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DESIGN AND IMPLEMENTATION OF LIBRARY INFORMATION SYSTEM (E-LIBRARY) FOR ABIA STATE COLLEGE OF EDUCATION (TECHNICAL) AROCHUKWU.

OYUNRANTI TUBOSUN LANRE
School of Science Education
Department of Computer Science Education
e-mail: tubormail@yahoo.com

Abstract
This research design intends to provide solution to perennial problem of managing information in Abia State College of Education (Technical), Arochukwu library facility. The product of this research will enhance management of record keeping in the college and ensure that library resources are adequately tracked by providing software tools through which databases of books, staff, students, loan and equipment are created, updates and communicated for smooth running of the college library. The research makes use of combination of programming languages such as PHP scripting language, HTML5, JavaScript, JQuery library, Cascading Style Sheets, MySQL 5.3 database running on Xamp Server, Bootstrap, Microsoft Visio 2010, Microsoft Project 2007 and Microsoft Office 2010. The product of this research is the production of fully functional software package that could be used by both students and staff for electronic cataloguing or classifications of books, tracking of loans to library users and referencing services for academic research.

Keywords: Database, Programming, Library Management System, Computerization.

Introduction

Information is the life wire of every organization both public and private. Accurate and timely information help organization achieve its objectives and goals seamlessly. Every department of an institution or organization needs information system that drives its activities and help fast track its operations to ensure adequate utilization of resources for effective performance.
Library is an important department of educational institution. It is a facility that provides learning resources through which academic activities are enhanced. Library provides learning resources inform of books, journals, magazines, periodicals and maps that help academic researcher derive information useful for learning and research.

Usually, library consists of large volume of books and other resources which are required to be adequately tracked and maintained. Due to large number of these resources stock in the library and as well as services required by the users of the library facility, it has become necessary to keep and maintain records of these resources for accountability and optimal usage.

Traditional method of keeping library records has been through manual classification of books, use of index cards, note books and user's card. This method of keeping records is most inefficient, unpopular and time consuming. It has led to loss of valuable library resources due to difficulty in tracing loans of books to library users. Similarly, referencing and classification are usually slow and tedious which makes it difficult to complete on record time.

Information and communication technology tool provides electronic means of keeping and tracing library resources so that they can be easily accounted for. It also ensures that library records are maintained as at when due. A computerized library management information system will provide electronic database where all the library information will be stores in a computer server. This way, it will be easy to maintain library records and finding or referencing books will be fast using client software through which users can interact with the server database. The system will also make it easier and faster to keep track of loan of books to library users thereby help reduce incident of loss.

Statement Of The Problem

Library being an important part of academic institution needs adequate and efficient management. Information system is central towards management of library resources which include books, journals, magazines, periodicals, computer and other electronic equipment. Traditional (manual) method of managing library records has been proofed inefficient and time consuming. Similarly, maintenance activities such as updating of library records are tedious and frustrating. Tracking and tracing of books loaned and sending reminder to library users are also almost impossible task thereby leading to loss of valuable library resources. Computerized library information system provides alternative or better strategy to solving aforementioned problems. A right combination of hardware and software tools will ensure these problems are minimized or eliminated.

Objectives Of The Study.

This research work intends to produce a software system that will handle the management of library information resources electronically rather than present manual method. Specifically, the research intends to:

(i). Use a cut edge database technology tools to develop computerized database for handling records of books, staff, students, equipment and loan of library resources.

(ii). Use object oriented system to develop a software that will interact with library database for accessing and updating library records in the computerized database.

(iii). Use Internet technology tools such as web browser to provide an electronic platform for accessing or referencing library on-line resources.

(iv). Develop a reporting system that produces reports on books, loan and reminders for quick recovery of library resources.

Advantages of Proposed System

Computerized Library Information system for Abia State College of Education (Tech) Arochukwu (ASCETA) is significant is many ways. The system will help to improve services delivered to library users by reducing time in searching for books and other references in the library. Also, costs are cut down in terms of number of staff required to use the system compare to the old manual system. Data saved in the electronic form help to improve the integrity of the database by eliminating duplication and redundancy Multiple users can access the system at the same time. The system operates electronically hence ensures less space is occupied and also presents a paperless working environment. The system has access control limiting access to restricted areas. User privacy is ensured by providing login functionality which verifies them to determine their authenticity to access the system. Library staff members are motivated by the system since it makes work easier. The system has a friendly user interface which is attractive and easy to use. Information concerning all the library activities is stored in the most secure manner. The system's database is password protected preventing unauthorized access and it can also be backed up easily. Repetition of processes is done away with. The system is easy to manage and administer and can be accessed remotely on any computer connected to the internet.

System Requirements

The system requirement document specifies the purpose of computerized library system and what it must do. The aim of this document is to spell out in unambiguous terms the services provided by the system. As it has been outline the objectives of the study, the requirement services that should be provided by the computerized library information system for ASCETA includes:

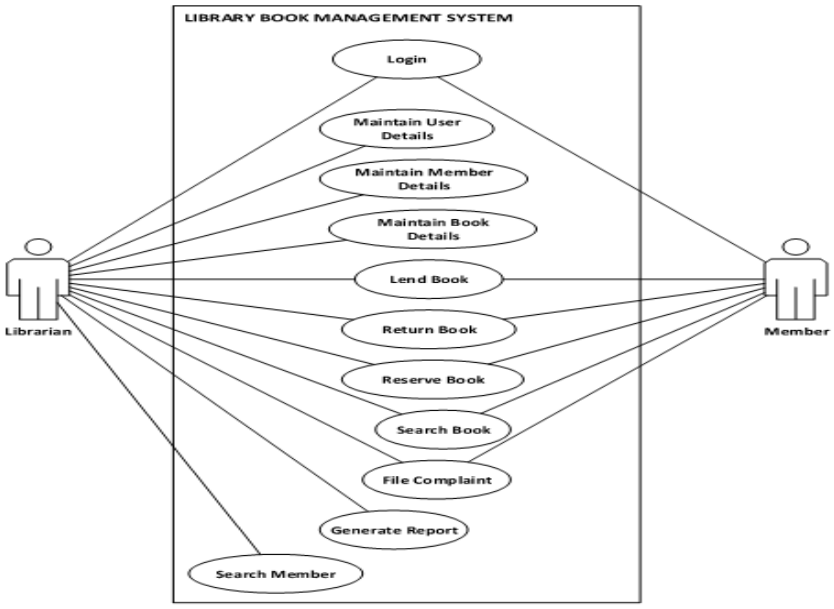
1. Provision of electronic means of storing library information which include records of books, magazine, staff and students and other users of the library.
2. Provision of means of creating attributes of each book and magazine in the library which include the book identification number, title, author, data of publication and as well provide means of tracking their uses including loses.

3. Means of keeping records of library users which include the students and staff of the institution. Such record must include their identification number, names, departments, contact number and access password for remote log in to the system.
4. Mechanism for tracking book loan to library users, this will include keeping of adequate records of borrowers and as well as books or magazine borrow. The information recorded will help the library administrators calculate fine for late return of the book or sending a reminder to a user when the due date is passed.
5. Also, a report generating services will be included in the system to generate and print report on books, magazine, users book issued and loaned out.

Use Case Diagram

The use case diagram helps to model the interactions between a system's client (that is the system users e.g. Liberian, students and staff) and its use cases. It helps to clarify the kinds of interactions users have with a system without providing the detail. The diagram below is a simplify model of use case of library management system for Abia state college of education (tech) Arochukwu.

The system is specifically designed to be used by two categories of users – the system administrator (Liberian) and the non-system administrator. Each of them has a level of control over the system. The administrator is responsible for creating and maintain records of books, magazines and users of the library database. He maintains the control over the system and restrict access based on system censorship over use



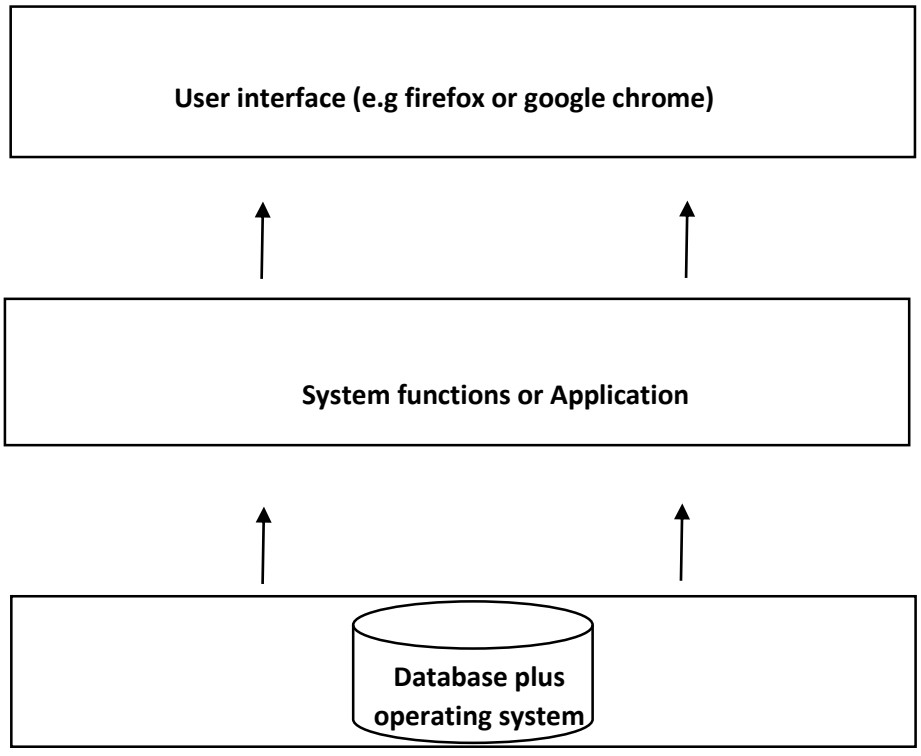
of library information. The **use case diagram** below gives a clear understanding of functions of system administrator

The other users of the system are the staff and students of the college who uses the system to perform varieties of functions such as lend book, return book, search, reserve and file a complaint. Each user of the system is assigned a password for accessing the system from a remote location using web browser. Below is analysis of use case narration for the system.

1. Log-in use case – The user of the system is expected to register with a user name and user id. These information is required by the system as pre-condition for accessing and using its services. The basic flow

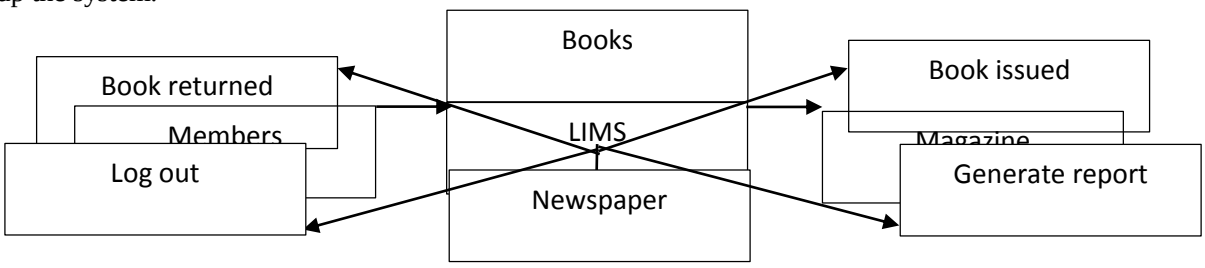
required s user to enter registered user name and password. If the name and password are valid, the system grants access to the system otherwise, the system log itself out after three attempts by the users.
2. Maintain books detail use case – This operation is specifically carried out by the Liberian, he collects details of data on each book in the library and create an electronic version using the application function. He also uses this function to add, edit or modify and delete records of books from the database.
3. Maintain users detail- This service as provided by the application helps Liberian create and maintain records of library users. He can add, edit, delete or query the database for records of each users of the library.
4. Lend book- Library users such as staff and students of the college can access the library database through a web browser to enquire and borrow a book from the library database. In this case, the user log in to the system and make reservation for the book after perusing the information in the database. He can later go physically to collect the book from the library.
5. return book – This function helps the Liberian, maintain the records of books returned back to the library. It can also be used by the Liberian to enquire about the status of books in the library as to know who is yet to return the book after due dates.
6. Search book – This is used to search for books from the library database. The system allows searching of books information based on some criteria or condition. The user can search books using such fields as title, author or data of publication.
7. Generate report – This can be used by the library administrator to generate different kinds of report such as book issued, book loaned, members, newspaper or magazine reports. The system displays the report on screen and allows for print option if necessary.

System Architecture
The Computerized Library Information System for ASCETA uses multi layered approached in the design of the core functionality of the system. The architecture of this system is such that the system layer overlaps each other with layer below supporting the layer above it as show in the diagram below



The first and the most basic layer is the ***operating system, sever and database layer***, this layer provides the link between the system and the operating system that controls the software, the database layer manages all the data stored in the database and provides tools for managing them, the design adopt the use of MySql database management system, the sever host the database and as well provide access by remote system. The ***core functionality layer*** provides all the functionality of the system as seen by the users. The ***user interface layer*** consists of interface elements of the system, this include the log in system, the dash board that provides menu commands through which the users access the system functions. The ***web interface layer*** allows the application to run on the world wide web and for remote log in into the system using web browser.

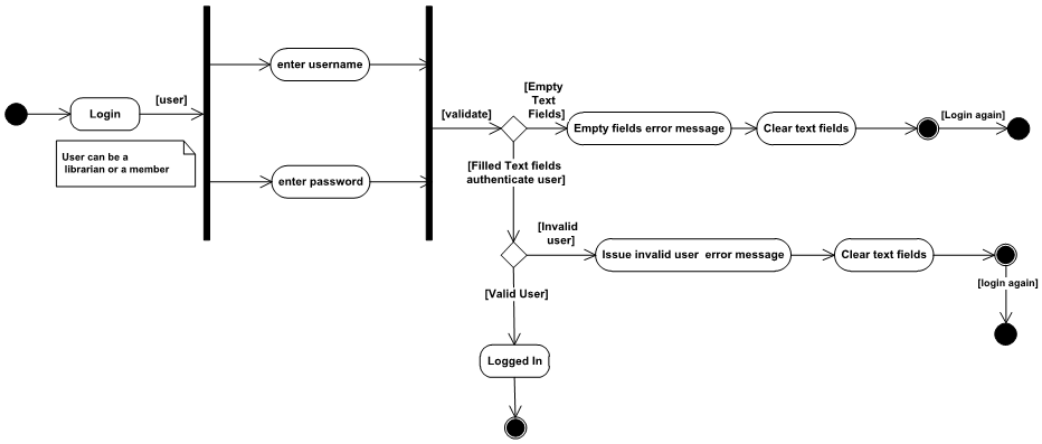
The class design for Library Information Management System
The diagram below shows a simplify version of class composition and interactions among many classes that made up the system.



The system composed of Books, Magazine, Newspaper and Members class which provides various functions of the system. The Book class is responsible for creating and maintaining books records in the database. The Liberian uses the Newspaper and Magazines class to create and maintain the Newspaper and Magazine records in the library database while records of library users (members) are created through the Member class of the system. This system depicts the modular programming techniques that are often used in structured programming.

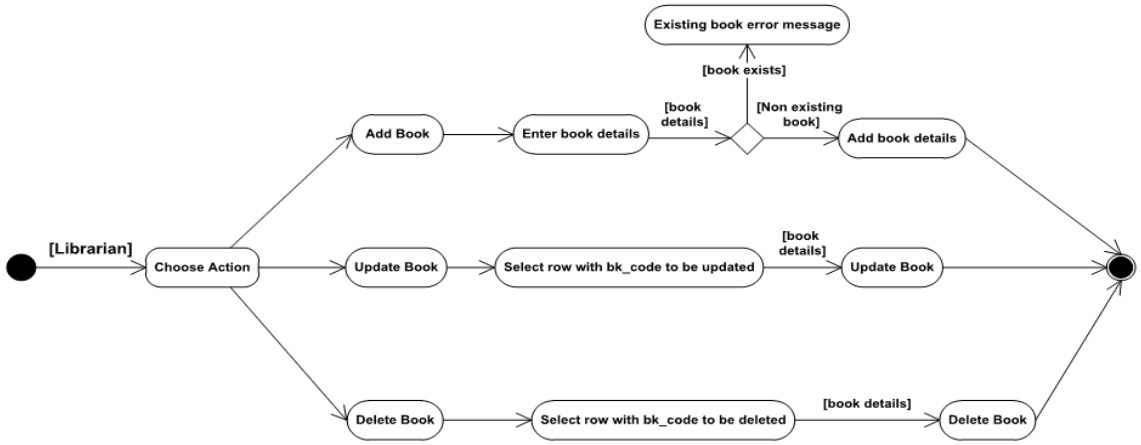
Activities Diagram for the System
The work flow (sequence of events) during the execution of the software can be depicted using the activity diagram. This helps us to understand the action(s) various objects in the system will perform during the program execution. The first action required by the users of the system is authentication. Users are authenticated by means of user name and password.

Log in Activity Diagram



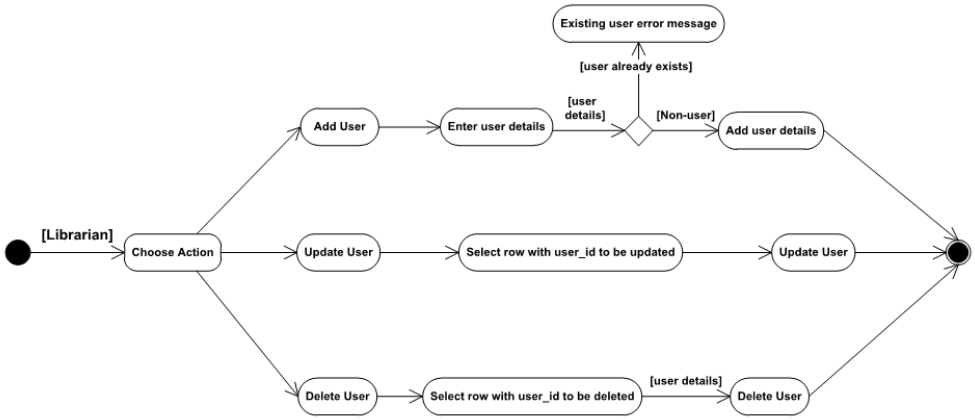
Invalid entries such as empty fields or wrong password trigger error message which makes it impossible to gain access to the system. If user is validated, the system grants him access to the program dashboard.

Maintain Book detail activity diagram.



The maintain book activity diagram shows that the action is initiated by the Liberian. When he selects book from the dashboard of the software, he can choose any of the action presented at the menu (add, update or delete book). This action triggers a series of actions such as selecting the row with bk_code to be updated or deleted. Then finally, he can carry out the action he initiated from the menu.

Activity Diagram for Member.



The activity diagram above shows the series of actions to be performed by the Liberian using the software to create and maintain records of users. The first action is to choose from the available options the type of

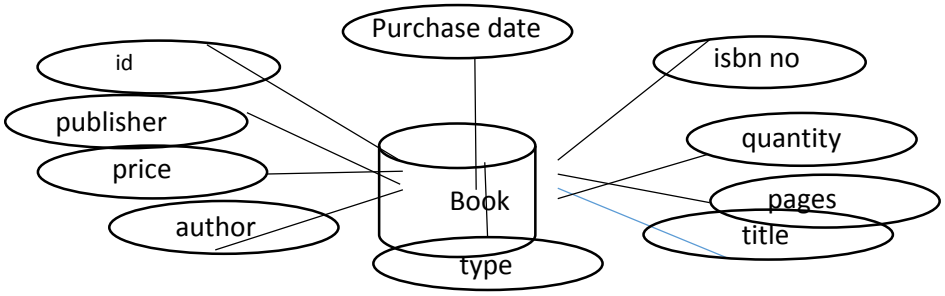
action to be carried out on members' records (add, update and delete) members' information. Any of this option selected triggers further actions such as entering and validating user's details, select row with user's identity to be updated or deleted, then thereafter, updated or added to the database.

The Database Design.

Since the system designed for library is a kind of information management system, database technology tools are involved in the design of database system for the software. The prominent among Data Base Management System (DBMS) is MySQL. MySQL is a DBMS used primarily by developers in most application because of its robustness and rich data structure. The software system for Abia State College of Education (Technical) Arochukwu library system consist of the following main entities that has been identified during system analysis stage of the development includes

1. Books
2. Users
3. Magazines
4. Newspaper

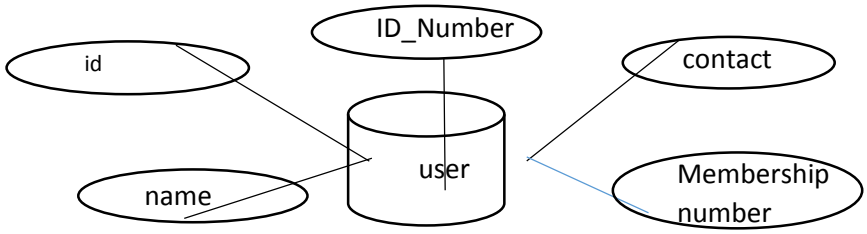
The conceptual structure for Book Entity.



The diagram above is the Book Entity-Relationship diagram, this shows the data items or attributes that make up the book entity, these include the book id (primary key), the title of the book, the ISBN number, the author, publishers, number of pages, quantity supplied and type. These information is used primarily by the management for cataloguing and tracking of books in the library.

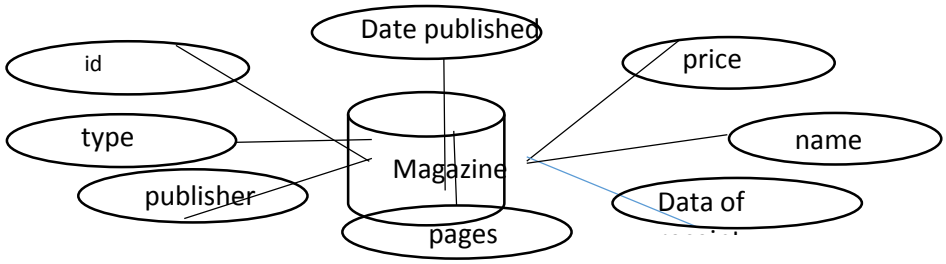
The conceptual structure for Users Entity.

User entity consist of data attributes that helps capture information about users of library resources. These attributes include id, name, membership_number, contact and ID_Number. The diagram below shows the E-R of users' attributes.



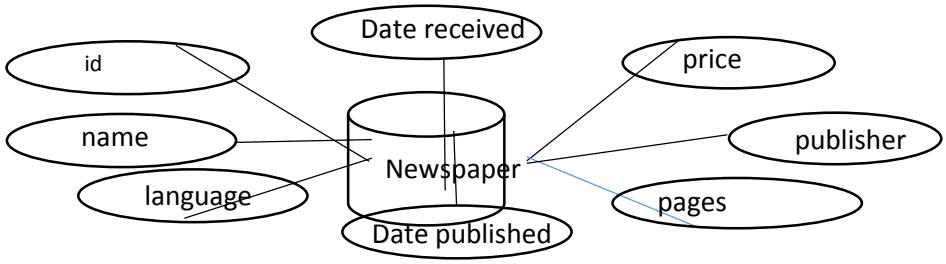
The Conceptual structure for Magazine Entity

The entity structure for magazine is used to store information about magazines in the library which include id, type, name, date of receipt, date published, pages, price and publisher. The description of entity for Magazine is shown below



The conceptual structure for Newspaper

This entity structure stores data items or attributes necessary for managing information about newspaper supplied to the library. The attributes of this entity include id, language, name, date of receipt, date published, pages, price, type, publisher.



Logic Structure design for database

The relational model of the above E-R diagram can be obtained thus:

1. Books (BookId, ISBN, Title, Type, Author, Quantity, Data_Purchased, Edition, Price, Pages, Publisher).
2. Users (UserID, Membership_Number, Name, Member_ID, Contact)
3. Magazine (ID, Type, Name, Date_of_Recepit, Date_Published, pages, Price, Publisher)
4. Newspaper (ID, Language, Name, Date_of_Receipt, Date_Published, Pages, Price, Type, Publisher).

Realization of Database.

The structure for database above can be created as show below.

The Book Information Table

Table structure | Relation view

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	id	int(10)		UNSIGNED	No	None		AUTO_INCREMENT	Change Drop More
2	ISBN_NO	varchar(100)	utf8_general_ci		Yes	NULL			Change Drop More
3	Book_Title	varchar(200)	utf8_general_ci		Yes	NULL			Change Drop More
4	Book_Type	int(10)		UNSIGNED	Yes	NULL			Change Drop More
5	Author_Name	varchar(100)	utf8_general_ci		Yes	NULL			Change Drop More
6	Quantity	int(11)			Yes	NULL			Change Drop More
7	Purchase_Date	date			Yes	NULL			Change Drop More
8	Edition	varchar(40)	utf8_general_ci		Yes	NULL			Change Drop More
9	Price	decimal(10,2)			Yes	0.00			Change Drop More
10	Pages	int(11)			Yes	NULL			Change Drop More
11	Publisher	varchar(140)	utf8_general_ci		Yes	NULL			Change Drop More

Check all With selected: Browse Change Drop Primary Unique Index Fulltext

Add to central columns Remove from central columns

The Users Information Table

Table structure | Relation view

Table structure | Relation view

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	id	int(10)		UNSIGNED	No	None		AUTO_INCREMENT	Change Drop More
2	Type	varchar(40)	utf8_general_ci		Yes	NULL			Change Drop More
3	Name	varchar(100)	utf8_general_ci		Yes	NULL			Change Drop More
4	Date_Of_Receipt	date			Yes	NULL			Change Drop More
5	Date_Published	date			Yes	NULL			Change Drop More
6	Pages	int(11)			Yes	NULL			Change Drop More
7	Price	decimal(10,2)			Yes	0.00			Change Drop More
8	Publisher	varchar(140)	utf8_general_ci		Yes	NULL			Change Drop More

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Add to central columns Remove from central columns

The Magazine Information Table

The Newspaper Information Table

Table structure | Relation view

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	id	int(10)		UNSIGNED	No	None		AUTO_INCREMENT	Change Drop More
2	Language	varchar(40)	utf8_general_ci		Yes	NULL			Change Drop More
3	Name	varchar(100)	utf8_general_ci		Yes	NULL			Change Drop More
4	Date_Of_Receipt	date			Yes	NULL			Change Drop More
5	Date_Published	date			Yes	NULL			Change Drop More
6	Pages	int(11)			Yes	NULL			Change Drop More
7	Price	decimal(10,2)			Yes	0.00			Change Drop More
8	Type	varchar(40)	utf8_general_ci		Yes	NULL			Change Drop More
9	Publisher	varchar(100)	utf8_general_ci		Yes	NULL			Change Drop More

Check all *With selected:* Browse Change Drop Primary Unique Index Fulltext

Add to central columns Remove from central columns

Conclusion

Library being an important part of academic institution should not be left out in enhancing its operation using information technology tools. Library Information Management System is a software program specifically designed to help run operations of the library in the smoothest and effective manner. It is meant to replace the old traditional manual method of keeping and managing library records of books, magazines, newspaper and register of users and loan of books. There are lots of benefits derivable as a result of digitalization of library activities such benefits include, accurate keeping of records, fast access to information, minimizing or eliminating loss of books, instant referencing and enhanced academic activities. The cost-benefit analysis also shows that the system is economically feasible as it helps to generate revenue for the college through charges incur from late return of books by the users. Finally, staff of the library are motivated as their work is made easier by the use of the software program.

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