

LIBRARY INFORMATION MANAGEMENT SYSTEM
(CASE STUDY: COMPUTER SCIENCE DEPARTMENTAL LIBRARY)

BY

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**A PROJECT SUBMITTED TO THE DEPARTMENT OF COMPUTER
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CERTIFICATION

This is to certify that this project work was carried out and compiled by Okunmuyide Temitope E. with Matric No: CSC/11/0279 in the Department of Computer Science, Faculty of Science, Federal University Oye-Ekiti, in partial fulfillment of the requirements for the award of Bachelor of Science degree in Computer Science, under my supervision.

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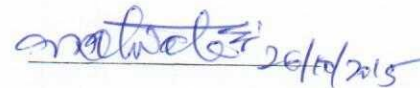
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DEDICATION

This project is dedicated to Almighty God for his inspiration, mercy and grace upon my life throughout my academic years, to my loving mother Mrs.Olanike Okunmuyide, her labor of love cannot be quantified, her sacrifice at all time is total. She is truly a mother. Also, to my family, relatives and friends for their support, love and prayers.

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ABSTRACT

Library Information Management System is desktop application software that computerizes library processes in the Department of Computer Science, Federal University Oye-Ekiti. Its computerized processes include registration of users, books cataloguing, books classification according to subjects on the shelves as well as circulation of books within and outside the library. The software comprises of a well designed and implemented fast, simple and user- friendly environment that accomplish the stated processes. The project shows a breakdown of the manual library system and its functions which are integrated into the design for the application using tools like Entity Relationship (ER) Diagram for the data design and flow- chart for the user-interface design.

Each of the entities for example books and users within the database is given a particular unique identity (id) number which makes accessing information about such entities easy and without conflicts. This system reduces human involvement in the library which makes data entry, data update and data retrieval easier to accomplish. The navigation control is efficient in navigating through the large amount of records. When the numbers of records are getting very large then the user need to just type in the search string and users get results immediately. The editing is also made simpler. The user has to just type in the required field and press the update or add button to update the desired field(s). The system has been adequately tested for errors and will report any error found during data entry.

The system is developed using Java programming language for the graphical user-interface and program flow while Microsoft Access is used for data storage and manipulation. This system is a computerized library system that achieves basic library functions in an efficient and cost effective manner thereby reducing errors and increasing storage capacity.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Library Information Management System is the application software responsible for organizing, monitoring and controlling library and library operations. Library procedures include; adding library users, updating new information, searching for books, lending books and returning books facilities(Agbaje, 2002). The application is developed in java with modules to depict the basic library operations. These operations are:

- i. Cataloging – this refers to classifying and indexing library materials
- ii. Circulation – this refers to lending library materials to patrons and receiving them back
- iii. Registration – this refers to adding members or users to the library(Sonaike&Osinulu, 2007).

The study is aimed at finding means of automating library procedures. It is made up of a relational database and five-module graphical interface interacting with the database. The relational database serves as storage for basic library information like library user details, staff details and book details. The five main graphical interfaces written in java for all library activities, books, software users (staff and library users) and the access control module through which users can access the other modules using their usernames and passwords. The software includes more functionality to keep history of transactions in the library which can be used to generate monthly report of activities of books and library users.

There is a search engine that is designed to search a library database and return a complete book record, including the shelf number on which the book resides. Each book has an ISBN number (and no two books have the same ISBN number). In order to answer queries about

the books in the library, the system to keep track of the title and author of each book as well as its location. Titles and authors are not generally unique, detailed information about authors won't be maintained, so it is assumed that the author for a book is represented by a short character string.

The system also stores information about users (who are entitled to borrow books from the library). Each member has a unique identification number, name (other names and last name), telephone number, and e-mail address. Each library user can have zero or more books out on loan; clearly, a book can be out on loan to at most one user at a time. It is not necessary for this system to maintain information about a loan after the book has been returned to the library.

The system can be used by the librarian to maintain the information described above, and to produce several reports. In particular, the librarian should be able to supply an ISBN number as input, and receive a report listing the title and author for the corresponding book, as well as its status (that is, whether it's currently on loan, the identification number of the card holder who has it out, and the due date for the loan, if it is). The librarian should also be able to supply a library user's identification number and receive a report listing information about the corresponding member, including the ISBN numbers of all books that the card holder has on loan, along with their due dates. Finally, the system should automatically generate a set of overdue notices once a day, for the books on loan that have just become overdue, as well as a set of reminder for loans that are now overdue by more than one week.

1.2 Statement of the Problem

Retrieving books from a library is very important for library users as well as staff. The main problem is to define whether this book is exactly what the user wants and where this book

resides in the library. There are some hindrances when searching for books in the manual library system.

- i. Wasting time looking for books in wrong locations in the library
- ii. Using wrong search item and ending up with the same title for more than one author
- iii. Misallocate books in the wrong section on shelves
- iv. Search process consumes a lot of the librarian's time as well as the member's and it could be overwhelming for the librarian especially if he or she has to deal with more than one visitor at the time.
- v. A lot of paper work is involved in keeping history of books and readers.
- vi. Books are not properly monitored which leads to damage and lost.
- vii. Information about books and members are not properly kept which can lead to alteration by external bodies.

1.3 Aim and Objectives

1.3.1 Aim

The aim of this project is to design and implement fast, simple and user-friendly software that organizes the library in the department of Computer Science, Federal University Oye - Ekiti.

1.3.2 Objectives

The objectives are to;

- i. Design Library Information Management System which will assist in keeping records of books
- ii. Implement the system using Java and Microsoft Access

1.4 Justification of the Study

The transition towards computerized libraries is good or welcome development of the 21st century. The entire information scene is moving towards automation and networked distribution of information. Libraries cannot lag behind or they will be at risk of extinction. The justification of this proposed system is directed towards the various stakeholders of the library:

- i. For the user of the library, the automated library will provide clearly enhanced services, improving the availability of useful information, the speed of access and delivery, the usability of information, etc. for the institutional libraries which leads to an added value to the organization, for instance improved productivity and/or higher quality of work performed by the user.
- ii. For the funders of libraries, the benefits of automated library are expressed in terms of more effective use of available (financial) resources. An example is an increase in resource sharing between libraries as an outcome of the use of information technology. (It should be noted that institutional justification can be a mix of financial/resource arguments and enhancement of services).
- iii. The final stakeholder is the library itself, or more specifically: the library staff. Without commitment and involvement of library staff, the move towards library automation cannot be successful. Justification in this respect means convincing library staff that the outcome will be a more stimulating, professional environment in which to work. Hence, Library Information Management System concentrates on enhancement of service to the user, added value to the organization, more efficient use of funds, continuation of a challenging and professional working environment for library staff.

1.5 Scope and Limitation of the Study

1.5.1 Scope of the Study

The proposed software's activities will be limited to maintaining books, staff, shelves, library users and transaction (Library activities) information. It is also going to handle search requests on the information stored in the database. Retrieval operations will be based on specific search items like: the book's title, author, subject etc.

1.5.2 Limitations of the Study

This study will not look in detail into other sections of the library except the only three sections aforementioned. The intuitive works like reading of a book before classification and technical work like ownership stamping conveyance of books etc., this section is not part of this study. It will also not give alerts of those that are yet to return borrowed books.

1.6 Definition of Terms

Software: A collection of computer programs and related data that provide the instructions to the computer

Modules: A portion of a program that carries out a specific function and may be used alone or combined with other modules of the same program

JAVA: A programming language used to create interactive content to develop stand-alone programming and server-side applications, as well as web pages.

Database: A collection of information organized in such a way that a computer program can quickly select desired pieces of data.

String: A finite sequence of symbols

Character: A name of a letter, number or any symbol that can fit in the same space the letters and numbers fit

Relational Database: A collection of related information organized in such a way that a computerprogram can quickly select desired pieces of data

Objects: An entity that can be manipulated by the commands of a programming language

Primary Key: A primary key of a relational table uniquely identifies each record in the table

Tables: A set of data elements (values) that is organized using a model of vertical columns

Administrator: A person who manages an application or software.

CHAPTER TWO

LITERATURE REVIEW

2.1 Library

A library is a collection of sources, resources, and services and the structure in which it is housed; it is organized for use and maintained by a public body, an institution, or a private individual (Nche, 2010). In the more traditional sense, a library is a collection of books. It can mean the collection itself, the building or room that houses such a collection, or both. The term "library" has itself acquired a secondary meaning: "a collection of useful material for common use (Bush, 2011)." This sense is used in fields such as computer science, mathematics, statistics, electronics and biology. It can also be used by publishers in naming series of related books.

Public and institutional collections and services may be intended for use by people who choose not to or cannot afford to purchase an extensive collection themselves, who needs material no individual can reasonably be expected to have, or who requires professional assistance with their researches. In addition to providing materials, libraries also provide the services of librarians who are experts at finding and organizing information and at interpreting information needs (Bush, 2011). Libraries often provide a place of silence for studying.

Today's libraries are repositories and access points for print, audio, and visual materials in numerous formats, including maps, prints, documents, microform (microfilm/microfiche), audio tapes, CDs, cassettes, videotapes, DVDs, video games, e-books, audiobooks and many other electronic resources. Libraries often provide public facilities to access their electronic resources and the Internet. Modern libraries are increasingly being redefined as places to get unrestricted access to information in many formats and from many sources. They are extending services beyond the physical walls of a building by providing material accessible by electronic

means, and by providing the assistance of librarians in navigating and analyzing tremendous amounts of information with a variety of digital tools.

2.2 Types of Library

National Library: The history of the national library would be dated back to 1795 when the French national convention declared the library belonging to the king's national property and granted it the right to obtain deposit copies of all printed publications of the country (Chen, 2011). In the 19th century, following this, national libraries were established in more than 20 countries. During the 20th century, 30 more were founded (James, 2013). The national library in Nigeria opened its door to the public in November 1964 through the appointment of Dr. Carl White as the library adviser in March 1962 (Chen, 2011). A library is called a national one when it is the official depository of printed works, a general access library, an information bibliographical center, and a center of co-ordination, planning and stimulation of the entire library system of the nation (Chen, 2011).

Public/State Library: The term public has many different definitions. It could be said to be a library which is not private. It could be said to be a library which is available generally to the public. It could also be said to be a library which is supported substantially by public funds. The purpose of the public library is to make it possible for every member of the community according to their needs and circumstances, to enjoy whatever benefits, full access to books and related forms of record may bring them. The public library is concerned with all materials of value to the individual and community and it is their duties not only to meet existing demands, people also encourage and facilitate wider demands from more people. Also, the public library must be comprehensive, general service library for the use of all sections of the community. This

is being the case; it then follows that it should be established by the community as a whole, at the common expense of the community (Chen, 2011).

Academic Library: Academic library or libraries in institutions of higher learning, are as varied and as distinctive as the institutions which they serve. It is a fact that whatever level of quantity an institution of higher learning processes or aspires to, will be determined by the character of its library. The academic library is the means whereby the individual in an institution of higher learning can escape from the limited frame of reference which the classroom represents. It is also a place where an individual can seek a sense of intellectual integrity and self-understanding which is the ultimate goal of education. The basic function of an academic library according to Gates (1968) is to aid the institution in carrying out its programme. The nature of the institution determines its objectives by acquiring and making available books, materials and services needed in the institutional programme (Chen, 2011).

Special Libraries: The term "special" as applied to libraries, has different meanings. It could be used as a term to apply to all libraries that are not national, public or academic. It may be used to cover certain privately endowed specialized collections. It can also be used to apply to subject branches or departments of public or university library, such as Africana collection, law collection of a university (Chen, 2011).

2.3 Importance of Libraries

What are libraries for?

This question had a more straightforward answer fifty, or even thirty years ago than it has today. Libraries were storehouses and quarries of knowledge, held in books. Human endeavor of many kinds, including education, research, invention, business and leisure, has always depended

to some extent on access to information, or on what other people have known or said, and for many centuries books have been the containers for holding and transmitting these things. Books were created to be communication devices for texts, and libraries existed to store, organize and make them accessible in large quantities. Those who have founded and funded libraries, or donated collections to them, have done so in the knowledge that they have been augmenting reservoirs of knowledge for which there is no substitute. The value of libraries has often been measured in terms of the size of their stock; more books mean a greater reservoir, more comprehensiveness of coverage. There have been other sources of information but when looking for authoritative, cumulative and trustworthy places to find it and look after it, civilization has turned to libraries(Pearson, 2012).

2.4History of the Library

The first libraries were composed for the most part, of published records, a particular type of library called archives. Archaeological findings from the ancient city-states of Sumer have revealed temple rooms full of clay tablets in cuneiform script. These archives were made up almost completely of the records of commercial transactions or inventories, with only a few documents devoted to theological matters, historical records or legends. Things were much the same in the government and temple records on papyrus of Ancient Egypt (Finkelstein &McCleery, 2006).

The earliest discovered private archives were kept at Ugarit; besides correspondence and inventories, texts of myths may have been standardized practice-texts for teaching new scribes. There is also evidence of libraries at Nippur about 1900 B.C. and those at Nineveh about 700

B.C. showing a library classification system. Another early organization system was in effect at Alexandria(Chen, 2011).

Over 30,000 clay tablets from the Library of Ashurbanipal have been discovered at Nineveh, providing archaeologists with an amazing wealth of Mesopotamian literary, religious and administrative work. Among the findings were the EnumaElish, also known as the Epic of Creation, which depicts a traditional Babylonian view of creation, the Epic of Gilgamesh, a large selection of "omen texts" including EnumaAnuEnlil which "contained omens dealing with the moon, its visibility, eclipses, and conjunction with planets and fixed stars, the sun, its corona, spots, and eclipses, the weather, namely lightning, thunder, and clouds, and the planets and their visibility, appearance, and stations", and astronomic/astrological texts, as well as standard lists used by scribes and scholars such as word lists, bilingual vocabularies, lists of signs and synonyms, and lists of medical diagnoses (Hoare, 2014).

2.5 Arrival of Computing in Libraries

For nearly a century modern libraries had been creating and settling themselves into a highly complex but essentially stable professional world. By the late 1950s everything began to change. This was the period of Cold War rivalries, post-Sputnik scientific and technical excitements, and economic growth. Moreover, computer technology had begun to come into widespread use. It was a heady period of optimistic technological expansionism that captured the imagination of the general public. Libraries, however, now began to experience new kinds of pressures.

The higher education system and the research establishment, expanding rapidly, created new demands on old libraries and, indeed, demands for new libraries (Bregziset *al*,

2012,).Libraries had huge collection gaps created by World War II. Cooperative acquisitions projects coordinated by the Library of Congress, ALA, and the Association of Research Libraries were designed to fill these gaps and to ensure that copies of anything published anywhere in the world would be available in the US research library system. Apart from these and other special projects, libraries generally had to acquire and manage access to rapidly increasing volumes of publications. Of critical importance were the exponentially escalating volumes of scientific and technical literature. This comprised a category of materials that were formally published and fell within the purview of established systems of bibliographical control, increasingly strained though such systems were becoming. But it also comprised a new and increasingly large and messy category of what was described as “gray” literature that fell outside the reach of these systems(Akinbulumo, 2008).

The idea of computer-based solutions to the range of increasingly difficult problems that libraries were experiencing became potentially attractive to them. Many libraries were beginning to face the breakdown of the systems that had served them so well in the past and which incorporated so much of the librarian’s professional knowledge. Reynolds describes some of the operational crises that encouraged librarians to turn to automation: “An increasingly large backlog in cataloging, the lack of accurate fund accounts in acquisitions, hopelessly disorganized circulation files, or a large measure of internal inconsistency in a public catalog.” Computers seemed to offer librarians the prospect of more efficient processing, improved services to library users, saving money and containing costs, and facilitating resource sharing and library cooperation, all concerns central to their traditional operation(Reynolds, 2013). These giant brains threatened to transform the nature of work. Maybe they could or maybe they could not think (Berkeley, 2013).They operated by means of a highly systematized, routinized, atomization

of tasks. Was not the library an extremely labor-intensive organization much of whose work was accomplished with unitbased, algorithmic processes standardized in library systems across the country? Seemingly, libraries were ideally suited to the application of the new technologies. Both librarians and computer experts were eager to think so.

However, library automation began essentially in an environment of complex misunderstandings that took some time and effort to dispel. The nature of some of these misunderstandings is revealed in Burke's account of Project Intrex. If these misunderstandings were to be dispelled, techniques and practices representing nearly a hundred years of codified professional knowledge could not simply be swept away although computerization might have made this seem possible. It was to become clear that this tradition had not led to the stultifying accretions of now-irrelevant dogma. Libraries were in effect constituted within and by this tradition to an extent that neither librarians nor technologists fully appreciated at the time. What was needed was not the replacement of the librarian's hard-won professional knowledge but its further development to deal with the opportunities presented by the new technology. This is a simple point but one that requires an emphatic statement(Onuoha, 2014).

Library automation was not to be implemented successfully until this development had occurred, essentially signaled by the creation and widespread adoption of the MARC and ISBD standards. Librarians, on the whole, whether embracing the new computer technology reluctantly or enthusiastically, did not at first realize the extent to which computer applications would result in imperfectly realized much-criticized system products. They did not envisage how much disruption would be created in the routine functioning of their libraries. Nor did they foresee the eventual structural reorganizations of various kinds that would have to be undertaken, reorganizations that would involve both changes in the composition of the staff and heavy

requirements for staff training. And of course, there was the ultimate burden of cost (Oketunji, 2010).

For most libraries, the costs of initial system development could only be met by access to external sources of funding. Few realized at the outset the extent to which initial computerization would require not only major subsequent and continuing expenditures for systems maintenance and replacement but radical and permanent shifts of budget priorities. Rapid changes in computer and communications technologies were one of the engines of systems development. Reynolds periodizes these often overlapping changes for library automation essentially by decades. First there was the precomputer era of unit-record equipment. Then came the offline computerization of the 1960s and early 1970s. This was followed by the online systems of the 1970s (King & Griffith, 2012). The 1980s saw the advent of microcomputers and the emergence of CDROM technology.

Finally, the Internet revolution of the 1990s. During all this time, libraries faced ever increasing pressures on their resources. The prospects of automation remained beguiling in their promises of relief. Funding also became available to support both demonstration projects and systems implementation. Notable in its support of research and development was the Council on Library Resources founded in 1956 (Marcum, 2002). Other funding came through the federal government, through foundations, and some derived from internal budget support. As libraries automated, the library systems marketplace became a dynamic source of systems development and marketing that now presents a spectacle of bewildering variety. From the broad perspective that has been adopted here, it seems that another way to periodize library automation history is from the point of view of library development rather than that of computer development. From

this viewpoint, one might argue that library automation falls into three general periods: pre-MARC, post-OCLC, and post-Internet(Onuoha, 2008).

The importance and the development of MARC are thoroughly dealt with by Sally McCallum in this issue. OCLC, however, has been mentioned only in passing, both here and in the other articles in this issue. It was set up in 1971 as the Ohio College Library Center, designed to facilitate library cooperation and to reduce the costs of library processing. The idea, according to Fred Kilgour whose brainchild it essentially was, was to develop an online computerized library network having half a dozen major subsystems: (a) an on-line union catalog and shared cataloging subsystem, (b) serials control subsystem, (c) technical processing subsystem, (d) on-line interlibrary loan requesting system, (e) retrieval bysubject, (f) remote catalog access by readers and circulation control (Kilgour, 2007). It developed rapidly, expanding its membership first to libraries in Ohio and then libraries nationally and, of course, more recently internationally. Kilgour was able to boast that, by 1975, its online catalog contained nearly 2 million records and 8 million locations (Kilgour, 2000).

By 2002, what is now called WorldCat at OCLC recorded 833,324,664 locations around the world for items represented by 46 million cataloging records (Rayward, 2002). As well as implementing systems related to all of the functions Kilgour listed, it has become an important center for research and development, which now includes the Dewey decimal classification as a result of the acquisition in 1998 of Forest Press. It seems appropriate to label the period in the history of library automation and of librarianship more generally, from the introduction of MARC to the current Internet and Web based developments, the era of OCLC, both for its own sake but also as representing the many library networks and bibliographical utilities that emerged at this time.

Finally, Rayward (2002) opined that we have come to the present where history is still being written and where libraries continue to wrestle with the opportunities and challenges of changing technologies. In trying to come to grips with what is happening, to assess what is possible and desirable in planning for the future, libraries need to be understood in the historical context within which they have been created and developed as outlined here. Such an understanding is not so much valuable in preventing the repetition of past mistakes, one of the functions often attributed to history; it is to begin to know more fully what libraries are for, and how it functions.

2.6 Contribution of Libraries to Communities and Society

The modern library is not only a collection of textbooks. It includes other sources like reference materials, books relating to school curriculum, general books not relating to a specific subject area, periodicals, newspapers, audio-visual materials, government publications and electronically stored and retrievable materials. These resources enable libraries to play a crucial role in the success of lifelong education of communities and society in general (Abolaji, 2011). It is a well-known fact that education at certain levels goes beyond the normal teacher–student or classroom–student relationship. Students who really intend to acquire substantial knowledge must work independently in their search by using reference materials and other sources available in the library. Apart from being agents of educational change, libraries serve other purposes like economic, social, political and recreational changes because they contain the written history, culture and knowledge of the human race (Dipeolu, 2002).

In Nigeria and other developing countries of Africa, government objectives include (a) life-long education for the citizens as the basis for the nation's educational policy (b) emphasis on the use and improvement of modern educational techniques at all levels of the educational

system (c) the structuring of education system to develop the practice of self learning (d)making the people to become actively literate and generally well-informed (e) the introduction of universal basic and compulsory education for all citizens. In this regard, the African Network Campaign for Education for All (ANCEFA) stresses the need for serious focus on and investment in formal education and non-formal education like adult literacy programs and youth training centers to tackle the literacy crisis (Olanrewaju, 2009). These objectives can be easily achieved with the aid of well-stocked and equipped libraries in primary, secondary and tertiary institutions in addition to the maintenance of public, rural and mobile libraries across the country.

2.7 University Libraries

Some university libraries in Nigeria have taken certain steps to bring together different sections of their communities. The first is the establishment of Leisure Reading Collection (LRC). Two universities did this several years ago. In 1967 the University of Ife Library (now called Hezekiah Oluwasanmi Library, ObafemiAwolowo University, Ile-Ife) established an LRC. The idea was copied from the University of Ibadan where such a collection existed.

The collection covered all subject areas like history, biography, science, religion and philosophy. Current fiction and drama predominated. At Ibadan, students who wished to read books outside their degree programs for purposes of information and pleasure used the collection as a great deal. More importantly, wives of staff, mainly expatriates, borrowed immensely from the collection. At Ife, the same principle and similar objectives informed the introduction of the collection (Dipeolu, 2002). The point to emphasize here is that, with the LRC, the two universities extended their services beyond the staff and students, whom they were primarily

established to serve, to wives of staff, who were neither students nor staff but members of the university communities. By so doing the libraries also inculcated the reading and library use habit in those patrons. They also developed in the patrons effective library use by teaching them the skills and techniques of using a collection of this kind as a basis for library use in later life.

Secondly, the Customary Court Records of Hezekiah Oluwasanmi Library has always attracted users from different parts of the country especially the six states of the South-West. The library inherited the records of all the old customary courts of the old Western Region of Nigeria from which Lagos State, Ogun State, Oyo State, Osun State, Ondo State and Ekiti State have been carved out. Today users patronize the library to obtain photo copies of judgments of cases handled by the customary courts, especially on land disputes, whenever such cases are revisited in higher courts of the land.

Thirdly, at Joseph Ayo Babalola University, Ikeji-Arakeji, in Osun State, two of the resources of the library always bring patrons from different sections of the community together. The first is the e-library, which we shall discuss more about later. The second is the Reprographic Section. Members of the Ikeji-Arakeji community use this resource a great deal. In this section the people make photo copies of documents such as birth certificates, drivers' license, vehicle license and academic certificates. The lamination of the original copies of such certificates is also done in the section. By this effort the library brings town and gown together (Afolabi, 2009).

2.8 History of Libraries in Nigerian Universities

The history of university library development in Nigeria dates back to pre-independence time when the University of Ibadan and its library were established in 1948. As pointed out by

Aguolu (2013), since independence in 1960, there has been an unrelenting upsurge in the establishment of educational institutions at all levels, especially university education. Successive Nigerian governments have continued to invest strongly in education. It must be realized that university libraries, being integral academic parts of the universities, generally emerged simultaneously with their parent institutions. Hence there are as many university libraries as there are universities.

The proliferation of universities, despite the economic recession in the country since the 1980s, has increased the problems of the universities and their libraries so much that now their future seems uncertain. Added to these problems are the problems of Information and Communication Technologies (ICTs) in Nigerian universities as related to library development. Ever since the problem of the literature explosion became noticeable in the 1970s, the developed world has devised various systems to facilitate the flow of information both within and across the countries, and developing countries are invited to take advantage of these devices. However, this invitation is not often readily accepted by the developing nations like Nigeria because of some mitigating factors. These include the human factors, fear, and the level of development-cum infrastructure of the nation and so on. The case of application of modern technology in the library should start with the acceptance of the new technology as vital to the effective performance of the functions of the library (Ekpenyong, 2007).

Perhaps in any discussion of application of modern technology in the library, as revealed by Ukoh (2004), the first thing that comes to mind is the computer. The librarian does not have to be literate in the various technologies before employing them. In other words, he does not have to be a technical expert before using any form of technology or a programmer before using a computer. However, he still is required to possess some technological knowledge, albeit at an

abstract and intellectual level. Whatever we choose to call it, the computer has made such a tremendous impact on the organization, management, and dissemination of information that it readily commends itself to any library ready to accept it. The computer has become such a household word in the developed world that university libraries should see it as a great opportunity which should be taken up as soon as possible(Nok, 2006).

For the library, several systems have been developed for their various house-keeping chores and more still are being designed and refined, thanks to the technology of large-scale integration. These are known as mini or micro computers designed to handle any of the library processes, be it acquisitions, cataloguing, serials, or circulation control. The use of communication tools such as e-mail; fax, computer, and videoconferencing overcomes barriers of space and time, and opens new possibilities for learning. The use of such technology is increasing and it is now possible to deliver training to a widely dispersed audience by means of on-demand two way video over terrestrial broadband networks. Many students and lecturers can gain experience of communications through e-mail and electronic conferencing systems that run over the telephone network. College and university libraries should continue to make increasing use of the Internet.

The Internet should be used both to access materials, people, and resources and to display their own Web pages created by teachers and students. These developments are not only giving learners' access to vast libraries and multimedia resources, but give access to tutors and natural phenomena throughout the world; hence the whole world is regarded as global village. The boundaries between one institution and other and between institutions and the outside world will become less important. Crucially, technology will remove the barriers between school and home.

Many nations have used audio-visual devices to transmit educational materials over long distances (Aguolu, 2013).

2.9 Information System

An information system (IS) - is any combination of information technology and people's activities using that technology to support operations, management, and decision-making. In a very broad sense, the term information system is frequently used to refer to the interaction between people, algorithmic processes, data and technology (Wikipedia, 2011).

Silver et al. (2005) provided two views on Information system (IS) and IS centered view that includes software, hardware, data, people, and procedures. A second managerial view includes people, business processes and Information Systems. He also stated that Information systems are implemented within an organization for the purpose of improving the effectiveness and efficiency of that organization. Capabilities of the information system and characteristics of the organization, its work systems, its people, and its development and implementation methodologies together determine the extent to which that purpose is achieved. There are various types of information systems, for example: transaction processing systems, office systems, decision support systems, knowledge management systems, database management systems, and office information systems. Critical to most information systems are information technologies, which are typically designed to enable humans to perform tasks for which the human brain is not well suited, such as: handling large amounts of information, performing complex calculations, and controlling many simultaneous processes.

2.10 Background to Library Automation

When exploring the history of library automation, it is possible to return to past centuries when visionaries well before the computer age created devices to assist with their book lending systems. Even as far back as 1588, the invention of the French "Book Wheel" allowed scholars to rotate between books by stepping on a pedal that turned a book table. Another interesting example was the "Book Indicator", developed by Albert Cotgreave in 1863. It housed miniature books to represent books in the library's collection. The miniature books were part of a design that made it possible to determine if a book was in, out or overdue. These and many more are examples of early ingenuity in library systems (Kadiri, 2004).

It could be said that library automation development began in the 1930's when punch card equipment was implemented for use in library circulation and acquisitions. During the 30's and early 40's progress on computer systems was slow which is not surprising, given the Depression and World War II. In 2005, Vannevar Bush envisioned an automated system that would store information, including books, personal records and articles. Bush (2005) wrote about a hypothetical "memex" system which he described as a mechanical library that would allow a user to view stored information from several different access points and look at several items simultaneously. The ideas are well known as the basis for hypertext and computers for their operations. The first appeared at MIT, in 1957, with the development of COMIT, managing linguistic computations, natural language and the ability to search for a particular string of information. Librarians then moved beyond a vision or idea for the use of computers, given the technology, they were able make great advances in the use of computers for library systems. This led to an explosion of library automation in the 60's and 70's (Kadiri, 2004).

The advancement of technology led to increases in the use of computers in libraries. In 1961, a significant invention by both Robert Noyce of Intel and Jack Kirby of Texas Instruments, working independently, was the integrated circuit. All the components of an electronic circuit were placed onto a single "chip" of silicon. This invention of the integrated circuit and newly developed disk and tape storage devices gave computers the speed, storage and ability needed for on-line interactive processing and telecommunications. The new potential for computer use guided one librarian to develop a new indexing technique. HP. Luhn, in 1961, used a computer to produce the "keyword in context" or KWIC index for articles appearing in Chemical Abstracts. Although keyword indexing was not new, it was found to be very suitable for the computer as it was inexpensive and it presented multiple access points. Through the use of Luhn's keyword indexing, it was found that librarians had the ability to put controlled language index terms on the computer (Sani&Tiamiyu, 2005).

By mid 60s, computers were being used for the production of machine readable catalog records by the Library of Congress. Between 1965 and 1968, LOC began the MARC I project, followed quickly by MARC II. MARC was designed as way of "tagging" bibliographic records using 3-digit numbers to identify fields. For example, a tag might indicate "ISBN," while another tag indicates "publication date," and yet another indicates "Library of Congress subject headings" and so on. In 1974, the MARC II format became the basis of a standard incorporated by NISO (National Information Standards Organization). This was a significant development because the standards created meant that a bibliographic record could be read and transferred by the computer between different library systems (Kadiri, 2004).

During the 1970's the inventions of the integrated computer chip and storage devices caused the use of minicomputers and microcomputers to grow substantially. The use of

commercial systems for searching reference databases (such as DIALOG) began. BALLOTS (Bibliographical Automation of Large Library Operations) in the late 1970's were one of the first and later became the foundation for RLIN (Research Libraries Information Network). BALLOTS were designed to integrate closely with the technical processing functions of the library and contained four main files:

- (1) MARC records from LOC;
- (2) An in-process file containing information on items in the processing stage;
- (3) A catalog data file containing an on-line record for each item;
- (4) A reference files(Ekpenyong, 2007).

Furthermore, it contained a wide search retrieval capability with the ability to search on truncated words, keywords, and LC subject headings, for example. OCLC, the On-line Computer Library Center began in 1967, chartered in the state of Ohio. This significant project facilitated technical processing in library systems when it started its first cooperative cataloging venture in 1970. It went on-line in 1971. Since that time it has grown considerably, providing research. In order to have automation, there must first be a computer. The development of the computer progressed substantially from 1946 to 1961, moving quickly through a succession of vacuum tubes, transistors and finally to silicon chips. From 1946 to 1947 two significant computers were built.

The ENIAC I (Electronic Numerical Integrator and Calculator) computer was developed by John Mauchly and J. Presper Eckert at the University of Pennsylvania. It contained over 18,000 vacuum tubes, weighed thirty tons and was housed in two stories of a building. It was intended for use during World War II but was not completed in time. Instead, it was used to assist the development of the hydrogen bomb. Another computer, EDVAC, was designed to store

two programs at once and switch between the sets of instructions. A major breakthrough occurred in 1947 when Bell Laboratories replaced vacuum tubes with the invention of the transistor.

The transistors decreased the size of the computer, and at the same time increased the speed and capacity. The UNIVAC (Universal Automatic Computer) became the first computer using transistors and was used at the U.S. Bureau of the Census from 1951 until 1963. Software development also was in progress during this time. Operating systems and programming languages were developed for the computers being built. Librarians needed text-based computer languages, different from the first numerical languages invented for the number crunching "monster computers", in order to be able to use features designed to provide users with the ability to access bibliographic records, scientific and literary information which continues to the present. The 70's were the era of the dummy terminals that were used to gain access to mainframe on-line databases. The 80's gave birth to a new revolution. The size of computers decreased, at the same time, technology provided faster chips, additional RAM and greater storage capacity. The use of microcomputers during the 1980's expanded tremendously into the homes, schools, libraries and offices of many Americans. The microcomputer of the 80's became a useful tool for librarians who put to them to use for everything from word processing to reference, circulation and serials. On-line Public Access Catalogs began to be used extensively the 1980's. Libraries started to set-up and purchase their own computer systems as well as connect with other established library networks. Many of these were not developed by the librarians themselves, but by vendors who supplied libraries with systems for everything from cataloging to circulation. One such on-line catalog system is the CARL (Colorado Alliance of Research Libraries) system. Various softwares became available to librarians, such as

spreadsheets and databases for help in library administration and information dissemination (Ekpenyong, 2007).

The introduction of CD-ROMs in the late 80s has changed the way libraries operate. CD-ROMs became available containing databases, software, and information previously only available through print, making the information more accessible. Connections to "outside" databases such as OCLC, DIALOG, and RLIN continued, however, in the early 90s the databases that were previously available on-line became available on CD-ROM, either in parts or in their entirety. Libraries could then gain information through a variety of options (Ekpenyong, 2007).

The nineties gave rise to yet another era in library automation. The use of networks for e-mail, ftp, telnet, Internet, and connections to on-line commercial systems has grown. It is now possible for users to connect to the libraries from their home or office. The World Wide Web which had its official start date as April of 1993 is becoming the fastest growing new provider of information. It is also possible, to connect to international library systems and information through the Internet and with ever improving telecommunications. Expert systems and knowledge systems have become available in the 90s as both software and hardware capabilities have improved. The technology used for the processing of information has grown considerably since the beginnings of the thirty ton computer. With the development of more advanced silicon computer chips, enlarged storage space and faster, increased capacity telecommunication lines, the ability to quickly process, store, send and retrieve information is causing the current information delivery services to flourish (Ekpenyong, 2007).

2.11 Library Automation in Nigeria

Libraries in Nigeria are at cross roads in their attempt to automate their operations. One of the major issues has to do with choice of software to deploy. Just as Onohwakpor & Anre (n.d.) observed, software selection decision in libraries is basically based on report from other colleagues through conferences on what they feel and heard the software could offer. They also note that some of the libraries do not do a thorough system analysis to ascertain what their library needs are. Onohwakpor&Anre further note that, dependence on software vendors has been of great disadvantage. This is true especially where the library staff input is inadequate in the acquisition and installation, with the library ending up with an inappropriate automated system. Despite these challenges, Agha (2001) observed while carrying out a survey observed that Nigeria library workers are enthusiastic about and willing to use new technologies. In spite of this interest, findings on automated services in Nigerian universities by Sani and Tiamiyu (2002) revealed that the services were far from adequate and that out of about 29 different automated services that one will expect from a modern university, only 40% were available and utilized.

In spite of the challenges automation brings, its benefits quite outweigh its disadvantages. It is a known fact that automation of library enables easy access to library materials, and allows staff to better serve the patrons and facilitate a multitude of tasks such as acquisitions, cataloguing, circulation and reference etc. Tamuno&Ojedokun (2012) observed that once a library is computerized there are some intangible benefits that staff and students gain such as computer literacy, introduction of new services such as internet searches, online database searches, CD-ROM searches, etc. Kadiri (2004) also stated that automation of library will address the problem of manual processing of materials with short comings of filling and typing

errors, retrieval errors, time consumption and drudgery. He stated further that the advantages of library automation includes less drudgery, easy generation of records, space conservation, improvement of information services, and easy retrieval among others.

IyaAbubakar delivered a lecture in a meeting of the Nigerian Library Association (NLA), the national association that is equivalent to the American Library Association (ALA). The theme of the lecture was the library and the computer. Abolaji (2000) states that significant and widespread efforts at "The Challenges of Computerizing a University Library in Nigeria: the Case of Kashim Ibrahim Library, Ahmadu Bello University, Zaria," Nok (2006) computerizing library services started in the 1990s. Major efforts at computerization were stalled by the supposed lack of funds and expertise.

Ekpenyong (2007) notes that most notable research libraries in Nigeria are advanced in computerization. The International Institute for Tropical Agriculture (IITA), Library, Ibadan, an agricultural research library, migrated to a fully computerized integrated library system in the 80s. The Institute for Policy and Strategic Studies, Kuru, Jos, the International Livestock Centre for Africa (ILCA), the Federal Institute for Industrial Research (FIIR), Oshodi, Lagos, the Nigerian Institute for International Affairs (NIIA), the British Council Library, the United States Information Service (USIS), and the Raw Materials Research and Development Council Library have implemented various degrees of automation in their library services. In fact, the Raw Materials Research and Development Council Library pioneered the development of indigenous Windows-based library software, *X-Lib*.

In 1989, the World Bank provided funds to 30 federal universities in Nigeria for the acquisition of books, journals, and equipment (including computers), to encourage those

universities to open their doors to information and communications technology. Unfortunately, no significant efforts were recorded in the computerization of library services Ekpenyong (2007).

2.12 Information Technology (IT) and Nigerian Libraries

In the university environment, the library is a major information providing system that supports teaching, learning and research with information materials of various types. Among these diverse information materials, serials are needed especially by faculty and research students. Before the development and use of IT facilities for capturing/acquisition, processing dissemination and retrieval of information, serials operations were predominantly manual. However with the development of IT based library service which brought with it self-service and simultaneous access to resources (Womboh and Abba 2008), peoples' interest switched from print to electronic information. Furthermore, serials operations in developing countries which was besieged with problems associated with cost (Millis 1992; de Marcas 2000; Aina 2003), inadequate acquisition and processing tools (Szilvassy 2014), competency and accessibility problems (Cohen 2004 and Mullis 2014), embrace the use of IT facilities as an approach to overcome some of the mentioned problems. This is necessary since according to Ajayi (2003) any industry information or any other which "sidelines IT has simply signed a death warrant'.

The IT facilities applied in the library in general and serials unit in particular are based on the functions performed therein. The functions performed in the university serials unit as indicated by Tuttle (2013) are acquisition, processing, public service and preservation. These functions are synonymous with the functions performed in the university library though with some peculiarities emanating from the nature of serials. Therefore IT facilities used in the broad university library are also applicable to the serials unit but also with peculiarity occasioned by the nature of serials. These services and operations have been transformed using IT. Aina (2004)

informed that there is efficiency in resource organization as delivery and dissemination of information have become effective and easy. Repetitive and routine tasks in the library have been eliminated.

Furthermore, the availability of bibliographic database, full text documents and digital library collection is now taken for granted as noted by Chesenga (2004). The IT (IT) facilities use in the library is defined by the American Library Association (2003) as "the application of computers and other technology to the acquisition, organization, storage, retrieval and dissemination of information. Ifidon (2005) enumerated the functions available for IT use in the library to include ordering and acquisition with the following activities: ordering, receiving, settlement of invoice and administration of records and expenditure.. Further to that, Oketunji (2001) and Chesenga (2004) listed library functions in which IT could be applied to include acquisition, cataloguing, circulation, serials control, selective dissemination of information services and preparation of management information. Furthermore, the application of IT facilities in the library could be in the stand alone or integrated form.

Many countries and institutions are at varying level of IT application in their library operation. Islam and Islam (2007) documented the use IT in libraries in Bangladesh and informed that though the use started between 1964 and 1995, progress was not made until 1996.

In Nigeria many universities are at the advanced stage of IT use in library operations. Anunobi and Benard (2007) informed that in their study of IT availability for library operations in the Imo state of Nigeria only two of the four academic libraries; Federal University of Technology Owerri and Imo State University show evidence of using IT for library operations. Emorjorho, & Nwalo (2009) found in their study that only very few libraries in the Niger-Delta of Nigeria use IT in library operations where university libraries have more IT facilities than the

special libraries. Nok(2006) documented the use of IT in Kashim Ibrahim library, Ahmadu Bello University Zaria while Ekpenyong(2007) presented the situation in special libraries in Nigeria. Ani, Esin and Edim(2005) also studied the use of IT in Nigeria University libraries.

For serials operation, Agbaje (2002) informed that "information technology can be an effective hand-maid to serials management at every stage of management process and irrespective of content, use, format and overall strategy adopted for serials management by the organization in question" Akinyotu (1977), Alabi (1985), Oketunji (2001) Agbaje (2002) and Oni (2004) noted that using various approaches, IT facilities in serials unit can be for the following functions and activities: subscription control, procurement process, order preparation, fund analysis and accounting. These facilities can also be used for bibliographic file control, cataloguing of new serials, preparation of serials record entries and transaction control. Effecting serials additions, changes and deletions or collection control can be performed with IT facilities. Services and preservation functions such as servicing request for serials publication, binding control file, missing issues, holdings accession of want list as well as union lists are amenable to IT facilities use. In their findings on the use of computer for library services in Bangladesh, Islam and Islam (2007) discovered that all the libraries surveyed used IT for serials control as well as other activities. The services provided according to them include CD-ROM searching, online searching, online networking, photocopying, online information services and database searching services. In Nigeria according to Ikem and Ajala (2000), preliminary use of IT in the library started with its use to produce Union list of Serials sponsored by Committee of University Librarians of Nigeria. That notwithstanding, its continuous use for various serials function is yet to be known

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter offers information on design of Library Information Management System. It involves the system analysis in which data is collected on the various files, decision points and transactions handled by the manual library system. The tools used are: observation of the library environment, surfing the internet for information and Data Flow Diagrams (DFDs). The system design captures Information gathered from the analysis, used to provide an efficient modular design that will reduce the system's complexity, facilitate change, and result in easy implementation. Tools used for the design are; Entity Relationship (ER) Diagrams and Data Flow Diagrams (DFDs).

At the coding phase the design is transferred into the actual software. The database design is implemented in Microsoft Access and the interface design in JAVA programming language. During testing, I evaluated the capability of the system and determine that it meets the required results. The database was populated with sample data and GUI is verified and validated to check if it conforms to the objectives of the system. The code is checked for bugs and the application is checked for errors. Implementation is the phase in which the software is integrated into the departmental library. The software is deployed on the library's computer system and a manual on how to use it is also made available to the librarian. The librarian is also trained on how to use the application who will also be the system administrator.

3.1.1 Existing System of the Library:

The manual system of library can be divided into three basic operations which are:

Registration: The intending library user is given a library card to fill with their details and a passport photograph. The completed card is verified by the librarian before he/she signs validating the member to make use of the library and library materials. Sonaike & Osinulu (Eds.)

Cataloguing and classification: Library materials are catalogued by filling the book's detail (title, author(s), publisher, number of pages, etc.) on the catalogue card and classified by grouping them based on the subject or series. Cataloguing and classification of books are very useful in referencing and locating books in the library. Sonaike & Osinulu (Eds.)

Circulation: Library materials are borrowed for use outside the library or can be used within the library. In the case of borrowing, the user request or selects a book from the shelves and there is a limit to the number of books that can be borrowed at a time. The librarian checks the book(s) if they are books that can actually be lent out to members, the librarian records the member's name, borrow date and date to return the book(s) on the borrower's card. When the book(s) are returned the librarian checks the borrower's card to verify that the book(s) was/were returned on or before the return date, if the return date has been exceeded the member pays a stipulated amount as fine which he needs to pay before he can borrow any other material from the library. Sonaike and Osinulu (Eds.)

In the case of use within the library, the member can also select a book from the shelves or request for a book from the librarian. In either case the member records the book against his/her name on the library's record book and after use the member signs out against his/her name on the record book.

3.1.2 Developed System of the Library

Developed system is an automated Library Management System. Through this software the librarian can add library users, add books, search members, search books, update information, edit information, borrow and return books in quick time. The proposed system has the following advantages.

1. User friendly interface
2. Fast access to database
3. Less error
4. More Storage Capacity
5. Search facility
6. Quick transaction

In this system, all manual difficulties in managing the Library have been rectified by implementing computerization.

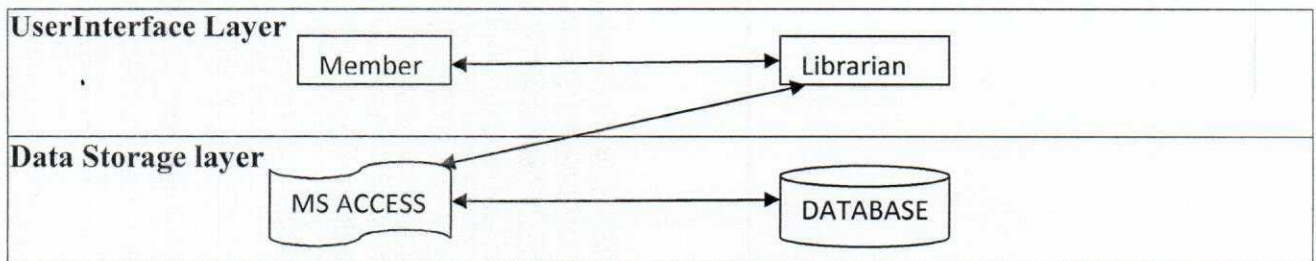


Figure 3.1 The Developed System Architecture

Whatever the system is need be feasible. Feasibility is the study of impact, which happens in the organization by the development of a system. The impact can be either positive or negative. When the positive dominates the negatives, then the system is considered feasible. Here the feasibility study can be performed in two ways such as technical feasibility and Economical Feasibility.

Technical Feasibility:

The system is technically feasible, since there will not be much difficulty in getting required resources for the development and maintaining the system as well. All the resources needed for the development of the software as well as the maintenance of the same is available in the organization here the resources which are available already are utilized.

Economical Feasibility

Development of this application is highly economically feasible. The library need not spend much for the development of the system already available. The only thing to be done is making an environment for the development with an effective supervision. Doing so will attain the maximum usability of the corresponding library resources. Therefore, the system is economically feasible.

The modeling is in two parts

- Analysis, and
- Design

3.2 Analysis

The analysis of the existing information system in FUOYE library was extensively carried out by studying the existing FUOYE library environment. The result of the analysis is presented using the Use-case diagram shown in figure 3.1

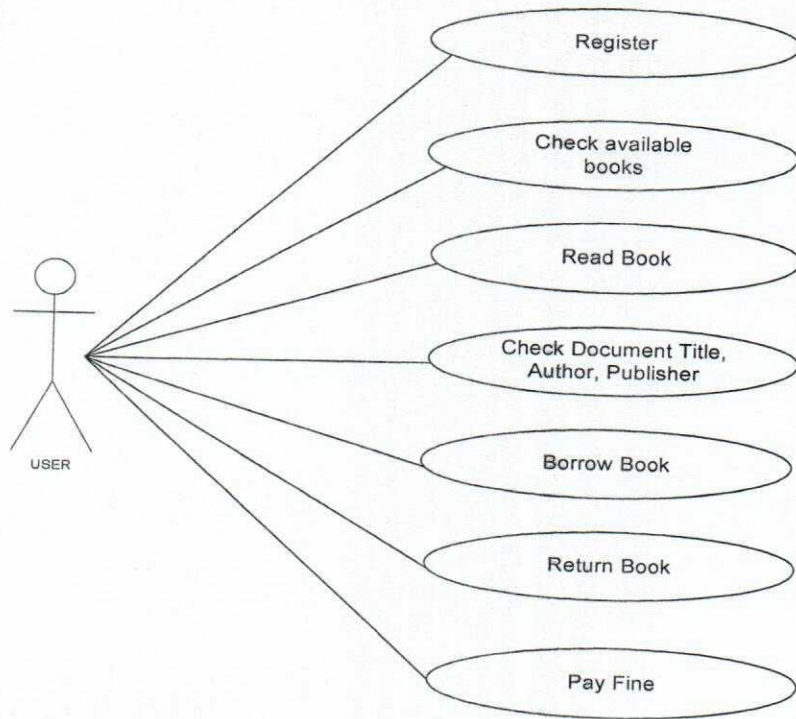


Figure 3.2 shows the result of analysis of Computer Science library system

The result of the existing library information shows that the system allows potential users to register, registered user to check available books, read books, check document title, author, publisher, borrow book, return book and pay fine in case of late submission of book.

The proposed system in addition to the functionality of the existing system allows users to search, modify user details, and upload documents.

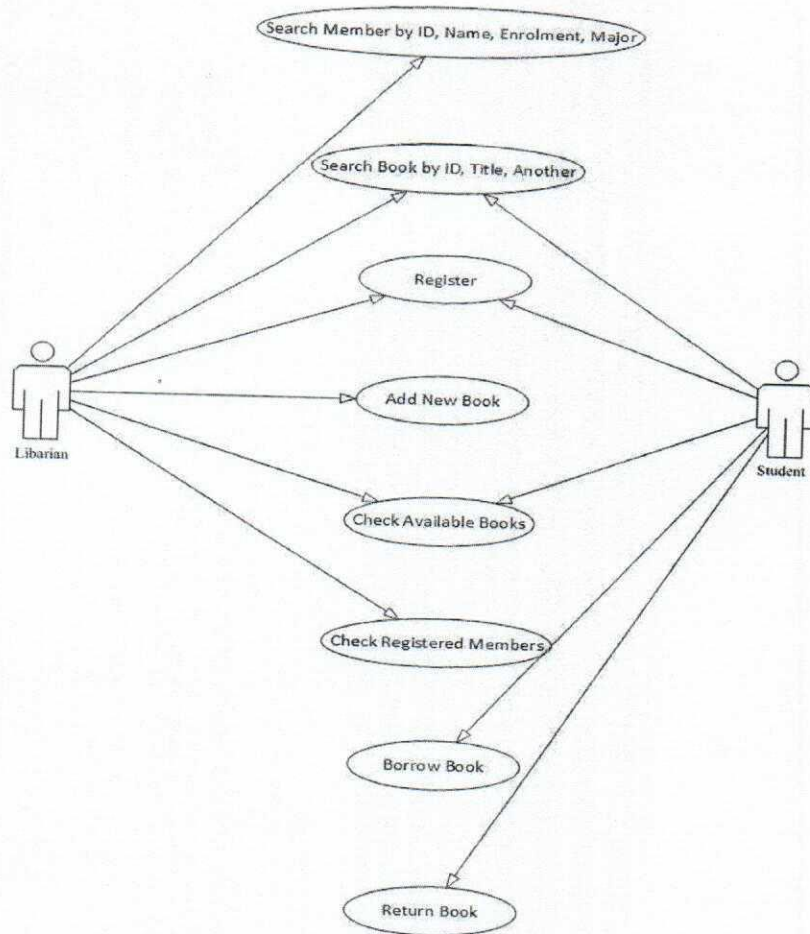


Figure 3.3: Proposed system functionality

The system to be developed should be able to allow users perform the functions in figure 3.2.

3.3 Design

This subsection presents design for the implementation of a full text search digital library system. The design was carried out in the following phases

- Architectural Design
- Objects Design
- Database Design
- Algorithm Design
- User Interface Design

3.3.1 Architectural Design

This architecture gives the conceptual model that defines the structure, behaviour, and views of the Library Management System. The main components of the system architecture: Oracle Database containing relevant tables and Application Interface, and Administrator and Guest. The Applicant interface and status interface is responsible for user experience, database takes care of storage that are required in the Library Management system.

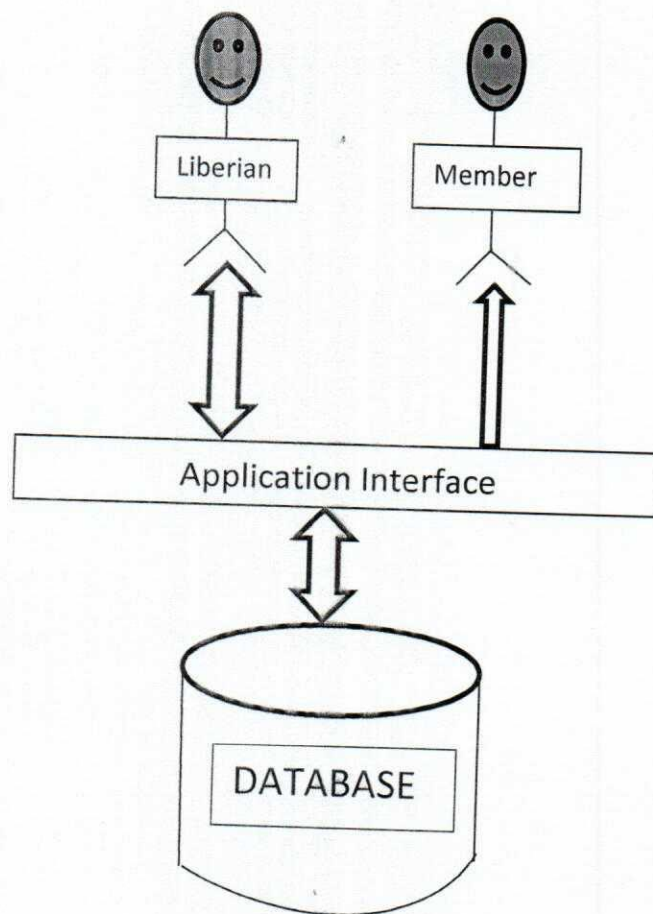


Figure 3.4: Architectural design of the developed system

3.3.2 Objects Design

The result of analysis shows the following objects: Members (students or staffs), Liberian, Alert and Books.

3.3.3 Database Design.

Database design mainly includes requirement analysis, concept structure design stage, the logic structure design stage, physical structure design stage; database implementation stage, database operation and maintenance stage, there're six steps altogether. Among them; Conceptual structure design which is mainly express by the Entity-Relationship model; Logical structure design is to make sure the logical structure of database, is turn into E-R model which was got in the concept structure design stage into relation model; Physical structure design stage is to choose a logical data model which is the most suitable for applications environment for physical structure.

3.3.3.1 Concept Structure Design

Through analyzing the function of the library system, we could arrive at a conclusion that, the entities of the system mainly entails books information entity and member information entity. This are illustrated:

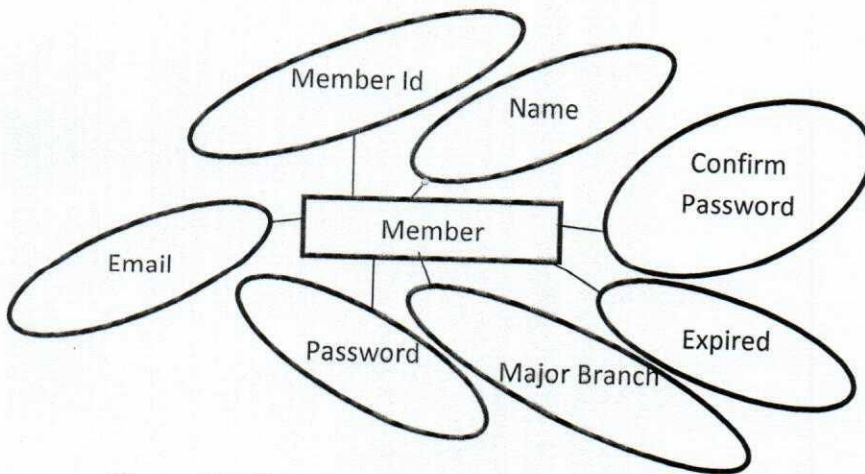


Figure 3.5 Showing object Member

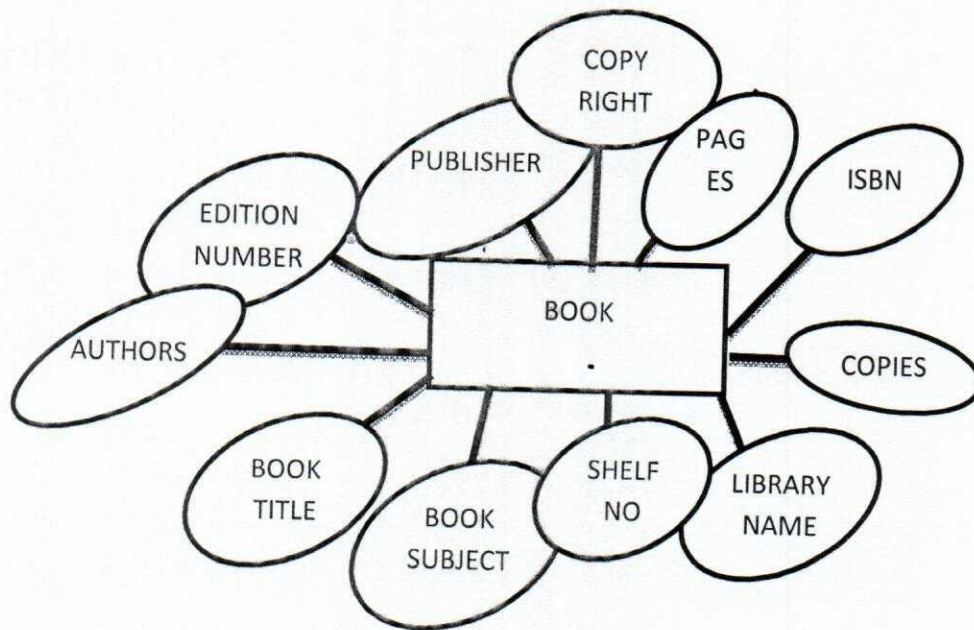


Figure 3.6 Showing object Book

3.3.3.2 Database Tables

From the analysis done, the following tables were designed for the implementation of the proposed system.

Book

FUOYE library use book registration logs for the purpose of keeping and tracking of books information. Also part of books information is kept on the book catalogue cards for the purpose of tracking lent books. The table below is the needed data for the book based on results of the author's surveys and interviews

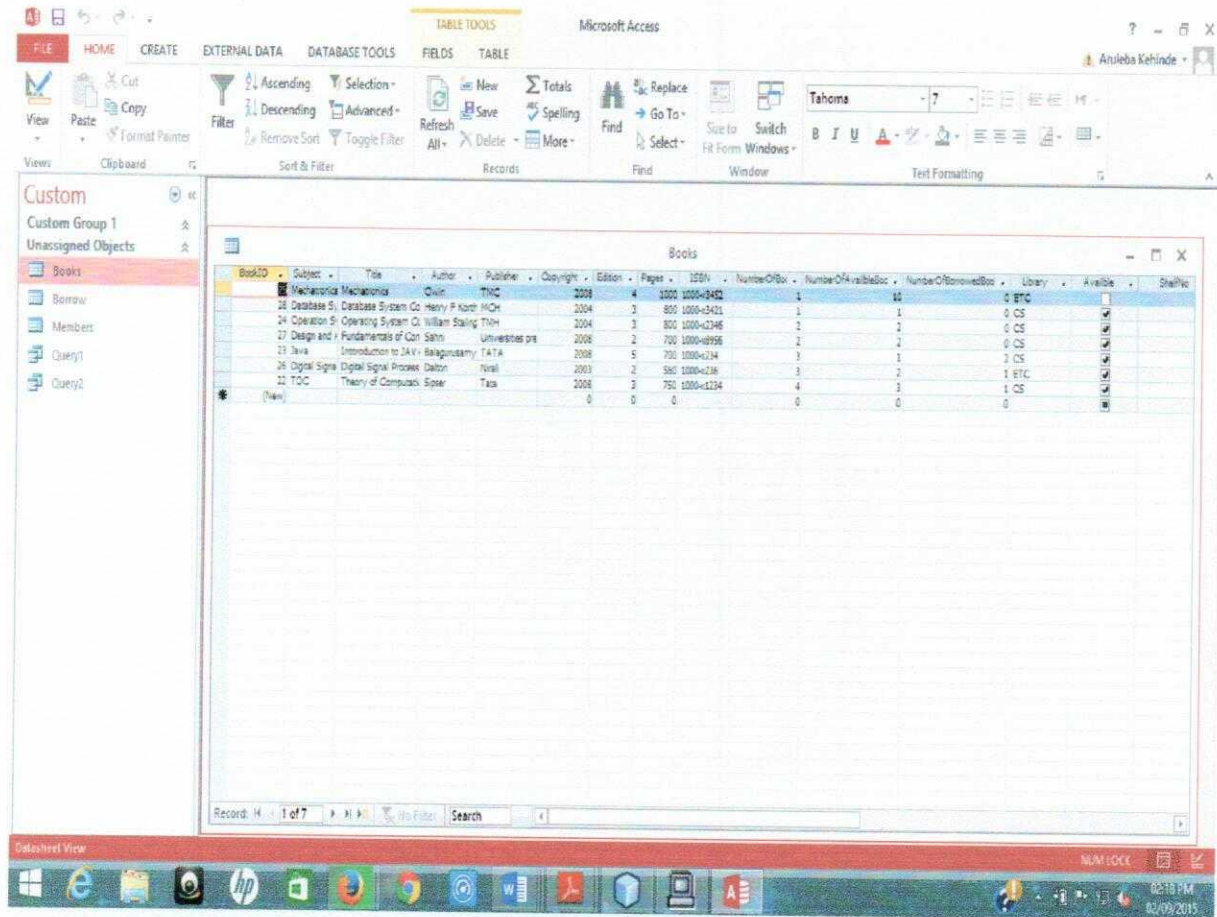


Figure 3.7 Screenshot of database table design under book module

'Member

Library membership cards have been issued to members including students and staff as the library membership cards enable them to borrow their favorite books from the library. FUOYE library use member registration logs for the purpose of keeping and tracking member's information. The table below summarizes user's information as the result of the author's interviews with library staffs.

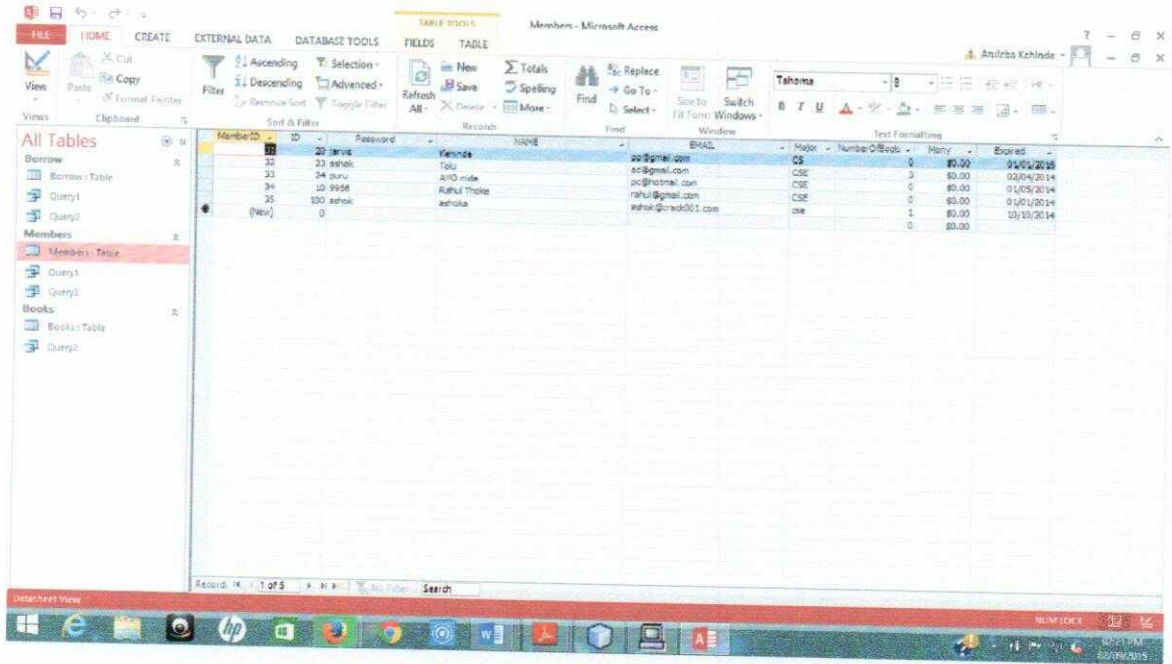


Figure 3.8 Screenshot of database table design under member module

3.3.4 Algorithm Design

Start

Homepage

Check book availability

If Available

Validate member

Else

Output (Book not available) and End

If valid

Check no of books issued to member

Else

Register member

If available

issue book

Else

output (book not issued)

Add member book and issue details

Update book status

End.

3.3.5 User Interface Design

After completing the requirement study and documentation, the next phase is to design the software based on these requirements. The interface is a system by which users interact with the database designed for the library system. It provides a means of input i.e. allowing the users to manipulate a system and output allowing the system to indicate the effects of the users' manipulation. The user interface for library information management system will have the following features:

- i. The structure: Interface is organized for the user purposefully, in meaningful and useful ways based on clear, consistent models that are apparent and recognizable to users, putting related items together and separating unrelated items, differentiating dissimilar things and making similar things resemble one another. The structure principle is concerned with overall user interface architecture.
- ii. The simplicity: The interface makes simple, common tasks easy, communicating clearly and simply in the user's own language, and providing good shortcuts that are meaningfully related to longer procedures.

- iii. The visibility: The interface makes all needed options and materials for a given task visible without distracting the user with extraneous or redundant information. Good designs don't overwhelm users with alternatives or confuse with unneeded information.
- iv. The feedback: The interface keeps users informed of actions or interpretations, changes of state or condition, and errors or exceptions that are relevant and of interest to the user through clear, concise, and unambiguous language familiar to users.
- v. The tolerance: The interface is flexible and tolerant, reducing the cost of mistakes and misuse by allowing undoing and redoing, while also preventing errors wherever possible by tolerating varied inputs and sequences and by interpreting all reasonable actions.
- vi. The reuse: The interface reuses internal and external components and behaviors, maintaining consistency with purpose rather than merely arbitrary consistency, thus reducing the need for users to rethink and remember.

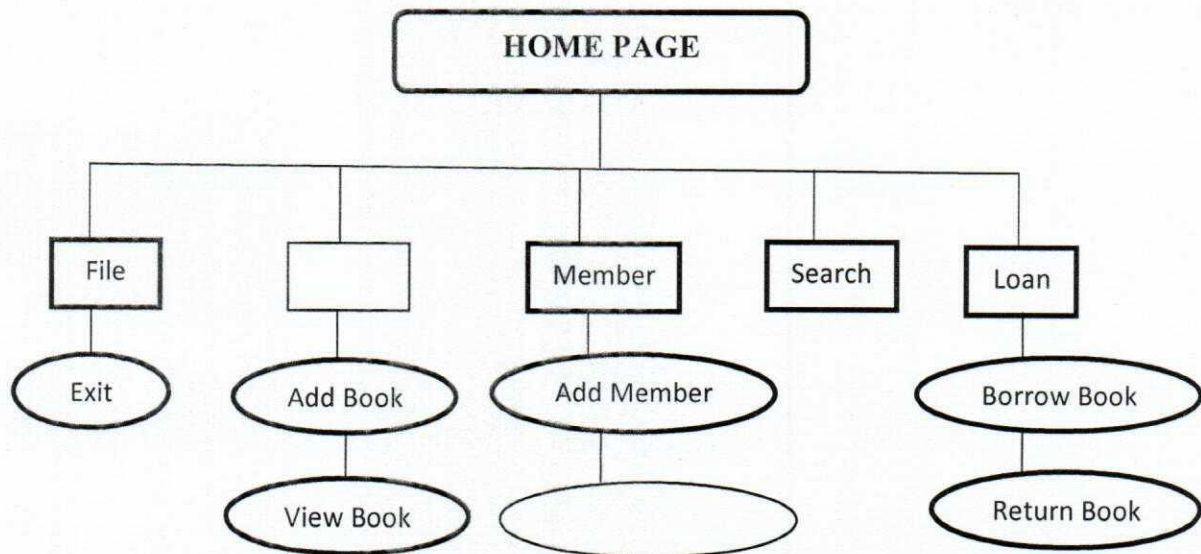


Figure 3.9: Showing the Main Interfaces

The home page screen contains five major modules which are the File, Books, Member, Search and Loan, each of these modules contains sub-modules. Each of them will lead you to its database when clicked and manipulated.

Home Page

The home page is the key aspect of the system, because it gives the basic user interface system. It is the default page of the application. It is mainly a static page that consists of several buttons. An event (a new page) is generated upon pressing any of these buttons. Each button is registered to a specific page which opens a path to a unique operation (search, books, and registration).



Figure 3.10 Screenshot of the main interface

Book Registration

There are fields for the book attributes and create book button, this enables the admin to register a new book.

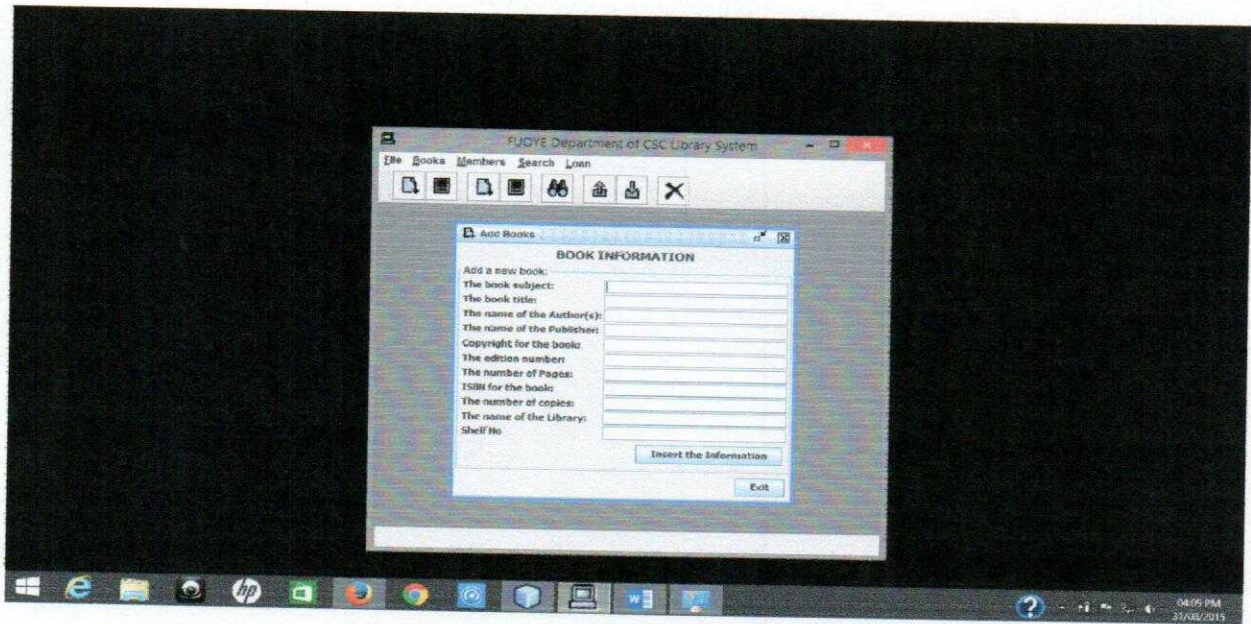


Figure 3.11 Screenshot of book registration under book module

Member Registration

There are fields for the student data and create account button, this enables the student to create an account and register with the digital library.

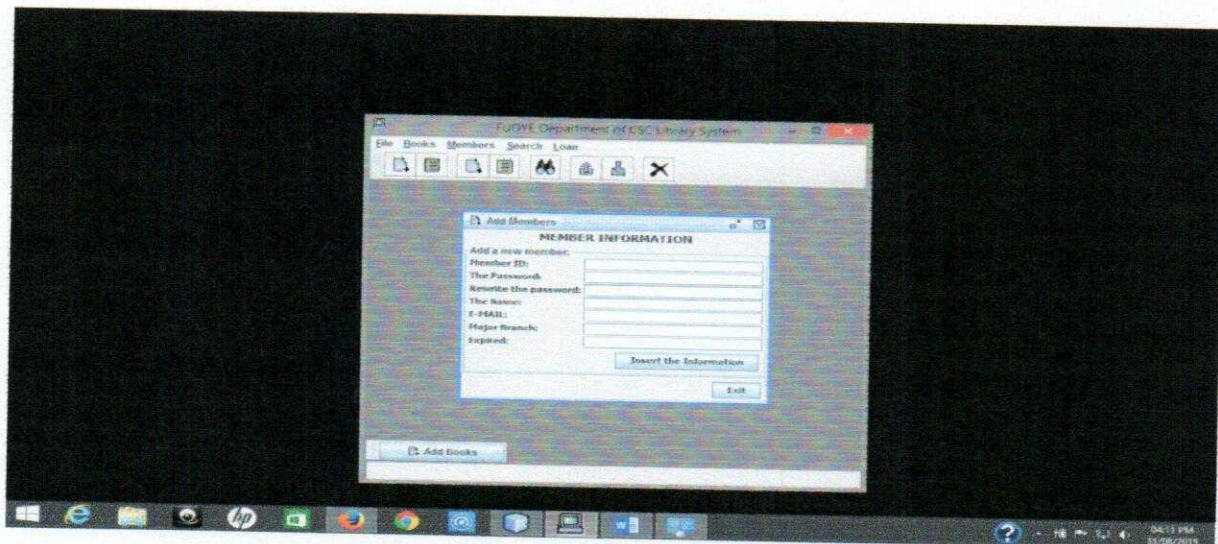


Figure 3.12 Screenshot showing member registration under member module

Borrow Book

This module is used to borrow book from the library.

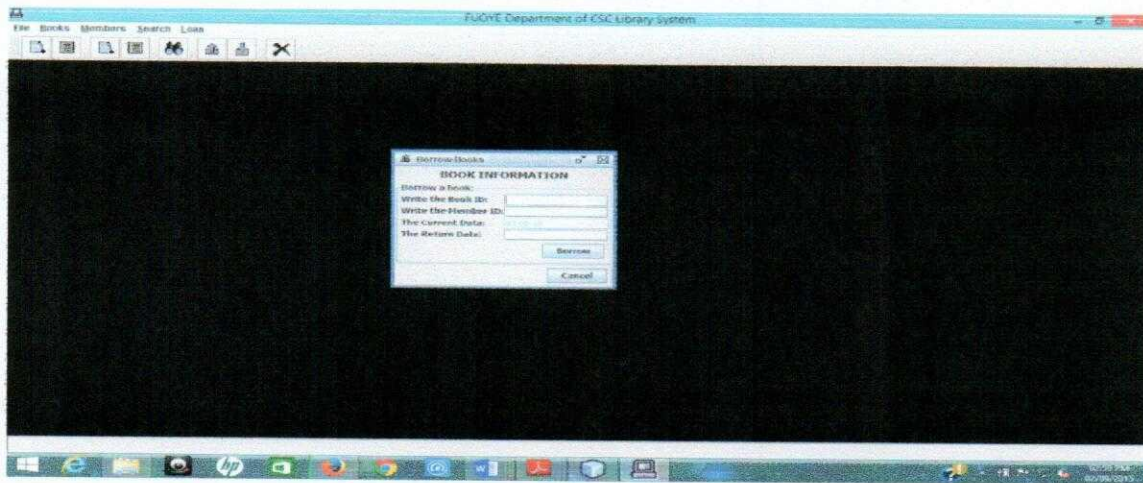


Figure 3.13 Screenshot of borrow books under loan module

Return Book

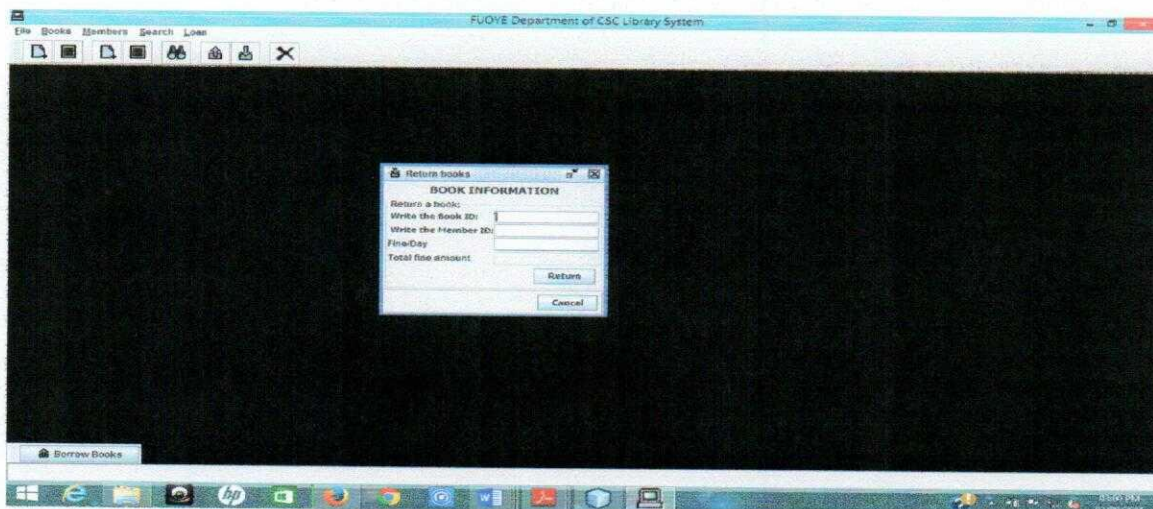


Figure 3.14 Screenshot of return book under loan module

Search

This feature can be used by any user. This module provided a convenient book and member searching function; the user could search books and members based on a variety of conditions like Book ID, Title, Subject, Member ID, Name, Email etc.

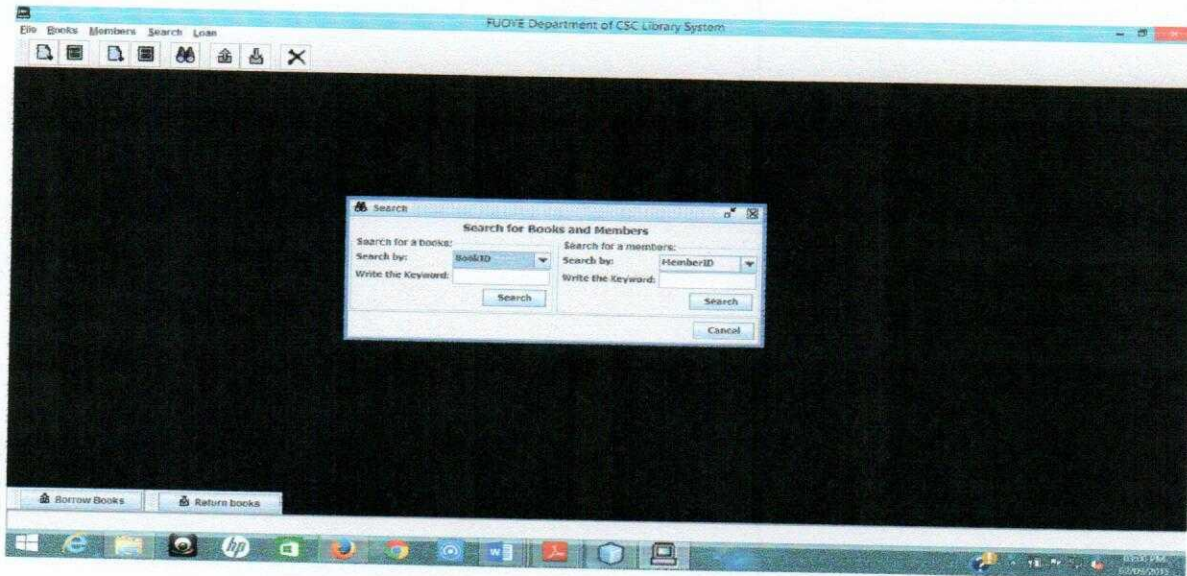


Figure 3.15 Screenshot showing the search option under the search module

View Book

This holds page information about books that are stored in the system.

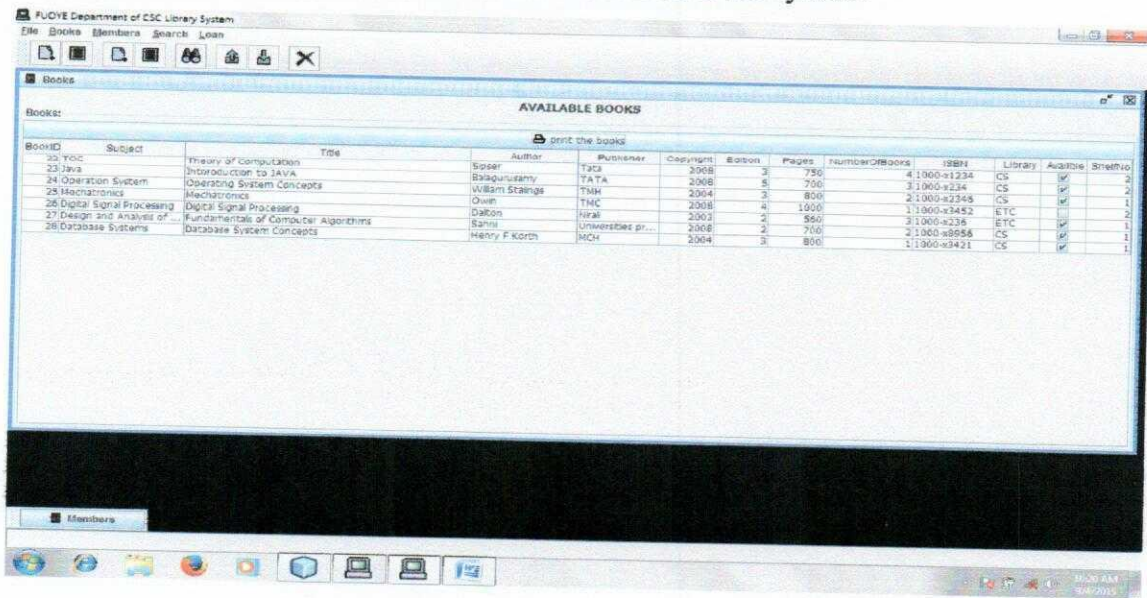
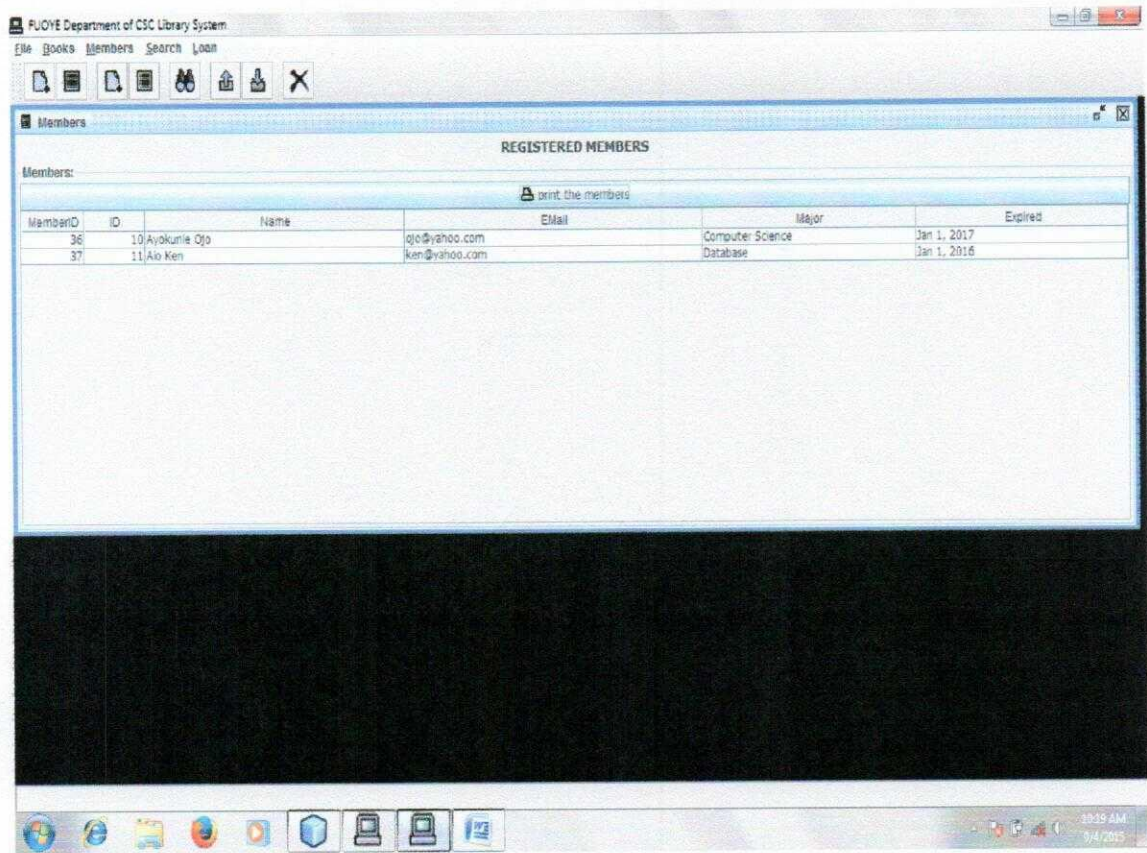


Figure 3.16 Screenshot of available books under books module

View Members

This page holds information about registered members that makes use of the Library.



The screenshot displays a web browser window titled "FUOYE Department of CSC Library System". The main content area is titled "REGISTERED MEMBERS" and contains a table with the following data:

MemberID	ID	Name	Email	Major	Expired
36	10	Ayokunle Ojo	ojo@yahoo.com	Computer Science	Jan 1, 2017
37	11	Alo Ken	ken@yahoo.com	Database	Jan 1, 2016

The interface also includes a menu bar with "File", "Books", "Members", "Search", and "Loan", and a taskbar at the bottom showing various application icons and the system clock.

Figure 3.17 Screenshot of registered members under the members' module

CHAPTER FOUR

SYSTEM IMPLEMENTATION

4.1 System Development Tools

System development comprises of the database and interface development respectively. The database design is implemented in Microsoft Access and the interface design in JAVA programming language. Graphical User Interface (GUI) in JAVA allows users interact with the database where information can be retrieved, inserted and updated, while the database stores up the information that is inserted, updated and retrieved.

4.2 Development Tools

4.2.1 Java

Java programming language was originally developed by Sun Microsystems which was initiated by James Gosling and released in 1995 as core component of Sun Microsystems' Java platform (Java 1.0 [J2SE]). Java is a general-purpose computer programming language that is concurrent, class-based, object-oriented, and specifically designed to have as few implementation dependencies as possible.

JAVA has the following properties which makes it suitable for the system designed:

Java is simple: Java was designed to be easy to use and is therefore easy to write, compile, debug, and learn than other programming languages. Java uses automatic memory allocation and garbage collection unlike languages that requires the programmer to allocate memory and to collect garbage.

Java is object-oriented: Java is object-oriented because programming in Java is centered on creating objects, manipulating objects, and making objects work together. This allows creation of modular programs and reusable codes.

Java is platform-independent: One of the most significant advantages of Java is its ability to move easily from one computer system to another. The ability to run the same program on many different systems is crucial to World Wide Web software, and Java succeeds at this by being platform-independent at both the source and binary levels.

Java is distributed: Distributed computing involves several computers on a network working together. Java is designed to make distributed computing easy with the networking capability that is inherently integrated into it. Writing network programs in Java is like sending and receiving data to and from a file.

Java is interpreted: An interpreter is needed in order to run Java programs. The programs are compiled into Java Virtual Machine code called bytecode. The bytecode is machine independent and is able to run on any machine that has a Java interpreter. With Java, the program need only be compiled once, and the bytecode generated by the Java compiler can run on any platform.

Java is secure: Java is one of the first programming languages to consider security as part of its design. The Java language, compiler, interpreter, and runtime environment were each developed with security in mind.

Java is robust: Robust means reliable and no programming language can really assure reliability. Java puts a lot of emphasis on early checking for possible errors, as Java compilers are able to detect many problems that would first show up during execution time in other languages.

Java is multithreaded: Multithreading is the capability for a program to perform several tasks simultaneously within a program. In Java, multithreaded programming has been smoothly integrated into it, while in other languages, operating system-specific procedures have to be

called in order to enable multithreading. Multithreading is a necessity in visual and network programming.

4.2.2 Microsoft Access

Microsoft Access is a DBMS (also known as Database Management System) from Microsoft that combines the relational Microsoft Jet Database Engine with a graphical user interface and software-development tools. It is a member of the Microsoft Office suite of applications, included in the Professional and higher editions or sold separately.

Microsoft Access stores data in its own format based on the Access Jet Database Engine. It can also import or link directly to data stored in other applications and databases.

4.2.3 Challenges Faced During System Development

Changes in system requirements: the system requirements were updated frequently due to new ideas which effected changes to the design as well.

4.3 Modular Design

4.3.1 Home Page Interface Implementation

The home page is the key aspect of the system, because it gives the basic user interface for the library management system. It comprises of: File, Books, Member, Search and Loan.

File: This feature can be used by any user. This module contains a sub-module called Exit; this sub module can be used by the user to exit the library system.

Book: This module contains two sub-modules namely Add Book and view book. The Librarian fills all the required fields, the system detect whether the book id already exist or not, if

not, once the insert information button is clicked, it write the book information into the database, and registration is successful.

Member: This involves registering new members (student, staff) implementation interface. It contains registration form interface with entries like email address, last name, first name, password, password confirmation, and create account query. Java language is equally used to implement this feature.

Search: This feature can be used by any user. This module provided a convenient book and member searching function, the user could search books based on a variety of conditions.

4.4 System Configuration

The system configuration is the minimum hardware and software components the computer system must possess in order to perform efficiently.

Hardware Configuration

Processor	:	Pentium III 630MHz
RAM	:	128 MB
Hard Disk	:	20GB
Monitor	:	15" Color monitor
Key Board	:	122 Keys

Software Configuration

Operating System	:	Windows NT, Windows XP,
Language	:	Java 2 Runtime Environment
Database	:	Microsoft Access Server.

4.5 System Testing

System testing is a technique of verifying and validating if the library information management system works according to specification. The testing procedure asks questions such as: Is the menu bar displayed in the appropriate contested some system related features included either in menus or tools? Do pull –Down menu operation and Tool-bars work properly? Are all menu function and pull down sub function properly listed?; Is it possible to invoke each menu function using a logical assumptions that if all parts of the system are correct, the goal will be successfully achieved .? Inadequate testing or non-testing will lead to errors that may appear few months later.

This create two problems

1. Time delay between the cause and appearance of the problem.
2. The effect of the system errors on files and records within the system

The purpose of the system testing is to consider all the likely variations to which it will be suggested and push the systems to limits.

The testing process focuses on the logical intervals of the software ensuring that all statements have been tested and on functional interval is conducting tests to uncover errors and ensure that defined input will produce actual results that agree with the required results. Program level testing, modules level testing integrated and carried out.

There are two major types of testing done on the system they are;

4.5.1 White Box Testing

White box sometimes called "Glass box testing" is a test case design uses the control structure of the procedural design to drive test case.

Using white box testing methods, the following tests were made on the system

- A) All independent paths within a module+ have been exercised once. In the system, ensuring that case was selected and executed checked all case structures. The bugs that were prevailing in some part of the code were fixed
- b) All logical decisions were checked for the truth and falsity of the values.

4.5.2 Black box Testing

Black box testing focuses on the functional requirements of the software. This is black box testing enables the software engineering to derive a set of input conditions that will fully exercise all functional requirements for a program. Black box testing is not an alternative to white box testing rather it is complementary approach that is likely to uncover a different class of errors that white box methods like.

- 1) Interface errors
- 2) Performance in data structure
- 3) Performance errors
- 4) Initializing and termination errors

4.6 System Implementation

System implementation is making the new library system available to the prepared set of users (the deployment), and positioning on-going support and maintenance of the system within the department of computer science library (the transition). At a finer level of detail, deploying the system consists of executing all steps necessary to educate the librarian on the use of the new system, placing the developed system into production, confirming that all data required at the start of operations is available and accurate and validating that business functions that interact with the system are functioning properly. Transitioning the system support responsibilities involves changing from a system development to a system support and maintenance mode of operation, with ownership of the new system moving from the system developer to the library.

4.7 System Changeover Method

The process of putting the new information system into use and retiring the old system is known as system changeover. There are four changeover methods which are:

Direct cutover: The direct cutover approach causes the changeover from the old system to the new system to occur immediately when the new system becomes operational. It is the least expensive but involves more risks than other changeover methods.

Advantage

As we know health centre does not have enough funds for implementing the new system so it would be easier to implement direct cutover method in the health centre.

Disadvantage

This method of system changeover involves more risks of total system failure and it is preferred for commercial software packages. So if there is a system failure in health centre then

it will be difficult to store information of child who visits health centre. And if there is no proper storage then there will be incorrect reports and monitoring of child's health will not be properly done.

Pilot operation: The pilot changeover method involves implementing the complete new system at a selected location of a company. The group that uses the new system first is called the pilot site. By restricting the implementation to a pilot site reduces the risk of system failure as compared with is less expensive than a parallel system.

Advantages

Pilot operation is combination of both direct cutover and parallel operation, which restricts the implementation to a pilot site and reduces risk of system failure as compared with a direct cutover method.

Operating system only at pilot site is less expensive than parallel operation for entire health centre and all health centers.

If we use parallel approach to complete the implementation then the changeover period can be much shorter if system proves successful at the pilot site so a lot of time will be consumed at health centre in implementing the new system.

Disadvantage

This method is also costly as compared to the direct cutover.

Phased operation: The phased operation changeover method involves implementing the new system in stages, or modules. We can implement each subsystem by using any of the other three changeover methods. In this approach risk of errors or failures is limited to the implemented module only as well as it is less expensive than the full parallel operation.

For implementing child health information system we can use above methods but there are some advantages as well disadvantages of using these systems, which are explained below:

Advantages

In this method, the new system has to be implemented in stages, or modules, which is less prone to risk of system failure or errors at health centers, as failure is limited to the implemented module only.

It is also less expensive than parallel system because we have to work only with one part of system at a time.

Disadvantage

As the system, which we are implementing, involves various phased operation like treatment, measuring weight, registration, vaccination etc so it can cost more than the pilot approach.

Parallel operation: The parallel operation changeover method requires that both the old and the new information systems operate fully for a specified period. Data is input to both systems and output generated by the new system is compared with the equivalent output from the old system. When users, management, and IT group are satisfied that the new system operates correctly then the old system is terminated. It is the most costly changeover method and involves lower risks.

Advantage

The advantage of parallel system is lower risk of system failure so all the tasks can be done properly at health centre. If the new system does not work properly, the health centre can use the old manual system as a backup until appropriate changes are made.

Disadvantage

As we know parallel system is the most costly changeover method as both old and new systems operate fully for specified period and we also know that the budget of health centre is also low so it will be difficult for health centre to follow this changeover process.

From the above information, the parallel approach is the most suitable approach which is a combination of fewer risks as well as less implementation cost because while we are running the Library Information Management System we keep track with the manual system to verify and validate that the system is working correctly and it also makes it easier to detect error(s) if any occur. Chance of system failure is minimal.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

This project satisfies the basic needs in the library. The software meets all the requirements of the organization and serves as a tool to achieve readers' delight. It also increases the level of security in the library through efficient record tracking (keeping history of books and library users). The problems, which existed in the earlier system, have been removed to a large extent and it is expected that this project will go a long way in satisfying users' requirements. The computerization of the Library information will not only improve the efficiency but will also reduce human stress thereby indirectly improving human resources.

5.2 Recommendation and Future Work

This study has been done to improve the library system in terms of time needed to get information and certifying that the information gotten is the one intended by the library users. It is strongly recommended that this application be used judiciously to allow easy access to the library's collection and create a stimulating environment for both the students and staff. The application should be evaluated to know its benefits and shortcomings to the library.

In future study, It is recommended that this application be extended to a much larger library and include more functionalities like a networked system from which the libraries' collection can be viewed from anywhere in the world together with modules to add other media items.

Also, a notification should be added to the application which helps the librarian to know when a particular user has not returned a library material.

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APPENDIX

```
import javax.swing.*;

import java.awt.*;

import java.awt.event.ActionEvent;

import java.awt.event.ActionListener;

import java.awt.event.WindowAdapter;

import java.awt.event.WindowEvent;

/**
 * A public class
 */

public class JLibrary extends JFrame implements ActionListener {

    //for creating the JPanel

    private JPanel searchPanel = new JPanel();

    //for creating the JToolBar for the program

    private JToolBar searchToolBar = new JToolBar();

    //for creating the label

    private JLabel searchLabel = new JLabel("Book title: ");

    //for creating the JTextField to use it on the searchToolBar

    private JTextField searchTextField = new JTextField(15);

    //for creating the JButton to use it on the searchToolBar

    private JButton goButton = new JButton("Go");
```



```
privateJDesktopPane desktop = new JDesktopPane();
```

```
privateJSplitPanessplitPane;
```

```
privateJScrollPane desktopScrollPane;
```

```
privateJScrollPane treeScrollPane;
```

```
/******
```

```
 *create objects from another classes for using them in the ActionListener *
```

```
*****/
```

```
privateMenuBar menu;
```

```
private Toolbar toolbar;
```

```
privateStatusBar statusBar = new StatusBar();
```

```
privateListBooks listBooks;
```

```
privateAddBooks addBooks;
```

```
privateBorrowBooks borrowBooks;
```

```
privateReturnBooks returnBooks;
```

```
privateAddMembers addMembers;
```

```
privateListMembers listMembers;
```

```
privateSearchBooksAndMembers search;
```

```
//constructor of JLibrary
```

```

publicJLibrary() {
    //for setting the title for the frame
    super("FUOYE Department of CSC Library System");
    //for setting the size
    Dimension screenSize = java.awt.Toolkit.getDefaultToolkit().getScreenSize();
    //setSize(screenSize.width, screenSize.height - 30);
    setExtendedState(JFrame.MAXIMIZED_BOTH);
    Toolkit kit = Toolkit.getDefaultToolkit();
    Image image = kit.getImage(ClassLoader.getResource("images/Host16.gif"));
    setIconImage(image);

    menu = new Menubar();
    toolbar = new Toolbar();

    // menu bar Action.....

    setJMenuBar(menu);
    menu.exit.addActionListener(this);
    menu.addBook.addActionListener(this);
    menu.listBook.addActionListener(this);
    menu.addMember.addActionListener(this);

```



```

menu.listMember.addActionListener(this);
menu.searchBooksAndMembers.addActionListener(this);
menu.borrowBook.addActionListener(this);
menu.returnBook.addActionListener(this);

//get the graphical user interface components display the desktop
Container cp = getContentPane();
desktop.setBackground(Color.BLACK);
cp.add("Center", desktop);

//for setting the font
searchLabel.setFont(new Font("Tahoma", Font.BOLD, 11));

//for setting the font
searchTextField.setFont(new Font("Tahoma", Font.PLAIN, 12));
goButton.setFont(new Font("Tahoma", Font.BOLD, 9));

//for adding the searchLable to the searchToolBar
searchToolBar.add(searchLabel);

//for adding the searchTextField to searchToolBar
searchToolBar.add(searchTextField);

//for adding the goButton to searchToolBar
searchToolBar.add(goButton);

//for adding listenerAction for the button
goButton.addActionListener(this);

//for setting the layout

```

```

searchPanel.setLayout(new BorderLayout());
    //for adding the toolbar to the searchPanel
searchPanel.add("Center", toolbar);
    //for adding the searchToolBar to the searchPanel
    //searchPanel.add("South", searchToolBar);
    //for adding the searchPanel to the Container
cp.add("North", searchPanel);
    //for adding the statusbar to the Container
cp.add("South", statusbar);

for (int i = 0; i < toolbar.imageName24.length; i++) {
    //for adding the action to the button
toolbar.button[i].addActionListener(this);
}

    //for adding WindowListener to the program
addWindowListener(new WindowAdapter() {

public void windowClosing(WindowEvent e) {
System.exit(0);
}

});

//show the program

```



```
show();
```

```
}
```

```
/**
```

```
 *this method is invoked when an action occurs.
```

```
 *@param ae the action event.
```

```
 */
```

```
public void actionPerformed(ActionEvent ae) {
```

```
if (ae.getSource() == menu.addBook || ae.getSource() == toolbar.button[0]) {
```

```
    Thread runner = new Thread() {
```

```
        public void run() {
```

```
            addBooks = new AddBooks();
```

```
            desktop.add(addBooks);
```

```
            try {
```

```
                addBooks.setSelected(true);
```

```
            } catch (java.beans.PropertyVetoException e) {
```

```
            }
```

```
        }
```

```
    };
```

```
    runner.start();
```

```
    }
```

```
if (ae.getSource() == menu.listBook || ae.getSource() == toolbar.button[1]) {
```

```

Thread runner = new Thread() {

public void run() {
listBooks = new ListBooks();
desktop.add(listBooks);
try {
listBooks.setSelected(true);
        } catch (java.beans.PropertyVetoException e) {
        }
    }
};

runner.start();
}

if (ae.getSource() == menu.addMember || ae.getSource() == toolbar.button[2]) {
    Thread runner = new Thread() {

public void run() {
addMembers = new AddMembers();
desktop.add(addMembers);
try {
addMembers.setSelected(true);
        } catch (java.beans.PropertyVetoException e) {
        }
    }
}
}

```



```

        }
    };

    runner.start();
}

if (ae.getSource() == menu.listMember || ae.getSource() == toolbar.button[3]) {
    Thread runner = new Thread() {

        public void run() {
            listMembers = new ListMembers();
            desktop.add(listMembers);
            try {
                listMembers.setSelected(true);
            } catch (java.beans.PropertyVetoException e) {
            }
        }
    };

    runner.start();
}

if (ae.getSource() == menu.searchBooksAndMembers || ae.getSource() == toolbar.button[4]) {
    Thread runner = new Thread() {

        public void run() {
            search = new SearchBooksAndMembers();

```

```

desktop.add(search);
try {
search.setSelected(true);
        } catch (java.beans.PropertyVetoException e) {
        }
    }
};

runner.start();
}

if (ae.getSource() == menu.borrowBook || ae.getSource() == toolbar.button[5]) {
    Thread runner = new Thread() {

public void run() {
borrowBooks = new BorrowBooks();
desktop.add(borrowBooks);
try {
borrowBooks.setSelected(true);
        } catch (java.beans.PropertyVetoException e) {
        }
    }
};

runner.start();
}

```



```
if (ae.getSource() == menu.returnBook || ae.getSource() == toolbar.button[6]) {
```

```
    Thread runner = new Thread() {
```

```
        public void run() {
```

```
            returnBooks = new ReturnBooks();
```

```
            desktop.add(returnBooks);
```

```
            try {
```

```
                returnBooks.setSelected(true);
```

```
            } catch (java.beans.PropertyVetoException e) {
```

```
            }
```

```
        }
```

```
    };
```

```
    runner.start();
```

```
    }
```

```
if (ae.getSource() == menu.exit || ae.getSource() == toolbar.button[7]) {
```

```
    dispose();
```

```
    System.exit(0);
```

```
    }
```

```
    }
```

```
}
```