AN ONLINE BOOK-BANK MONITORING SYSTEM

By

Twine Bananuka
BA/Ed (Mak), Msc.EDUC (FAMU, USA)

A Project report Submitted to the School of Graduate Studies, Makerere University in Partial Fulfillment of the Requirements for the Award of a Postgraduate Diploma in Computer Science

November’ 2005
DECLARATION

I, Twine Hannington Bananuka, declare that this project is my own product and the work here in has not been submitted to Makerere University or any other institution of higher learning for any academic award.

Signed: ........................................................……….. Date: .........................................……..
TWINE HANNINGTON BANANUKA,

Approval:
I certify that this project is the original work of the above named candidate and has been done under my supervision. The work has never been submitted for any academic award in any institution of higher learning.

Signed: ........................................................……….. Date: .....................................
MWEBAZE JOHNSON (MR.)
Supervisor.
DEDICATION

This project is dedicated to my dear wife Mrs. Rose Bananuka and my lovely daughter, Atwine Bananuka as well as my son, Atamba Bananuka for their love and patience during the development of this project.
ACKNOWLEDGEMENT

I want to acknowledge the extraordinary assistance of Mr. Johnson Mwebaze; my supervisor who accepted to bear my endless phone calls, visits and emails even at awkward hours. I greatly say thank you. I also wish to thank the department of Adult Education and Communication Studies (Mak), where I work for the financial support extended to me towards tuition payment. Without their support I would not have realized my dream of attaining formal training in the field of computer science. I can only promise to pay back by availing my skills to their service. I also want to express my appreciation to my classmates and friends who helped me in one way or another during the course of developing this project. I just wish to single out a few among the many; Mr. Kaddu Ismael, Mr. Johnson Munaba, Ms. Allen Nahabwe and Mr. Moses Mugumya. Finally I wish to thank my wife and children for their love and patience during the writing of this project. They endured the long hours of my absence during the development of this project.

Twine Bananuka
KAMPALA, UGANDA
November’ 2005
# TABLE OF CONTENTS

Declaration ........................................................................................................... ii  
Approval .............................................................................................................  ii  
Dedication .......................................................................................................... iii  
Acknowledgments .............................................................................................. iv  
List of figures ...................................................................................................... viii  
List of tables ....................................................................................................... ix  
Acronyms ............................................................................................................ x  
Abstract ............................................................................................................ xi  

## 1. Introduction  

1.1 Background to the Study ...........................................................................  1  
1.2 Statement of the Problem .........................................................................  4  
1.3 Objectives ...................................................................................................  4  
   1.3.1 General Objectives ...........................................................................  4  
   1.3.2 Specific Objectives ..........................................................................  4  
1.4 Scope ..........................................................................................................  5  
1.5 Significance of the study ............................................................................  5  

## 2. Literature Review  

2.1 Introduction ...............................................................................................  6  
2.2 Learning Objects and patterns of software Architecture .......................  6  
2.3 Approach to Library Design and required necessities ......................... 10  
2.4 Related Information Systems ..................................................................... 15  

## 3. Methodology  

3.1 Introduction ............................................................................................... 19  
3.2 Methods of Data Collection ....................................................................... 19  
   3.2.1 Interviews ................................................................................. 19  
   3.2.2 Observation ............................................................................. 20  
   3.2.3 Document review ....................................................................... 20  
3.3 Tools used in System design and Implementation ................................ 21
3.3.1  My Sql ................................................................. 21
3.3.2  PHP ................................................................. 21
3.3.3  Html ................................................................. 22

4. System Study ......................................................... 23

4.1  Description of the Existing System .............................. 23
4.1.1  Registering New Books ........................................... 23
4.1.2  Reports ........................................................... 23
4.1.3  Procedures and Regulations ..................................... 23
4.1.4  Borrowing ....................................................... 24
4.1.5  Acquisition Policy ............................................... 24

4.2  Problems of the existing System ................................. 25

5. System specification and design ...................................... 26

5.1  Requirement Specifications ....................................... 26
5.1.1  User Requirements of the Proposed system .................. 26

5.2  System Requirements .............................................. 26
5.2.1  Functional Requirements of the Proposed System ........... 26
5.2.2  Non Functional Requirements .................................... 27
5.2.3  User Specification ............................................... 27
5.2.4  Hardware Requirements ........................................... 27
5.2.5  Software Requirement ............................................ 28
5.2.6  Proposed System modules ....................................... 28

5.3  System Design ..................................................... 28
5.3.1  The Interactive level ............................................. 29
5.3.2  The Manipulative level .......................................... 29
5.3.3  Data storage level ................................................ 29

5.4  System Design ..................................................... 39
5.4.1  Architectural Design ............................................ 30

5.5  Conceptual Design .................................................. 34
5.5.1  Entities and Attributes ......................................... 34
5.5.2  Relationships .................................................... 34

6. Implementation ....................................................... 39
6.1 Programming Environment ........................................... 39
  6.1.1 The Monitoring System ........................................... 39
  6.1.2 Data Manipulation ................................................. 39
  6.1.3 Scripting ............................................................... 40
  6.1.4 Interface ............................................................... 40
6.2 Form Input Design ....................................................... 40

7. Findings, Recommendations and Conclusions 48
  7.1 Findings and Achievements ...................................... 48
     7.1.1 Limitations ....................................................... 48
  7.2 Recommendations .................................................. 49
  7.3 Conclusion ............................................................. 49

References ................................................................. 51
APPENDIX A ................................................................. 53
APPENDIX B ................................................................. 58
## LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1</td>
<td>Architectural Design</td>
<td>30</td>
</tr>
<tr>
<td>5.2</td>
<td>The Context Flow Diagram of the Proposed System</td>
<td>31</td>
</tr>
<tr>
<td>5.3</td>
<td>Level 1 Data Flow Diagram of the Proposed System</td>
<td>32</td>
</tr>
<tr>
<td>5.4</td>
<td>Key to the Data Flow Diagram</td>
<td>33</td>
</tr>
<tr>
<td>5.5</td>
<td>ERD of the Proposed System</td>
<td>35</td>
</tr>
<tr>
<td>6.1</td>
<td>The Login form</td>
<td>41</td>
</tr>
<tr>
<td>6.2</td>
<td>Book entry form</td>
<td>42</td>
</tr>
<tr>
<td>6.3</td>
<td>Book-bank entry form</td>
<td>43</td>
</tr>
<tr>
<td>6.4</td>
<td>All books in the book-bank system</td>
<td>44</td>
</tr>
<tr>
<td>6.5</td>
<td>Books in the AECS book-bank</td>
<td>45</td>
</tr>
<tr>
<td>6.6</td>
<td>Book defaulters</td>
<td>46</td>
</tr>
<tr>
<td>6.7</td>
<td>Book Statistics</td>
<td>47</td>
</tr>
<tr>
<td>7.1</td>
<td>MUK Library home page</td>
<td>58</td>
</tr>
<tr>
<td>7.2</td>
<td>Book order form</td>
<td>59</td>
</tr>
<tr>
<td>7.3</td>
<td>Borrower’s card</td>
<td>60</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th></th>
<th>Table Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Acronyms</td>
<td>x</td>
</tr>
<tr>
<td>5.1</td>
<td>Borrower Table</td>
<td>36</td>
</tr>
<tr>
<td>5.2</td>
<td>Book bank staff</td>
<td>36</td>
</tr>
<tr>
<td>5.3</td>
<td>Book table</td>
<td>37</td>
</tr>
<tr>
<td>5.4</td>
<td>Book Copy Table</td>
<td>37</td>
</tr>
<tr>
<td>5.5</td>
<td>Student Table</td>
<td>38</td>
</tr>
<tr>
<td>5.6</td>
<td>Coordinator Table</td>
<td>38</td>
</tr>
<tr>
<td>5.7</td>
<td>Lecturer Table</td>
<td>38</td>
</tr>
</tbody>
</table>
## Acronyms

<table>
<thead>
<tr>
<th>Initial</th>
<th>Full Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR/RS</td>
<td>Automated storage and Retrieval systems</td>
</tr>
<tr>
<td>CGI</td>
<td>Common Gateway Interface</td>
</tr>
<tr>
<td>FCIT</td>
<td>Faculty of Computing and Information Technology</td>
</tr>
<tr>
<td>GUI</td>
<td>Graphical User Interface</td>
</tr>
<tr>
<td>HTML</td>
<td>Hyper Text Markup Language</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>ODA</td>
<td>Overseas Development Association</td>
</tr>
<tr>
<td>OPACs</td>
<td>Online Public Access Catalogues</td>
</tr>
<tr>
<td>PGD</td>
<td>Postgraduate Diploma</td>
</tr>
<tr>
<td>PGD. CSC</td>
<td>Postgraduate Diploma in Computer Science</td>
</tr>
<tr>
<td>PHP</td>
<td>Hypertext Preprocessor</td>
</tr>
<tr>
<td>RDBMS</td>
<td>Relational Database Management System</td>
</tr>
<tr>
<td>SQL</td>
<td>Structured Query Language</td>
</tr>
<tr>
<td>URL</td>
<td>Universal Resource Locator</td>
</tr>
</tbody>
</table>
ABSTRACT

This project was aimed at developing an online book-bank monitoring system in Makerere University. The responsibility of monitoring book-banks in Makerere University is vested in the main library and is executed by the Bank-Bank section. It was intended to address the current problems encountered in using a manual system to monitor the activities of the book-banks. The study covered three book-banks namely; Faculty of Computing and IT, Faculty of Law and Department of Adult Education and Communication Studies (Institute of Adult and Continuing Education). Interviews, observation and questionnaires were used as data collection techniques. The project analyzes the system requirements and then comes up with the requirements specifications. It studies other related systems and then come up with system specifications. The system is then designed in accordance with specifications to satisfy the requirements. The system design is then implemented with MYSQL, PHP and HTML. The system is designed as an interactive and content management system. The content management system deals with data entry, validation and updating while the interactive system deals with system interaction with the users. The system is capable to largely address the problems mentioned in the existing system. It can generate reports on the total inventory of books in the system, books in each book-bank, list defaulters and other vital information required by the book-bank coordinator in the monitoring of the book-banks in the University.
CHAPTER 1

INTRODUCTION

1.1 BACKGROUND TO THE STUDY

The idea of the book-bank was first conceived at Makerere University in 1977 but it did not take off not until 1990. Makerere University introduced the book-bank system as a component of the University Library. The creation of this unit arose out of the desire by the University to cut down on the cost of allowances given out to students to purchase essential books for their courses. Originally each government-sponsored student would be given an allowance called boom to enable him/her purchase relevant books necessary for the course.

The Book-Bank system was established in Makerere University in 1990 with an initial book stock of 44,000 from the defunct University Bookshop. The stock has steadily increased and stands at over 221,696 books (November 2003), distributed in all departments, schools and institutes of the University. Departmental Book-Banks are managed at departmental level (Available; [www.makerere.ac.ug/library](http://www.makerere.ac.ug/library) [1]).

However as the number of students grew, the government/University was no longer able to meet the book requirements in terms of allowances per student every other year. It ought to be noted that the purchased books would thereafter become the property of the student. In order to solve this problem to ensure that students accessed books at a limited cost, it was decided that the University sets up a book-bank project where the money that would otherwise be passed on to students to purchase personal books, instead be used to purchase books that would be put in a pool/bank for use by students after which they would be left behind for use by incoming students. The following objectives were behind the creation of the book-bank:

i. To help the teaching units (Faculties and Departments) acquire the right books for the syllabus at the right time.
ii. To develop a system capable of sustaining the university education system amidst student’s inability to buy/acquire the right textbooks on a personal basis.

iii. To utilize carefully the limited funds allocated for textbooks.

iv. To ensure availability of basic textbooks to students against limited funds.

v. To develop students ability to handle property loaned to them.

The Book-bank system, coordinated from the Main Library provides the following services: -

i. Solicits Book orders from heads of departments.

ii. Processes the orders for suppliers; both local and overseas.

iii. Receives and processes the new books acquired.

iv. Distributes the new processed books to respective departments, schools and institutes.

v. Maintains a database of the acquired books.

vi. Carries out annual stocktaking.

The book-banks of all the faculties are under the general supervision of the main university library. Each Faculty and in some cases departments have book-bank units which are directly supervised by the University Library.

The University library has recently created a database of library books that can be accessed online, where researchers, teaching staff and students can check the availability of a given book by following a link on the University library website. This system however has not been made possible for books in the book-bank section. A database has been created but is only used for record purposes for all the books purchased and disbursed to various book-bank units. This means that when it comes to monitoring, the process becomes manual whereby a printed list from the database is carry to a book-bank unit to compare with the books available.

Individual book-banks are not yet electronically and digitally linked to the main library, thus calling for the study of the current system so as to design a suitable online book-
bank monitoring system. Distance learning has become a buzzard for educational programming in many institutions of higher learning in recent years. The need to provide access to post-secondary coursework at a distance has been identified as a top priority for many universities and colleges.

The driving force behind this has to do with the increased demand for access to higher education, the rising cost of colleges, the growth of information technology and competition among private enterprises in the ever-increasing commercialization of the education market (Slade, 1999 [2]). This is evident in Makerere University; with the increased number of students, management of individual book-bank units and students of different faculties has become harder. Much as book-banks are under direct control of the University Library, monitoring by the coordinator is very difficult. The books are purchased and distributed to respective units, but monitoring is very difficult taking into account the limitations of the manual system. In some cases, the book-bank staff may be tempted to flout the rules of the University library in terms of lending policy and procedure.
1.2 STATEMENT OF THE PROBLEM

The current monitoring system is manual and as a result highly tedious in terms of monitoring the book-banks. These book-banks place orders for books from the University Library. Monitoring of these book-banks is currently difficult due the fact the staff in the main Library in charge of book-banks is small and one must physically walk to a particular book-bank unit (Faculty/Department) to assess the performance. Since books are manually recorded, grouped and stored, many a time, it becomes very difficult to know how many books of a given type are available in individual book-banks by the Book-bank Coordinator. Producing a list of lost books and defaulters for example is also a nightmare. This calls for the automation of the book-bank monitoring system.

1.3 OBJECTIVES

1.3.1 GENERAL OBJECTIVE

The general objective was to design an online book-bank monitoring system to enable a central monitoring mechanism of the book-bank be more faster and less error prone.

1.3.2 Specific Objectives

i. To study and analyze the current monitoring system/procedures of the book-bank in order to come up with proper requirement specifications for the new system.

ii. To design an online system to monitor the activities of the book-banks.

iii. To create an application that will enable the coordinator to evaluate various book statistics, which can influence decision-making.

1.4 Scope

The study covered Makerere University Main Library book-bank section, and also focused on three book-banks namely Faculty of Computing and Information Technology (FCIT), Institute of Adult and Continuing Education (department of adult Education and Communication studies) and Faculty of Law.
1.5 Significance of the study

The current system is highly manual and therefore tedious in terms of monitoring the book-banks in the University. Libraries are changing rapidly as they strive to bring access to electronic resources, seamless document delivery systems and information literacy skills to their communities. The new electronic information environment is pushing many libraries to rethink their services and reengineer their organizations (Holly, 1999 [3]).

Therefore the electronic system will help to speed up the process of book-bank monitoring in light of the increasing number of student population and shrinking number of staff. It will further allow the coordinator and other stakeholders to access the information on the book-banks online by logging into the system using their respective log-on rights.
CHAPTER 2

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter reviews the literature of the related systems. It looks at what has already in areas of digital library and book information processing systems. The literature was covered in two major sections. The first section explored learning objects and electronic information processing. The second section explored approaches to Library design and the required necessities. This section also explored a case study of a digital Library design.

2.2 Learning Objects And Patterns Of Software Architecture

Learning objects are potentially reusable components from which course of the study may be constructed. The economic arguments for their reuse in this manner are compelling, instead of many institutions developing their own materials for a common course.

Materials in the form of reusable learning objects could be shared across institutions, thus saving the cost of many hours of individual development (Lonsdale, 2004 [4]). This is especially so if the users can access the learning materials electronically. Digital publishing represents an effort to use basic digital principles in a more flexible way of producing and distributing verbal texts (Terje, 2005 [5]). This means that there is need for fast processing and access of information, thereby making digitization a necessity.

Given that university libraries are traditionally set up for on campus use, libraries are now faced with the challenge of restructuring and re-orienting their services to accommodate off campus users as well (Slade, 1999 [2]). The most significant aspect of the digital shift is the separation of storage and representation in two different places. In digital cycles, texts are produced, distributed and read with the use of computers, networks and monitors in a predominantly digital environment. There is a great shift from typewriting to digital writing though both contain text cycles (Terje, 2005 [5]).
Libraries are merging with computing and technology centers to facilitate the use of information and technology in their institutions. Electronic resources seem to have entered more students and faculty into the library’s virtual spaces, whereby demanding virtual service and instruction (Holly, 1999 [3]). The library should begin to migrate towards electronic formats for many of its resources, that is, increase on the databases and full text resources, develop electronic reserves, and design web pages for academic courses (for example course syllabi, reading, etc) (Slade, 1999 [2]).

(Roberts, 1999 [6]) writes that until spring of 1998, they had only automated their circulation function using old software in the Cohen Hillel school library. To make the library more useful, simplify staff workload and streamline technology school-wide, they upgraded the circulation system and replaced its card catalog with a computerized catalog.

With the new system in place, now students can quickly access books and other resources by title, author, subject, call number, series and keyword. They can also find out whether books are available for checkout.

Some of the automation benefits the Cohen Hillel students and staffs got were:

i. Increased interest in library and easier access to resources – Replacing the card catalog with electronic search stations has increased interest in and use of the library by helping students and staff more easily find resources.

ii. Enhanced Circulation – Enhanced circulation and reporting capabilities have made it easier to produce reports that help library staff more effectively manage library operations.

iii. Saving time – The Cohen Hillel library staff has benefited because now they can quickly run reports, circulation statistics, overdue notices and more, which once took days to prepare.

Automation usually reduces cost and improves output by providing traceability, accuracy and reliability as will be seen in the dairy firm example.
Lynn, 2003 [7]) writes in the dairy field that because reliability and security from the cooler to the loading dock are tantamount to successful distribution and customer satisfaction, many dairy companies are investing in modern material handling systems. Automated Storage and Retrieval Systems (AS/RS) allow manufacturers to improve performance in an ultimately cost-effective way.

Basic AS/RS setups include computer-based software, automatic, unmanned machinery and multi-level storage configurations. System components can be customized to include integrated warehousing and transportation software, racks constructed up to 70 feet high or a dozen pallets deep, triple beam pallet support, innovative conveyor technology and the use of automatic and retrieval cranes, among other features.

Across all types of dairy operations, processors that have embraced AS/RS configurations cite several reasons for investing in the system—chief among them being accuracy, for example, when Santee Dairies Inc. built a new, 250,000-square-foot warehouse in City of Industry, Calif., in 1998, the site included high-tech storage and case handling, packing and stacking system supplied by Westfalia. They were looking for efficiency and a better method to rotate dairy products so they bought an AS/RS and the added benefit was the fact that they now have perfect rotation, its quick and nothing gets lost at the end of the day.

Likewise, Tillamook County Creamery Association, Tillamook, Ore., made accuracy a priority for the $23 million automated warehouse the company constructed nearly three years ago. The multi-level site, which can store up to 35 million pounds of cheese and finished product, features an unmanned retrieval crane and a central Westfalia computer that automatically identifies and loads correct batches for order processing. According to Shawn Woods, Tillamook's AS/RS lead control operator, the computer-based system has led to near perfection. Indeed, accuracy remains a top goal and selling point behind the development of AS/RS solutions. Automated software and equipment work together for successful order fulfillment and shipments.
Reliability exemplifies the dairy industry's priorities. The incentive in dairy is in control of the inventory, putting this in an automatic storage system gives good, tight control with all batch information tied to the system.

Traceability is another central issue. A well-done AS/RS includes thorough tracking of products into and out of the system, allowing elimination of human error. Accuracy and efficiency have greatly improved in the two companies because of automation.

(Marcus, 2000 [8]) defines automation as all aspects involved in using a computer system for such tasks as circulation, cataloging, acquisitions etc. In relation to the above preposition by Marcus, it is possible for the implementation of an online book-bank monitoring system to yield substantial benefits for the users.

According to (Horsfall, 1992 [9]) Information Technology has pervaded our work and home lives in the last decade. One cannot do anything without it touching some aspect of our life – going shopping, telephoning interstate, doing the banking or borrowing a book etc. It has changed and continues to change the world our parents knew.

The rapid spread of information technology in our society is due to its ability to store, analyze, record and transmit information accurately, speedily and in large quantities. Therefore it is not surprising that organizations, whose operations are information intensive, like libraries, have tried to incorporate information technology in their systems. Major world libraries have installed online public access catalogues (OPACs) since the late 1960s. The ability to search online databases half a world away has also been available to libraries since the mid-1970s; and during the 1980s libraries introduced microcomputers and compact disk technology.

However the development of fourth and fifth generation computers in the mid-1980s and the subsequent availability of better, more flexible and easier to use software, has meant that automation of nearly all aspects of library systems is now possible.
Zuboff, 1988 [10]) says information technology has the ability to inform or automate the workplace. The capacity of information technology to generate vast amounts of information about the underlying processes of production and administration, allows employers to inform their work force so that employees can do their jobs better.

However, information technology also allows the employer to automate the workplace by:

- Using technology to replace human effort, skill, and knowledge to perform a process at lower cost;
- Emphasizing the machine's intelligence;
- Placing controls over the access of the organization's knowledge base;
- Using the technology as a fail-safe mechanism to monitor and increase certainty and control over production and the organizational functions.

(Horsfall, 1992 [9]) suggests that the positive effects of automation are:

- A reduction in repetitive work and tedious procedures;
- An increase in skill level;
- Possibly higher job satisfaction;
- An increase in the variety of tasks;
- Greater flexibility

2.3 Approach to Library Design and required necessities

The distributed model is in use at the Feniberg Library of Plattsburgh State University of New York since 1994. The model was developed so that a medium sourced college Library could offer an extensive away of off campus library services with limited additional staff (Holly, 1999 [3]).
It is certainly possible to develop library services that are integrated with existing on-campus services. An integrated approach provides flexibility for program growth encourages the development of broad-staff expertise and contributes to the essential Institutionalization of the distance-learning program as a whole on the campus (Holly, 1999 [3]).

(Holy, 1999 [3]) goes ahead to state that equally important distributed model bring all staff into the detailed work of meeting the research and information need of distance learning students which makes it possible for smaller libraries to support distance learning programs. (Davidson, 1999 [11]) states that a number of tailors need to be considered while designing a library system: Access to library services is essential, instilling long learning skills through information literacy as a primary outcome of higher education, a library should meet needs, services for extended, academic communities may differ from, but the digitalized services should also offer services of a traditional manual library.

This study will contribute to general researched knowledge on library information systems and especially on e-learning in general. With the great increase on the number of students in the university, there is need for more studies on resource sharing. The system will help any other interested institutions in library systems.

It is evident from the above that there is an increased need in library resources and in a more effective and efficient way therefore the literature reviewed indicates that, there is a growing need to make library services more accessible and flexible to many users including those that do not necessarily have to enter ‘the library building’. This implies that the use of online materials accessible through log-on rights and library extension services like the book-banks are the way to go.

(Matovu, 2000 [12]) argues that Information technology has led to an increased dependence on information by firms and individuals giving rise to the information age. The binary system as applied by computers leads to faster and more accurate methods of processing data. This has made information a more dependable resource in management.
Binary was later extended to other information related technologies, which resulted in easy exchange of data between a computer and these technologies. This has led to a convergence phenomenon involving integration of text, sound, graphics, drawings, fixed images and animations in many communication, a product referred to as multimedia. Working with multimedia requires specialised skills. Training institutions need to review their curriculums regularly to suit the changes. The rapidly changing information technology call for life long self-training by information workers.

With modern information systems, management is adequately and competently informed of what to make, how, when and how much. Information also tells management how to make better or cheaper commodities or services, what to charge and so on. In other words, information has become the basis for decision making in almost every human endeavour. The competitive edge enjoyed by one firm over others is largely a result of better access to good information pertaining to issues relating to production such as production processes, research, labour, market, capital, technology, government policies, etc. The provision and handling of quality information has, thus become a priority issue in modern management.

Although the history of library automation the replacement of manual operations in libraries by computerized methods is linked to the history of modern-day data processing and computer technology, the situation has not been the same in sub-Saharan Africa, especially for public libraries. The movement towards the use of computers in libraries in sub-Saharan Africa really began in the 1980s, the decade that saw rapid development and growth in sales of microcomputers. The arrival of the microcomputer, also known as a personal computer (PC) or desktop computer, changed the face of data processing and information management in organizations. For the first time computers became affordable both to individuals and institutions that could not previously afford the expensive minicomputers and mainframe computers. The opportunities presented by microcomputers, coupled with their relative low price, led some libraries, especially university and special libraries, in sub-Saharan Africa to consider automating some of their functions and activities.
In general, there is a paucity of literature documenting the status and use of information and communication technologies (ICTs) in public libraries in sub-Saharan Africa. Much of the available literature is in the form of journal articles and conference papers documenting ICT activities in academic and special libraries on the continent (Chisenga, 2004 [13])

According to (Tise, 2001 [14]), in most cases where online journals now form part of collections in South African libraries, it is interesting to note that it was not the result of specific library policy or strategy, but it happened out of necessity due to a number of factors beyond the control of library management. Some of the factors that contributed to this scenario are:

- Library budgets have been cut gradually over the last couple of years. This had a negative impact on collection development in general;
- Budget cuts also led to retrenchments of key library staff in some libraries;
- Demands placed on libraries by academic staff and students to provide access to online journals.

On the other hand, librarians have recognized the advantages of online journals, i.e. easy access to journals from any desktop, and have decided to include this in their own planning and started to see it as an additional, basic library service. However, very few libraries have integrated this service in the normal functioning of the library. Here and there it is now part of medium and/or long-term planning of libraries or institutions. In some libraries it is not yet seen as a long-term solution to supplement or replace print subscriptions.

Most libraries' first policy was to provide access to free online journals. The journals
were linked on the library web site and/or on the OPAC. Staff in the technical services divisions of the library automatically took responsibility for activating the journals.

Decisions around planning, funding, staffing, needs, training, IT infrastructure and marketing are some of the main issues facing libraries in the management of online journals. Identifying appropriate dedicated staff to administer and manage online journals is also critical. Some libraries have appointed dedicated librarians who are responsible for all e-resources. However, it is still seen as an additional task of the periodicals and/or cataloguing librarians in some libraries.

Marketing of online journals to users needs constant attention. Libraries that subscribe to full-text databases such as Science Direct have found that 99% of the online journals used by patrons, are the journals that the library subscribe to in print and only 1% access additional titles. I have focused mainly on academic libraries, because very few public libraries have the necessary information technology infrastructure in Africa to make online journals available to their users.

Due to some of the issues listed above, it is difficult to really say what the impact of online journals is in facilitating access to information in Africa. African libraries must develop a management model that will suit our circumstances best. Models are being developed in some library consortia such as the Gauteng and Environs Library Consortia (GAELIC).

Thomas (1998) stresses that computerized monitoring has been used for decades to study the behavior of remote users of online library resources. The older method of using transaction log analysis to study how remote users interact with online catalogs and abstracting and indexing services recently has been complemented by the use of Web server log analysis to study how remote users navigate into and through library-created and library-supported Web sites. The technique is particularly well suited to the task because the behavioral data can be gathered unobtrusively without interrupting the user’s search for information because, compared to in-library use, it is relatively easy to identify discrete search sessions, and remote users are much more reliant on computerized library
systems than are in-library users. For remote library users, content, context, and assistance all are delivered through the same channel and interface. The diffusion of remote access techniques and behavior among the information-seeking population raises some fundamental questions about the nature of access. As indicated by (Thomas, 1998 [15]) in his argument above, it’s actually true that with the online monitoring the main library coordinator will be able to easily monitor the activities of other book-banks in the entire university. Besides that, because the library coordinator will be monitoring the activities of the other book-banks remotely, there will be no interruption in their daily duties. This will help in turn help the top management to implement timely decisions making processes.

2.4 Related Information Systems:

2.4.1 A Case study of the automation of the library at Moi University, Kenya.

(Kibet Bii and Wanyama, 2001 [16]) have examined what influence the automation has had on the job satisfaction among the staff of the Margaret Thatcher Library (main library). They conducted their study by interviewing the university librarian, his deputy and the system librarian. 24 librarians working in the library, with different positions, answered questionnaires. Due to the automation, the way of dealing with different services and information material is changing. Therefore the automation brings a change in the way the librarians relate to their work, which might affect how satisfied they are with the job.

Moi University Library was established in 1984, first shaped the idea of automating the Library was shaped in 1988. However, at this state, it was still only an idea and a
proposal had to be written to get funding. In 1992 the Moi University Library got their proposal granted, the British Overseas Development Agency (ODA) agreed to finance the automation project. The same year, the library got two microcomputers that the library staff was going to use for training in cataloguing. Not until 1994 did the actual automation of the library start. A local area network (LAN) was established by 1996. (Kibet Bii and Wanyama 2001 [16]) claim that, in the beginning of the automation, the library did not have any official policy document or any prior objectives for the automation project.

The major driving force for the change, the library team of the Moi University Library argues; resulted from “a global need for effective and efficient ways of processing and accessing information.

When the library became financed by ODA, training was not a priority, and the library hoped to get funds from another donor for that issue. However, ODA eventually agreed to fund some training. Since a lot of staff at the library was not even computer-literate at this point, a basic computer-literacy course was arranged. One librarian was sent abroad to the UK for training in library automation, for twelve months. He then became the system librarian and the only one fully trained in an automated library system. The circulation and cataloguing modules have been fully automated in the main library, and also all the branch libraries have automated these operations.

All governments and many international and private agencies invest in higher education. However, although there is widespread commitment in principle to such investment in Africa, development of library and information services is generally perceived to be inadequate and inputs into library development have been typically small scale, piecemeal and lacking in co-ordination. At the same time university libraries have remained central to the management of scholarly communication and for centuries they have been repository of the written record and a powerful symbol of human intellectual achievement. Although traditionally libraries have been the most important of the university facilities in supporting advanced scholarship, today, perhaps as never before
fundamental questions are being raised concerning their nature and purpose as institutions.

A number of issues are at play. First, there is the explosion in the quantity of desirable published material and secondly rapid escalation of unit prices of these items. These jeopardize the traditional research mission of the university library of creating and maintaining large self-sufficient collections for their users. The third is the rapid emergence and development of electronic information technologies, which make it possible to envision radically more efficient ways of organizing and managing collections but which present a big challenge of adaptation.

The central purpose of libraries is to provide access to information to support the objectives of their parent institutions or interests of the communities they serve. Information has become a key resource in contemporary social and economic life upon which countries, organizations, and individuals depend in managing their affairs. In this sense libraries take part directly in research process and hence are components of knowledge innovation, and are involved in the diffusion and conversion of knowledge thereby acting as bridges for turning the results of knowledge into realistic productive entities. Therefore libraries as centres for collection, processing, storage and distribution of information and knowledge represent a crucial link in the development of knowledge and are important ideological and cultural force with far reaching implications for the society.

In relation to the online monitoring system, the coordinator will be able to carry out his work efficiently during the process of monitoring the activities of other book-banks hence this will bring change in relation to their work and satisfaction.
2.4.2 British Library case study in the provision of bibliographic record in the UK Library Management

The British Library currently maintains twenty-two databases accessible via the British Library Automated Information Service (Blaise), which was launched in 1977. Among these databases is the BNBMARC database. In 1974 British National Bibliography Ltd, a non-profit consortium of various bodies established in 1949, was absorbed into the new British Library, forming the nucleus of the National Bibliographic Service (NBS). The NBS continued to produce the printed British National Bibliography (BNB), which provided bibliographic access to the publishing output of the UK and the Republic of Ireland. The NBS also made machine-readable records available in UKMARC format on the BNBMARC database for those items, which would appear in the printed BNB. There are three routes by which records are created for the BNBMARC database.

Firstly Cataloguing-in-Publication (CIP) records are created by a contract agency, currently Bibliographic Data Services, and are upgraded to full NBS records when the British Library legal deposit copy is received. Secondly, records are created directly by NBS for items received by the British Library under the legal deposit laws. Thirdly, records may be created by the Copyright Libraries Shared Cataloguing Programme (CLSCP) partner libraries of the Universities of Cambridge and Oxford, Trinity College Dublin and the National Libraries of Scotland and Wales. These are later augmented by British Library staff with Dewey decimal classification and with subject headings on receipt of the BL legal deposit copy, (Chapman, 1997 [17]).
CHAPTER 3

3.0 METHODOLOGY

3.1 Introduction

The chapter deals with methods of data collection that were used in the system study and design of the proposed system. An investigation of the current manual system was carried out in order to determine the requirement specifications for the book-bank monitoring system. Therefore the process of data collection involved identifying all the major activities and selective sampling to choose what activities should be considered for the development of the system. During the fact-finding process, the researcher used different techniques to study the existing situation.

3.2 Methods of data collection

The methods that were used in data collection included the following:

3.2.1 Interviews

This technique was used because:

1. It gives you accurate information on what you are researching on.
2. The researcher gets final results since it is collected from the main source of information.
3. The researcher is able to ask all the questions and get all the answers at that moment, since there is direct contact.
4. It allows the researcher to get more information through probing and observing non-verbal messages.

The researcher used interviewing as the method to obtain information from various stakeholders in the book-bank system within the University. These included the coordinator of the book-bank in the main Library and her assistant, three book-bank staff chosen from the three sampled book-bank units, three teaching staff members in charge of book-banks and six students.
i. The book-bank coordinator; Here the researcher’s aim was to find out the role of coordination office in the running of the book-bank system, the process of securing books for the system and how the system ensures that the books purchased are properly used by the various book-bank units.

ii. Book-bank attendant; the researcher wanted to know how the attendants collaborate with the book-bank coordinator to ensure that all procedures of lending are followed. The researcher also wanted to know the process that borrowers go through to secure a book and what is required of the borrower, thereafter.

iii. Student; The researcher wanted to establish the convenience of the system to the users and particularly the students. This involved the ease of locating a book of one’s choice and the process of getting a book from the shelves.

iv. Lecturer in charge of the book-bank; the researcher aimed at establishing the linkage between the University library, the Faculty/department and individual book-bank units. This wanted to establish the power relations and the chain of command within the system.

3.2.2 Observation

The researcher observed the procedures that were being used in monitoring book-bank activities, the ordering process and disbursing books to respective book-banks. The researcher also observed the loaning out books and receiving them back, acquiring books, processing transactions and tracking defaulters.

3.2.3 Document review

The researcher also looked at the available relevant literature like list of books in the database, order lists, invoices and correspondence documents with book-bank units and faculties/departments. Also reviewed were lists of Book-Bank users who borrow books, library files, registration records, rules and regulations and procedures of borrowing and returning books.

- The main library keeps a record of all books bought and disbursed to different book-banks. These books are recorded in the order of; year, faculty/department,

- Book order lists; these are forms which are sent out to different faculties and departments to indicate books of their choice. These forms contain book information in terms of ISBN, title, Author and quantity. This form helps to identify the priorities of respective faculties and departments.
- Invoices; these are received from book suppliers indicating the price of books per copy and the respective totals per department or faculty.
- Borrowing cards; these are found in each book in the book-bank. It contains date, Accession Number, Author, Title, Department, Borrower’s names, due date and signature. Once a book is borrowed, the book-bank staff retains the card as proof of possession of the book by the borrower.
- Register book; this is a book used by the book-bank staff to record the information of a borrower. It as a parallel record to the borrowing card. Its advantage over the borrowing cards is that it holds information of all borrowers together.

3.3 Tools used in system design and implementation

3.3.1 MYSQL
Preferred because,

- Efficient in developing database driven web sites.
- Is an open source database, it does not cost anything.
- The most popular database systems in use today are relational databases. A language called Structural Query Language.

3.3.2 PHP
Preferred because,

- It is compatible with MYSQL.
- A fast search engine.
• PHP is a server side scripting language.

3.3.3 HTML
Used in web designing because of its being interpretable by all available web browsers and makes the directory accessible.
CHAPTER 4

System Study

This chapter explores a critical analysis of the workings of the current system.

4.1 DESCRIPTION OF THE EXISTING SYSTEM

The monitoring system that exists is highly manual. The library currently has a database that contains a list of all books disbursed to each book-bank, but this is hardly used in the monitoring process since it cannot be accessed online. Monitoring is done using the traditional methods, which involves the use of paper i.e., Paper work based contrary to modern computerized methods.

4.1.2 REGISTERING NEW BOOKS

Accessioning does this and it involves recording author information, title information, publisher information, and edition and accession number for each book title that the library disburses to the Book-banks. They help in the sense that each copy has its own identification number (Accession Number). Prior to accessioning stamping of the book is done.

4.1.2 REPORTS

Manual reports are supposed to be produced annually. However for three years in row, this has not happened due to limited number of staff in the book-bank section of the main library. These reports include; Total books in the University book-bank system, Books per book-bank, borrowed books and the list of defaulters.

4.1.3 PROCEDURES AND REGULATIONS

The Book-bank has a set of regulations. The regulations are aimed at ensuring that the books are not borrowed beyond the established duration and that limited numbers of books are borrowed so that other users can access the books. The regulations specify the eligible borrowers who are students and staff in the respective faculties and departments.
Monitoring of the activities of the book-banks as per the described procedure is the main function of the coordinator/coordination office of the book-bank in the main library.

4.1.4 BORROWING

As already mentioned above, one can only borrow, when he/she is a member of staff or student registered in a particular faculty/department. While borrowing, students and staff, use their identity cards to identify themselves to the book-bank staff. The details of the book like ISBN, title, publisher and accession numbers are put on the borrowing card and then inserted in the book. The eligible borrower then takes a book off the shelf and signs for it. The borrowing card remains as a record of the book. The librarian then puts the card in the drawer of his desk.

4.1.5 ACQUISITION POLICY

This is the guideline used in acquiring books for the book-bank. The library/coordinator sets budget limits for each book-bank annually according to the number of students and degree of necessity. The coordinator then sends out requests for specific book requirements as per the course requirements in the faculty/department. These lists are then forwarded to the book suppliers, who in turn give price quotations as per the department/faculty. In case the prices quoted, exceed the money allocated to a department, then the library requests the particular department to adjust in order to fit within the budget limits. However, if the quoted prices fall below, likewise the faculty/department can be advised to order for more or it forfeits the money to other departments/faculties. Once the book costs have been reconciled with the money available, the supplier sends out a proforma, which the University library through the office of the bursar forwards to the Bank of Uganda for final processing of payment.

Once the book suppliers have received payment, the consignment is sent to the University Library. The University library (book-bank section), verifies the order in terms of Authors, edition, quantity, condition and any other specification. After the verification
exercise, the books are then stamped, catalogued, classified and entered into their database before sent to the respective book-bank units.

4.2 PROBLEMS OF THE EXISTING SYSTEM

The problems experienced are a result of the system being manual. They include,

i. Time consuming and slow: The use of paper in the process of monitoring book-banks is slow and time consuming. For example the library staff have to physically move to individual units to tally their book list with what is physically available at the particular book-bank unit. No wonder, the library staff says that, no physical check has been done in the past three years.

ii. Too much paper work: Paper is used all the time when doing work. This generates a lot of records and keeping them can be a problem in a sense that they can be easily mixed up, making retrieval difficult especially when the reports are urgently needed for decision-making. There is also a possibility of loosing papers or misplacing them and yet they contain vital information that is used to monitor the book-bank activities.

iii. Using a manual system to do stock taking is highly tedious. For example, it would need possibly a week by one person to verify the stock of books in one book-bank and yet Makerere currently has over one hundred book-bank units, whereas the library has a staff of only four in the book-bank section.

iv. Establishing defaulters, Calculating overdue fines and enforcing policy using a manual system are prone to mistakes.
CHAPTER 5

System specification and design

This chapter details the functional and non-functional requirements of the proposed system.

5.1 REQUIREMENT SPECIFICATIONS

5.1.1 USER REQUIREMENTS FOR THE PROPOSED SYSTEM

The system should:

i. Be able to display the list of books in the entire database to the users as per their access rights and privileges.

ii. Have user-friendly interfaces and user guides understandable by people of average computer skills.

iii. Be robust enough so that users cannot corrupt it.

iv. Be able to handle more than one user.

v. Be maintainable by persons of average computer skills, with no knowledge about software used.

vi. Be able to evolve without damaging existing system.

vii. Have the capacity to handle expansion.

viii. Be friendly to both users and administrators.

5.2 SYSTEM REQUIREMENTS

5.2.1 FUNCTIONAL REQUIREMENTS

i. Storing and retrieving information on users.

ii. Storing and retrieving book information.

iii. Maintaining and manipulating records in system database through functions like data entry, editing, deletion and reports.

iv. Create pre-designed reports on a regular basis.

v. Store and retrieve records of all transactions of the various book-banks.
vi. Validate input data
vii. Carry out parallel manual operations

5.2.2 NON FUNCTIONAL REQUIREMENTS

i. The system should be fast enough to satisfy the users.
ii. The system will authenticate all users by username and password before getting access to resources.
iii. The system should be available at any time of the day so that the searching individual is able to search at his/her own convenience.
iv. The system should be accessible on the Makerere University intranet as well as any other place where there is Internet.
v. The system should be maintainable by an individual with average computer capabilities. Data input, modification and elementally logical streamlining should be done using online prepared forms that will be friendly and robust enough for the user to manage with minimal possibilities of causing mistakes.
vi. The system shall have appropriate menus from which the user will make selections for the required functions.
vii. The system shall have a user-friendly interface, which can be easily learnt and used in a short time.
viii. System should be protected from abuse by unauthorized users
ix. The system shall be able to present output in an orderly manner.

5.2.3 USER SPECIFICATION

The user of the system is expected to:

i. Posses basic knowledge on how to use electronic data processing
ii. Be familiar or able to familiarize with the terminologies used in the library.

5.2.4 HARDWARE REQUIREMENTS

The proposed system would need a computer with at least 400MB random access memory and should have a UK/US system of keyboard. In addition to that the system
should have a colored monitor screen with a minimum processing speed of 1 GHz, a printer preferably a laser jet 6P, mouse and pad.

5.2.5 SOFTWARE REQUIREMENT
The application runs under Windows 2000 or higher, which should be pre installed on the computer. The anti virus software toolkit used is Macfe anti virus that should be regularly upgraded.

5.2.6 PROPOSED SYSTEM MODULES
- **Data entry**: Will be designed to cater for data inputs in the respective databases. The modifications should also be validated and the system should respond to incorrect data. It will be designed to validate data inputs in order to maintain data integrity.
- **Data edit**: Will be designed to modify and update already existing files in the databases. The modification should also be validated and system should respond to incorrect data to make the user aware of the incorrect data.
- **Data deletion**: Will be used to delete data from databases. Records marked for the user will not access deletion.
- **Report summary**: Report summaries will be generated to give timely reports needed for monitoring purposes. These reports may be used in decision-making and assessment.
- **Passwords**: Passwords will be designed as a security measure against unauthorized access to the entire system use. Modules will also be designed to cater for change of records whenever required.

5.3 SYSTEM DESIGN
System design is the most important component of system development. Most of the project efforts are devoted to this phase. It involves a logical design and a physical design.
The logical design consists of designing files, databases and procedures to meet the requirements of the proposed system.

The system was designed in three design levels i.e.,

- The interactive level.
- The manipulative level.
- The data storage level

5.3.1 The interactive level

Consist the graphical user interface with which users will be able to interact with the system.

5.3.2 The manipulative level

Consist of data manipulating and web scripting codes that will query the database, orders and present the results in logical manner.

5.3.3 Data storage level

Houses the data in the system and the data about it. It will consist of tables, which will make up the system database schema. Primary keys will identify each entry in the tables while foreign keys will link the tables with each other.
5.4 System Design levels

5.4.1 Architectural design

This gives a high level view of the system with the main components and the services they provide and how they communicate in the system.

Level 0 Data Flow Diagram

Figure: 5.1 Architectural design
Context Flow Diagram of the proposed system

Figure 5.2: The context Flow Diagram of the proposed system
Data Flow Diagram of the proposed System

Figure 5.3: Level 1 Data Flow Diagram of the proposed system
Key to the Data Flow Diagram

- **Process**
- **Entity**
- **Data store**
- **Data flow**
- **Physical flow**

Figure 5.4: Key to Data Flow Diagram
5.5 CONCEPTUAL DESIGN

The system has the following entities:

- Book-bank coordinator
- Book-bank staff
- Book-bank
- Student
- Lecturer
- Book
- Book copy

5.5.1 ENTITIES AND ATTRIBUTES

- **Book-bank coordinator** (coordID (PK), FirstName, lastName, email)
- **Book-bank staff** (staffID (PK), FirstName, lastName, email, bookbankID (FK))
- **Book-bank** (book-bankID(PK), bookbankName, faculty)
- **Student** (regNO (PK), studentName, course, yearOfStudy)
- **Lecturer** (lecturerID (PK), lecturerName)
- **Book** (ISBN (PK), title, author, publisher, edition, borrowDate, returnDate, dueDate, NoOfCopies)
- **Book copy** (AccessNo(PK), title, author)

5.5.2 Relationships

- Coordinator Supervises Book-Bank
- BookBank staff WorksIn Book-bank
- Book has BookCopy
- Student Borrows BookCopy
- Lecturer Borrows BookCopy
- BookBank Stores Book
4.1.3 ENTITY RELATIONSHIP DIAGRAM

**BBCORDINATOR**
- coordID
- firstName
- lastName
- email

Supervises

**BOOK BANK**
- bookbankID
- bookbankName
- faculty

**BOOK**
- ISBN
- title
- author
- publisher
- edition
- noOfCopies

**STUDENT**
- regNo
- studentName
- course
- yearOfStudy

Borrows

**LECTURER**
- lecturerID
- lecturerName

Borrows

**BOOK COPY**
- accessNO
- title
- author
- borrowDate
- returnDate
- dueDate

**BBC STAFF**
- User name
- Password
- Book bank ID
- email

Figure 4.2: Entity Relationship Diagram
Data Dictionary

Borrower

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BorrowerNo(PK)</td>
<td>Varchar (20)</td>
<td>Borrower’s number</td>
</tr>
<tr>
<td>borrowerName</td>
<td>Varchar (30)</td>
<td>Borrower’s first name, last name and other names.</td>
</tr>
<tr>
<td>Type</td>
<td>Varchar (20)</td>
<td>Type of a borrower whether student or lecturer</td>
</tr>
<tr>
<td>Course</td>
<td>Varchar (20)</td>
<td>Student’s course if the borrower is a student.</td>
</tr>
<tr>
<td>bookTitle</td>
<td>Varchar (30)</td>
<td>Title of the book</td>
</tr>
<tr>
<td>copyNo</td>
<td>Varchar (20)</td>
<td>Accession number of a book copy</td>
</tr>
<tr>
<td>borrowDate</td>
<td>Date</td>
<td>Date when the book was borrowed</td>
</tr>
<tr>
<td>returnDate</td>
<td>Date</td>
<td>Date when the borrowed book is returned</td>
</tr>
<tr>
<td>dueDate</td>
<td>Date</td>
<td>Date when the book is due</td>
</tr>
</tbody>
</table>

Table 5.1: Borrower’s Table

Book-bank staff

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>StaffID(PK)</td>
<td>Varchar (10)</td>
<td>Uniquely identifies a book-bank staff.</td>
</tr>
<tr>
<td>firstName</td>
<td>Varchar (30)</td>
<td>The first name of the book-bank staff.</td>
</tr>
<tr>
<td>lastName</td>
<td>Varchar (20)</td>
<td>The last name of the book-bank staff.</td>
</tr>
<tr>
<td>Email</td>
<td>Varchar (40)</td>
<td>The email address of the book-bank staff</td>
</tr>
<tr>
<td>bookbankName</td>
<td>Varchar (20)</td>
<td>The name of the book-bank to which the staff belongs</td>
</tr>
</tbody>
</table>

Table 5.2: Book-bank staff
### Book

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISBN (PK)</td>
<td>Integer (11)</td>
<td>Uniquely identifies the book</td>
</tr>
<tr>
<td>Title</td>
<td>Varchar (40)</td>
<td>The title of the book</td>
</tr>
<tr>
<td>Author</td>
<td>Varchar (30)</td>
<td>The author of the book</td>
</tr>
<tr>
<td>Publisher</td>
<td>Varchar (40)</td>
<td>The publisher of the book</td>
</tr>
<tr>
<td>BookbankName</td>
<td>Varchar (20)</td>
<td>The book-bank to which the book belongs</td>
</tr>
<tr>
<td>Faculty</td>
<td>Varchar (20)</td>
<td>The faculty where the book-bank is located</td>
</tr>
<tr>
<td>NoOfCopies</td>
<td>Integer (5)</td>
<td>The number of copies of a given book</td>
</tr>
</tbody>
</table>

Table 5.3: Book Table

### Book Copy

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AccessNo (PK)</td>
<td>Varchar (20)</td>
<td>Uniquely identifies a book copy</td>
</tr>
<tr>
<td>Title</td>
<td>Varchar (40)</td>
<td>The title of the book</td>
</tr>
<tr>
<td>Author</td>
<td>Varchar (30)</td>
<td>The author of the book</td>
</tr>
<tr>
<td>borrowDate</td>
<td>Date</td>
<td>The date when the book was borrowed</td>
</tr>
<tr>
<td>ReturnDate</td>
<td>Date</td>
<td>The date when the book returned</td>
</tr>
<tr>
<td>Borrower</td>
<td>Varchar (30)</td>
<td>The name of the borrower of a book (lecturer or student)</td>
</tr>
</tbody>
</table>

Table 5.4: Book Copy Table
### Student

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RegNo (PK)</td>
<td>Varchar (5)</td>
<td>Uniquely identifies a student</td>
</tr>
<tr>
<td>firstName</td>
<td>Varchar (30)</td>
<td>The first name of a particular student</td>
</tr>
<tr>
<td>lastName</td>
<td>Varchar (30)</td>
<td>The last name of a particular student</td>
</tr>
<tr>
<td>DOB</td>
<td>Date</td>
<td>The date of birth of a student</td>
</tr>
<tr>
<td>Course</td>
<td>Varchar (20)</td>
<td>Shows the course in which the student is enrolled.</td>
</tr>
<tr>
<td>Faculty</td>
<td>Varchar (25)</td>
<td>The faculty to which the student belongs</td>
</tr>
</tbody>
</table>

Table 5.5: Student Table

### Coordinator

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CoordID (PK)</td>
<td>Varchar (10)</td>
<td>Uniquely identifies the bookbank</td>
</tr>
<tr>
<td>FirstName</td>
<td>Varchar (20)</td>
<td>The book-bank coordinator’s first name</td>
</tr>
<tr>
<td>LastName</td>
<td>Varchar (20)</td>
<td>The book-bank coordinator's last name</td>
</tr>
<tr>
<td>Email</td>
<td>Varchar (40)</td>
<td>Book-bank coordinator’s email address</td>
</tr>
</tbody>
</table>

Table 5.6: Coordinator Table

### Lecturer

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>lecturerID</td>
<td>Varchar</td>
<td>Uniquely identifies a particular lecturer.</td>
</tr>
<tr>
<td>lecturerName</td>
<td>Varchar</td>
<td>The name of a lecturer.</td>
</tr>
</tbody>
</table>

Table 5.7: Lecturer Table
CHAPTER 6

IMPLEMENTATION

6.1 PROGRAMMING ENVIRONMENT

6.1.1 THE MONITORING SYSTEM

The relations were created using a script that runs on a database that was created on a command prompt. Primary keys uniquely identify all entries and checks duplication while foreign keys link tables and enhance referential integrity. Data manipulation that is inserting, deleting, retrieving and ordering of outputs for any search was done at this level.

The system was designed under Linux environment to ensure better security implementations. The database was done using MySql and PHP scripting because it’s fast processing especially under Internet access.

Considering that the greatest expansion of the Internet came after the introduction of globally unique identifier to digital information (URL), the development of a Hyper Text Markup Language (HTML) and the compilation of a Hyper Text Transmission Protocol (HTTP), and forming World Wide Web in early 1990s (Terje, 2005) [11]. This means that since it is possible to access the information on the network, then HTML was used to design the web pages.

6.1.2 DATA MANIPULATION

SQL is used in the data manipulation i.e. inserting, deleting, retrieving and ordering of outputs for any search.
6.1.3 SCRIPTING
Scripting helps web pages come live by allowing the developer manipulate elements of a web page dynamically as a client browses that page. PHP was used to make the system dynamic. Codes written such that the database is searched in a predetermined format using a user supplied clue.

6.1.4 INTERFACE
The interface was designed using Hyper Text Markup Language (HTML). This makes up the overall graphical user interface in which PHP was embedded to carry the appropriate SQL queries that fetch data from MySql database.

6.2 FORM INPUT DESIGN
MySql and PHP are used to enter data, change data, view and print data. Forms offer the most convenient layout for entering data, changing data, and viewing database. The following are forms that were created.
LOGIN SCREEN

Figure 5.1 Login screen
5.3.2 BOOK ENTRY FORM

Figure 5.2 Book Entry form
5.3.3 BOOK-BANK ENTRY FORM

![Book bank Entry Form](image)

**Figure 5.3 Book-bank Entry form**
### 5.3.4 REPORT ON ALL BOOKS IN THE BOOK-BANK SYSTEM

**Figure 5.4 All books in the University Book-bank System**

![Image of the database interface for Makerere University Library Book Bank Section](image-url)

<table>
<thead>
<tr>
<th>ISBN</th>
<th>Book Title</th>
<th>Author</th>
<th>Publisher</th>
<th>Edition</th>
<th>Department</th>
<th>Faculty</th>
<th>No. of Copies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1243783236</td>
<td>13456</td>
<td>74689065456</td>
<td>9863785678525</td>
<td>2147686847</td>
<td>Select</td>
<td>2147686847</td>
<td>2147686847</td>
</tr>
<tr>
<td>1243783237</td>
<td>13456</td>
<td>74689065456</td>
<td>9863785678525</td>
<td>2147686847</td>
<td>AECS</td>
<td>2147686847</td>
<td>2147686847</td>
</tr>
</tbody>
</table>

**2010000100**
- **Constitution**
  - Author: Mekere Miti
  - Publisher: Macmillan
  - Department: Law
  - Faculty: Law
  - No. of Copies: 15

**2010000105**
- **Database Systems**
  - Author: Cundy
  - Publisher: Prentice Hall
  - Department: CSIT
  - Faculty: CSIT
  - No. of Copies: 12

**2010050200**
- **Programming**
  - Author: Deitel
  - Publisher: Prentice Hall
  - Department: CSIT
  - Faculty: CSIT
  - No. of Copies: 6

**2010050201**
- **Proposals Writing**
  - Author: Tanna
  - Publisher: Prince Town
  - Department: AECS
  - Faculty: AECS
  - No. of Copies: 3

**2010024551**
- **Psychology of Adult Learning**
  - Author: Nwape
  - Publisher: Wadwadke Inc.
  - Department: AECS
  - Faculty: AECS
  - No. of Copies: 0

**2010025221**
- **Report Writing**
  - Author: Kaltendra Darnia
  - Publisher: Darnia
  - Department: AECS
  - Faculty: AECS
  - No. of Copies: 10
5.3.5 Books in AECS book-bank

![Image of AECS book-bank section](image)

**Figure 5.5 Books in the AECS Book-bank**
5.3.6 BOOK DEFAULTERS

![Book Defaulters Table]

Figure 5.6 All book defaulters
5.3.7 BOOK STATISTICS

**Figure 5.7 Book Statistics**
CHAPTER 7
FINDINGS, RECOMMENDATIONS AND CONCLUSION

7.1 FINDINGS AND ACHIEVEMENTS

The newly developed online book-bank monitoring system as described in chapter five solves problems experienced using the file based manual system as it provides for quick data generation that saves time. Security is catered for through access password for both the coordinator and the book-bank staff. The system is able to generate reports, which can be used for monitoring and decision-making. The system is user friendly, as it does not require much computer skills.

The online book-bank monitoring system is able to help the book-bank coordinator to perform various functions in the process of monitoring the activities of the different book-banks in the University. The system has the capability to maintain a database of all book-banks in the university by allowing the library coordinator to add, view, update, delete and generate reports from the database.

The newly developed system successfully implemented the objectives of the study already stated by reflecting the current system procedures and interfaces for data manipulation, which have been put in place. Therefore, if the monitoring system is implemented and enhanced, there will be improvements in efficiency in monitoring of book-banks by the University library, hence timely decision-making based on timely and accurate reports.

7.2 LIMITATIONS

The major limitations faced during the development of this project included:

1. The researcher faced the problem of time constraint given the fact that it was difficult for him to combine office work and project work. The time allocated for
the completion of the project was limited and his employer had at the same time assigned him a lot of field responsibilities.

2. In addition to that it was expensive to finance the project from personal funds. A lot of funds were spent on the investigation of the existing system, mainly in form of fuel and communication in the process of linking up with the respondents. Other big expenses were in terms of purchasing relevant software plus printing the drafts and final copies.

3. The researcher had limited knowledge of scripting languages, since the researcher was only introduced to them in only one semester. The researcher at first had tried to use java-scripting language, which was later abandoned for php, which was easier to learn and later use.

7.3 RECOMMENDATIONS

The growth of web-based resources requires staff skilled in digital technologies and techniques. Therefore there should be training of staff in the library book-bank section and those in different book-banks about computer knowledge.

The system was designed and piloted in only three book-bank units. The system should therefore be extended to all the book-bank units within the university, in order to harvest maximally the benefits associated with it.

The development of an online book-bank system is a large project, and there will be several cycles of development, testing, user feedback and implementation to be done before the final product is deployed. The major aspects include the handling of more constraints, the advancement of client/server architecture, and better scheduling algorithms.

7.4 CONCLUSION

The new realities of Digital information processing require that access is provided in a widely distributed manner, and it is up to the user to locate what is needed. The ability to call up all relevant information at the click of a mouse is a researcher’s dream. The Book-
bank monitoring system project aims at developing a software infrastructure that enables those who manage and maintain such collections to make them publicly available. The entire University community stands to benefit greatly from an online book-bank monitoring system. The system will enable the update, retrieval, deletion, and generation of status reports according to the existing demands.
REFERENCES

1. Main Library Sections, the book-bank section; Makerere University website, available online (retrieved on 19/10/2005 from http://www.makerere.ac.ug/library)


APPENDICES

Appendix A

Interview schedules

Faculty of Computing and Information Technology,
Makerere University
P.O BOX 7062,
KAMPALA.

May 11, 2005

The Coordinator,
Book-bank,
Makerere University Library,
P.O BOX 7062,
KAMPALA.

Re: REQUEST FOR AN INTERVIEW WITH YOU

I humbly request for an interview with you regarding the operation of the Book-bank system in Makerere University. I am pursuing a Postgraduate Diploma in Computer Science in the Faculty of Computing and Information Technology. The title of my project is “Online Book-bank monitoring System”. The project is aimed at developing a prototype online system to monitor book-bank units by the centre.

In the same vein, I request for your permission to interview some staff from selected book-bank units within the University.

The information received will be treated with utmost confidentiality.

I thank you in advance.

Sincerely yours,

Twine Bananuka
2004/PGD18/231U
INTERVIEW SCHEDULE FOR THE BOOK-BANK COORDINATOR

1. As a Book-bank Coordinator, What is your structural relationship/administratively with the book-bank units? What powers do you exercise over them? (Can you please give me a copy of the administrative structure in case you have). How do you fit in this structure

2. How many book-bank units are in Makerere University?

3. How many members of staff are under you’re unit (Book-bank coordination). What are their titles? And what roles do they perform?

4. Do the book-bank units produce and submit periodical reports to you? If so, what type of reports and how often?

5. How do you monitor performance of these units? (Is your monitoring system manual or automated?)

6. How is stock inventory taken for all the books in the University book-bank System? Do you have a database of sorts for these books?

7. What are the processes involved in monitoring book-banks?

8. Are the various book-banks linked with each other in anyway?

9. Do you have any form(s) that users fill in order to borrow or use book-bank facilities? If yes, can you give me a sample(s)?

10. I have heard that some book-bank units receive donations in form of books and equipments directly from partner organizations. Do these automatically enter into your system? If not, then to whom do such equipments accountable to?

I thank you very much
INTERVIEW SCHEDULE FOR UNIT BOOK-BANK ATTENDANT

1) What type of information do you normally require from students before they can borrow a book? (If you have a specimen form, can I look at it?)

2) Briefly tell me about the process involved in borrowing and returning a book by a student/Lecturer

3) What type of system do you use in your operations (Manual or automated)

4) Do you keep an update list of lent, returned and lost books? Can I have a look at the sample?

5) Do you report lost books to the coordinator in the main library? How often?

6) In your opinion, do you think students and Lecturers find the system convenient or otherwise?

7) How do you locate books demanded by students?
INTERVIEW SCHEDULE FOR UNIT BOOK-BANK STUDENT

1. What are the requirements required before borrowing a book from the book-bank?

2. How convenient, do you find the borrowing process in the book-bank?

3. What advice or adjustments would you recommend to the book-bank management?

4. How easy is it to locate a book of your choice in the book-bank?
AN INTERVIEW SCHEDULE FOR LECTURERS IN CHARGE OF BOOK-BANKS

1. How do you find the process of borrowing books from the book-bank by students and lecturers?

2. What process must a student/lecturer go through before borrowing a book from the book-bank?

3. How do you monitor the book-bank staff in terms of lending?

4. What is your relationship with the Book-bank coordinator in the main Library? (e.g. do you take orders from her/ Can she fire or reprimand you or the staff in the book-bank?)

5. What type of advice, would you give towards effective management and monitoring of the book-bank system in the University?
APPENDIX B

Makerere University Library Homepage

Figure 7.1: MUK Library Homepage
<table>
<thead>
<tr>
<th>ISBN</th>
<th>AUTHOR</th>
<th>TITLE</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 7.2: Book order form
Borrower’s Card

**MAKERERE UNIVERSITY BOOK-BANK**

**BOOK NO.**

**AUTHOR**

**TITLE**

**DEPARTMENT**

<table>
<thead>
<tr>
<th>DATE</th>
<th>BORROWER’S NAME</th>
<th>HALL</th>
<th>SIGN</th>
<th>DUE DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 7.3: Borrower’s Card