforts to speed the process of transcribing borrower information have led to various innovations in methods of recording borrower information. The Dickman Book Charging Machine,
introduced in 1927, was a hand-operated imprinter that recorded the call number, borrower registration number, and date due from embossed metal tags.

The machine incorporates a date imprinter that can be easily changed. Embossed library identification cards are issued to each patron. To check out material the user presents the card. Library staff takes the circulation card and patron identification card and insert them into slots on the machine. The machine imprints patron information and date due information onto the circulation card. As with the Newark system, date due information is provided to the patron and circulation cards are filed at the end of the day (Rach, 2008).

According to Country Lending Service (2013), the manual circulation system in university libraries has both advantages and disadvantages. In regard to advantages; a reader can quickly see how many more books the can borrow before handing in – by the number of cards the user is remaining with. Additionally, the librarian can look at the tray and instantly visualize the number of transactions that day. The system is based upon cards and cardboard/paper slips: it is a low-technology approach yet proven over 100 years to be robust and scalable to work even in large libraries. Training can be completed in a small number of hours, and the cost of implementation is mostly centered on labor. Therefore, it is still a suitable solution for small loan libraries where financial resources are limited, or in locations where a computer-based solution is not suitable (e.g. lack of equipment, guaranteed electrical supplies).

However, the manual system has the following disadvantages; there is a lot of manual processing of the cards in the trays. Each day, the issues have to be ordered and added to the trays. When a book is returned, the identification 'key' and date of return guide you to the card location in the trays. When a book is reserved, somebody needs to check the catalog, and, if the book is not on the shelf, look for the relevant card in the trays. This involves manually looking for the card with the matching 'key' in the trays, sequentially looking in each date until found. A reserved item is flagged with a piece of colored card, so that when it is returned it can be set aside and checked against the file of reservations. Renewals involve finding the ticket and moving it to its new location in the trays. Typically, a small number of 'queries' will mount up, cases where something goes awry because a card or ticket is misdirected in some way.
These may consume quite a bit of time to sort out. A tray of cards dropped on the floor could prove catastrophic and require a substantial amount of time to re-sort.

According to Endevour (2016), manual systems put pressure on people to be correct in all details of their work at all times. With manual systems the level of service is dependent on individuals and this puts a requirement on management to run training continuously for library staff to keep them motivated and to ensure they are following the correct procedures. It can be all too easy to accidentally switch details and end up with inconsistency in data entry or in hand written orders. This has the effect of not only causing problems with client service but also making information unable be used for reporting or finding trends with data discovery. Reporting and checking that data is robust can be timely and expensive.

This is often an area where significant money can be saved by automation. Another deficiency is that the manual circulation system takes more effort and physical space to keep track of paper documents, to find information and to keep details secure. When mistakes are made or changes or corrections are needed, often a manual transaction must be completely redone rather than just updated. With manual or partially automated systems information often has to be written down and copied or entered more than once.

Another impact of manual systems is on Customer service. Customer queries can be difficult to respond to as information is stored in different places and may even require that you find the right person before being able to respond. This is no good if they are out to lunch or only work part time. Manual systems bring about;

- Inconsistency in data entry, room for errors, mis-keying information.
- Large ongoing staff training cost.
- System is dependent on good individuals.
- Reduction in sharing information and customer services.
- Time consuming and costly to produce reports.
- Lack of security.
- Duplication of data entry.
2.3 Requirements for a Web-Driven Circulation Control System for Academic Libraries

The Web Driven Circulation Control System for Makerere Law School Library is an online circulation system. According to Maureen and Blessing (2011), library automation has to do with the act of computerizing user's registration and library materials, borrowing and returning, locating of material and calculating overdue fines in the library system. Library system automation is done so as to ensure that the registration, borrowing and returning of books is done effectively as well as overcoming the problem of inaccurate overdue charges and to generate report at the end of each day, week, month and semester.

Most of the libraries, in initial stage of their computerization, assign priorities on library housekeeping activities, as these activities are most rudimentary to make the foundation of automation stronger and the success of other advanced services depends heavily upon these activities (Jayaprakash and Balasubramani, 2011). Rao (2006) states that depending on the type of library, all or some of these library housekeeping operations are computerized according to their priority. Circulation control is given first priority in any library while serials control is given a top priority in a special library.

However, circulation is very important for any library and its computerization must be one of the ultimate aims of the automation programme. Saffady (2009) on the other hand claims that the circulation control is one of the most widely automated library housekeeping operations, and it is often the first and simplest activity to be automated in a given library, possibly because circulation control systems bear an obvious resemblance to inventory management, retail charge card operations, and other transaction processing activities which have been successfully automated in general business applications.

Sahu, et al. (2015) noted that those library operations should be automated in order of priority. However, in prioritizing the library housekeeping operations, processes that are repetitive, occupy large amounts of staff time, require retrieving information from large, unwieldy files, or are high-profile functions should be prime in automation for example public Given these diverse opinions librarians should be cognizant and plain with their priority concerns and reasons for
automating, as this would help them opt for or design a system that supports their priority operations and make an effective use of frequently scarce.

Library services are divided into two categories, library housekeeping routines and information retrieval, housekeeping routines include circulation, serials control (Ayub and Ghazanfa, 2014). Rao (2006) notes the scope of an automated circulation control can be traditional, charging and discharging or broader depending upon the design objectives established by the library. However, every Web Driven Circulation Control System record, manipulates these three kinds of information, Information about the borrower, Information about the document and Information about the transactions.

The best design of a circulation control system must be one which is automated. A Web-Driven Circulation Control System includes a plurality of remote book processing terminals and a computer controlling the terminals and processing data between the terminals and the computer to maintain a current inventory of the circulation status of the library books. Such a system provides for automatic charging of library materials by patrons, record keeping of all library transactions, modification and interrogation of computer data files, intercommunication between the computer and a remote data processor and detection of unauthorized removal of books from the library.

Each terminal has a card reader for patron identification, an optical reader for book identification, an electromagnetic activator for magnetizing and demagnetizing a magnetic strip in each book, a printer for printing charge-out information, and a display screen and keyboard for communications between patron and computer. In charging a book, a patron inserts his card in the card reader and places the book in a book tray in the terminal. The optical scanner reads bar coded symbols on a label on the front of the book. The computer compares the card reader and optical scanner inputs with its data files to determine that the patron is authorized to charge out books and that the book is authorized to be checked out. If authorization is given, the transaction is recorded by the computer which then enables the printer to provide a print-out of the transaction for the patron. Circulation systems can be designed in one of two ways:
The absence reporting method (also called transaction systems): tracks items in circulation only. Records are added and deleted constantly. As books are circulated, their titles and call numbers or other identification codes are entered in the system, and as they are returned, their records are deleted. Not much computer disk space is required to store circulation records.

The full database method: involves the entire collection. Typically, the full cataloguing record for every item in the library is input into the database. Instead of adding and deleting records continually, records are permanently retained in the database and coded as they are checked out or in. A whole database system requires more computer space because records for the whole collection are included.

Systems that include full cataloguing records will typically also permit users to access this information. An online public or patron access catalogue (OPAC) enables patrons to search a library’s holdings from a computer terminal and also gives information on the circulation status of an item. Circulation functions would only be one part of a larger integrated automated system. Besides circulation and the OPAC, most integrated online systems also include acquisitions, serials and cataloguing modules.

2.4 Designing and implementing Web-Driven Circulation Control Systems for Academic Libraries

Devi and Haritha (2010) recognize this position with the assertion that ‘the primary motive to automate circulation, therefore, appear to be the hope of realizing cost containment, materials receipt and monitoring, and expanding function systems into integrated system. Therefore, the study proposes a Web Driven Circulation Control System for Makerere Law School to support the librarians in charging and discharging of the Information Resources. The Proposed system is an online system which allows users to register new members, add Information Resources, add members, update the details, borrow and return the Information Resources in the library.

Information regarding a circulation transaction can be entered in one of two ways. The first way is to key in all information about a particular item or patron. Transaction systems typically work in this manner. Most libraries with Web Driven Circulation Control Systems have increased efficiency in the circulation process through the use of barcode systems. Barcodes would be
similar to those used in supermarkets or grocery stores. Each individual item in the library receives a barcode label. The barcode number corresponds to catalogue information about the item. Similarly, each patron is assigned an identification number that corresponds to the barcode placed on their card. This creates two computer files of information: Patron information filed by identification number; and Item information filed by the barcode number on the item. A good automated system that can handle charging and discharging is the ‘Koha’ system.

‘Koha’ is an open source integrated library system (ILS) maintained by and used by libraries all over the world (http://bywatersolutions.com/what-is-koha/). It has the following advantageous;

It is a full-featured Integrated Library System used worldwide in libraries of all sizes, Koha has a comprehensive functionality including basic and advanced options. It includes modules for acquisitions, circulation, cataloging, serials management, authorities, flexible reporting, label printing, multi-format notices, offline circulation for when Internet access is not available, and much more. Koha will work for consortia of all sizes, multi-branch, and single-branch libraries.

Koha is multilingual and translatable. Koha has a large number of available languages, with more languages every year.

It allows full text searching. Powerful searching, and an enhanced catalogue display that can use content from Amazon, Google, Library Thing, Open Library, and Syndetics, among others.

It is compliant with Library Standards. Koha is built using library standards and protocols such as MARC 21, UNIMARC, z39.50, SRU/SW, SIP2, SIP/NCIP, ensuring interoperability between Koha and other systems and technologies, while supporting existing workflows and tools.

It has Web-based Interfaces. Koha’s OPAC, circ, management and self-checkout interfaces are all based on standards-compliant World Wide Web technologies–XHTML, CSS and JavaScript–making Koha a truly platform-independent solution.

2.4.1 Basic features of Web Driven Circulation Control Systems

Regardless of where the system is developed, most libraries look for the following basic features in an Web Driven Circulation Control System:
- Efficient and effective charge and discharge functions.
- Able to record and access pertinent user information.
- Automatic maintenance of accurate, up-to-date circulation records.
- Information detailing availability of individual items.
- Information that allows tracking of an item’s progress through its processing stages in the library.
- Efficient hold and recall functions.
- Automatic production of overdue, recall, and hold notices and bills.
- Automatic calculation of fines.
- Able to handle different loan periods, user categories, and item type categories.
- Able to handle course reserves.
- Provides a variety of statistical information.
- Flexibility in handling increases in collection size, number of users, and number of transactions.

In addition, the system might include additional features, such as various batch-processed reports, or flexibility in setting user categories and loan periods. Another desirable feature is permitting patrons to access their own circulation records so that they can review items that they have borrowed or place their own holds.

### 2.4.2 Challenges in Setting Up a Web-Driven Circulation Control System in an Academic Library

One of the important challenges of the librarians for automating libraries is the selection of good integrated library management system, which caters for the needs of the library. Proprietary as well as open source library automation software is available in the market. Most of the libraries are not in a position to buy high priced commercial software due to their financial constraint. Open source software is easily available and ‘free of cost’ and committed to user’s freedom to use and customize as per the requirement of the library managers (Mukhopadhyay, 2008).

Circulation work in a library through Koha involves a group of operations that are specific, repetitive and systematic. Circulation systems through Koha require minimum set of essential
data for carrying out circulation activities. Circulation systems are designed to capture and manipulate three kinds of data sets i.e. information about the borrower (Name, Address, Category and Membership No), information about the borrowed documents (Bibliographic information, item information i.e. reference copy, number of available copies, status of the document i.e. Lost, Damaged, Hold etc.) and information about the rules for loan (fixing Issue date, Return date, etc.)

According to Peterson (2013), automating a circulation control system is expensive. Many ongoing costs of automation are overlooked in the zeal to embrace the technology. Automation may bring with it new expenses such as software support and dedicated phone lines. While these may not be present in every case, rest assured that the amount quoted to you by the automation vendors will not include all associated costs of automation.

According to Lam (2012), the main challenges of setting up a circulation control system are costs and risks in automation. Automation costs involve; Planning and consulting costs, Purchase of the system, hardware, and software, Purchase of network-specific hardware, software, and cabling, Internet connection costs, Conversion of manual records into machine-readable form, Access, and subscriptions where appropriate, to external databases and systems, Ongoing operating costs, Maintenance of system hardware and software

Every institution faces problems whenever new services are introduced and policies are implemented (Jayaprakash & Balasubramani, 2011). Hopkinson (2009) as cited in Mutala (2012) points out that the laggard status of sub Saharan African universities in library automation was attributed to among other factors budgetary constraints, high cost of ICT facilities, inadequate ICT skills, inefficient electricity/telecommunication infrastructure, and lack of ICT strategies/policies.

Rajput & Gautam (2010) in an investigation of special library in Indore note the same pre-automation problems; paucity of funds, lack of administrative support, lack of trained staff, hesitancy in learning computers and lack of space. Chisenga (2004) also in a survey of ten countries in Anglophone Africa identifies the initial challenges facing library automation projects in sub Saharan Africa to include; lack of budgets, inadequate ICT facilities, lack of ICT
strategies, low skills levels of users, lack of qualified staff in ICT, lack of commitment by institutional management, and reluctance among staff to use ICT. In a Case of Kashim Ibrahim Library, Ahmadu Bello University, Nok (2006) concludes that lack of funds and lack of information resources have been problems for academic libraries in Africa for many years. In the midst of all these challenges confronting library automation, Mutala, (2012) argues that lack of budget for automation in most university libraries has been attributed partly to the inability of library staff to adequately articulate benefits to be derived from investing in ICT to the authorities.

However, Nok (2016) observes automation of information resources and services pose few problems. These include the acquisition, selection, and cataloguing of online information resources, the construction of databases, providing information literacy education for library users, and the new skills required by, and continuing education for librarians.

A critical review shows that most libraries in Africa faced automation problems of lack of funds, reluctance among staff to use ICT, lack of trained staff as well as erratic power supply. On the other hand, in a few libraries are faced with challenges such as lack of commitment by institutional management, serious technical problems encountered and software not being user friendly.

2.5 Research Gap

Various scholars have investigated about library circulation systems, advantages and the various ways through which these Information Resources are managed in the library but the literature doesn't discuss clearly the circulation control system for Makerere Law School Library. The research project analyzed the different challenges that are faced while managing circulating the information at Makerere Law School which helped in designing a Web-Driven Circulation Control System for the Library.
CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This section presents a detailed description of the procedures, tools, instruments, approaches, processes and data collection techniques, data structures were employed in research study to determine the requirements, system analysis, system design and implementation as well as in testing and validating the Web-Driven Circulation Control System for Makerere University School of Law Library that was developed to meet the study objectives as shown in table 3.

Table 1: Methodology of study objectives

<table>
<thead>
<tr>
<th>Objective</th>
<th>Research methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>System study and investigation</td>
<td>The study was conducted at Makerere School of Law Library. Data collection methods such as: interviews and observation methods were used.</td>
</tr>
<tr>
<td>System design</td>
<td>Data Flow Diagrams and Entity Relationship Diagrams was used to design the process and data models of the Web-driven Circulation Control System for Makerere School of Law Library</td>
</tr>
<tr>
<td>System development</td>
<td>HTML, CSS, PHP, Bootstrap, AngularJs, jQuery, and MySQL were used to develop the Web-Driven Circulation Control System for Makerere School of Law Library.</td>
</tr>
<tr>
<td>System testing and validation</td>
<td>To test the Web-Driven Circulation Control System, integrated and system-testing methods was used. For validation, the system was taken to the users in order to find out if the system met the user requirements.</td>
</tr>
</tbody>
</table>

Source: Primary Data (2018)
3.2 Systems Study and Analysis

Robinson et al, (1970) defines system analysis as the methodological study of a system, its current and the future required objectives and procedures in order to inform a basis for the system and the design. In other words, system analysis was the detailed look at the current system and what a Web-Driven Circulation Control System would be required to do; system analysis always leads to system design which is the development of new system that meets the future requirements.

The basic tool of system analysis was the ability to prove, inquire, observe more and reconcile all what happens in any situation. With this alone, the information that were gathered and analyzed to identify the components of the system, creating a structure from which the essential requirements will most efficiently be met.

The analysis of data led the researcher to gain wide understanding of the manual existing systems and processes. The literature read and data collected from the stakeholders was analyzed to determine the functional and non-functional requirements of the proposed Web-Driven Circulation Control System for Makerere School of Law Library.

In this section, the study determined the functional and non-functional requirements of the Web-Driven Circulation Control System for Makerere School of Law to draw a light into the actual requirements for the system implementation. This subsection comprises of stages inclusive of studying the existing systems and Data analysis. The techniques to be used were:

For purposes of this study, the primary data was collected using the interview method and the observation method. However, it should be noted that care and thought was given in the application of these methods since this study is has taken a case study dimension.

3.2.1 Interview method

In this method, the researcher interacted with the School Librarian, Librarians and the Assistant Librarians to find out the challenges they in the circulation of library resources at Makerere School of Law Library. Denscombe (2010) argued that when the researcher needs to gain
insights into things such as people’s opinion, feelings, emotions and experiences, then interview is almost certainly providing a more suitable method.

The primary purpose of interviewing was to obtain both quantitative and qualitative data (current as well as desired data) regarding user requirements, policies, procedures and practices. Interviews were carried out with the library staff of Makerere School of Law Library.

The technique helped the researcher in fact finding and as well help the end-users to get involved in the generated user-requirements. The interview assisted the researcher to attain the highest rate of data quality and also able to identify problems, causes, information requirements and solutions since respondents answer objectively during face-to-face sessions.

3.2.2 Document Analysis Method

This involved document review/analysis in obtaining relevant documentary evidence to support and validate the facts of the study. It involved analytic reading and review of written materials, to extract relevant part as statements of facts to validate the research objectives. Reading existing secondary literature, prototypes of similar systems and so on helped to determine the requirements for designing the system.

The objectives of the study were achieved in the study using the different methods of data collection as shown in the table below;

Table 2: Objectives and different methods of data collection used

<table>
<thead>
<tr>
<th>Objective</th>
<th>Method/Source</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To analyze the existing library circulation system in Makerere Law School Library and establish the effects of the Manual circulation system in Makerere Law School Library.</td>
<td><strong>Interview method</strong>&lt;br&gt;Source: Librarians, Assistant Librarians&lt;br&gt;<strong>Document Analysis Method</strong>&lt;br&gt;Source: Registers, Policies and Procedures</td>
<td>Helped to gain insights into things such as people’s opinion, feelings, emotions and experiences.</td>
</tr>
</tbody>
</table>
2. To Identify requirements for a web-driven circulation control system for Makerere Law School Library

<table>
<thead>
<tr>
<th><strong>Method</strong></th>
<th><strong>Source</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interview method</strong></td>
<td>School Librarian, Librarians</td>
</tr>
<tr>
<td><strong>Document analysis method</strong></td>
<td>Textbooks, Journals, Internet</td>
</tr>
</tbody>
</table>

It will provide the advantage of eliminating bias that may not be presented by the respondents.

3. To design and Implement a web-driven circulation control system for Makerere Law School Library

<table>
<thead>
<tr>
<th><strong>Design</strong></th>
<th><strong>Source</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Flow Diagrams and Entity Relationship Diagrams will be used to design the process and data models of the Web-driven Circulation Control System for Makerere School of Law Library</td>
<td></td>
</tr>
</tbody>
</table>

**Implementation:** HTML, CSS, PHP, Bootstrap, AngularJS, jQuery, and MySQL will be used to develop the Web-Driven Circulation Control System for Makerere School of Law Library.

Will involve document review/analysis in obtaining relevant documentary evidence to support and validate the facts to design the system.

**Source:** Field Data (2018)

### 3.2.3 Data Analysis

The data was collected by the various tools above, grouped, analyzed and interpreted using tables and figures in percentages.
3.3 System Design

The collected data and information was systematically analyzed so that requirements needed to develop a Web-Driven Circulation Control System can be identified. The design was at three levels, conceptual, logical and physical. The analysis and design were done using Data Flow Diagram (DFD), and Entity Relationship Diagrams (ERD). The Web-Driven Circulation Control System was designed based on the functional and non-functional requirements, which describe the parameters and the data to be incorporated into the system.

The researcher used a Data Flow Diagrams (DFDs) to model the processes and Entity – Relationship Diagrams (ERD) for the conceptual level design. DFDs showed the functions performed by the system and the data flowing into the system, what transformations are done on the data, the data flowing out of the system, and data within the system. DFDs: a) was easier to understand by technical and non-technical audiences; b) provided a high-level system overview, complete with boundaries and connections to other systems; and c) provided a detailed representation of the system components.

Entity Relationship Diagrams (ERDs) ware used in the model of both the logical and physical database structure designs. The entity-relationship data model showed the relationships between the entities involved in the system together with their attributes and indicate the number of occurrences an entity can exist for a single occurrence of the related entity. ERDs were used to identify the data to be captured, stored and retrieved in order to support the activities performed in product ordering processes. ERDs: a) are relatively simple, user-friendly; and b) can provide a unified view of data, which was independent of any data model.

3.4 System Implementation

i) System Architecture: A web-based Graphical User Interface (GUI) was used to interact with a Relational Database Management system directly using queries. Different stakeholders had different interfaces but an integrated solution. On submission of information/data, it was stored in centralized and appropriate tables in a database. All data manipulation and processing will be done using the following technologies;
a) Hyper Text Markup Language (HTML) for front end. JavaScript was used to develop the modules of the Web-Driven Circulation Control System since it is an object-oriented programming language. Its ability to display information in the browsers will also enable users to use the system.

b) Cascading Style Sheet (CSS) will be used in formatting the user interfaces of the system.

c) PHP Hyper-Text Pre-Processor (PHP) that is a server-side scripting language will be used in connecting the front end to the back end of the Web-Driven Circulation Control System.

d) Bootstrap was used for responsiveness of the system

e) AngularJs was used to validate the system using regular expressions.

f) My Structured Query Language (MySQL) for the backend [Database].

ii) System Security: the We-Driven Circulation Control System is intended to provide a login form for various stakeholders involved to prevent unauthorized users from accessing confidential information.

3.5 System Testing and Validation

The Web-Driven Circulation Control System was tested by the researcher, using sample data, on the basis of error rates to verify that it meets design requirements. Thereafter, the system will be taken to the users for validation to ensure that it operates to their satisfaction.

Testing was done before and after the Web-Driven Circulation Control System has been put to use. It will be done in phases.

i) Unit Testing: Unit testing will be carried out on individual modules of the Web-Driven Circulation Control System to ensure that they are fully functional as separate units.

ii) Integration Testing: The researcher carried out integration testing after the different modules are integrated to make a complete system. Integration testing will be carried out to ensure that the modules are compatible and that they can be integrated to form a complete working system.
iii) User Acceptance Testing [UAT]: The researcher also carried out user acceptance testing to check for any errors that may arise. In user acceptance testing, the researcher will use a number of applications to ensure that the developed system is error-free and it meets the specified requirements.
CHAPTER FOUR
ANALYSIS, PRESENTATION AND DISCUSSION OF FINDINGS

4.1 Introduction

This chapter presents, analyses, interprets and discusses the study findings based on the objectives of the study. The purpose of the study was to design a Web-Driven Circulation Control System for Makerere Law School Library. It provides the findings in relation and accordance to the objectives discussed above. The researcher used interviews to get information from the librarians on the circulation system used at Makerere Law School.

4.2 Description of Respondents

4.2.1 Response Rate

Data was obtained from the library administrators, technical staff, senior library assistants and the library assistants from Makerere Law School. The researcher obtained information from the respondents using the interview guides response, the researcher’s observations and document analysis and all this was presented as follows. The respondents such as Makerere Law School Library administrators, technical staff, senior library assistants and the library assistants were chosen because these are responsible with the management of the library circulation services.

Table 3: Response Rate

<table>
<thead>
<tr>
<th>Category</th>
<th>Expected Number</th>
<th>Actual Number</th>
<th>Response Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Library Administrators</td>
<td>02</td>
<td>02</td>
<td>40</td>
</tr>
<tr>
<td>Technical staff</td>
<td>02</td>
<td>01</td>
<td>20</td>
</tr>
<tr>
<td>Library Assistants</td>
<td>02</td>
<td>02</td>
<td>40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>06</strong></td>
<td><strong>05</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

*Source: Field Data (2018)*
Table 3: above shows the response rate for the three categories of the respondents who were involved in the study. From the study findings, 40% of the respondents were the Makerere Law School Library administrators, 20% of the respondents were technical staff, and 40% were library assistants. It was not possible to achieve a 100% response rate due to the tight schedules of the targeted group. The I.T technician was not around for the whole week because he had gone for some work in the main library.

From the study findings, 20% of the respondents were technical staff. These were involved in the study because they are responsible with the library systems, hardware and software in the library. These support the functionality and maintenance of the system once implemented at Makerere Law School Library.

4.2.2 Gender of Respondents

The gender distribution of respondents through an observation method employed to find out the gender distribution of respondents because the respondents were in two categories either female or male were the only races found in the institution. This is as shown in the figure below;

Figure 2: Gender of Respondents

![Gender Distribution Chart]

Source: Field Data (2018)

Figure 2 above shows the gender of the respondents who participated in the study at Makerere Law School Library. It shows that the majority of the respondents were female with 56% and 44% were the male who participated in the study. This proves what is said that the library
profession is dominated by female. This implied that the study findings were not affected with gender biasness because the attitudes of female respondents are not the same as those for men as regards to the automated library circulation systems.

4.2.3 Experience of the Respondents

The researcher also asked the respondents on how long they had worked with Makerere Law School and below was the responses.

Table 4: Experience of the Respondents

<table>
<thead>
<tr>
<th>Period of Work</th>
<th>Number of Respondents</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-5 years</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>5-10 years</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>10 years and above</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

*Source: Field Data (2018)*

Table 4 above shows that 40% of the respondents had worked for a period of 2-5 years, 20% of the respondents had worked for a period of 5-10 years and 40% of the respondents had worked for a period of 10 and above years.

The study findings shows that majority of the users had worked for 5-10 years at MLSL with 40%. This is because the workers at Makerere Law School Library are in good conditions, motivated and receive incentives while at work. This is a reliable group of people to participate in the study because they have experience on the library circulation practices that take place at Makerere Law School.

4.3 Current Library Circulation System at Makerere Law School Library

In the interviews with the library staff, the study established the following on the current circulation system at Makerere Law School Library. The features of the current circulation system at Makerere Law School Library were examined in order to establish how the circulation
Information Resources is done at Makerere Law School Library. Data was collected using both the interviews and the observation methods.

**Figure 3: Features of the Current Library Circulation System at MLSL**

![Bar chart showing different features of the circulation system at Makerere Law School Library.](chart)

**Source:** Field Data (2018)

Figure 3 above shows the different features of the circulation system at Makerere Law School Library. From the study finding, 11% of the respondents reported that the library has online information resources accessible to all the library users, 28% of the respondents reported that users have to visit circulation desk to have access to the resources, 39% said that the system involves the use of the University IDs in order to have access to the library resources, 11% also reported that the system widely use counter books and registers, while 11% also mentioned the use of the library cards while accessing the Makerere Law School Library resources.

The majority of the respondents reported that the Makerere Law School Library users access the library resources with the use of IDs with 39%. This is because all the students who have access
to the library have the University identity cards which they present in order to have access to the information resources in the library. In the interview with the library administrator, he reported that all students have students’ IDs which they can use to access the Information Resources from the library.

From the study findings, 28% of the respondents said that majority of the library users visit the library circulation desk in order to receive information resources from the library. This is because majority of the information resources in the Makerere Law School Library were in print form which can only be accessed when the users physically visit the Makerere Law School Library. In the interview with one of the senior library assistant, she reported that when the library user is in need of the information, he/she approaches the circulation desk in any of the library departments to access the Information Resources.

The study findings also showed that 11% of the respondents said that the Makerere Law School Library circulate online information resources to the users of the library. This is because the Makerere Law School Library users have no skills to have access to a variety of the library resources subscribed by the library. The library provides online resources for the users and open access resources. It subscribes to different databases which include; LibhubKiox, Emerald, Sage, Jstor, Oxford Scholarship Online, Ebscohost, ebrary, Research4Life, E-books, Google Scholar and more online resources.

The library assistant also reported that the library has an online catalogue with the online resources which users can access from the library. The researcher searched online and she was able to see the online catalogue for Makerere Law School Library which shows the online resources accessible by users of the library.

The respondents still expressed the use of counter books and the registers to record the library users and resources details. In the study, 11% of the respondents said that this is because the Makerere Law School Library is still using the Browne System in circulation of the information resources at Makerere Law School Library.

The use of the library cards in the circulation of the library resources was reported by 11% of the respondents who participated in the study at Makerere Law School Library. This is because
majority of the external library users and lecturers do not have the students’ IDs in order to have access to the library resources. These present the library cards to the staff in order to access the resources from the library. One of the Library assistants said that; “we issue library cards to non-students which they can use to access library resources and services from the Makerere Law School Library.”

In the interview with one of the library assistants, she also reported that once the materials which are requested for by the library users are not available in the library; library staff can reserve the Information Resources for the users which are noted down by the librarian until when the material is returned. In the situation when the information material requested is not available in the library, the library assistant said that users can be referred to other libraries to access these Information Resources.

In the interview with the senior library assistant, she mentioned that the once users are issued with the library materials, they are expected to return the Information Resources in a period of one day. She said that; “Users are allowed to stay with the text books for a period of one day or else they are fined for having stayed with the book beyond the time expected.”

4.3.1 Information Resources Available for Circulation to the Library Users

From the interview and observation, the study established the various Information Resources which are available in the Makerere Law School Library. this was aimed at examining the different Information Resources which are available in the Makerere Law School Library.
Figure 4 above show that majority of the respondents reported that text books were available in the Makerere Law School Library. The study findings show that 33% respondents reported text books, 22% said that the library has periodicals, 17% mentioned dissertations and thesis as the resources which are available in the library. The study also showed that 17% said that reference materials are available in the library whereas the least respondents that is 11% reported online information resources are available in the Makerere Law School Library.

The majority of the respondents with 33% reported that the Makerere Law School Library has text books which are made available for access by the Library Users. This is because text books provide detailed and authentic information necessary for academic purposes. The information should be appropriate, reliable, and adequate and that which meet the expectations of all its users (Nicholas, 2009). According to Magara and Nyumba (2004) they noted that resource allocation in Uganda concentrated on text books without balancing the needs of the library users.
The study findings also showed that 22% of the respondents in the Makerere Law School Library reported that periodicals were available in the library. This is because majority of the users request for the newspapers, magazines and journals availed by the library with new issues to get the updated information. The researcher observed that these were housed in the library mostly newspapers and magazines which are published at regular intervals. A collection of newspapers for each month were bound together. The library assistant indicated that these are requested by users on a daily basis the get information about the current issues in the world.

In the study, 17% of the respondents reported that the MLSL provides reference materials to its users. This is because these are usually required by the users to answer the questions and make more clarification on some information. The library assistant reported that these are commonly used by the library users to answer some questions. The researcher observed some of these materials such as dictionaries, encyclopedias placed at the table towards the entrance of the library.

From the study findings, 17% of the respondents also reported that dissertations and thesis are available in the Makerere Law School Library. This is because every year student produce dissertations and thesis as their final year projects. The library assistant indicated that these are produced by the students on their final studies as requirement to complete their studies. Majority of these are mostly requested by the students as they are also doing their final dissertations to act as guidelines.

The study findings also revealed that 11% of the respondents reported that the library has different online information resources available for access by the library users. The senior library assistant also reported that the library subscribes to a number of databases that are accessible to the users in the library. These included; LibhubKiox, Emerald, Sage, Jstor, Oxford Scholarship Online, Ebscohost, ebrary, Research4Life, E-books, Google Scholar and more online resources. From the interviews with the library assistant, majority of the students were not aware of different electronic resources available in the library. This is dissimilar to Adesoye&Amusa (2011) who revealed that students were aware of the library and its resources and made use of them for their information needs, but libraries fell short of their expectations in terms of
inadequate facilities to assist them access information. He also noted that students lacked skills in using electronic information resources.

4.3.2 Guidelines for Borrowing Information Resources at Makerere Law School Library

By using interviews and the document review methods, the researcher was able to examine the different guidelines for the borrowing information resources from Makerere Law School Library. This was examined so as to understand the whole process which can support in the formulation of the circulation system that can satisfy all these guidelines. These are as described below;

i. Borrowing cards are not inter-changeable. Therefore, a borrower remains responsible for a book as long as the borrowing form remains un-cancelled.

ii. Lost borrowing cards must be reported to the University Librarian in writing. Duplicate borrowing cards (in lieu of those reported lost) is issued upon payment of US$1 (one) per card. Notwithstanding such replacement, the reader is still being held responsible for any book borrowed on the original card(s).

iii. Academic staff of the University can borrow up to 6 volumes at a time for a period of four weeks or one vacation (except end of Academic Year long vacation).

iv. Students of the University can borrow up to (4) four volumes at a time for a period of two weeks or one vacation (except at the end of Academic Year).

v. Administrative and Technical staff of the University can borrow up to Four (4) volumes at a time for a period of three (3) weeks.

vi. An external borrower can borrow up to two (2) volumes at a time for a period of four (4) weeks.

vii. Books in excess of the above-stipulated numbers can be borrowed only in very exceptional circumstances and by written permission of the University Librarian.

viii. A fine of Shs.1000 (one hundred) per day reviewable periodically is charged on every book retained beyond the permitted loan period. Receipts are issued for the payment.

ix. Fines and charges for lost/damaged books are regarded as debts to the University and in case of non-payment, a defaulter is liable to disciplinary action.
x. Provided that the book is not reserved by another reader, a loan can be renewed but for not more than two consecutive times.

xi. Any lost book(s) has to be replaced either in kind or the cost of the book plus an administrative charge of 20% of the cost of the book.


4.3.3 Library Users at Makerere Law School

Through the use of the interviews and the document review methods, the different library users at Makerere Law School Library were identified so as to design a circulation system which caters for all the different library users in the Makerere Law School Library. In the interviews with the librarians at Makerere Law School, the university serves different categories of users who access the library resources to meet their needs. These can be represented as shown in the table below;

Figure 5: Library Users at Makerere Law School Library

Source: Field Data (2018)

Figure 5 above shows that 39% of the respondents said that the users of the Makerere Law School Library were students, 33% reported the Makerere Law School staff as the users of the
library, 11% mentioned former students and 17% reported the external users who access the Makerere Law School Library as the users of the library.

From the interviews with the respondents, 39% of the respondents reported that the library users were the students of Makerere Law School Library. This is because all the students admitted to the University with a valid ID qualify to borrow information resources from the library. One of the library assistants said that; “All present students and staff of Makerere Law School are entitled to use the Library as readers and borrowers.”

The study also revealed that 33% of the respondents said that Makerere Law School staff are the library users who can access information resources from the Makerere Law School Library. Both teaching staff and the non-teaching staff can have access to the information resources from the library.

From the study findings, 17% of the respondents reported that Makerere Law School Library has external users who access the library resources. These include researchers, authors, civil workers who access the resources such as professional journals to meet their informational needs. From the library user’s manual; External membership of the Makerere Law School Library consists of the following four categories:

i. Family of Staff; Annual subscription of 30,000 per person (excludes borrowing rights).

ii. Alumni of the University pay an annual subscription of 50,000 plus a Referee (includes borrowing rights).

iii. Present individual students and staff of Institutions affiliated to Makerere Law School pay an annual subscription of 20,000 or equivalent (includes borrowing rights).

iv. Other individuals pay an annual Subscription 100,000 or equivalent (includes borrowing rights).

The study findings also showed that 11% of the respondents reported the former students as the users who can access the library resources. In interview with the senior librarian, she said that; “Former students who completed a regular course of study can apply to the University Librarian
for individual reading and borrowing upon payment of the prescribed dues.” The applicants are required to give someone known to the University as a referee in order to be registered as the library user.

4.3.5 Library Working Hours

In the interview with the library assistant, she reported that the library staff is supposed to circulate Information Resources during the library working hours. She further reported that the library users can approach the library and get information resources from the library. The library users’ manual showed the operating hours when users can visit the Makerere Law School Library and borrow resources.

Table 5: Library Working Hours

<table>
<thead>
<tr>
<th></th>
<th>Days</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>During the Semester</strong></td>
<td>Monday to Friday</td>
<td>9.00 am to 10.45 pm</td>
</tr>
<tr>
<td></td>
<td>Saturdays and Sundays</td>
<td>9.00 am to 6.00 pm</td>
</tr>
<tr>
<td><strong>During Holidays</strong></td>
<td>Monday to Friday</td>
<td>9.00 am to 12.45 pm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.00 pm to 5.00 pm</td>
</tr>
<tr>
<td><strong>Public Holidays</strong></td>
<td>The Library remains closed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>on public holidays</td>
<td></td>
</tr>
</tbody>
</table>

Source: Field Data (2018)

4.4 Challenges in Circulation System in Makerere Law School Library

In the interview with the library staff, they mentioned different challenges in the current circulation system for Makerere Law School and the figure below were their responses;
From the findings, the results show that majority of the library staff face a challenge of the inadequate Information Resources in the Makerere Law School Library. It shows that 33% face a challenge of inadequate Information Resources, 22% face a challenge of inadequate funding, 17% of the respondents reported that they face a challenge of difficulty to notice overdues, 11% reported that they face a change of the current system which is very tiresome and theft of the information whereas 11% of the respondents are faced with a challenge the system which is tiresome and only 6% reported the delays in returning the information resources in the library.

Majority of the respondents in the study reported a challenge of inadequate information resources in the library. In the interview with the library assistant librarian, she reported that the current library circulation system provides limited number of Information Resources to users and those available in the library shelves are not enough for the growing number of students at the university. This could be the reason why users are not allowed to use the resources for more than 8 hours to enable other users to access them.

Source: Field Data (2018)
Inadequate funding was also reported by the respondents as a challenge that has affected the library staff at the Makerere Law School Library. Respondents reported that the University administration allocates little funds to support the activities undertaken in the Makerere Law School Library.

Delays in Returning the Information Resources borrowed by the library users; from the interviews, the library staff reported that this is a challenge to the library users in the current library circulation system. The senior librarian stated that; “Some students take long the books they borrowed and this takes place normally during the exams time.”

However; she reported that the delay with the resources and in most cases, they are fined. This could the reason why all students are required to use the resources within the library premises.

In the interview with the senior library assistant, he reported that the existing circulation system is tiresome. He said that this is seen in most of cases when the circulation reports are need by the library management from the librarians. These have to compile from a wide number of records generated by the system manually.

In the interview with the one of the library assistants, he said that the current library circulation system does not allow the librarians to send the updates and notifications to the users on the Information Resources available in the library.

The existing library circulation system does not allow regular updating of the ledger book details pertaining frequency of certain users, number of resources out on loan, renewals and reservations. The librarian has to record details of the user and the material manually in the ledger book.

Librarians also noted that it’s hard to notice long overdue dates; this is because they use a manual ledger book and does not indicate when the materials are returned. The librarian does not in most cases follow up details on which dates are the resources are returned and by users.

In the interview with the senior library assistant; he indicated that there is theft of Information Resources by some library users. These take out information resources without the knowledge of a librarian and do not bring them back. This reduces the number of useful copies and limits use by other users.
4.5 Suggestions to Promote the Library Circulation System

From the interviews, the respondents suggested a number of suggestions to solve the above challenges in order to improve the library circulation system. The study was aimed at examining what should be put into consideration in order to design a library circulation system that can support the staff while delivering information resources to users of the library. The suggestions are as shown in the figure below;

**Figure 7: Showing Suggestions to Improve the Circulation System**

<table>
<thead>
<tr>
<th>Suggestion</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing the library funding</td>
<td>33%</td>
</tr>
<tr>
<td>Purchasing more information materials</td>
<td>22%</td>
</tr>
<tr>
<td>Digitalization of the library</td>
<td>17%</td>
</tr>
<tr>
<td>Strengthening of the library rules and regulations</td>
<td>11%</td>
</tr>
<tr>
<td>Employing more library staff</td>
<td>17%</td>
</tr>
</tbody>
</table>

**Source:** Field Data (2018)

Figure 10 above shows that majority of the respondents suggested that there is need for increasing the library funding with 33%, 22% of the respondents reported that purchasing of more information resources, 17% of the respondents suggested digitalizing of the library materials and employing of more staff in the library and only 11% reported the need to
strengthen the rules and regulations to help the library staff in delivering of the information resources.

The findings show that majority of the respondents reported that through increasing the library funding, the challenges affecting the Makerere Law School Library circulation system can be solved. It is evident that if the funds are increased, the library will purchase more information resources, support the digitization of the information resources, and employ more library staff who can support the delivery of the information resources in the Makerere Law School Library. From the interviews, one of the senior librarians said that; “the University has to increase the library funding that will help librarians purchase more text books that meet the academic needs of our users.”

4.6 Requirements for a Circulation Control System for Makerere Law School Library
From the interviews, the library staff identified some of the requirements for the new library circulation control system for Makerere Law School and table below were their responses;

**Figure 8: Requirements for a Circulation Control System for Makerere Law School Library**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheap in terms of setup and maintenance</td>
<td>5%</td>
</tr>
<tr>
<td>User friendly</td>
<td>35%</td>
</tr>
<tr>
<td>Compatibility with the available computers</td>
<td>15%</td>
</tr>
<tr>
<td>Security for information materials</td>
<td>10%</td>
</tr>
<tr>
<td>Easy to search the information materials</td>
<td>30%</td>
</tr>
</tbody>
</table>

**Source:** Field Data (2018)
Figure 13 above shows that the respondents mentioned a number of the requirements for the newly designed library circulation system. The findings show that 5% of the respondents required a system which is cheap in terms of setup and maintenance, 28% required a system which is user friendly, 17% needed a system which is compatible with the available computers, 17% also required a system which can secure the information resources and 33% needed a system that can easily search for the Information Resources from the Makerere Law School Library for access by the users.

The findings of the study show that majority of the respondents require a system which supports the librarians easily search for the information resources from the library. this is because the respondents required a system which can save the time for the library users access information resources from the Makerere Law School Library. The study findings are similar to those of Mong’are (2014) who said that time is important to every person and is a major concern for librarians to save time of the reader. Librarians should always bear in mind that the time of users is essential and precious. Libraries should devise, design, and develop methods, systems of organization and dissemination of information that provide the best service to their readers in the most efficient, accurate and effective manner that save the time of the reader (Bhatt, 2011).

In the interview with the one of the library administrators; she indicated that the new library circulation control system should be cheap in terms of setup and maintenance of the system. She said that; “the system you are proposing for our library must be cheap in terms of purchase and maintenance.”

The research findings also established the library circulation control system must be user friendly. One of the senior library assistants said that;” some of our users are computer illiterates, so they will need a system which is easy to use by both the library staff and users.”

Compatibility with the available computers in the library; most of the library staff said that the new proposed system should be able to work on the computers available in the library.

The library staff also mentioned that the new library circulation system should be easy to use. The library assistant said that;” the library circulation control system should require less skills to operate by the librarians.”
4.6.1 Functional Requirements

The functional requirements define what the system is supposed to accomplish and these include;

i.  The system allows authentication of both the system administrators (librarians) and the library users

ii. The administrator is in position to insert data, delete and edit the data stored in the system.

iii. The system enables the library users to easily search for information.

iv. The system enables the system administrator to perform quick searches for information.

v. The system allows the librarians to lend the Information Resources to the library users.

4.6.2 User Requirements

These are the desires of the users who interacts with the system. The key players and their user requirements are as show in the table below;

Table 6: User Requirements

<table>
<thead>
<tr>
<th>Key Players</th>
<th>User Requirements</th>
</tr>
</thead>
</table>
| System Administrator | Upgrade the system  
                   | Edit details in the system  
                   | Update the system software  
                   | Assign access rights and privileges to the system users. |
| Librarian       | Lend Information Resources  
                   | Register the library users  
                   | Register the Information Resources  
                   | Edit the users’ details  
                   | Edit information details information  
                   | Search for Information Resources  
                   | Renewal of the Information Resources  
                   | Reserve the Information Resources |
| Library User    | Borrow Information Resources  
                   | Search for Information Resources |
4.6.3 Hardware and Software Requirements

The hardware requirement of this system is a computer system with at least this configuration:

<table>
<thead>
<tr>
<th>Hardware Requirements</th>
<th>Processor</th>
<th>Pentium IV 3.0 GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory</td>
<td>256 MB RAM</td>
<td></td>
</tr>
<tr>
<td>Monitor</td>
<td>LCD 15 screen (HP)</td>
<td></td>
</tr>
<tr>
<td>Key Board</td>
<td>Intex Wired</td>
<td></td>
</tr>
<tr>
<td>Graphics</td>
<td>Onboard graphics card, 8mb</td>
<td></td>
</tr>
<tr>
<td>Hard Disk</td>
<td>40GB</td>
<td></td>
</tr>
<tr>
<td>Processing Speed</td>
<td>1.80 GHz</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Software Requirements</th>
<th>Operating System</th>
<th>Windows XP, 7 or 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web browser</td>
<td>Mozilla Firefox or Google Chrome</td>
<td></td>
</tr>
<tr>
<td>Programming Language</td>
<td>HTML, CSS, Java Script and php for sever side scripting.</td>
<td></td>
</tr>
</tbody>
</table>

Source: Field Data (2018)

4.7 Design of a Web-Driven Circulation Control System

4.7.1 Use Case Modeling

Use case modeling is developed in the system analysis phase of the object-oriented system development process. Use case modeling is done in the early stages of system development to help developers gain a clear understanding of the functional requirement of the system, without worrying about how those requirements was implemented.

A use case is a representation of a discrete set of work performed by a use (or another system) using the operational system. A use case model consists of actors and use cases. An actor is an
external entity that interacts with the system and use case represents a sequence of related actions by an actor to accomplish a specific goal (Hoffer et al. 2012). A use case diagram is a graphic depiction of the interactions among the elements of a system (Gemino, 2009). It is used to identify and define the requirements of a system. A use case diagram contains four components;

i. The boundary, which defines the system of interest in relation to the world around it.
ii. The actors, usually individuals involved with the system defined according to their roles.
iii. The use cases, which the specific roles are played by the actors within and around the system.
iv. The relationships between and among the actors and the use cases.

The use case diagram for a Web Driven Circulation Control System is as shown in the diagram;

**Figure 9: Use Case Diagram**

![Use Case Diagram](image)

**Source:** Field Data (2018)

### 4.7.2 Activity Diagram

Activity diagrams are graphical representations of workflows of stepwise activities and actions (Grobelna and Adamski, 2014). In Unified Modeling Language (UML), an activity diagram is a graphical representation of an executed set of procedural system activities and considered a state chart diagram variation. Activity diagrams describe parallel and conditional activities, use cases and system functions at a detailed level.
4.7.3 Database Design

Database design is used to manage large of information. The database is a collection of information and is systematically stored in tables in the form of rows and columns. The table in the database has unique name that identifies its contents.
Table 8: Information Resources Details Table

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Data Type</th>
<th>Size</th>
<th>Relation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accession No.</td>
<td>Varchar</td>
<td>50</td>
<td>Primary key</td>
</tr>
<tr>
<td>Author</td>
<td>Varchar</td>
<td>50</td>
<td>Not null</td>
</tr>
<tr>
<td>Title</td>
<td>Varchar</td>
<td>50</td>
<td>Not null</td>
</tr>
<tr>
<td>Publication</td>
<td>Varchar</td>
<td>50</td>
<td>Not null</td>
</tr>
<tr>
<td>Edition</td>
<td>Varchar</td>
<td>50</td>
<td>Not null</td>
</tr>
<tr>
<td>Call No.</td>
<td>int</td>
<td></td>
<td>Not null</td>
</tr>
<tr>
<td>Date_pur</td>
<td>Date</td>
<td>50</td>
<td>Not null</td>
</tr>
</tbody>
</table>

Source: Field Data (2018)

Table 9: Library Users Table

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Data Type</th>
<th>Size</th>
<th>Relation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Varchar</td>
<td>50</td>
<td>Not null</td>
</tr>
<tr>
<td>ID No.</td>
<td>Varchar</td>
<td>50</td>
<td>Primary key</td>
</tr>
<tr>
<td>Date_of_issue</td>
<td>Datetime</td>
<td></td>
<td>Not null</td>
</tr>
<tr>
<td>Addresss</td>
<td>Varchar</td>
<td>50</td>
<td>Not null</td>
</tr>
<tr>
<td>Date_of_return</td>
<td>Datetime</td>
<td></td>
<td>Not null</td>
</tr>
</tbody>
</table>

Source: Field Data (2018)

Table 10: Librarian Table

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Data Type</th>
<th>Size</th>
<th>Relation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Varchar</td>
<td>50</td>
<td>Not null</td>
</tr>
<tr>
<td>Staff No.</td>
<td>Varchar</td>
<td>50</td>
<td>Primary key</td>
</tr>
<tr>
<td>Department</td>
<td>Varchar</td>
<td></td>
<td>Not null</td>
</tr>
<tr>
<td>Addresss</td>
<td>Varchar</td>
<td>50</td>
<td>Not null</td>
</tr>
<tr>
<td>Position</td>
<td>Varchar</td>
<td></td>
<td>Not null</td>
</tr>
</tbody>
</table>

Source: Field Data (2018)
Table 11: Information Resources Issue Table

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Data Type</th>
<th>Size</th>
<th>Relation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID. No.</td>
<td>Varchar</td>
<td>50</td>
<td>Foreign key</td>
</tr>
<tr>
<td>Date_of_issue_books</td>
<td>Datetime</td>
<td></td>
<td>Not null</td>
</tr>
<tr>
<td>Date_of_return_books</td>
<td>Datetime</td>
<td></td>
<td>Not null</td>
</tr>
<tr>
<td>Name</td>
<td>Varchar</td>
<td>50</td>
<td>Not null</td>
</tr>
<tr>
<td>Author</td>
<td>Varchar</td>
<td>50</td>
<td>Not null</td>
</tr>
<tr>
<td>Edition</td>
<td>Varchar</td>
<td>50</td>
<td>Not null</td>
</tr>
</tbody>
</table>

Source: Field Data (2018)

Table 12: Information Resources Return Table

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Data Type</th>
<th>Size</th>
<th>Relation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID. No.</td>
<td>Varchar</td>
<td>50</td>
<td>Foreign key</td>
</tr>
<tr>
<td>Date_of_issue_books</td>
<td>Datetime</td>
<td></td>
<td>Not null</td>
</tr>
<tr>
<td>Date_of_return_books</td>
<td>Datetime</td>
<td></td>
<td>Not null</td>
</tr>
<tr>
<td>Name</td>
<td>Varchar</td>
<td>50</td>
<td>Not null</td>
</tr>
<tr>
<td>Author</td>
<td>Varchar</td>
<td>50</td>
<td>Not null</td>
</tr>
<tr>
<td>Edition</td>
<td>Varchar</td>
<td>50</td>
<td>Not null</td>
</tr>
</tbody>
</table>

Source: Field Data (2018)

4.7.4 Architectural Design

An architectural design refers to the physical layout of the system and the interconnections between the users, computer-based servers and database servers. The library circulation control system the library staff can access the system that is turned as computer based system, from the system, the library staff login, using username and password provided the welcoming screen displays who should register with the system.
The Data Flow Diagram (DFD) is a graphical technique used for effective modeling and analyzing the information processes and systems.

**Source:** Field Data (2018)
Figure 12: Data Flow Diagram (DFD)

Level 0

Details Verification

Level 1

Verifying Details

Level 2

Issue Materials

Level 3

Return Information Resources

Source: Field Data (2018)
4.7.4 Flow Chart

A library circulation control system data flow diagram (DFD) shows how the information within a library system needs to flow to meet the needs of patrons or students as well as library administrators.

Figure 13: Flow Chart

Source: Field Data (2018)
4.8 System Implementation

Tosin (2015) noted that system implementation describes how the system works and how best computers together with other resources is applied to perform data storage, management and retrieval for decision making. Testing and validation was done by running the system on a physical device that is was a computer.

4.8.1 System Testing

This was done to ensure that the whole system functioned as expected with the various functions coordinating to each other in order to achieve the system goals. The system malfunctions were corrected and this was achieved by testing the various functionalities such as; creating an admin account, authentication by logging into the system using wrong user names and passwords was done and review the registered information by the administration.

4.8.2 System Validation

The researcher allowed some users to use the system and they were left to prove the proper functionality of the system. This was done to proof whether the system is developed and met the user system requirements and more so satisfied user needs.
CHAPTER FIVE

A WEB-DRIVEN CIRCULATION CONTROL SYSTEM FOR MAKERERE LAW SCHOOL LIBRARY

5.1 Introduction

This chapter discusses the Web Driven Circulation Control System for Makerere Law School Library.

5.2 Overview of the Web-Driven Circulation System

The system is an online library circulation control system for Makerere Law School Library to help in the circulation of Information Resources to meet the needs of users. It ensures that users of the library are also involved in the process delivering information resources which can help them in research and learning.

5.3 System Functionality

A Web Driven Circulation Control System has various benefits to Makerere Law School in order to promote the library services to their users and these include;

- The library circulation system is used to track the Information Resources in the Makerere Law School Library.
- Records of the library’s orders, reservations and renewals for the library materials.
- Ability to deal with multiple copy orders or orders for specific item types
- Ability to print the circulation reports for a certain period of time electronically.
- Produce reports such as details of received orders, claims and vendor reports.
- Track the users’ details who access the library resources.

5.4 Benefits of a Web-Driven Circulation System

1. The Web-Driven circulation system is used to track the Information Resources
2. Records of the library’s orders, reservations and renewals for the library materials.
3. Ability to print the circulation reports for a certain period of time electronically.
4. Produce reports such as details of received orders, claims and vendor reports.
5. Track the users’ details who access the library resources.

5.5 Components of a Web-Driven Circulation System

1. Lending and borrowing Information Resources
2. Library user’s management
3. Generation of Reports.

5.6 System Interfaces

The system has interfaces which allow users and librarians to interact. It is designed to provide the platform for users to ask for the information resources, view some of the frequently asked materials, login and receive answers from the librarian.

5.6.1 Home Page

The home page is the first interface accessible to the librarians. It has links to pages where the library staff can login, register patron, reserve the information resources, issuing and returning of the materials borrowed by the library users.

Figure 14: Home Page

Source: Field Data (2018)
5.6.2 User/ Administrator Login Interface

This interface enables both the library staff to login to the system and access the data. It requires registration username and password as shown below. The system administrator has the authority to register and add users, information resources, reserve resources for users, recording the issue and return of the resources through the administrator interface.

Figure 15: User/ Administrator Login Interface

![Login Interface Image]

**Source:** Field Data (2018)

The registered users of the system login using their first names as the username and the last names as their passwords, however users can also reset their passwords. Users can only have access to the system when there is an internet connection. The steps for logging into the system are:

- Access Web-Driven Circulation System
- Click login
- Enter your user name (first name) and the password (last name)
- Press Enter.
5.6.3 Add New User

This interface allows the librarians to register the new users in the system. The details that are captured for a new member are; the user name, email, user’s names, need of notifications or not on new acquisitions, the type of the users. Users can be identified as librarians, students or teachers with different roles and limitations in the system.

Figure 16: Register Patron Interface

Source: Field Data (2018)

Librarians have the rights to access this interface by logging into the system as the system administrator. They can add new members into the system by following the steps;

- Login as an administrator
- Click on add new users
- Enter the details of the user
- Save the changes
5.6.4 Users List Interface

This interface shows a list of the registered library users who can login the system and have access to the system. It is the responsibility of the librarian to add and delete users of the system.

**Figure 17: Users List Interface**

![Image of Users List Interface]

**Source: Field Data (2018)**

On this interface, librarians can view the registered users of the system, add users and delete some who cease to be users of the library. Librarians can follow the following steps while registering and deleting the library users from the system;

- Login into the system as an administrator
- Click users
- Click on add new
- Enter the user’s names, email, type of the user
- Click add new users
5.6.5 Add New Item Interface

This platform enables the librarian to register Information Resources received in the library. The librarian can login into the system and add information/metadata concerning the Information Resources into the system. The details that are captured include; barcode number, title for the book, author, subject, description of these Information Resources, category and the media in which the material exist.

Figure 18: Add New Item Interface

Source: Field Data (2018)

Librarians can also add new items acquired in the library using this platform to be searched by the users. The steps below are followed to add new documents:

- Login to the System
- Click on the Collection
- Enter the details of the new item
- Save the new changes
5.6.6 Library Collections Interface

This interface provides the newly acquired Information Resources which are in the stock. These are put in the system in PDFs and can be downloaded by the library users and staff. The librarian has the responsibility of accessing the frequently requested Information Resources by users who can access them when connected to the internet.

**Figure 19: Library Collections Interface**

Source: Field Data (2018)

These Information Resources are available in the PDF files which are uploaded by the librarians. Users can access these Information Resources and the steps are;

- Login into the system
- Search for the name of Information Resources needed
- Click to download the file from the system
- Save the file on the computer
5.6.7 Information Resources Issue Interface

This interface is accessible by the library staff who can issue out the Information Resources to the library users. The interface can help librarians view the Information Resources which are rarely used or frequently used.

**Figure 20: Information Resources Issue Interface**

The following steps must be passed through for librarians to issue out materials to the library users.

- Login into the system as an administrator
- Click on the Circulation Desk
- Search for any information material requested
- Search for the library patron
- Click on Book loan.

**Source:** Field Data (2018)
5.6.8 Information Resources Return Interface

This interface is accessible by the library staff who register the book which has been returned. The interface can help librarians view the Information Resources which are rarely used or frequently used.

**Figure 21: Information Resources Return Interface**

![Information Resources Return Interface](image)

Source: Field Data (2018)

The following steps must be passed through for librarians to issue out materials to the library users.

- Login into the system as an administrator
- Click on the Circulation Desk
- Search for any information material requested
- Search for the library patron
- Click on Book loan.
5.6.9 Circulation Reports Interface

Source: Field Data (2018)

5.6.10 Alerts Interface

Source: Field Data (2018)
5.6.11 Reservation Interface

Source: Field Data (2018)

5.6.12 List of Overdue Interface

Source: Field Data (2018)
5.7 Systems Testing and Validation

Testing and validation was done by running the system on a physical device that is was a computer.

5.7.1 System Testing

This was done to ensure that the whole system functioned as expected with the various functions coordinating to each other in order to achieve the system goals. The system malfunctions were corrected and this was achieved by testing the various functionalities such as:

- Creating an admin account
- Authentication by logging into the system using wrong user names and passwords, the login attempt was unsuccessful and the system returned an error message and denied access.
- Review the registered information by the administration.

5.7.2 System Validation

The researcher allowed some users to use the system and they were positive about the proper functionality of the system, they included; the system was easy to use, to remember once used and the system was easy to learn. This was enough to proof that the system was developed right and met system requirements and more so satisfied user needs.
CHAPTER SIX
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter includes the summary of the findings, conclusions and recommendation of the report.

6.2 Summary

The purpose of this project was to design a Web Driven Circulation Control System for Makerere Law School Library that provides a convenient, easy-to-use, internet based application for librarians and users to track and manage the library resources of the University. The objectives of the study were to; examine the current Browne circulation system used at Makerere Law School Library, establish the challenges of Browne circulation system at Makerere Law School Library, establish the necessary requirements in designing a Web Driven Circulation Control System at Makerere Law School Library, design and implement a web-driven circulation control system at Makerere Law School Library that has an improved inventory control of resources at the University.

The study employed a case study research design since the study targeted a particular institution that is Makerere Law School Library. The study adopted a qualitative research approach in collecting data. Purposive sampling was used to select 18 respondents who participated in the study.

The study found out that majority of library users at Makerere Law School Library were University students. Majority of the information resources in the Makerere Law School Library were text books accessed by the users to meet their learning teaching and research needs. Library staff use counter books and registers in the management of the information resources and users’ details. The major challenge faced with the library circulation system is the inadequate information resources caused by inadequate funding in the Makerere Law School Library.
The study concluded that a Web Driven Circulation Control System would help the library staff provide library resources to the users, inadequate Information Resources and inadequate funds as the major challenges would be solved by increasing the library funding so as to support the library users meet their needs. The study recommended that the library staff should increase on the library funding, develop a library circulation policy, acquire more computers for the users to access and more staff with technical IT skills, should digitize all Information Resources to promote the access and provision.

6.3 Major Findings

The study found out that;

1) Majority of the library users at Makerere Law School Library were the University students. Most of these students visit the library to access information resources which help them to meet their academic needs such as passing exams and carry out research to supplement on their level of knowledge.

2) Librarians use counter books and registers to record the details of information resources and library users who use the University information resources. This puts the information resources at a risk of getting lost because lack of a system to keep track for the information resources.

3) In order to access the information from the library, users must have valid IDs or library cards for the non-students. This is time consuming since the library staff have to first cross check and confirm on the details of the library users who need the information resources from the Makerere Law School Library.

4) The major challenge affecting Makerere Law School Library circulation system is inadequate funds to support the activities that take place in the Makerere Law School Library. This has led to lack of enough information resources and limited number of library staff to help the users access the information resources from the library.

5) The other challenges in circulation of Information Resources at Makerere Law School Library were; delays in returning the Information Resources, the existing circulation system is tiresome, it does not allow the librarians to send the updates and notifications to
the users on the Information Resources, regular updating of the ledger book details is not availed, inadequate number of Information Resources, it’s hard to notice long overdue dates and there is theft of Information Resources by untrusted library users.

6) The requirements for a circulation control system for Makerere Law School Library and these were; the circulation control system should be cheap in terms of setup and maintenance, user friendly, compatible with the available computers in the library, and easy to use.

6.4 Conclusion

The study concluded that;

1) There is need to design a library circulation system that helps the librarians in the provision of electronic library resources at Makerere Law School Library.
2) There is need to train the library staff on how to use the online circulation system for the Makerere Law School Library.
3) There is need to purchase more up-to-date information resources which can meet the users’ needs.
4) There is need to develop a library circulation policy for Makerere Law School that guide the library staff on delivering information to the library users.
5) There need to acquire more Information Resources in the library to meet the rapidly growing number of library users at Makerere Law School Library.

6.5 Recommendations

1) The University should increase on the funds which are allocated to the library in order to support the library staff in purchasing more Information Resources and recruit more staff to support the staff in offering information resources to users.
2) The Makerere Law School Library should adopt the Web Driven Circulation Control System for the library. The system will support the library staff in offering information resources to the users through checking the users and information resources details from the computer system.
3) The Makerere Law School Library should develop a library circulation policy for Makerere Law School that guide the library staff on delivering information to the library users.

4) The library administration should acquire more computers for the users to access while in the library. Since system delivers information online, fully internet connected computers are needed for the smooth running of the system.

5) The system needs an employee to manage it with technical IT skills for it to execute the functions intended in the library. This person is responsible with the maintenance and updating the system in the library.

6) The library administration responsible with the acquisition of Information Resources should make sure that the Information Resources acquired in the library are on syllabus and are able to satisfy the user's information needs.

6.6 Areas for Further Study

The researcher suggested the following as the areas for further study;

1. Designing a customer care services system for Makerere Law School Library
2. An online users’ manual for Makerere Law School Library
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APPENDICES

Appendix 1: Interview Guide for the Library Staff

Dear respondent,

I am Nanteeza Olivia, a Bachelors’ Degree student in Library and Information Sciences at East African School of Library and Information Science, Makerere University. I am undertaking a research project on designing A Web-Driven Circulation Control System for Makerere Law School Library. The purpose of this study is for academic purposes. This is to request you to kindly answer the questions. All responses will be treated as confidential and no answer is wrong so feel free to bring out your views by answering the questions appropriately.

Section A. Background Information

1. Gender : Male ☐ Female ☐
2. Position : .................................................................
3. For how long have you worked with Makerere Law School Library?

Section B. Library Circulation System in Makerere Law School Library

4. How are the Information Resources issued to the library users in the library?
5. What are the requirements for a library user to have access to the Information Resources?
6. Where do you record the details for the book you have borrowed and returned?
7. How do you search for information material requested by the library users?
8. How do you trace the library users who borrow Information Resources from the library?
9. How long does it take for you to issue Information Resources to users once requested?
10. Do you send notifications about new acquisitions and overdues to users of the library to the library users?

Section C. Challenges in Circulation Control System in Makerere Law School Library

11. What are the library working hours at Makerere Law School Library?
12. What challenges do you face in borrowing information material to the library users?
13. What are your suggestions to solve the above challenges?

Section E. Requirements for a Circulation Control System for Makerere Law School Library

14. Do you think the proposed system will be helpful to the library and its users, yes can you give some reasons?

15. What would you expect of the new library circulation control system for Makerere Law School Library?

16. What are your suggestions to improve on the circulation system for the Makerere Law School Library?

17. What should be included in the library circulation system to meet the user needs?
 Appendix 2: Document Review Guide

The research used this guide to review and analyse all the documents available in Makerere Law School Library on the circulation of the information resources.

1. Guide lines for the circulation of the information resources
2. The library user’s manual
3. The library rules and regulations
4. Accessions registers
5. Users details registers
6. Library staff registers
7. Guidelines for selection and acquisition of information resources
Appendix 3: Introductory Letter
Appendix 4: A CD with the Prototype of a Web-Driven Circulation Control System for Makerere Law School Library