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# Developing a Library Management System for Managing the Books: A Suggested Model in the Central Library of Cihan University-Erbil

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## **Abstract**

*library management system (LMS) is considered as an advanced way to collect, organize, and process the essential data from library which relates to the borrowing, returning and reservation of a book, our purpose was to develop an LMS for the central library of Cihan University- Erbil in order to solve the issues of the traditional way of managing the library that they use, because it is very slow when it comes to issuing and reissuing of books and prone to errors all of the time, and by using Visual basic.net tool the researcher builds the suggested system. the research's problem is using the traditional way of managing the resources of the library, which results in a lot of errors, in addition to wasting the time, cost, and misplace and lose of the books of the library, the study's questions can be clarified by the following: a) does the library have an electronic system for book issuing? B) does the library have enough infrastructure to execute the suggested model? C) does the way of working in the current system prevents book loss, misplace, ruining and ripping the pages of the book?, the objectives of the research are: developing a library management system that is considered as an electronic way of checking the books issuing, suggesting a model that solves the problems of missing, misplacing and not returning the books of the library on time, simplifying the work of librarians and borrowers by the borrowing and returning system, in addition to designing a printable library ID that can be produced as an outcome of the system.*

**Keywords:** *library, information, library management system, library management.*

## **1. Introduction**

Library is considered as the heart of researching in educational institutes like universities. the library contains the books and scientific resources that is needed by the academic staff, students, and all the science seekers around the world. these libraries need to be managed, which is called library management, that is managing the library's resources and harnessing the libraries employees to prevent any mistakes that may happen during the issuing and reissuing of the books. Depending on the concept of library management and exploitation of the huge advances in technology especially the computer systems ones, some systems have been created to manage the library resources easily and without falling in those past mistakes in the work of libraries. to protect the library resources from being lost or damaged, and these systems are called library management systems. A lot of technologies have been used to build library management systems, such as RFID, cloud computing, IR, and robots, etc.

Library management systems are used to serve both of the employees of the library and the people who will use the resources of the library, to simplify the way of working, to minimize the mistakes that happen during the offering library services, such as borrowing, returning and reservation of the books, and to protect the books of the library from being lost, delayed, or misused, in addition to having an archive for the books of the library. This research is structured as follow: first, literature review for the previous studies about the subject; second, library management and its details; third, the library management

systems; fourth, related kinds of library management systems which is followed by the methods and discussion, then the results and outputs of the study, and the research ended with the conclusions of the study.

## **2. Research methodology**

The research methodology can be summarized as follows:

### **1- Research problem**

The problem of searching using the traditional methods of managing and organizing the titles of books in the library in addition to the lack of reliable database can be relied upon in the case of borrowing a book in addition to the possibility of loss and non-return of books to their places, besides the absence of having a complete electronic record of all book's information, the research problem can be summarized in the following research questions:

- a) does the library have an electronic system for book issuing?
- B) does the library have enough infrastructure to execute the suggested model?
- C) does the way of working in the current system prevents book loss, misplace, ruining and ripping the pages of the book?

### **2- Research objectives**

Research objectives can be clarified through the following:

- 1 - Design a system that collects all borrowed data and returned and rejection of the Central Library of the University of Cihan.
- 2 - Designing an electronic library identity includes all of the data and dates of borrowing and return and the amount of the fine in case of delay or loss of the book.
- 3 - Provide electronic records of all of the borrowed books data, and the returned and borrowed books data which ensures the organization of the work of the library in an electronic manner in order to abandon the traditional method that is full of errors and defects.

### **3-Research importance**

The importance of research can be illustrated by the following:

- 1. The research dealt with the real problem experienced by the Central Library of the University of Cihan, which includes the absence of a system that regulates the process of borrowing and return.
- 2 - The importance of research is in its ability to provide a system that is designed for the electronic identity of the borrower which includes all the information of the borrowers and the available books in the library and books that can be reserved by the borrowers if borrowed by other people.
- 3 - Solving the problem of wasting books or not returning them through the designed system which includes delaying fines or losing fine which includes the whole price of the book in case the book is lost.

### **4- Research Method**

The method of case study was adopted in the study of all the details of the work of the Central Library of the University of Cihan-Erbil. The problems of the library were diagnosed. Accordingly, a system was designed to regulate the processes of borrowing

and return, thus reducing the mistakes of work and loss of books and delays in returning them, and Exceeding the legal period to return the book.

### 3. LITERATURE REVIEW

Due to the essential evolution in the technology that transforms every aspect of our lives, which in turn happens as a result of the evolution of the internet, and the libraries services massive developments, all of this results in development in the library market. (Simmons, 2017:1). The library market has developed in the past ten years, and the new generation of libraries depends on all of the integration instruments, which will help the librarians to use all of the modern tools such as, unified search indexes and Open URL resolvers. (Wilson, 2012,110).

Behnert and Lewandowski, (2015:8) noted that the library provides entrance to the resources and attract the users of the library, and in order to accomplish this goal, the developer of the library should know all the library users are not in the same academic level. In addition to the library facilities services which is established to assist in writing researches, all university's libraries have the learning resources.

In recent years, especially with the demanding information world, higher education institutions namely, universities should initiate an up to date profiles which depends on knowledge management and development of information technologies which should be simultaneous with the developments in learning and education (Mole et. al, 2013, 183). And, nowadays, with the increased use of the internet, which makes it easier for most of the individuals to have digital skills, and with the current state of societies to be information societies, it will encourage and increase the individuals learning and make them skillful in utilizing modern technologies. (Balina, 2014: 414)

Digital libraries have appeared to make a combination between the libraries divergent assets and properties and the individuals who use the libraries resources, hence that digital libraries have been developed from uncomplicated user interfaces to libraries that depend on complex networks and communication that assist cooperation between the various utilizers around the world. (Barbuti et.al, 2014:128). As an example of this is the open sourced digital library system that is produced by Green Stone which is a software whose it's source code is protected by the General Public License, and any library user can utilize this software by downloading it then updating and changing the software according to their needs, and then spread the updated version. (Parichi and Nisha, 2015: 16).

Academic libraries evolved through accelerated developments because most of the libraries have shelved their content in computers and this have saved a lot of space for the student to search, study and learn and study ( Heidi Simmons, 2018: 1) Cabrerizo et.al.(2015: 2) noted that academic libraries especially the digital ones assist their users by enabling them to search and examine the contents of the library and gain the specific type of information that satisfies their needs.

### 4. LIBRARY MANAGEMENT

Library management means having a lot of work and time to perform its activities, and also make it easy to circulate the book from the library to the user and vice versa, As an example the library management system that depends on radio frequency identification (RFID), works remotely by encryption and other technical features (Zhang and Win, 2017: 1). there are a lot of problems that face the librarians and the workers which can be described by the following: (Pandey et .al, 2017:1) (a) Following the data of the borrowed books by the teachers and students and other academic staff, (b) The difficulty of specifying the definite number of borrowed and returned books. (c) The challenge of keeping the library's information up to date. (d) The challenge of following tangible

books because the borrowers move the book from its place and never return it to the correct place on the shelves.

Library management emphasis on library purposes. and the libraries of the University execute a lot of ideas of the institutions, a lot of libraries models of management, for example a lot of models of library management are suggested for university libraries for example these type of management which depends on teams (Tuamsuk, 2013:96).

## 5. LIBRARY MANAGEMENT SYSTEM

the traditional management of libraries waste a lot of the efforts of the human resources and workers which makes the book circulation in the library really slow. It also results in wasting a lot of reader's time, as the book reservation process takes a huge amount of time too, which will cause the library to be inefficient in the quality of its services. (Zhang and Weng, 2017: 1). Besides, the problem of unhurried way of giving services to library users in traditional management of library, there may be some other problems like, borrowing the book by book readers but never returned, damaging books or ripping off the pages. Comparing with traditional management and library, web-based library management system (WBLMS) is a library environment which gives privacy, security and detailed services to students and library workers. (Gharanai, 2016:1) (LMS) includes programmed software that uses the employees of the libraries to execute functions that work with a modulated monitor and this lowers the consumed time for the book borrowing and returning circulation, prevents book theft and makes the arrangement of the bookshelves more organized. (Markakis et.al, 2014: 3185). Lontar library is a basic example of the automating of libraries, which is used as a library information system in a few universities around Indonesia (Hermansyah, 2016:41).

(Centuri3n and Inchausti, 2016: 1) noted that the library management system is a type of a system that organize the books in a way that create a strong relationship between the library and the books borrowers and users, such as borrowings, reservations and the returning of the books, and the system can utilize all of this information to prepare statistics and reports that relate to the work of the library.

(Chang, 2018:126) stated that academics and faculty members in the university and educational institutions are the main beneficiaries of the Library management systems resources, regardless of the certificates and experience that they have in the library management system.

Library management systems can be open sourced or commercial systems, evergreen and Koha systems are examples of open source library systems. Using of these systems has many advantages such as the ability to be updated and changed according to the changes of the needs and the ability to adapt the system to work in all circumstances, the ability to build the system with the lowest level of costs. (Chen and Albee, 2012:221). Also (Rai and Kumar, 2011:122) stated that the library management system depends entirely on the web and simplifies the entrance to other systems and servers online in addition to permitting to gain sources via a single interface.

(Li et.al, 2012: 433) stated that library management system is a type of system that can be built upon two-layered architecture by utilizing client-server technology. this structure has some drawbacks such as the lengthened progression of its cycle and the client obtains most of the resources, and it takes a lot of energy to build in and fix it. (Markakis et .al, 2013: 227) noted that Intelligent library management system has lowered the financial support that the library needs, and maximizes the productivity in the library, (Nayagam et.al, 2017: 1) also suggested That the suggested library system encompasses detecting and determining of the books on the shelves, in order to simplify the work of the librarians. Thus when any book is put in the wrong place on the shelves, an alarm makes loud sound to show that there is an issue to be solved right the way, and when the book is not

returned to its place in the right time, the alarm will work again to notify that there is an issue.

Library information management system can be defined as a unified system which produces information that can be used to do the activities that relate to making decision and their making processes and fulfilling the whole functions that should be performed in the library (Ziveria and Elvander, 2016: 2). Generating library information systems gives us some benefits such as, executing the process of library materials remotely and accelerating the process of gaining information (Normatov and Rakhmatullaev, 2017:1). One of the good examples of practicing library information system is a Malaysian application, Malaysia use the integrated management system utility for managing libraries which is used to help the library workers and librarians to make all of the components of the system work as center of information, such as the information and the calendar of the library. (Bazlan and Rasam, 2012: 248).

## 6. EARLIER WORK IN LIBRARY MANAGEMENT SYSTEMS

There are various types of library management systems which can be used to manage the enormous number of books in the library as follow:

### 1- Integrated book circulation system (Cinthy WI Lindy, 2015:328)

The library management system will be divided into two subsystems, intra library system and inter library. Any libraries that want to join the system should install the application on their computers and then subscribe in the inter library system. The application has the following characteristics: (a) Management for the subscribers of the system. b) Electronic wallet. c) Management of the books. d) Evaluating the books by reviewing them via a special system. e) Borrowing and returning of the books. (Dowlin, 2007:340) clarified the meaning of integrated library management as systems that circulate the books. These systems depend on two dimensions. The internal and external environment. In addition to these dimensions there are two aspects that should be taken into consideration, the first one is the society that the system is giving its services to, and the network that is created to communicate with other automated library systems.

Based on the concept of integrated library system, a new modifications of library system have been come out, such as cloud-based integrated digital library system. By using the clouds software, the services given to the users become faster and easier, and it needs less financial support by the library (Geetha, 2017:1768). In addition, (Kan et.al, 2010:745) suggested that the components of cloud computing library management system is, the infrastructure of the system, and the platform that depends on it, (Li, 2016:1285) noted that the basic characteristic of integrated library systems is concentrating on being open access which means having open access interfaces for the system and backing up the regulation and standards in addition to using the knowledge bases which helps to use data, and to generate relationships between the data in order to support decision making, The main triggers of integration of the library management systems are not only minimizing the expenditures which are considered as a barrier in building library systems, but also maximizing the flexibility of the software in order to personalize it according to the needs of the library (Ponelis and Adoma, 2018: 432).

### a) Recommender library management systems

(Pijitra jomisri, 2018,551) proposed that recommender management system are systems that utilize divergent refining ways to search for a book, based on the using the information of the books which are published in Amazon.com and also having benefits of the titles of the books, the books reviews and rating, by practicing by an algorithm which gain the features of the book that is recommended by the user and compare it with the one that matches the recommended characteristics.

b) Radio frequency identification based library management system

Radio frequency identification technology is well known among the users as electronic tagging technology. It can be connected right the way with its goal by using radio frequency signals. Besides, it has the ability to followup and switch data in a very accelerated form. (Cheng et.al, 2016:392).

(Yenurkar, 2017:1070) noted that a sensor will be used to borrow and return books by placing the book near the sensor, every book will be recognized separately, via the tags that are connected to it, and depending only on wireless technology to issue and return any book. (Yenurkar et.al, 2017:1871).

There are three basic components of RFID library system, tags, readers, and middleware. The tags are those types of labels that are capable of saving information and data in bits. the readers are the senders and the receivers in the library system, and the middlewares are applications that are used to manage one or more of RFID challenger to keep the data and rout it back to other systems (Renold and Rani.R2, 2013: 932).This type of system is self-reliant when it comes to the management of information.it consists of hardware and software components which works very good by associating it with some supporting technologies, to use RFID technology, it should be associated with initial LMS that works in the library (Zhang and Wen, 2017: 2).

This system includes the following designs and elements: (Markakis et .al, 2013: 227)

a) Smart radio frequency identification bookshelves that are connected to the computer with a graphical user interface and that make it sufficient to the users.

b) A departing calculator that the borrowers use to finish the book borrowing by using the RFID system.

c) Portal-based RFID system which is used when in-convenient book checks out occur in the system.

There are some benefits of using RFID technology in book circulation in the libraries which can be explained as the follow: (Gibb et.al, 2011:246)

a) Self-auditing which minimizes the number of workers that is needed by the library.

b) Raising the level of user's satisfaction.

c) Increasing the level of security of the system which helps to discover the non-issued books.

d) Giving the workers more important tasks and duties as a result of reducing the traditional work that is basic when working in traditional paper systems.

6- Social library systems

(Jiang, 2013: 7) noted that social library systems are those types of library that provide a huge amount of information their its users. in order to present the resources to them in advance, and then the users will select the ones that they need and keep them in their own personal libraries. In general, the main notion of social library systems is empowering the beneficiaries of the library to know exactly what resources they already have, and what else they need to have in the future.

7- Robotics management system for libraries

MYRIOa system which is considered the center of the working system.The robot steps forward to the shelves of the books and avert any barriers on the way by using a data sensor, while LABVIEW here represents the programming part of the robot which manages the system to return.The robot takes the book from the librarians returning booth and put it back in its place on the book shelve. In this case the robot moves toward the

shelves and cross all of the barriers along the way, and the robot catches the book moves to the table of borrowing and returning, then releases the book on the table in order to be received by the borrower (Gade And Angal,2017:254)

#### 8- Bar code-based Library management

The operation that is done by bar code based systems is very complex and the barcode it a short life span, since it is cracks quickly, In addition the system does not give precise information about the book place, which not only influences the searching effectiveness of the books but also leads to disappointment to the borrower of the library (Cheng et.al, 2017: 392).

9-Open source library management systems This type of software can be classified to Koha, PHP my bible ( Kawagoi and Tominaga, 2011:2). This includes gaining basic information bythe users of the library, the capability of derivation in the library's visitors, and the capability of gaining and processing of the information and data from the external environment, capability of refining cthe information, review the feedback about the outcomes that comes from the users and readers of the library (Hiuxin Chen, 2018,953).

## 7. METHODS& DISCUSSION

The researcher has visited the central library of Cihan Universityseveral times and met the librarians and the people in charge of the work of the library. Beside; the researcher has borrowed books from this library several times, which helped the researcher to know all of the positive and negative ways of current library management in the central library of Cihan University-Erbil, in addition to the collection of information about the way management of the books.

the current way of work includes using a paper ID,which is used by the borrower and made by the librarians, with all the basic information of the borrower written on, the central library has a few employees, and the work of the librarians includes using the Excel sheets that contain most of the names of the library books, to look for a specific book, if found the librarian will go to the book's shelves and look for the willful book, sometimes the book is lost, or misplaced, or borrowed but not returned.This happens in most of the libraries that use the traditional systems of work. most of the library resources are books that relate to, computer science, management and economic science, engineering, literature and English language, law and international relation, we can abstract the problems of the current library management by the following:

- a) Using traditional paperwork, which leads to wasting the time and efforts of both the borrowers and the librarians.
- b) Having the problem of not returning, losing, and misplacing the books, and as well as ripping of pages due to the lack of using fines.
- c) Lack of having a unified system to record for borrowing, returning or preserving any books.

In order to solve the problems of the central library of Cihan University-Erbil, a library management system was designed as a suggested model. The system was programmed by using Visual basic.net programming language and it was considered cost effective and easy to use by the librarians who were working in the library.

In the Administratorlevel of authority : the administrator can do his activities through the system, as followed:

Add librarian This activity contains adding full information about the librarians who will work on the system, like the name, phone number, address, e-mail, date of birth, date of employment, their working shift as some of them work in the morning shift, and the others work in the evening shift, their username, password, their photo. in addition to editing and deleting librarians, this activity is done by the administrator of the system, and can be clarified by the following figure (1):

figure (1)

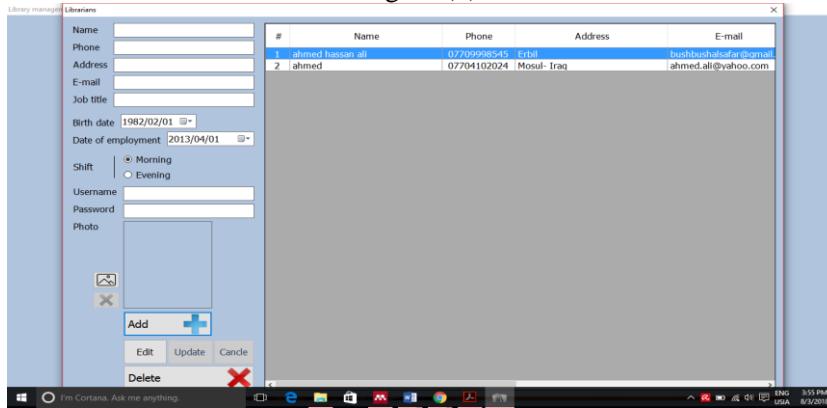


Figure 1. add new librarian interface

**Books interface:**, the books interface can be clarified by the following figure (2), which includes adding new book to the library which can be clarified in figure (3).

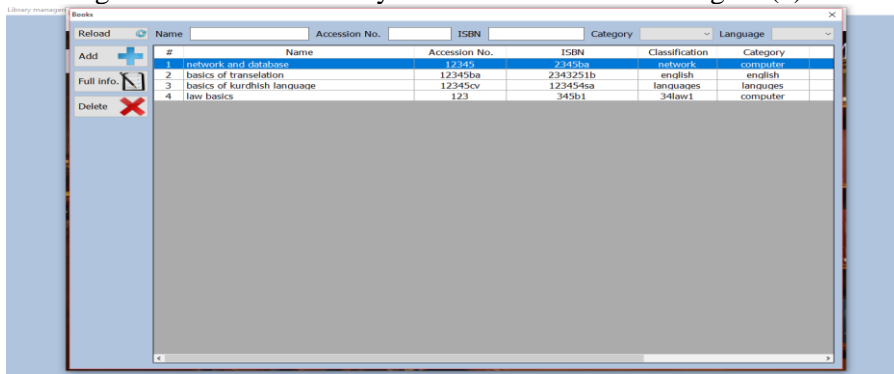


Figure 2.the book interface.

A new book can be added by entering the complete title of the book, and accession number which is a number that is given to any book by the librarian, as well as entering an ISBN which is the international coding of the book. Besides specifying the classification of the new books, some more information is needed; the writer's name, the publishing house, the category of the book, the language of the book, the edition of the book, its place on the shelves, the number of copies of the books, the number of the available books that is not borrowed, the price of the book and the amount of fine if the borrower loses the book. there are two types of fines for the borrowed books, the book losing fine which can be defined over here or the delaying fine for each borrower. The second option in the books interface includes viewing the full information about a book and edit on the book's information or delete this book( figure (3)).

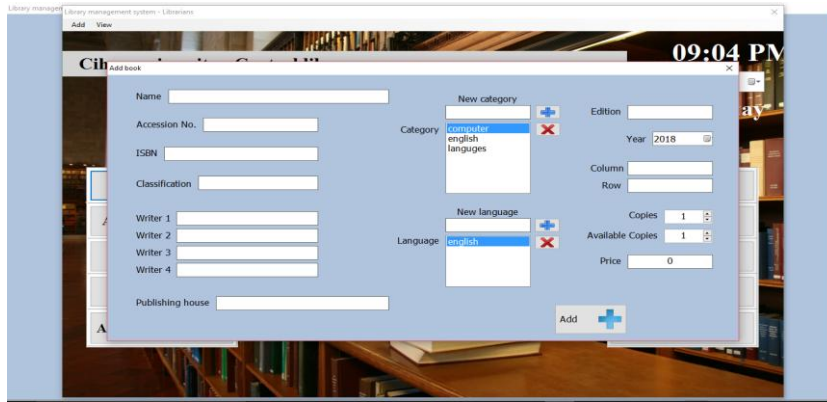


Figure 3. add a new book interface.

### Borrowers interface

The borrower interface includes adding borrower's full information. by clicking on the borrower button the system can add a new borrower, the borrower could be a student, a staff member of the university, or from outside of the university, which can be explained by the following figure:

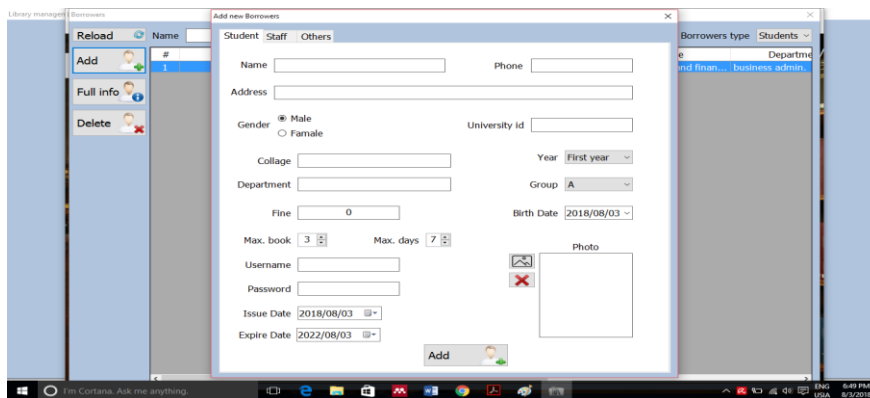
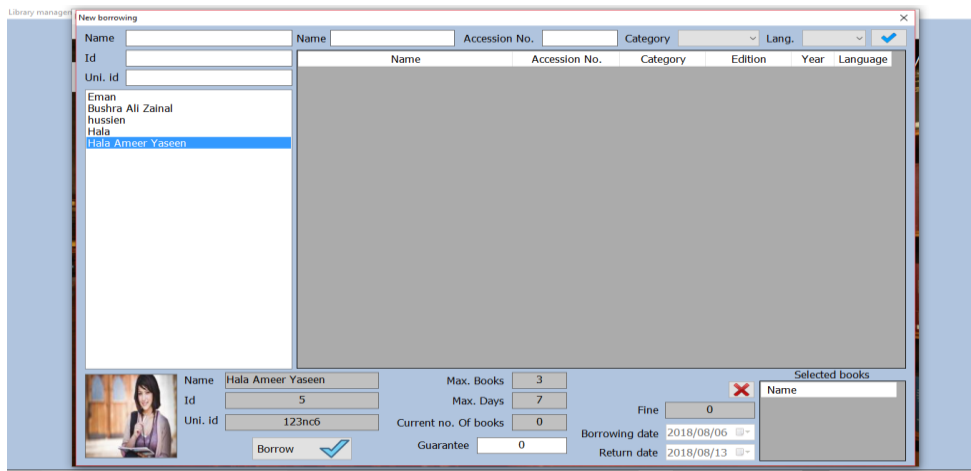


Figure 4. add new borrower interface

The students full information should be applied to the system, which includes the name, phone number, the address, gender, college and department, student's ID number, the year of studying and the group they study in, the fine for (delaying of every book which is 500 dinars for every day as a standard. or the library could define any amount of fine they want according to the case). Also defining a username and a password for this borrower, and most importantly, the issued date of borrowing, and the date of returning the book. Besides, the maximum number of books to be borrowed by the student which is standardly three books that should be returned in seven days, if the return date is coincidentally a holiday the book can be returned in the first day of the new week or after the holiday ends. Finally the user can add a photo for the student to be recognized. When the user clicks on the full information button, and the user over here represents only the system's administrator, the system will view the full information of the borrower, which can also be edited and changed then saved. in addition to the ability to delete any borrowers that are registered on the system. If the borrower is a staff member the same information will be inserted to the system, except changing the maximum allowed days of borrowing, plus the number of books to be allowed which can be more than that of the students. In addition to the students and staff member, people from outside of the university also can borrow books. The only change in this interface is that the librarian of

the system should enter a guarantee which is an amount of money for each book since the borrower is from outside of the university.

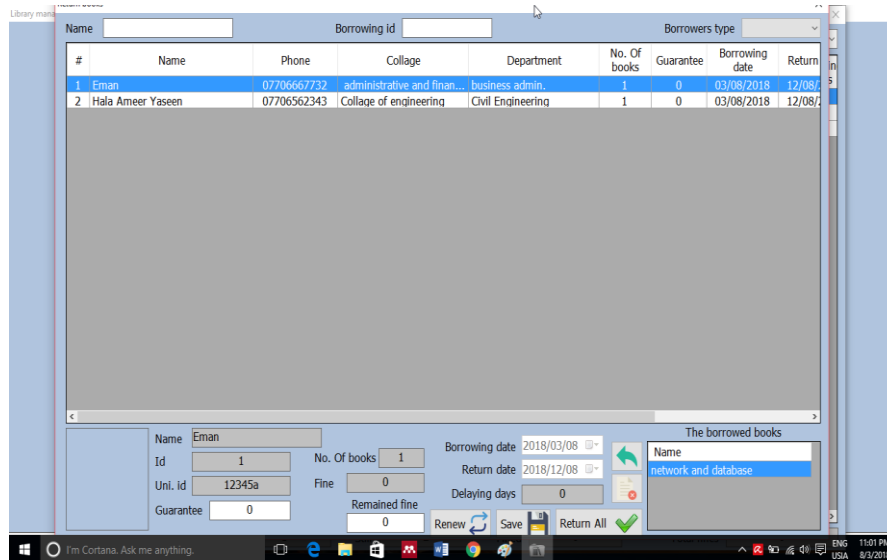
**New borrowing:** a button that is used if the librarian wants to borrow new book, which can be clarified by the following figure:



**Figure 5. add new borrowing interface**

The list on the left side represents the available books in the library which can be extended as the user adds more books. above the list, there is the searching fields to search for a book; the system can use the search by the names of the books, accession number, category and language. The list on the left represents the borrower's name, once the librarian enters the borrower's personal information, photo and full information will appear on the bottom of the borrowing interface; the borrower chooses the book, then press on the blue arrow, the book will be added right the way into the selected books. The user can add more books to this borrowing case until it reaches the allowed limit. The system includes deselection for the book if the librarian makes any mistakes in entering the data. with each selection of a book from the list, the fine value will be increased in case there were delaying in returning the books, the borrowing date takes the current day date, and the return date is the date when the borrower should return the book, with taking in our account the holiday days

**Return a book:** This feature is executed by the librarians and supervised by the administrator. This means that the interface of returning a book can be shown to both of the librarians and the administrator. In the return interface, the list on the top represents the current continuous borrowings which means if the borrowers have not returned the book yet, their name will appear in the list, and if they return the book their name will disappear from this list. Above the list of borrowings, there are fields to search by the name of the borrower, or by the borrowing ID which is on the borrowing receipt. So, by choosing the borrowings, the librarian can view the continuous borrowings according to the type of the borrower whether it is a student, a staff member, others from outside of the university, or all of the types mixed. The returning interface can be explained by the following figure:



**Figure 6. returning a book interface**

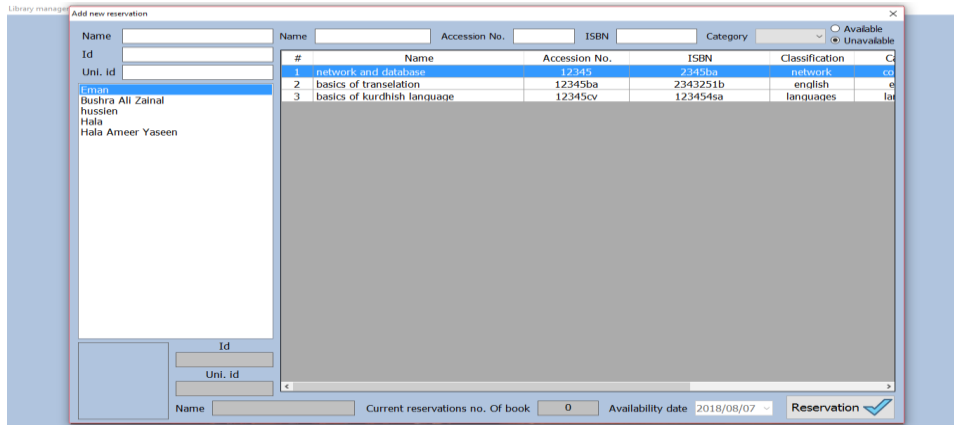
As it can be seen on figure (6), The list on the interface includes of the continuous borrowings that are entered to the system. These borrowings include the borrower's information, the borrowing's information, the date of borrowing, the returning date, delayed days, the counted fine, the remained fine. the delaying days and the fine fields are filled with zero as long as the borrower is not late for the returning date. Let us suppose that there is no delaying in returning the books. and the borrower will return the books in the right time. If the returning has occurred for all of the borrowed books, the librarian will click the return all button. So, as the borrowing is finished and the books are returned to the library. If the borrower has two borrowed books, and he wants to return only one of them, and there is no delaying in returning the book, we can select the book from the borrowed books to list below and press on the green arrow button, the book will disappear and considered returned to the library, but the borrowing is still continuous since there are still books not returned, in such cases we do not click on return all, but on save only. If the borrower wants to return the other books in the next day, the return all will be chosen. If there is any delaying of the returning time, the row of this borrowing will turn to red color, and if we choose it, the bottom of the borrowing interface will show the date of returning, the delaying days, and the fine for this delayed days. If the user returns all of the books, the librarian chooses the return all option and the system will show a message on the screen with the amount of the fine. This message is only for alerting the librarian to take the fine from the borrower. at the time the books are returned to the library and this borrowing is considered finished. for example if the librarian returns the delayed books, the remained fine which is a field that contains the remained fine which the borrower has not paid yet, this field will be empty as the books are all returned and the fine have all paid to the library, As for the fine field it will never be changed, because the administrator will need it in the future, for example, to know how many borrowings ended by paying a fine, and the amount of fine.

In case a book is lost by the borrower, with delaying or without it, the librarian selects the book and clicks on the red x button, a message will pop up that declare the amount of the fine that is calculated when the book is lost, in addition to the delaying fine if found, the fine field will be the summation of delaying fine and loss fine, but when it comes to paying the librarian will receive only the losing fine without the delaying fine for the books that are lost by the borrower, while the delaying fine should be paid by the borrower for the books that are returned and not lost.

The renew buttons is for students only. If the student wants to renew his borrowing, the system will add more tendays' deadline for returning the book. Or to make it clear with an

example, it can be said that the system an example if the student has borrowed a book, and he wants to renew his borrowing of the book, since there is no delaying the renew button will be active, the librarian could click on this button, and the date of returning the book will extend for ten days. The system gives the librarian the authority to renew the borrowing once; if the student wants to renew again, the system will refuse.

**Reservations:** The reservation can be done by two parties, by the borrower through his account via computers in the library, or by the librarian. The reservations can be executed only on books that are borrowed, and not returned yet, the reservation by the borrower includes using (add new reservation) option, when the librarian first opens add new reservation interface he can see the following figure:



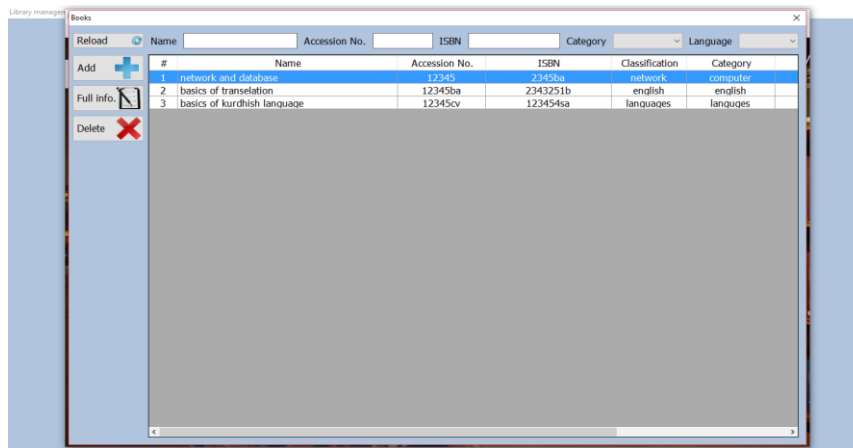
**Figure 7. add new reservation interface**

The available option on the top of the new reservation interface can show the available books to be borrowed right the way without reserving, while the unavailable option shows the book that are borrowed and not have returned and ready to be reserved. A closer look to this interface shows that the left side contains the entered names of the borrowers to the system. So the librarian can search for any name based on name, ID number, university ID. The right side shows a list of the names of the book that are unavailable which they are books that are borrowed and not returned yet, the user can search for any books in the library by its name, accession number, or category, he can pick the name of the borrower, from the left side and the name of the book from the right side then click on reservation button on the bottom of the interface so the book will be reserved over here for this borrower.

## 8. RESULTS

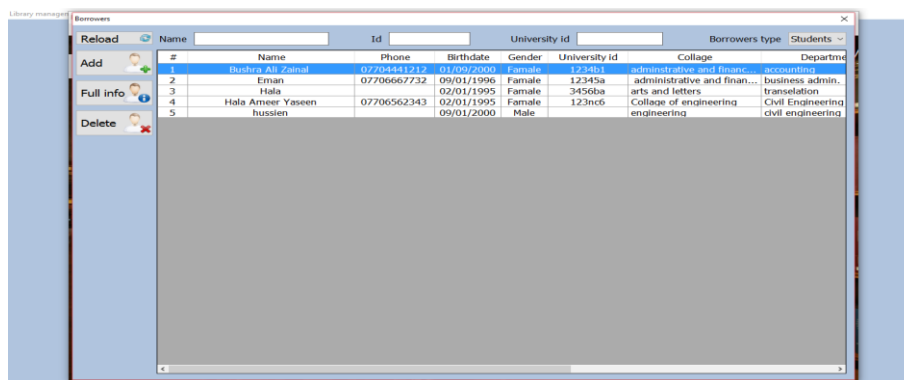
The results of this research can be summarized as the ability to add books and making electronic borrower ID and making borrower receipt. In addition to the borrowing archiving and the borrowings statistics and The output of the suggested system and the benefits that each user of the system have. In figure 7 we can notice that the table on the left side represents the books that are available in the library. The search results could be minimized by using fields that are on the top of the interface. It can be based on the name of the field; the accession number of the book, the international ISBN, the name field, on the top of the interface will be useful to search in the book's names in the library, or using accession number of the books, or the international ISBN of the book, the language of the book (Arabic, English, French, Kurdish), or the category of the book. The administrator can choose the reload option to go back to the previous case of showing the whole books of the library, this activity can be practiced basically by the librarians or sometimes by the

administrator for supervision. The books interface can be clarified by the following figure:



**Figure 8. the books interface**

**Borrowers:** the borrowers tab include searching for the borrower by the ID number, or the University ID number if it's a student or a teacher, or the user can minimize the search results by selecting the borrower type, a student, teacher, or others from outside of the university, or by pressing on the reload button to regain the previous case of search results which contains the whole results, as it is explained in the following figure:



**Figure 9. the borrower's interface**

#### **Add new borrower interface:**

Once the librarian clicks on the add button in the add new borrower interface which has been clarified earlier, a library ID card will be created as a replacement for the traditional way of making ID's. This way depends on printed ID of the library. In this way each person who wants to borrow a book will be able to make library ID card right the way. Without the need to depend on the traditional way. This identification of the library (ID) could be clarified by the following figure:

  
**Kurdistan Region- Iraq  
 Presidency of Cihan  
 Central Library**


---

**Library ID**  
**5**

Name : **Hala Ameer Yaseen**  
 College : **Collage of engineering**  
 Department : **Civil Engineering**  
 Year : **First year**  
 Gender : **Famale**  
 Phone Number : **07706562343**  
 Job Title :  
 Username : **hala1**  
 Issue Date : **03/08/2018** ... Expire Date : **01/08/2022**

**Figure 10. library’s ID of the borrower**

The borrowing receipt: to complete the borrowing on the new borrow interface, a printable borrowing receipt will appear on the screen whenever the librarian clicks on borrow button. This receipt explains the details of the borrowing; the borrower’s information and the fine if the borrower losses the book, or delays returning of the book. It can be clarified in the following figure:

  
**Kurdistan Region- Iraq  
 Presidency of Cihan  
 Central Library**

---

**Borrowing receipt**  
**3**

Id : **5** ..... Date : **..03/08/2018..**  
 Name : **Hala Ameer Yaseen** ..... Time : **..10:22 pm...**

#	Book name	Accession No.	Price
1	network and database	12345	10,000

No. Of books : **1** ..... Guarantee : **0** ..... IQD  
 Max. Days : **7** ..... Borrowing date : **..03/08/2018.**  
 Return date : **..12/08/2018.**

\* If the returning of the books is delayed from the date of returning . A total fine will be calculated for each day which is .....**500**..... IQD.  
 \* If the book is lost, You will be responsible to pay the triple price of the book.

**Figure 11. the borrowing receipt**

The guarantee field in the receipt above is left empty because the borrower is from the university, If the borrower is from outside of the university, the system can register an amount of money for this book to guarantee that the book will be returned on time. Sometimes when the librarian clicks on on to select a book to be borrowed, the system will show a message that says the book is preserved for someone else; This means that the librarian cannot make a borrowing for this book because it was reserved. If the borrower has a continuous previous borrowing and the book is not returned yet to the library, and he wants to borrow additional books, as an example a person has borrowed two books and he wants to borrow two other books, the system will refuse his request and show a

message to the librarian that says that the borrower have crossed the allowed limit to borrow a new book, and he is allowed only to borrow one extra book since the allowed limit is three books, as a standard.

**Borrowings Archive :** It includes all of the borrowings that can be viewed by the user whether the borrowing was finished or not. The administrator will see all details of all of the continuous and finished borrowings. while the librarian will be able to see the continuous ones only, and he will not be able to see the whole archiving. and the number of borrowings. The admin will see a list with all the borrowings and its details like the ones on the returning page but the difference that it shows all of the continuous and finished borrowings. This interface can be explained by the following figure:

#	Name	Phone	Collage	No. Of books	Guarantee	Borrowing date	Return date	Delay in days
1	hussien		engineering	1	0	03/08/2018	13/08/2018	0
2	hussien		engineering	1	0	06/08/2018	13/08/2018	0
3	Eman	07706667732	administrative and finan...	1	0	06/08/2018	13/08/2018	0
4	Bushra Ali Zainal	07704441212	administrative and financ...	1	0	06/08/2018	08/06/2018	0
5	Hala Ameer Yaseen	07706562343	Collage of engineering	1	0	04/08/2018	08/05/2018	0
6	Hala Ameer Yaseen	07706562343	Collage of engineering	1	0	03/08/2018	08/04/2018	0
7	Eman	07706667732	administrative and finan...	1	0	03/08/2018	08/04/2018	0
8	Eman	07706667732	administrative and finan...	1	0	03/08/2018	08/03/2018	0

Figure 12. the borrowing archive interface

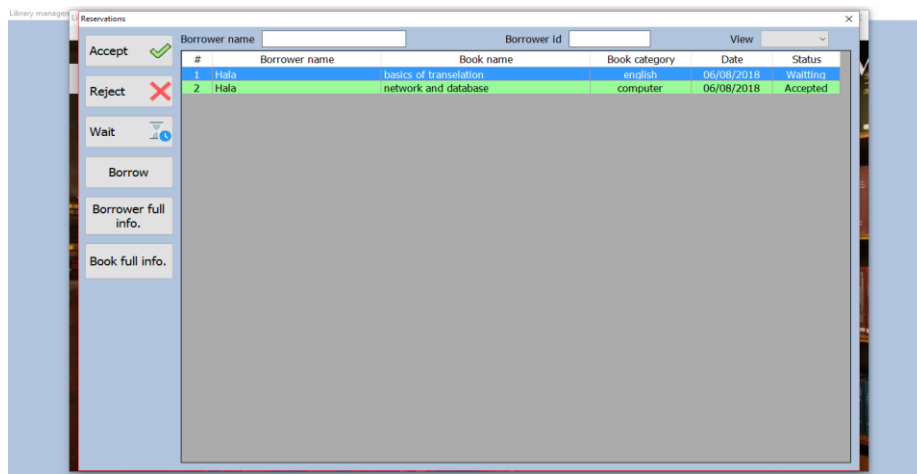
The administrator authority over here is the ability to show the borrowings that occur in between two dates. on the left side of the interface there are few options, all option show all of the borrowings; done option shows only the finished ones, still option shows the continuous ones, while fined option shows only the fined ones. Below these options there are other options to show the data for this month, last month, last 6 months, last year, or all. On the bottom of the interface there are counters for the summation of borrowings, the summation of the continuous ones, and the summation of the finished ones, the fined ones and the total fines. When the administrator clicks on one of the rows of the list, a pop up window will appear to show the borrowed books for this borrowing.

The Book statistics interface is viewed only to the administrator which contains two date tools, a list that shows all of the books, the number of times it has been borrowed. The books here, will be shown in order from the most borrowed to the less borrowed, figure 13 shows the book statistics interface.

#	Name	Accession No.	Classification	Category	Language	Count of borrowing
1	network and database	1224D	network	computer	english	0
2	basics of translation	12345ba	english	english	english	1
3	basics of kurdish language	12345cv	languages	languages	english	1

Figure 13. the books statistics interface.

**Accept, Refuse or Delay Reservations**once the reservation request is sent to the system either by the borrower or by the librarian, the librarian can accept, turn on wait, or reject the reservation, and this is done by the reservations interface which can be clarified by figure 14.



**Figure 14. reservation interface (accept reject, wait)**

The borrow Button in the reservation interface is used when there is a reservation, and the student can come to receive the book, when the librarian clickson thisbutton, the system will take the librarian right the way to new borrowing interface and automatically selects the book from the list on the left, and the borrower from the list on the right. The librarian's only duty over here is to click on the green arrow above the interface, the book is inserted down the interface, then the librarian clicks on borrow, a receipt is printed, which is the final operation. The borrow button here is possible to use when there is an accepted reservation and the person who asks for the book comes to receive it. The librarian here selects borrow and register this borrowing in the name of the reserved person of the book, the system here will move from this interface to the new borrowing interface, and the system will select the borrower and the book automatically. This means that a normal borrowing will occur over here but the system will move the borrower from the reservation interface to the borrowing interface and select the borrower and the borrowed book automatically. There is a difference between the reservation and accepting the reservation; the reservation process is done by the borrower or the librarian, the borrower can reserve by entering the system by his user name and password by the libraries computer and then complete the reserving process, the acceptance of the reservation is done by the librarian, who is free to accept or reject or return some accepted reservation to the waiting case or totally reject the whole reservation. This means that every reservation can be accepted by the system automatically, and the librarian is free to accept the reservation, make it wait, or reject it. The borrower full information option means that the librarian can view the details of the borrower, and the book full information optionhelp the librarian to view the whole information about the book.

There is a reject option. Which let the librarian reject any reservation whether it is on the waiting case or already accepted. The librarian can change the book from the accept case to waiting case.The blue field on the list on the left represents the waiting reservations and the green field represent the accepted reservations. Any reservation that is rejected automatically disappears from this list. While it can appear on the borrowers account as rejected.

In the borrowers side,there is a lot of option the the borrowers interface as can be shown in figure 14 The green field shows the accepted reservation, while the white one shows the waiting reservations, and the red one shows that the reservation is rejected. The

borrower also can delete any reservation request that is on the waiting case, but he cannot delete it if it is accepted or rejected. The system will accept the reservations automatically once the book is available, or the librarian can accept to reserve the book manually by clicking on accept option. The accepted reservations will appear in green, and the book will be reserved for the borrower whose reservation is accepted. It means that if the librarian tries to give the book to another person, the system will reject, and show a message that says that the book is reserved. If the reserved person is late in receiving the book for two days, the system will reject his borrowing case and finish it. So the book will be transmitted to next reserved person. This can be shown in figure 14.

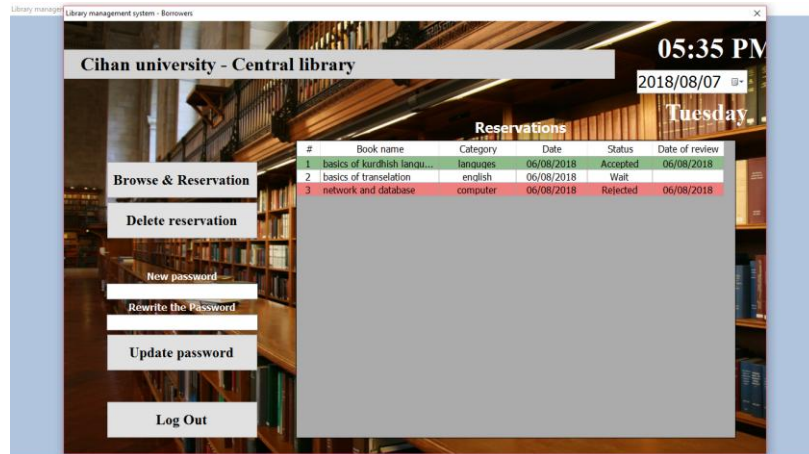


Figure 15. borrower's user interface

The borrowers will be able to view the available books on the library, or opt to make a reservation for any book through the unavailable option. Then click on reservation. Whenever the borrower makes a reservation, the librarian will be able to accept, reject or choose the waiting case for any reservation request as it is explained before. The borrower can check the status of his request by using his account. The use of the system results in saving the time of borrowing, returning and adding reservations, which can help the student to reserve any book that is not available in the library and still in the borrowing case. Previously the work of the library used to be slow, and full of massive errors but after developing the new suggested system, the librarian can do their duties very smoothly and easily without wasting a lot of time in registering, making ID cards, and returning which used to have a lot of problems in the paperwork system. but by using this new suggested system the librarian's work will be almost without errors due to the organized issuing and reissuing. In addition to the reservation function that is added to the libraries duties.

## CONCLUSIONS

The traditional way of managing libraries has a lot of pitfalls like wasting time, book returning delay, the research concludes that the suggested system tries to solve the problematic issues of the library. The suggested system depends generally on having a few computers inside of the library in order to permit the students and borrowers to reserve a specific book. The system has three types of users; administrator, librarians, and borrowers. There is no returning the book problem since the system gives a receipt with every borrowing that tells the borrowers about the specific time of returning the book, and the consequences of not returning the book on time or losing it. In addition, the system makes the library ID creation very easy since with inserting every new borrower's information to the system, the librarian can make and print ID cards for the borrowers very easily. Beside the ability of a system to have a reserved history of all borrowing and

the fines on these borrowings. It also gives the chance to the borrower to reserve any borrowed book. The system solves the problem of misplacing the book since every book in the library has a specific place by category, row and column. The system also allows the librarians to view the borrowers and their issuing and reissuing dates, the fines specified for each day of delaying and this solves the problem of not reissuing on time. In addition to having a loss fine which equals the price of the book. Every person from outside of the university should pay a guarantee through the system. Overall, the system simplifies the work of librarians, and maintains the resources of the library from losing, destruction and damaging.

## References

Balina, S. (2014). Public Libraries – Facilitators of Information Society and e-Inclusion in Latvia. *Procedia - Social and Behavioral Sciences*, 109, 412–416. <https://doi.org/10.1016/j.sbspro.2013.12.482>

Barbuti, N., Ferilli, S., Redavid, D., & Caldarola, T. (2014). An integrated management system for multimedia digital library. *Procedia Computer Science*, 38(C), 128–132. <https://doi.org/10.1016/j.procs.2014.10.021>

Behnert, C., & Lewandowski, D. (2015). Ranking Search Results in Library Information Systems - Considering Ranking Approaches Adapted From Web Search Engines. *Journal of Academic Librarianship*, 41(6), 725–735. <https://doi.org/10.1016/j.acalib.2015.07.010>

Cabrerizo, F. J., Morente-Molinera, J. A., Pérez, I. J., López-Gijón, J., & Herrera-Viedma, E. (2015). A decision support system to develop a quality management in academic digital libraries. *Information Sciences*, 323, 48–58. <https://doi.org/10.1016/j.ins.2015.06.022>

Carter, E. W., & Leaman, B. M. (1982). *Library M üBibliothè e*, (331), 1768–1773.

Centurion, A. A., & Inchausti, W. (2016). A proposal of clustering techniques applied to a Library Management System. 2016 XLII Latin American Computing Conference (CLEI), 1–11. <https://doi.org/10.1109/CLEI.2016.7833365>

Chang, Y. W. (2018). Exploring the interdisciplinary characteristics of library and information science (LIS) from the perspective of interdisciplinary LIS authors. *Library and Information Science Research*, 40(2), 125–134. <https://doi.org/10.1016/j.lisr.2018.06.004>

Chen, H. (2018). Evaluation of Personalized Service Level for Library Information Management Based on Fuzzy Analytic Hierarchy Process. *Procedia Computer Science*, 131, 952–958. <https://doi.org/10.1016/J.PROCS.2018.04.233>

Chen, H. liang, & Albee, B. (2012). An open source library system and public library users: Finding and using library collections. *Library and Information Science Research*, 34(3), 220–227. <https://doi.org/10.1016/j.lisr.2011.12.001>

Cheng, H., Huang, L., Xu, H., Hu, Y., & Wang, X. A. (2016). Design and implementation of library books search and management system using RFID technology. *Proceedings - 2016 International Conference on Intelligent Networking and Collaborative Systems, IEEE INCoS 2016*, 392–397. <https://doi.org/10.1109/INCoS.2016.35>

Gade, A., & Angal, Y. (2017). Automation In library management using LabVIEW. 2nd International Conference on Computing, Communication, Control and Automation, ICCUBEA 2016. <https://doi.org/10.1109/ICCUBEA.2016.7860133>

Gade, A., Bsiotr, J. S., & Bsiotr, J. S. (2017). Development of Library Management Robotic System, 254–258.

Gharanai, M. H. (2016). Shaping the Afghan learning settings and power to the learners through a high-tech library management system. 2016 IEEE/ACIS 15th International Conference on Computer and Information Science, ICIS 2016 - Proceedings, 3–8. <https://doi.org/10.1109/ICIS.2016.7550750>

Gibb, F., Thornley, C., Ferguson, S., & Weckert, J. (2011). The application of RFIDs in libraries: An assessment of technological, management and professional issues. *International Journal of Information Management*, 31(3), 244–251. <https://doi.org/10.1016/j.ijinfomgt.2010.07.005>

Jiang, T. (2013). An exploratory study on social library system users' information seeking modes. *Journal of Documentation*, 69(1), 6–26. <https://doi.org/10.1108/00220411311295306>

Jomsri, P. (2018). FUCL mining technique for book recommender system in library service. *Procedia Manufacturing*, 22, 550–557. <https://doi.org/10.1016/j.promfg.2018.03.081>

Kan, H., Yang, Z., Wang, Y., & Qi, N. (2010). Research on library management system for CDs attached to books based on Cloud Computing. *Proceedings of the 2010 14th International Conference on Computer Supported Cooperative Work in Design, CSCWD 2010*, 744–747. <https://doi.org/10.1109/CSCWD.2010.5471878>

Kenneth, E. (1985). The "Integrated Library System, 3(5), 340–345.

Li, Y., Zheng, H., Yang, T., & Liu, Z. (2012). Design and Implementation of a Library Management System Based on the Web Service. *2012 Fourth International Conference on Multimedia Information Networking and Security*, 433–436. <https://doi.org/10.1109/MINES.2012.94>

Lindy, C. D., Oktaviani, E., Willy, & Prasetio, Y. L. (2015). Library System Development Implementing Integrated Book Circulation for Interlibrary Loan. *Procedia Computer Science*, 59(Iccsci), 326–330. <https://doi.org/10.1016/j.procs.2015.07.574>

Markakis, I., Samaras, T., Polycarpou, A. C., & Sahalos, J. N. (2014). Safe and efficient design of the shelf antenna in an RFID-based Library Management System. *8th European Conference on Antennas and Propagation, EuCAP 2014, (EuCAP)*, 3185–3188. <https://doi.org/10.1109/EuCAP.2014.6902505>

Markakis, I., Samaras, T., Polycarpou, A. C., & Sahalos, J. N. (2013). An RFID-enabled library management system using low-SAR smart bookshelves. *Proceedings of the 2013 International Conference on Electromagnetics in Advanced Applications, ICEAA 2013*, 227–230. <https://doi.org/10.1109/ICEAA.2013.6632228>

Mole, V., Chatzilia, M., Paraskevopoulos, K., Garoufallou, E., & Siatri, R. (2013). Web-based Information Literacy in an Academic Library: The Example of the Library of ATEI of Thessaloniki. *Procedia - Social and Behavioral Sciences*, 73, 181–187. <https://doi.org/10.1016/j.sbspro.2013.02.039>

Nayagam, V. S. (2017). Radio Frequency Identification Technology for Advanced Library Management, 641–644.

Nisha, F., & Parichi, R. (2015). Greenstone Digital Library Management System – a functional review based on selected criteria. *Library Hi Tech News*, 32(10), 16–21. <https://doi.org/10.1108/LHTN-06-2015-0041>

Normatov, S. (n.d.). Extended model of Access Control for the Library Information Systems.

Pandey, J., Kazmi, S. I. A., Hayat, M. S., & Ahmed, I. (2017). A study on implementation of smart library systems using IoT. *2017 International Conference on Infocom Technologies and Unmanned Systems (Trends and Future Directions) (ICTUS)*, 193–197. <https://doi.org/10.1109/ICTUS.2017.8286003>

Renold, a P., & Rani, R. J. (2013). An internet based RFID library management system. *2013 IEEE Conference on Information and Communication Technologies, ICT 2013, (Ict)*, 932–936. <https://doi.org/10.1109/CICT.2013.6558229>

Saarti, J., Luokkanen, S., Ahlqvist, A., & Lager, L. (2015). Towards a new library system: A paradigmatic shift in the Finnish library system planning and acquisition. *Library Management*, 36, 2–11. <https://doi.org/10.1108/LM-07-2014-0081>

Simmons, H. (2018). A Framework for the Analysis and Management of Library Security Issues Applied to Patron-property Theft. *Journal of Academic Librarianship*, 44(2), 279–286. <https://doi.org/10.1016/j.acalib.2017.12.021>

Tuamsuk, K., Kwiecien, K., & Sarawanawong, J. (2013). A university library management model for students' learning support. *International Information and Library Review*, 45(3-4), 94-107. <https://doi.org/10.1016/j.iilr.2013.10.002>

Zhang, J. F., & Wen, C. J. (2017). The University Library Management System Based on Radio Frequency Identification. 10th International Congress on Image and Signal Processing, BioMedical Engineering and Informatics (CISP-BMEI 2017).

Ziveria, M., & Elvander. (2016). Web based Biblical library information system Lembaga Alkitab Indonesia - Jakarta. 2016 13th International Joint Conference on Computer Science and Software Engineering, JCSSE 2016. <https://doi.org/10.1109/JCSSE.2016.7748900>