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DEVELOPMENT OF SYSTEM FOR ORGANIZING ELECTRONIC LIBRARY CATALOGUE

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Finally I would like to thank my family for the continuous love and support they have given me throughout my time I could not have done it without them.

INTRODUCTION

Topicality

A library is a collection of informations, materials that is obtainable to the people. The library usually contains these materials in physical or in a digital appearance. In the past centuries the access to the materials and information was usually in the library halls only.

As the technology evolved and developed the access can be not only from the halls of the library but also online by click of a button and the help of many software's that are available for the user to use.

You interact with technology in everyday by using windows and spree sheets you use the technology every day.

Here's a short summary of the origins of software system development and the current state of it so what Is Software?

Simply, software is the interface between computer systems and the humans who use them software consists of programming instructions and data that tell the computer how to execute various tasks. These days, these instructions are written in a higher-level language, which is easier to use for human programmers, and then changed and converted into low-level machine code that the computer can directly understand it today, software has become ubiquitous, even in places that you might not expect it, from crock pots to nuclear submarines [1].

Some programming languages, like C and COBOL, have survived the test of time and are still in use. So it's very obvious and useful to make a library management system using the developed tools that arrived to us from generation to generation.

Library Management System is a system built to handle the functions of the library.

Libraries depends on library management systems to manage the relation between the collections of books and relationships with it members.

Library management systems help libraries keep track of the books and their

checkouts as well as members subscriptions and their profiles.

Library management systems also involve maintaining the database for editing and modifying new books and tracking books that have been checked-out with their respective due dates.

So it is an application used by librarian to manage the library using a smart system where the librarian can compute various transactions like issue of books, return of books, addition of new books, addition of new users etc.

Books and users maintenance modules are also included in this system which would keep track of the user using the library and also a detailed description about the books a library contains. With this computerized system there will be no loss of book record or member record which generally happens when a non-computerized system is used.[11]

In addition, report module is also included in Library Management System.

Admin, is able to generate different kinds of reports such as list of books, issue and return reports and the users that made the reservation all these modules are able to help librarian to control the library with efficient way as compared to library systems which are not managed[2].

Research goal and objectives

The goal of the research is to develop a Library System with a user-friendly Interface that will manage the activities in the library providing easy access of library usage for librarian and users and also help librarians keep track of library information etc.

This system will offer electronic means of storage and facilitate librarians of keeping track of library info.

To archive our goal we have to solve the following:

1) to develop a system that ensures privacy of its users;
2) to enable easy maintenance of members and book details;
3) to enable easy reservation of books by searching the system;

4) to design a system that consider timely manner;

5) to enable easy method of reservation and returning books;

6) to enable secure and portable database that don't accepts duplicated information's;

7) to ensure paperless environment.

The practical significance

This project is functional and useable for most of the library business in any library across the world wide because it contains a lot of features to assist the librarian or a user and the administrator.

Its very handful to help any type of users whether students or basic readers as well as workers of the library to keep the library in order and reduce the human efforts.

As I mentioned it contains features that are suitable for usual people and library's workers:

- fixed and secured access for the data for the users because the user will access the system using his phone number Saving time and efforts while working on the system;
- can easily search books author, Title, Accession No, and Publication;
- defining the books with the details on the system;
- effortlessly the users can check the books and the availability to borrow;
- smartly process to calculate the borrowed and returned books recorded in the system and its done automatically;
- easily for the user to check his borrowed books with the returned date;
- unlimited number of users;
- ability for making reports.

Structure of the thesis

The thesis consists of four chapters, introduction, conclusion and reference list.

In the first chapter, the problem statement is given in details, the comparative analysis of the existing applications is given. Also the description of the used development tools.

In chapter two, there is a description of functional requirements use case diagram, database scheme and the design of the application's interfaces.

In chapter three, we show several fragments of source code for implementing the basic functionality of the system.

Chapter Four is devoted to the testing of the application. It contains the results of functional, and usability testing.

1. THE ANALYSIS OF THE SUBJECT AREA

1.1. The problem statement

In our life and due to the evolution and everything is becoming more complicated and useful at the same time, with the evolution of the technologies appeared many useful tech that helps the user for day-to-day task.

Libraries on another view are complicated systems that have procedures and functions, these functions (subsystems) have included materials, categorization and sorting, for example loans, books management, and reference services. The main function, however, has been the provision of service to the users. For decades, librarians managed libraries and it categorization, and sorting books, journals, and other materials, and pass them around to their clients.

A library management system considered important due to the following.

1. It increases efficiency: library management system (LMS or ILS, integrated library system) enhances the efficiency of the librarians and library users.

2. It reduces the cost of managing a library: library management system reduces the cost of management suppose that the system eliminates the need to employ many workers and keep different manual files so for reducing the cost additionally, one librarian can achieve what more than other several can achieve at a given time. One computer can also store a lot of data eliminating the need for many manual files.

3. It saves time: time is of the essence for both librarians and users the librarian can easily record and go through the history of individual library users on the other hand, the library users can know the location and availability of a particular book faster and effect both the librarian and the student can archive more with less time.

4. It increases the productivity of library workers: automating your day to day processes will increase the productivity.

System ensures that the workers spend their time doing what is important.

Due to the growing ease of doing their work, workers can engage in other important activities in the library without the library incurring any additional cost.

5. It enhances the presentation of the library: a library should be as much about the looks as it is about the books. A library with a good management system looks tidy and attractive. The librarians can arrange the available books in good order, while the students can locate them easily [19].

I will create a library management system. My motivation to develop this system came from the increased need to access resources effetely and also help to improve the daily work of a librarian.

A library needs to store information to appertain to its users, and must keep the current status of each book in order: the location, description, and the availability of the book, users will give their name, and contact details when signing up in a library system.

This project will be available as a desktop system. The system will be developed with the help of c# programming language.

1.2. Comparative analysis of the existing applications

Libraries in general divided into two types:

- Public or a private library institution;
- E-library.

In case of public library excel, word, to perform all the operations for example the storage of books that available, the returned and reserved books, and so on.

And about the e-libraries they use an internet connection.

But I see in that a lot of disadvantages.

1. Waiting time: Often you have to wait to read a highly popular book if it just in store you won't have the ability to only know if the book is available for reading or borrowing or not you have to wait and ask while they search for your order in the old fashion way[12].

2. **Missing date of the borrowed book:** at some point, you need to return the book that you borrowed or be charged for it. I have some people who is reading and they already forgot about the date of the borrowed book because no available date is already available in the system.

Copyright: Digitization violates the copy right law as the thought content of one author can be freely transfer by other without his acknowledgement. So One difficulty to overcome for digital libraries is the way to distribute information [13].

3. **Initial cost is high:** The infrastructure cost of digital library i.e. the cost of hardware, software; leasing communication circuit is generally very high [12].

Environment: Digital libraries cannot reproduce the environment of a traditional library. Many people also find reading printed material to be easier than reading material on a computer screen [12].

4. **Health problems:** Reading on a phone, I-pad or computer is harder on your eyes than reading an actual book for starters. Most electronic devices have only so much storage capacity but you can put them on the cloud I guess. I do have books on my phone and I can't always access them when I want to. They can be hard to read depending on what size your screen is [14].

5. **Band width:** Digital library will need high band for transfer of multimedia resources but the band width is decreasing day by day due to its over utilization[15].

6. **Cyber-attacks and viruses:** while surfing the internet a lot of things can be hidden to us such as viruses Trojans and a lot of exe extension files that will compromise our privacy even in some cases will leave you vulnerable to credit card stolen acts.

1.3. The used development tools

I have chosen C# as a programming language for the implementation of my project because it's a general-purpose language designed for developing apps on the Microsoft platform and requires the .NET framework on Windows to work. C# is

often thought of as a hybrid that takes the best of C and C++ to create a truly modernized language. Although the .NET framework supports several other coding languages, C# has quickly become one of the most popular languages used now [16]. For the advantages it have

Some advantages of using c# as a programming language [17].

1. Object-Oriented Language: C# is pure object-oriented language, this allows you to create modular maintainable applications and reusable codes. This is one of the biggest advantages of C# over C++.

2. Automatic Garbage Collection: C# has got a very efficient system to erase and remove all the garbage present on the system. C# doesn't create a mess in the system and the system do not get hanged during execution.

3. No Problem if Memory Leak: C# has a major advantage of a strong memory backup. There would be no problem of the memory leak and other such type of problems in the C# as it happens in the case of C++ language. In this case C# has a very clear edge on all other languages.

4. Easy-to-Development: The rich class libraries make many functions easy to be implemented. C# has influence on most of the programmers of the world and it has a history in the programming world.

5. Cross Platform: Your application will run well only if the machine has installed the NET framework. This is the most important requirement for the C#. Also this could be an important opportunity for the young programmers to get them trained with .NET framework.

6. Better Integration: Applications written in .NET will have better integration and interpretability with other NET Technologies. Actually C# runs on CLR, making it easy to integrate with components written in other languages (specifically, CLR-compatible languages)

7. More Legible Coding: Formalized concept of get-set methods, so the codes

becomes more legible. Also in C#, you don't need to worry about header files. Coding would be a worth to do in C#.

8. Scarcity of Choice: When you are in Microsoft stack, you have a tool for everything. So, basically you match your needs to the tool, and you use it. That's why I recommend C# is very supportive kind of language especially for the beginners.

9. Programming Support: You can buy support from the Microsoft in C# (.NET framework) unlike Java where community is your support. So if things get wrong then you can solve your issues with the support of Microsoft.

Also I used Microsoft sql server 2014 as a controller for my database because it supports a wide variety of transaction processing, business intelligence and analytics applications in corporate IT environments. Microsoft SQL Server is one of the three market-leading database technologies, along with Oracle Database and IBM's DB2 [18].

Also it have a lot of advantages I will discuss some of them.

Advantages of MS SQL.

1. Installation Is Streamlined: It can be installed via a setup wizard and the prerequisite updates are detected and downloaded by the installer automatically. The complexity of installing the software is minimized significantly because of automatic installation of updates. Other components such as analytical and database services can be installed separately afterward. Automatic updating also reduces maintenance costs quite significantly.

2. Security Features Are Better: SQL Server 2008 uses Policy-Based Management to detect security policies that are non-compliant. This feature allows only authorized personnel access to the database. Security audits and events can be written automatically to log files.

3. Enhanced Performance: The MS SQL server has built-in transparent data compression feature along with encryption. Users don't need to modify programs in

order to encrypt the data. The MS SQL server has access control coupled with efficient permission management tools. Further, it offers an enhanced performance when it comes to data collection.

4. Lower Cost of Ownership: SQL server includes effective data management and data mining tools along with disk partitioning. Your server's optimum maintenance can be ensured by following effective data management practices. These practices also help you ensure the availability and recoverability of data.

2. DESIGN OF LIBRARY MANAGEMENT SYSTEM

2.1. Functional requirements

Functional Requirement (FR) is a description of the service that the software must offer. It describes a software system or its component. A function is nothing but inputs to the software system, its behavior, and outputs. It can be a calculation, data manipulation, business process, user interaction, or any other specific functionality which defines what function a system is likely to perform. Functional Requirements are also called Functional Specification [3].

Benefits of Functional Requirement

It helps you to check whether the application is providing all the functionalities that were mentioned in the functional requirement of that application.

A functional requirement document helps you to define the functionality of a system or one of its subsystems.

Functional requirements along with requirement analysis help identify missing requirements. They help clearly define the expected system service and behavior.

Errors caught in the Functional requirement gathering stage are the cheapest to fix.

Support user goals, tasks, or activities.

The features that are available for my system for the admin:

- CRUD Users;
- Read Books;
- Check Books Reservations;
- Reporting.

The features that are available for the librarian:

- CRUD Categories;
- CRUD Floors;
- CRUD Shelves;
- CRUD Books.

The features that are available for the user (costumer):

- Register New;
- Login;
- Read Books;
- CRUD himself Books Reservations.

2.2. Non-Functional Requirements

Simply non-functional requirement is a specification that describes the system's operation capabilities and constraints that enhance its functionality. These may be speed, security, reliability, etc. We've already covered different types of software requirements, but this time we'll focus on non-functional ones, and how to approach and document them [4].

The Non-Functional Requirements that available in my system.

1. Security

The library management system have an authorization mechanisms that make sure that the users access the system according to the access roles granted to them.

This also make sure that specific functions are given to different users preventing unwanted access between them in the program.

2. Response Time

The respond time from the system to the user must be between two and three from the request time.

3. Reliability

The system will work 99% of the time.

This system has to be accurate and stable due to the important data it have.

4. Accuracy

The system accuracy depends by the speed of the execution of the user

5. Availability

The system will be 100% available to all the users no specific privileges is

needed to use the system.

6. Usability

The system has a user friendly interface which it's easy to use and operate.

7. Friendliness

The system has a simple GUI and relaxing colors.

8. Privacy

The system keeps and save your privacy and you can login using only your phone number.

2.3. Use case diagram

Use case diagrams are usually referred to as behavior diagrams used to describe a set of actions (use cases) that some system or systems (subject) should or can perform in collaboration with one or more external users of the system (actors). Each use case should provide some observable and valuable result to the actors or other stakeholders of the system. [5]

Purpose of Use Case Diagrams

Use case diagrams are used to gather the requirements of a system including internal and external influences. These requirements are mostly design requirements. Hence, when a system is analyzed to gather its functionalities, use cases are prepared and actors are identified.

When the initial task is complete, use case diagrams are modelled to present the outside view.

In brief, the purposes of use case diagrams can be said to be as follows −

Used to gather the requirements of a system.

Used to get an outside view of a system.

Identify the external and internal factors influencing the system.

Show the interaction among the requirements are actors [6].

Every use case contains three essential elements:

The actor. The system user -- this can be a single person or a group of people interacting with the process.

The goal. The final successful outcome that completes the process.

The system. The process and steps taken to reach the end goal, including the necessary functional requirements and their anticipated behaviors.[7]

I develop the use case diagram for my system by following these steps:

- identifying the Actors (role of users) of the system;
- for each category of users, identifying all roles played by the users relevant to the system;
- indenting what are the users required the system to be performed to achieve these goals;
- created use cases for the desired goal;
- structure the use cases;
- prioritize, review, estimate and validate the users [8].

Use case “Register himself as new user” is available for the user only.

Use case “CRUD user” is available for the Admin only.

Use case “READ books” is available for the Admin and the user.

Use case “Book reservation” is available for the Admin only.

Use case “Reporting” is available for the Admin only.

Use case “CRUD Categories” is available for the librarian only.

Use case “CRUD Floor” is available for the librarian only.

Use case “CRUD Shelve” is available for the librarian only.

Use case “CRUD Book” is available for the librarian only.

Use case “CRUD reservation” is available for the user only.

Use case “Register himself as new user” is available for the user only.

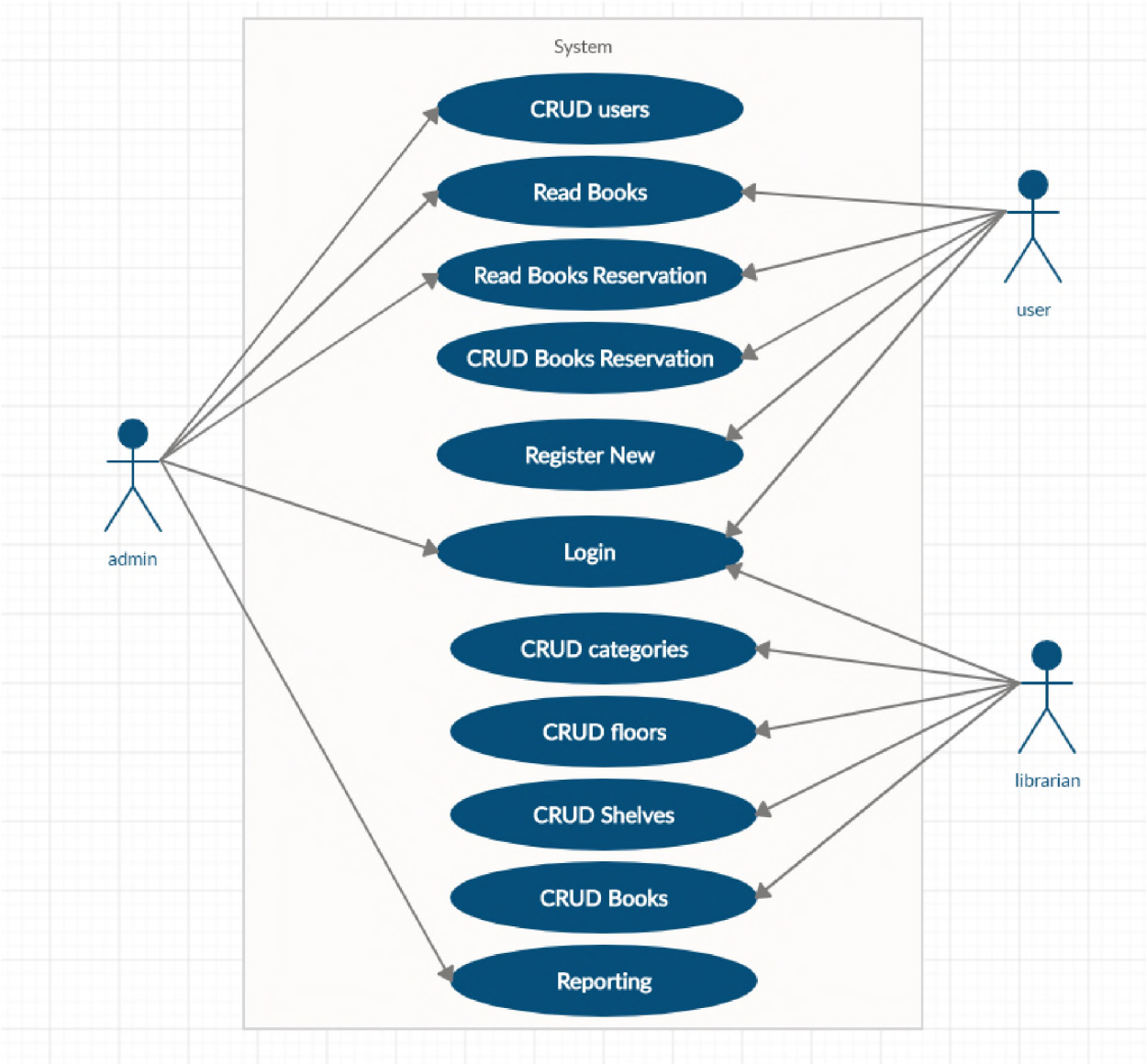

Fig. 1. Use case diagram

2.4. Development of the Database

A database is a data structure that stores organized information.

Most databases contain multiple tables, which may each include several different fields.

For example, a company database may include tables for products, employees, and financial records. Each of these tables would have different fields that are relevant to the information stored in the table [9].

On the other hand data base management system (DBMS) is a software system

that uses a standard method of cataloging, retrieving, and running queries on data. The DBMS manages incoming data, organizes it, and provides ways for the data to be modified or extracted by users or other programs [10].

We have to keep track on the new books and what connected to it and have a full acknowledgment about the details of the books available in the library that are based on a daily task operations in a library such as adding new user, new book, and reform information's, searching for books to borrow and return books, a user friendly interface for searching, insertion and placing potentiality.

The scheme of the database is shown in the fig. 2. It consists of six tables which connect with each other. The user table contain the information of the user like (user name, password, role, phone number). The book table contains all the information related to the books for example (title,year,author). The reserve table contain the reserved data of the book (id user,id book, start and end date). The floor table contains the data of the floor. Floor table contains the floor. Shelf contains id floor, shelf.

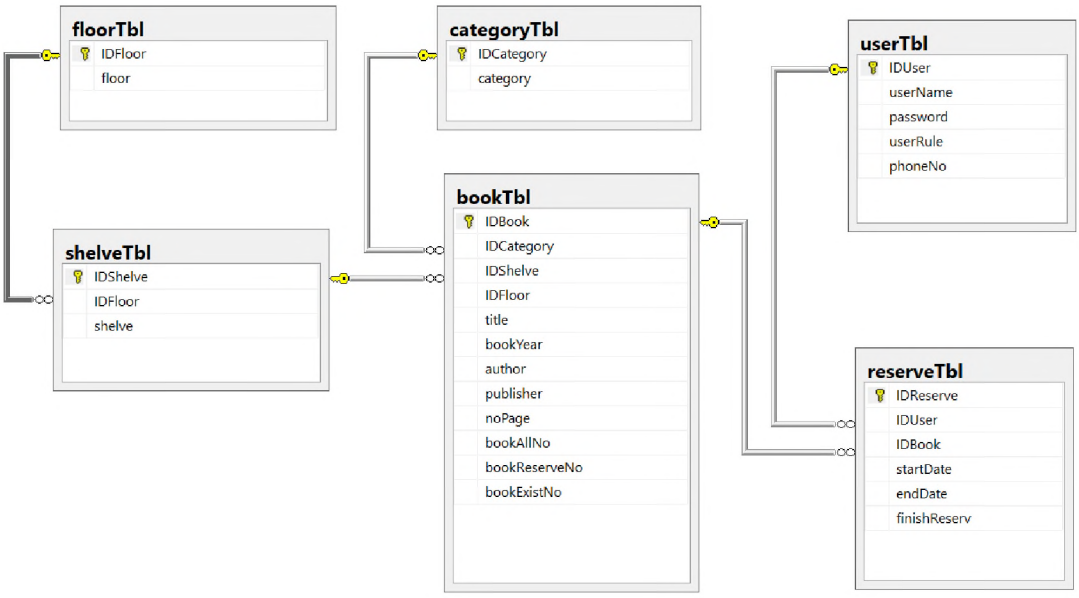

Fig. 2. Database scheme design

Table “userTBl”

This table has five columns. Column IDUser as a primary key with bigint datatype.

User name for users

Password for user

The rule of the user can be (admin,user,librarian)

And phone number user for login

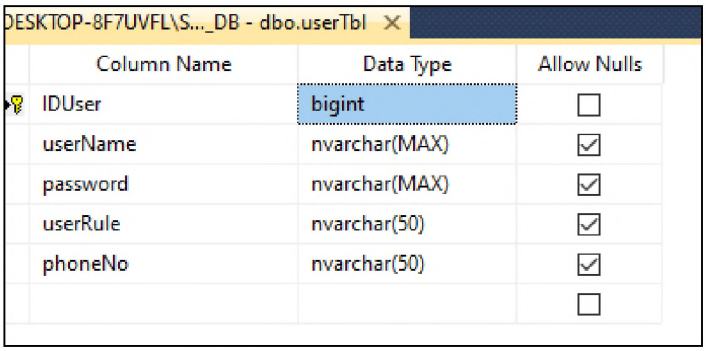

Fig. 3. User table

Table “reserveTbl”

This table have five columns. Column IDReserve as the primary key with big-int as datatype

Id for the user

Id for the book

Start and the end date of the reserved books

The finished reservation status.

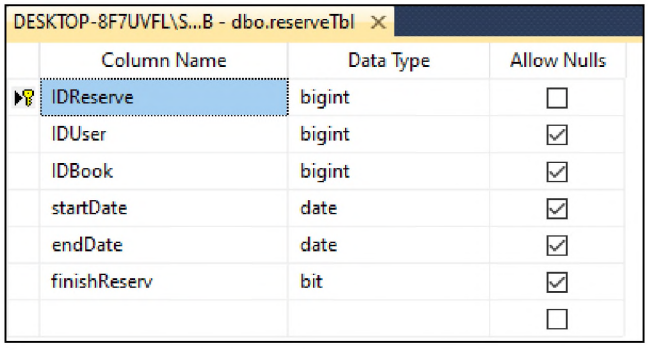

Fig. 4. Reserve table

Table “floorTbl”

Contains only 2 columns being

The id floor as primary key

The floor which the book located in.

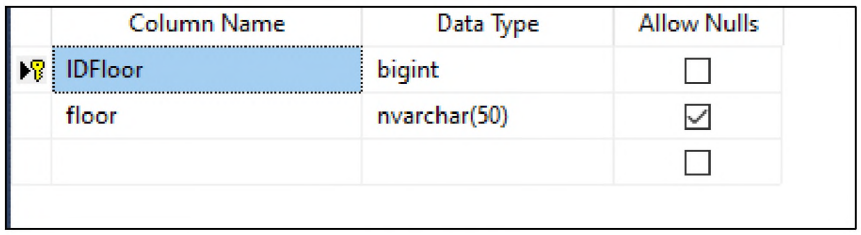

Fig. 5. Floor table

Table “categoryTbl”

Contains only 2 columns being

Id category as primary

And the category of the book in the system

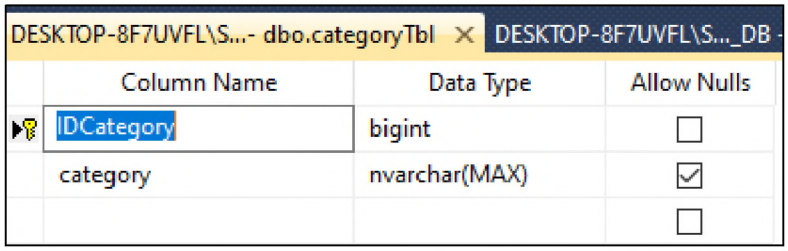

Fig. 6. Category table

Table “bookTbl”

Contains Idbook as primary key Gathers all of IDCategory,IDshelves,ID floor

And it contains Title of the book ,Book year which year Author of the book published if found, Number of pages, How many copies, The reservation state ,Exist or not in the library.

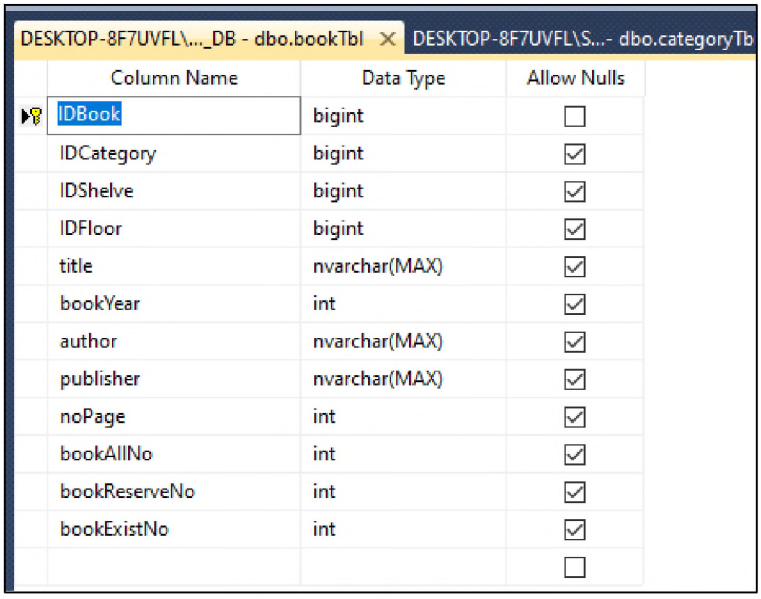

Fig. 7. Book table

Table “shelfTbl”

Contains the id of the shelf

The floor which the shelv located

And in the last is the sheves

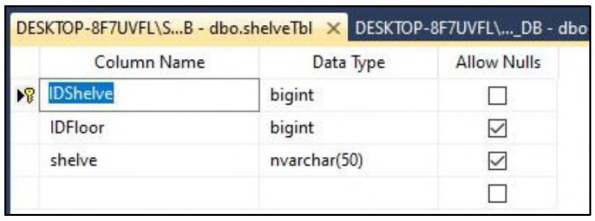

Fig. 8. Shelves table

2.5. Development of the interface

Each desktop application contains several interfaces and permits the user to move between the interfaces and to summarize the interfaces in our program

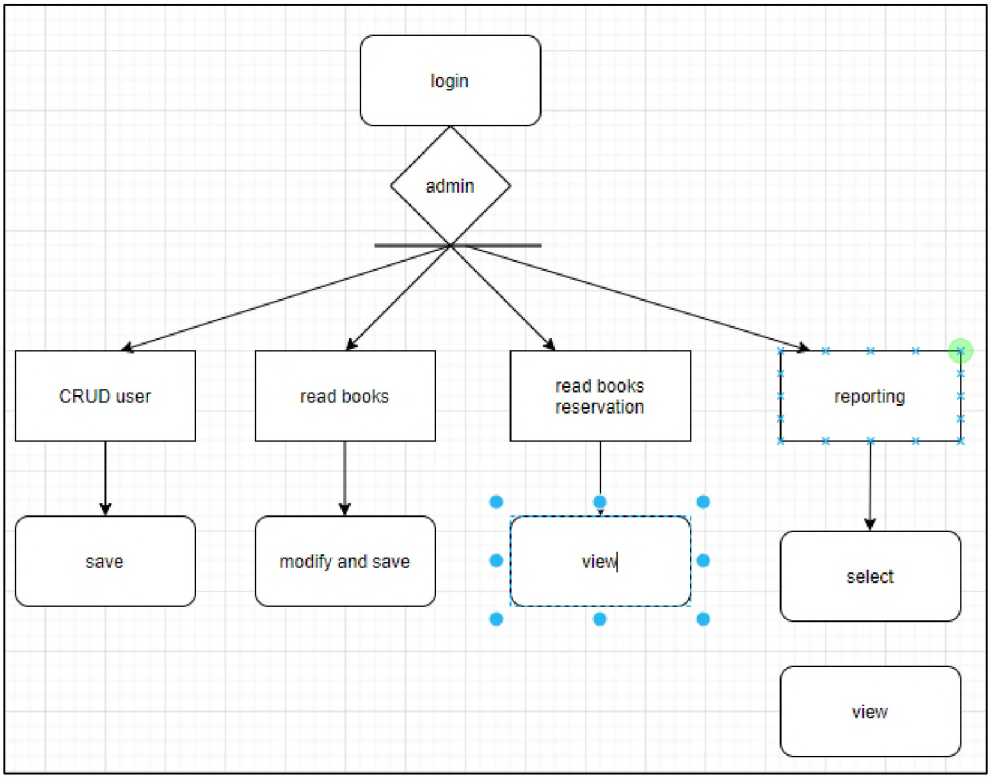

Fig. 9. Schema of available interfaces for admin

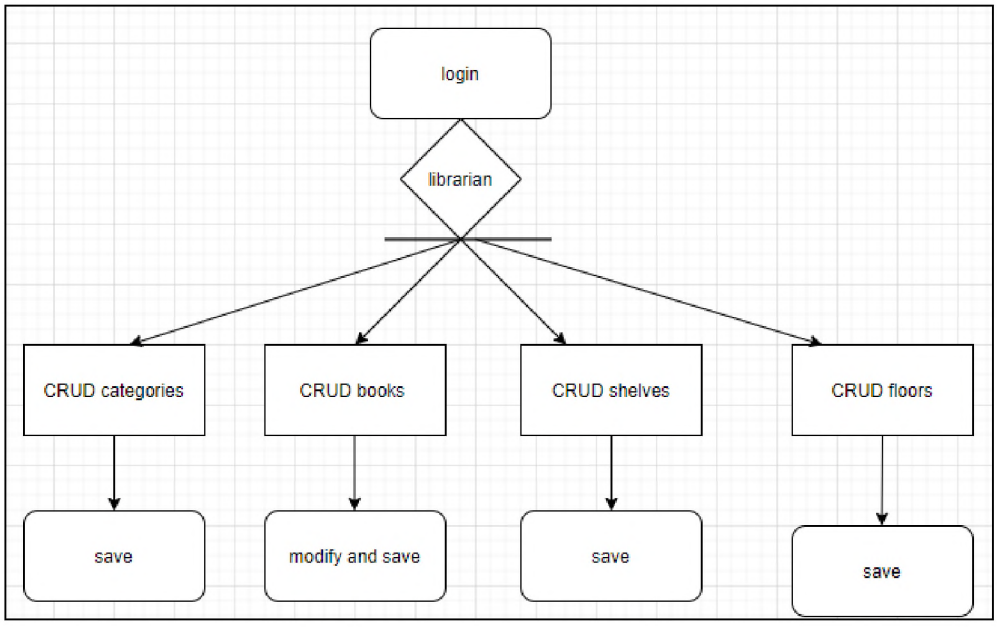

Fig. 10. Schema of available interfaces for librarian

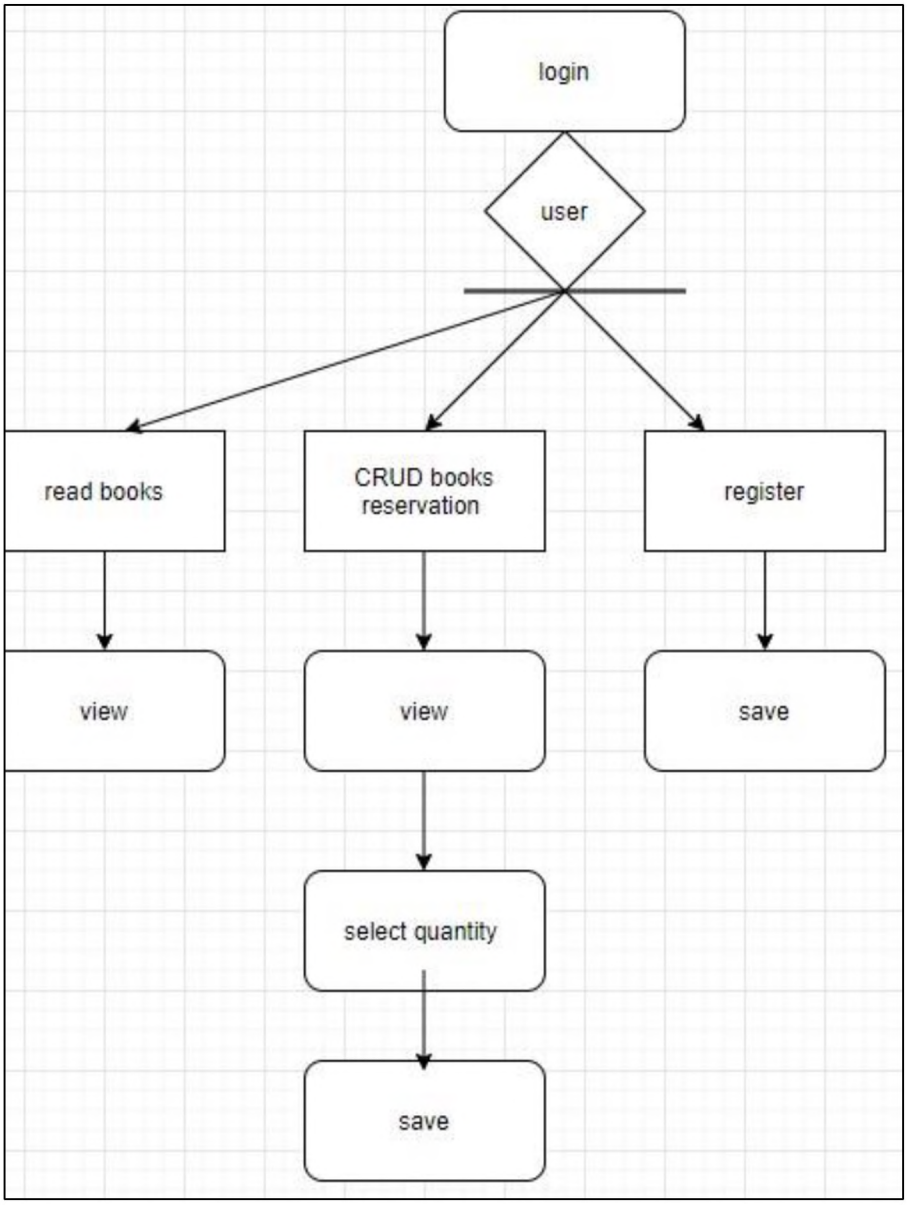

Fig. 11. Schema of available interfaces for user

3. IMPLEMENTATION OF THE APPLICATION

3.1. Architecture of the system

Component diagrams are used to visualize the organization of system components and the dependency relationships between them. They provide a high-level view of the components within a system [21]. UML Component diagrams are used in modeling the physical aspects of object-oriented systems that are used for visualizing, specifying, and documenting component-based systems and also for constructing executable systems through forward and reverse engineering [22]. The architecture of the system is shown in fig.12 shows that we have four component design, main, source and database .the first component "source" it is depending on "design" and he "main "has dependency relationship with "database".

Also we have dependency relationship between the "source "and "main". The component “Main” is devoted to the connection to database. The component “Source” contains the main code of the project. The component “Design” contains files with the description of GUI.

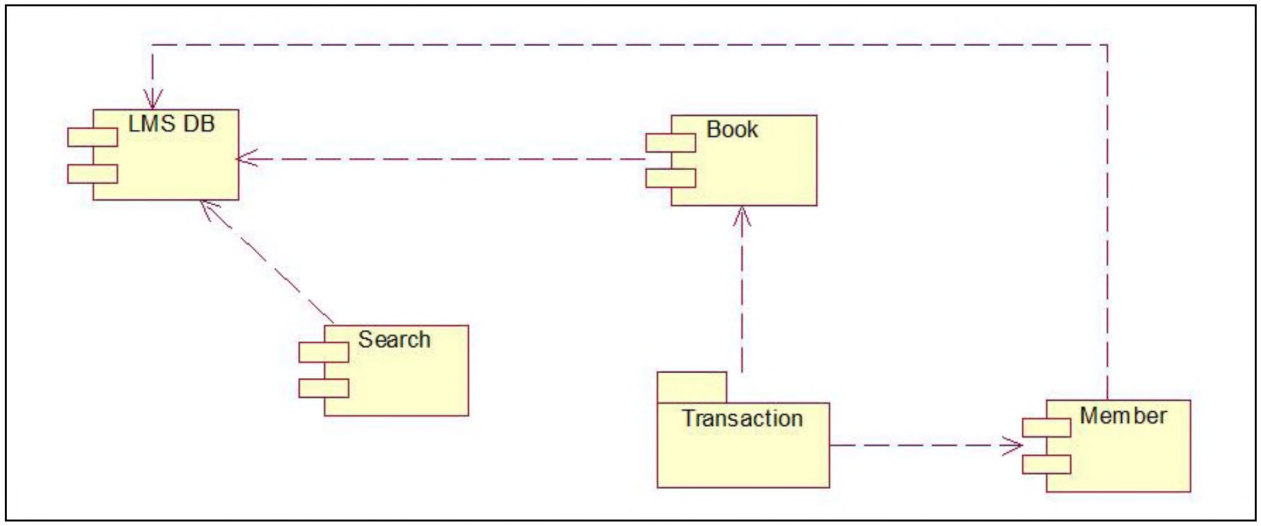

Fig. 12. Component diagram of the system

3.2. Several fragments of C#-code for implementing the basic functionality

Within the system, there are plenty of fragment codes, divided into simple and complex codes

Connection with our database. Fig. 13 shows in the picture the function which makes the program able to access our database which is already created.

```
class AppCode
{
    //connection string
    public static string key = @"Data Source=DESKTOP-8F7UVFL\SQLEXPRESS;Initial Catalog=Library_db;Persist Security Info=True;User ID=karrar;password=123456;";
    //Call froms Function to display on screen
    public static Form frmActv = null;
```

Fig. 13. Function for Connection with our database

Form login of an admin is shown in Fig. 14. The system will check the access level that written in the text box if it's an admin the rule is 1 if a librarian will be 2 and if it's a user it going to be 3

```
1 reference
private void btnAdmin_Click(object sender, EventArgs e)
{
    AppCode.winRule = 1;
    //frmAdmin frmAdmin = new frmAdmin();
    //frmAdmin.Show();
    frmLogin frmlogin = new frmLogin();
    frmlogin.Show();
    this.Hide();
}
```

Fig. 14. Admin login

The function of registration a user himself is shown in fig 15 the system will check for mistakes in case of empty spaces or an error in some information's.

```
1 reference
private void btnRegister_Click(object sender, EventArgs e)
{
    if (textBox5.Text == "User Name" || textBox5.Text == string.Empty)
    {
        errorProvider1.SetError(textBox5, "Please insert your User Name");
        //textBox5.Select();
        return;
    }
    if (textBox3.Text == "Phone" || textBox3.Text == string.Empty)
    {
        errorProvider1.SetError(textBox3, "Please insert your Phone no");
        //textBox3.Select();
        return;
    }
    if (textBox4.Text == "Password" || textBox4.Text == string.Empty)
    {
        errorProvider1.SetError(textBox4, "Please insert your Password");
       // textBox4.Select();
        return;
    }
```

Fig. 15. Registration

The admin can register new members and give them a privileges for being a user or another librarian even another admin can be made in the admin function as shown.

```
private void btnSave_Click(object sender, EventArgs e)
{
    if (txtName.Text == string.Empty)
    {
        errorProvider1.SetError(txtName, "Please Insert User Name!");
        return;
    }
    if (txtPwd.Text == string.Empty)
    {
        errorProvider1.SetError(txtPwd, "Please Insert Password!");
        return;
    }
    if (cbxRule.Text == string.Empty)
    {
        errorProvider1.SetError(cbxRule, "Please choose user rule!");
        return;
    }
    if (txtPhone.Text == string.Empty)
    {
        errorProvider1.SetError(txtPhone, "Please Insert Phone No!");
        return;
    }
```

Fig. 16. Register new member

Function add book to add book with specific information's related to that book for example Paperback, Publisher, year of the published, language, count, author, shelf, floor.

```
private void btnSave_Click(object sender, EventArgs e)
{
    if (cbxCategory.Text == string.Empty)
    {
        errorProvider1.SetError(cbxCategory, "Please choose category!");
        return;
    }
    if (cbxFloor.Text == string.Empty)
    {
        errorProvider1.SetError(cbxFloor, "Please choose floor!");
        return;
    }
    if (cbxShelve.Text == string.Empty)
    {
        errorProvider1.SetError(cbxShelve, "Please choose shelve!");
        return;
    }
    if (txtTitle.Text == string.Empty)
    {
        errorProvider1.SetError(txtTitle, "Please insert book's title!");
        return;
    }
    if (cbxYear.Text == string.Empty)
    {
        errorProvider1.SetError(cbxYear, "Please insert book's year!");
        return;
    }
    if (txtAuthor.Text == string.Empty)
    {
        errorProvider1.SetError(txtAuthor, "Please insert book's author!");
        return;
    }
    if (txtPublisher.Text == string.Empty)
    {
        errorProvider1.SetError(txtPublisher, "Please insert book's publisher!");
        return;
    }
    if (txtNoPages.Text == string.Empty)
    {
        errorProvider1.SetError(txtNoPages, "Please insert book's no of pages!");
        return;
```

Fig. 17. Adding new book

Function making a reservation of a book in the fig 18 is shown in case of book reservation with a message error if unexpected errors found in reservation that might be an invalid date or a book that are not available for now.

```
    {
        //Book Records Name
        ListView bookRecordLst = new ListView();
    bookRecordLst.Items.Add(book.bookExistNo);
    bookRecordLst.Items.Add(book.bookReserveNo);
    //Book Records Value
    ListView bookValueLst = new ListView();
    bookValueLst.Items.Add((Convert.ToInt16(dgBook.SelectedRows[0].Cells[14].Value) - 1).ToString());
    bookValueLst.Items.Add((Convert.ToInt16(dgBook.SelectedRows[0].Cells[15].Value) +1).ToString());
    //book id name
    ListView bookIDName = new ListView();
    bookIDName.Items.Add(book.bookID);
    //book id value
    ListView bookIDValue = new ListView();
    bookIDValue.Items.Add(dgBook.SelectedRows[0].Cells[0].Value.ToString());
    //Edit book records
    if (AppCode.editItem(book.bookTbl, bookRecordLst, bookValueLst, bookIDName, bookIDValue)== true){
        // reservation records values list
        ListView resRecordValue = new ListView();
        resRecordValue.Items.Add(AppCode.usrID);
        resRecordValue.Items.Add(dgBook.SelectedRows[0].Cells[0].Value.ToString());
        resRecordValue.Items.Add(dtpStart.Value.ToShortDateString());
        resRecordValue.Items.Add(dtpEnd.Value.ToShortDateString());
        resRecordValue.Items.Add(0.ToString());
        //add data to reservation table
        if (AppCode.AddItem(reservation.resTbl, resRecordValue) == true)
        {
                btnLoad_Click(sender, e);
                MessageBox.Show("Book reservation successfully", AppCode.msgTitle, MessageBoxButtons.OK, MessageBoxIcon.Information);
                button2_Click(sender, e);
        }
            else
            {
                MessageBox.Show("Book reservation faild", AppCode.msgTitle, MessageBoxButtons.OK, MessageBoxIcon.Error);
            }
    }else
        {
            MessageBox.Show("Book reservation faild", AppCode.msgTitle, MessageBoxButtons.OK, MessageBoxIcon.Error);
        }
}
    catch (Exception er)
```

Fig. 18. Book reservation

4. TESTING OF THE WEB APPLICATION

4.1. Screenshots of the application

The main interface (fig. 19).

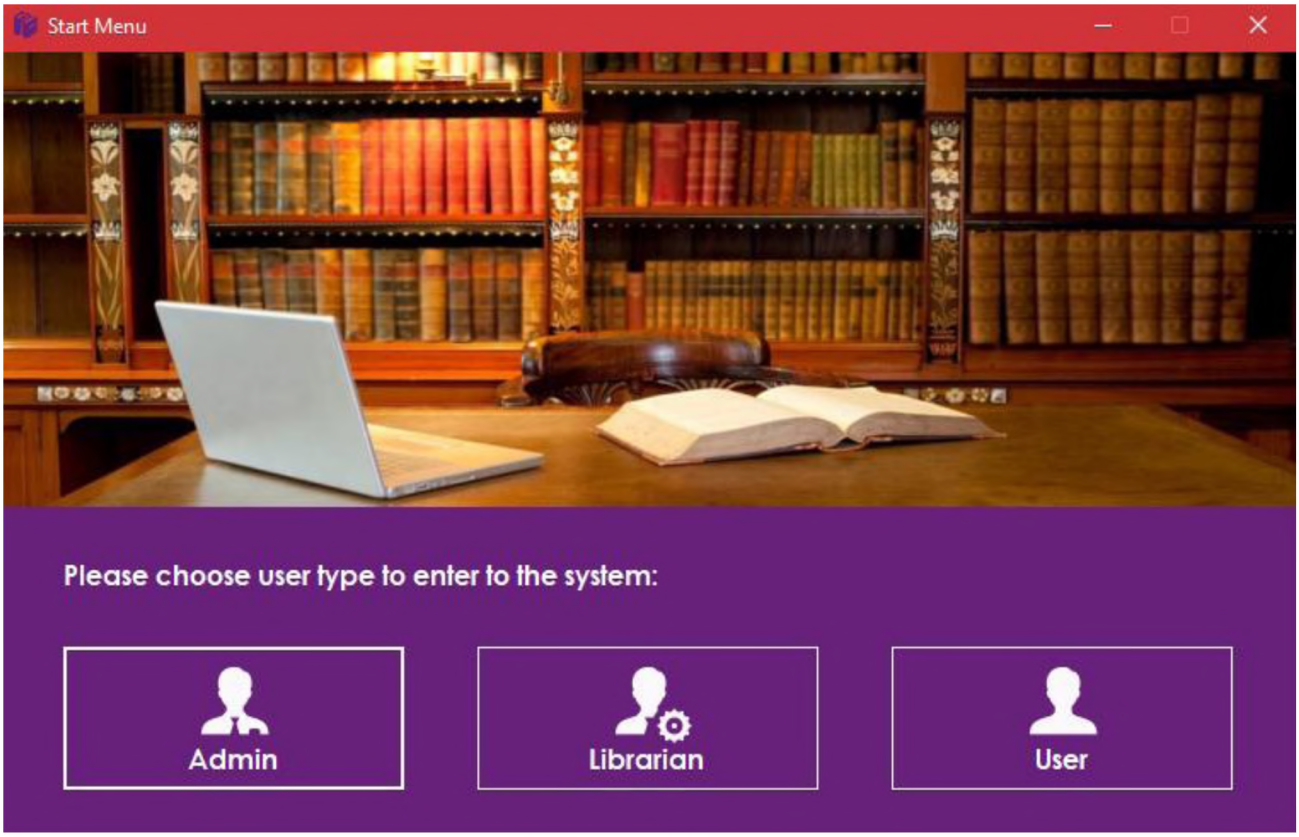

Fig. 19. Library interface

Any visitor can see the main interface, the main interface contains several functions ("Admin", "librarian", "user").

Any visitor can select the user option to enter to the system he can enter his information that already have been saved or he can register himself as a new user

As shown in the picture down below (fig.20): Or you can create new account by insert your information ("user name", "mobile number", "and password") as shown (fig. 21).

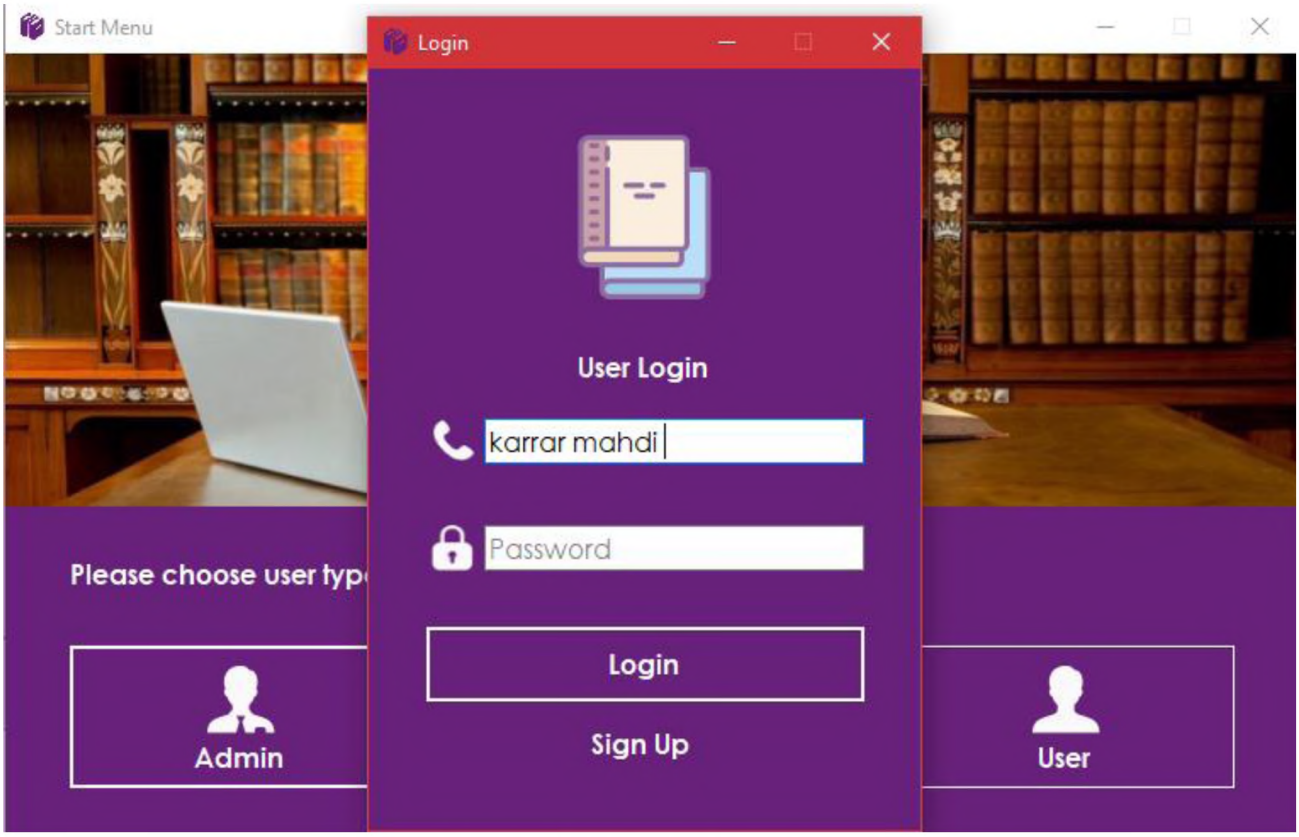

Fig. 20. User login interface

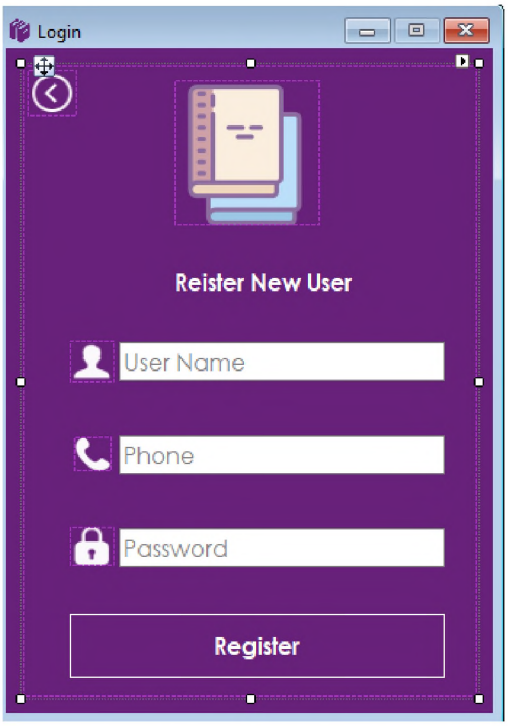

Fig. 21. User creation

After logging in using the phone number given, the user interface will appear to the user and shown his name in the right part of the interface also he can check and search for book and see the status of the received books (fig. 22).

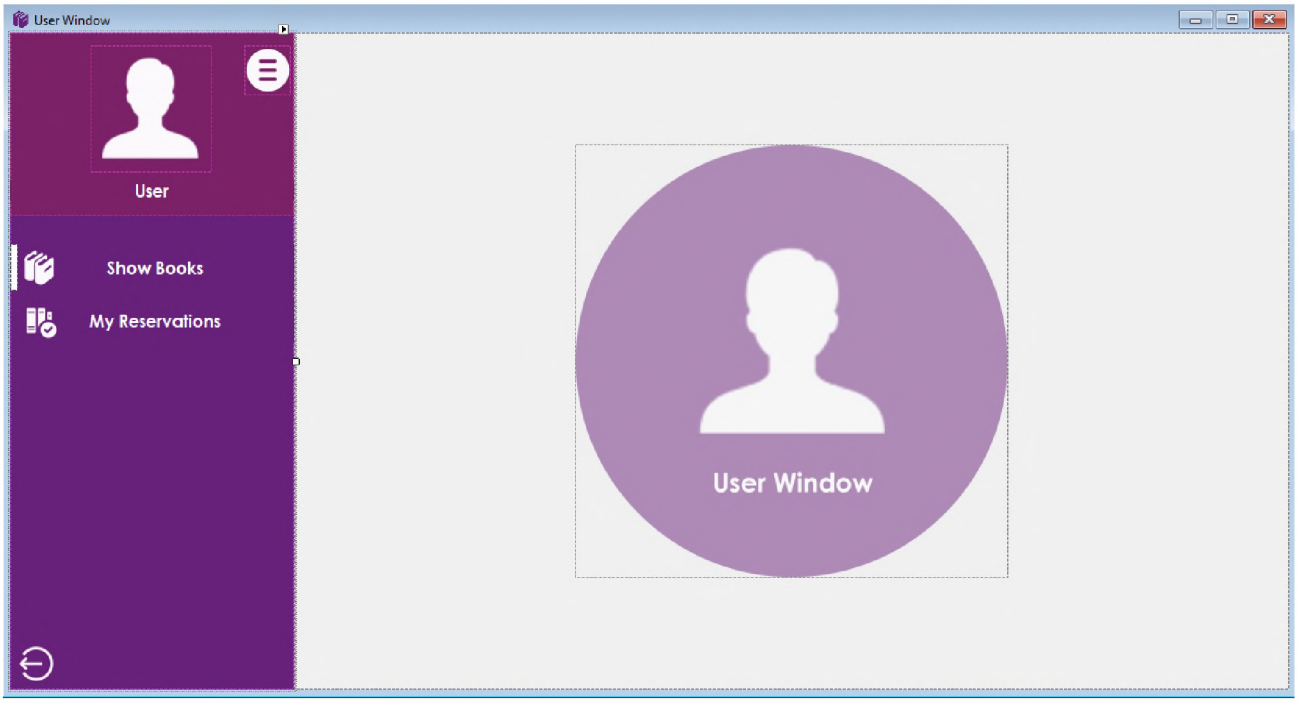

Fig. 22. User interface

The user interface after logging in will have his name shown on the screen (fig. 23).

And see all the available books in the library you can browse it individually or search for a specific thing.

All books are detailed with their (publisher, number of pages, how many copies available, and how many books that already reserved).

The available books will be in different many languages (Russian, English Arabic).

As shown in the figure an example of searching using only the publisher name (fig. 24).

You even don't have to write the full word only some letters will be enough to show you results after hitting search.

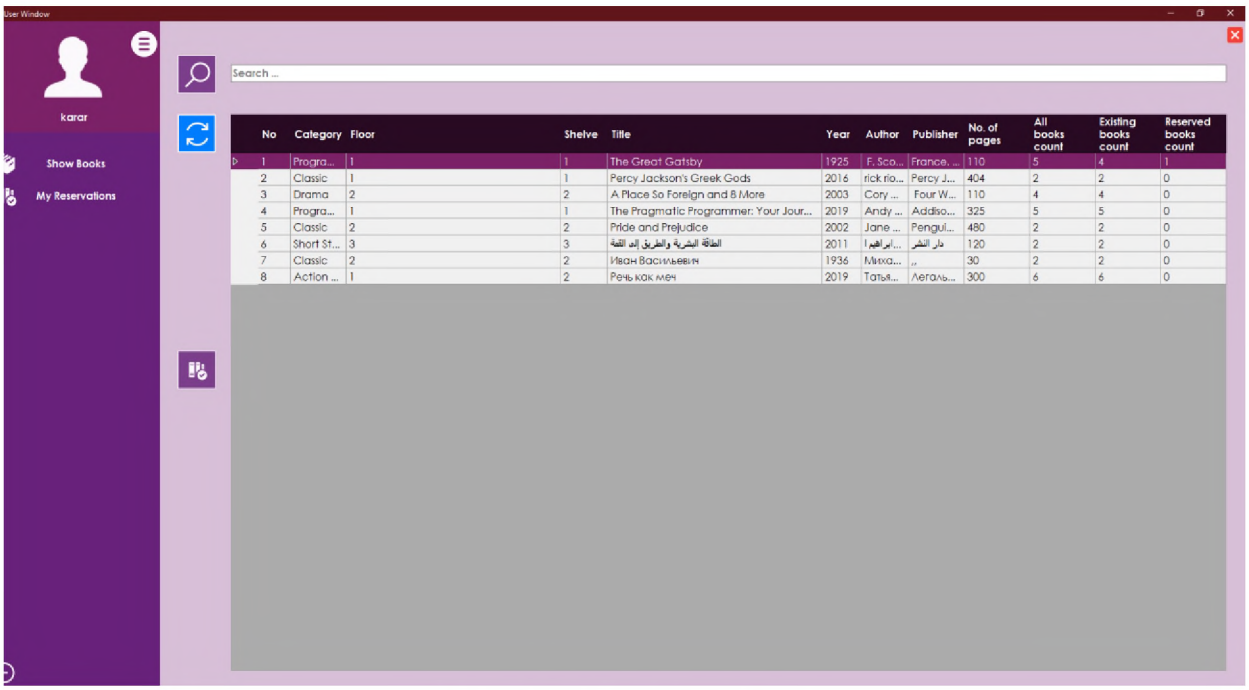

Fig. 23. User interface

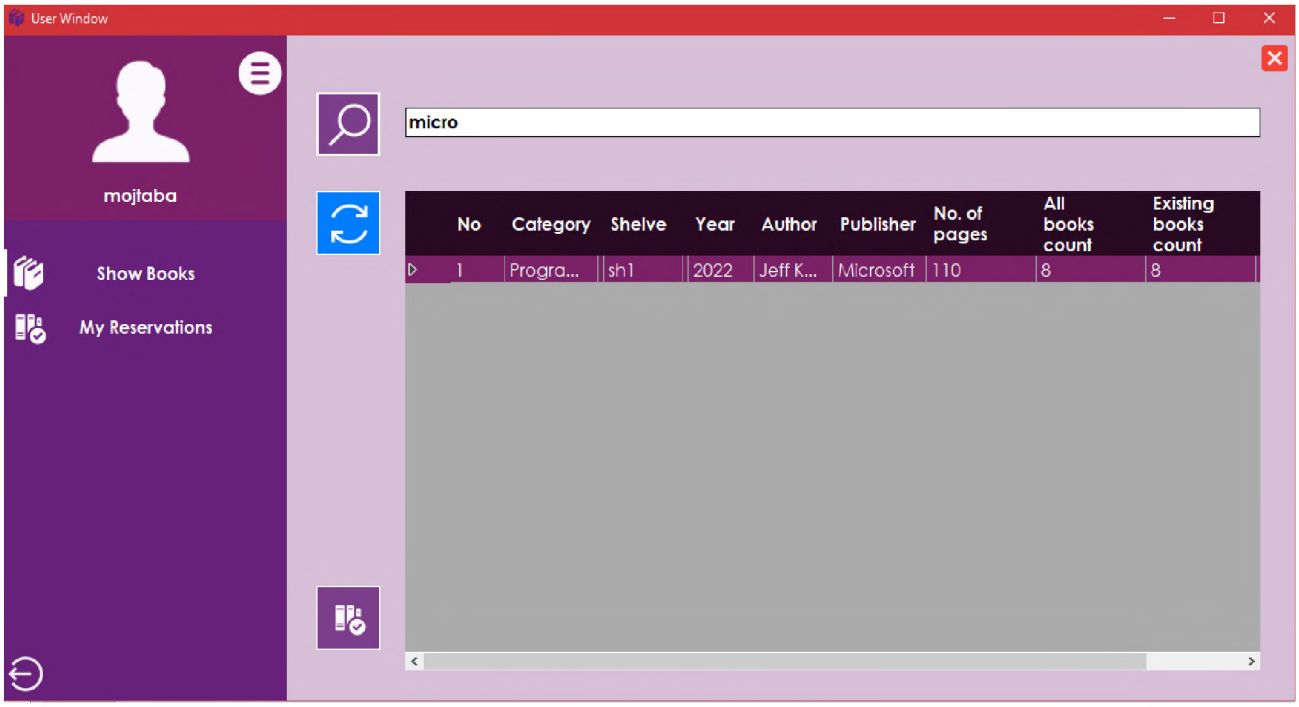

Fig. 24. Books search

After hitting the reserve button you can choose the specific date to borrow the book and hit the booking button and that's it as simple as that (fig. 25).

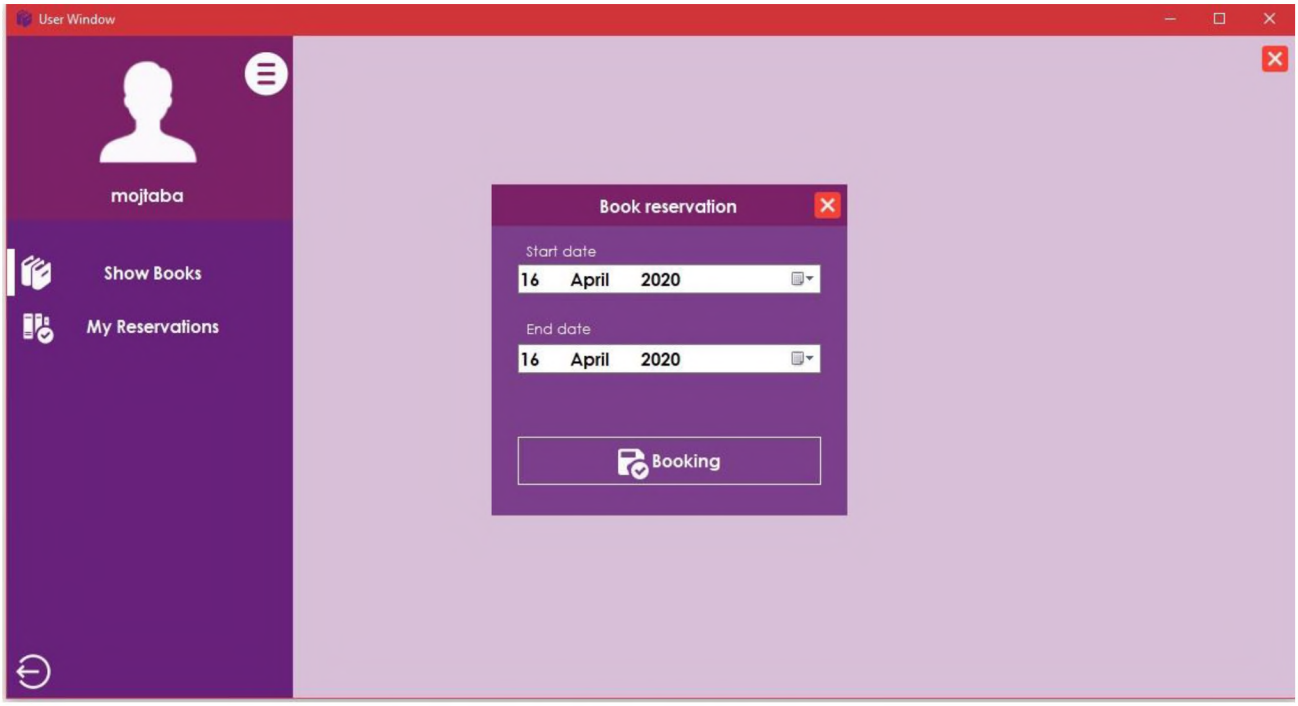

Fig. 25. Booking a book

After making a reservation you can see all the books that have been borrowed with their expiry date (fig. 26).

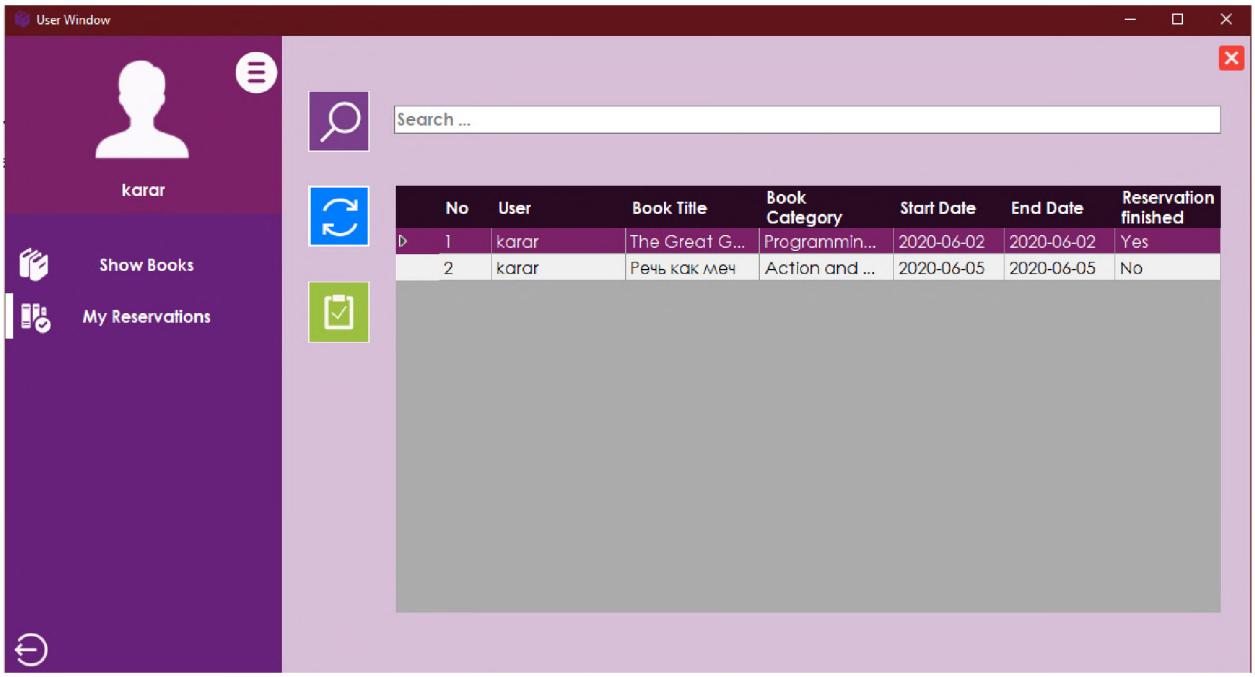

Fig. 26. Reservation

To return a book you can simple tap the finish reservation to return the book that you borrowed (fig.27).

With a warning screen if you tapped the button in accident.

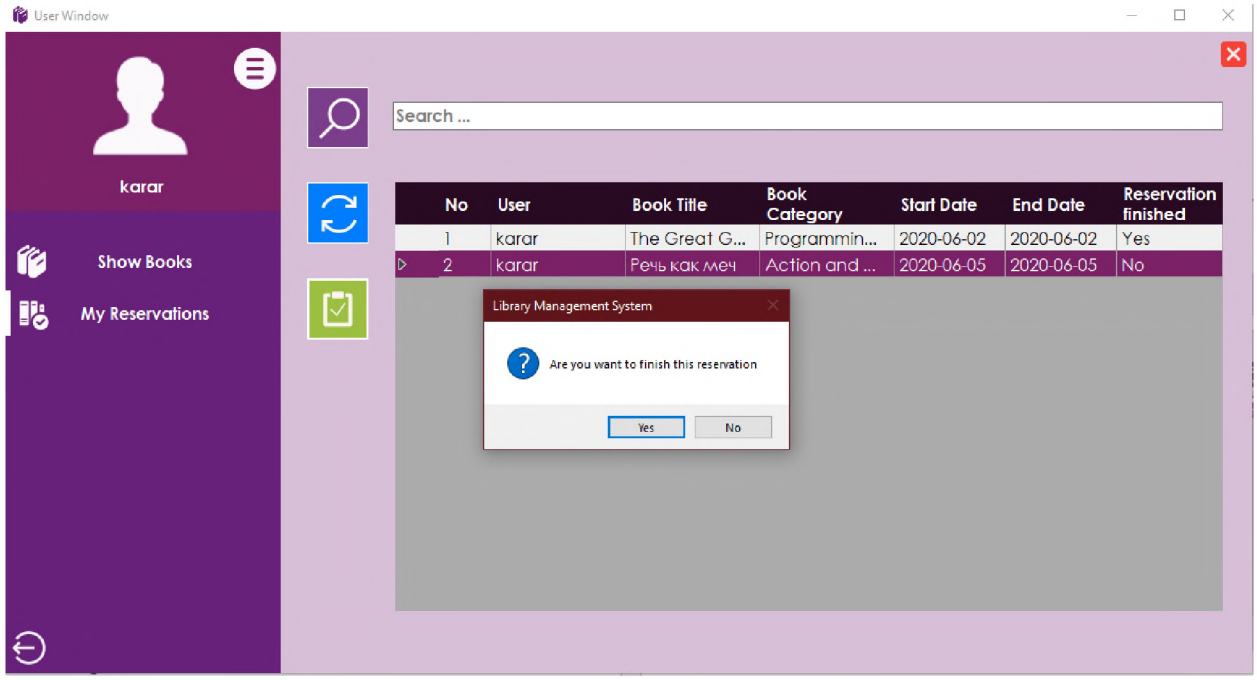

Fig 27. Book reservation

Admin interface – fig. 28.

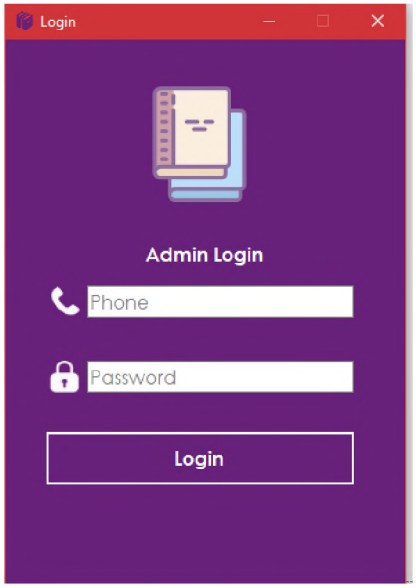

Fig. 28. Admin login interface

“Administrator" is this section the admin can enter his special username and password which already saved in the database of the system (fig. 29).

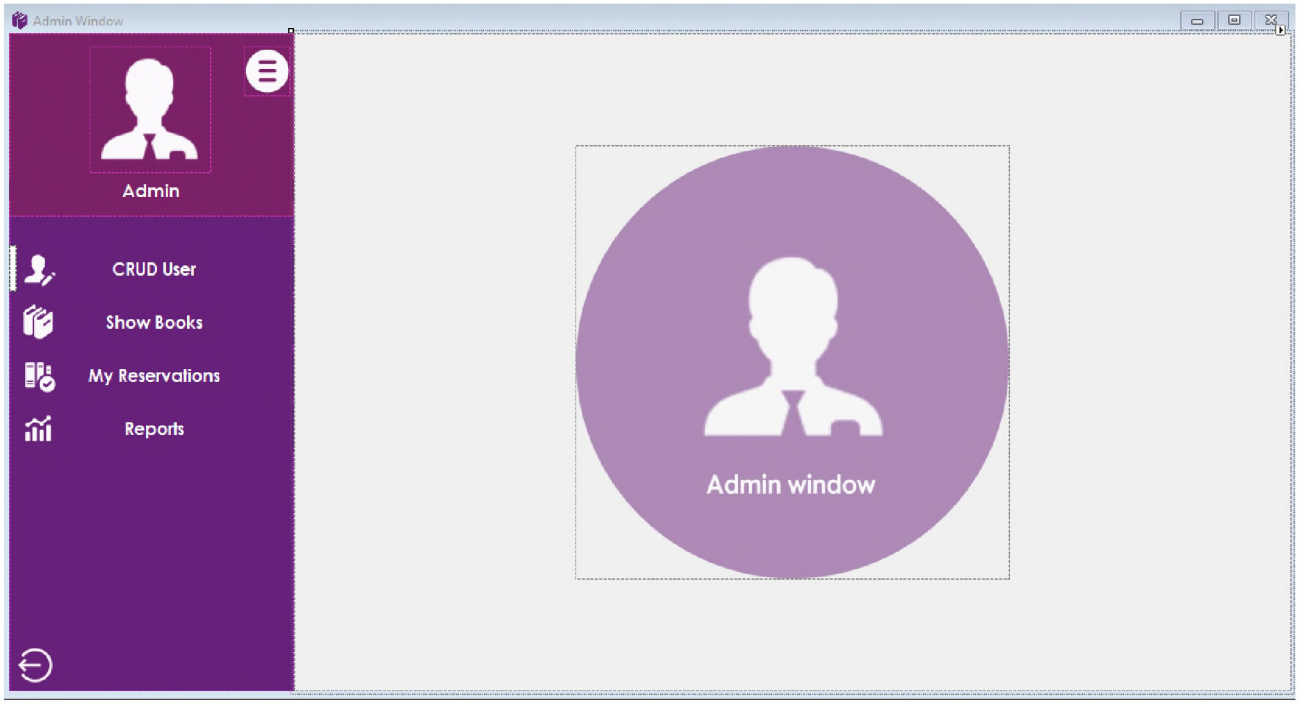

Fig. 29. Admin page

After logging in as the admin you will have access to (admin tools) you will have the ability to: (“CRUD user”, “show books”, “reservations”, “and reports”).

The admin can create a user and sign a role to them it can be a basic user or a librarian

Show the books that’s in the library

Take a look at any received status

Make a reports.

In the admin page the admin can create (user’s admins Liberians) also see their information’s and can edit them or delete any user of the system (fig. 20).

The admin also can create user and modify them (fig. 31).

Also the admin will have access to the books if there were any need to edit books if the librarian is missing or sick (fig. 32).

Also we can see the reserved books and makes some reports (fig. 33).

The admin can make report for all the reserved books with the start and end date with all the specific information the book title and the category with the ability to export it as excel or word and pdf extension.

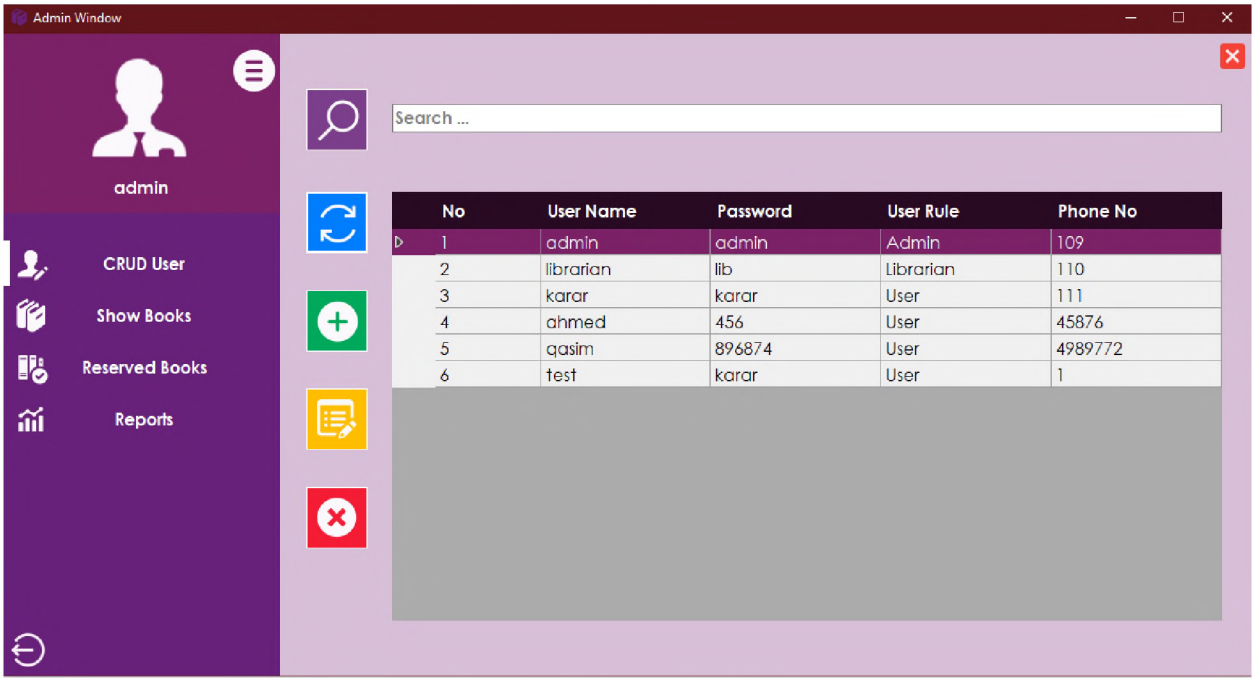

Fig. 30. Admin page

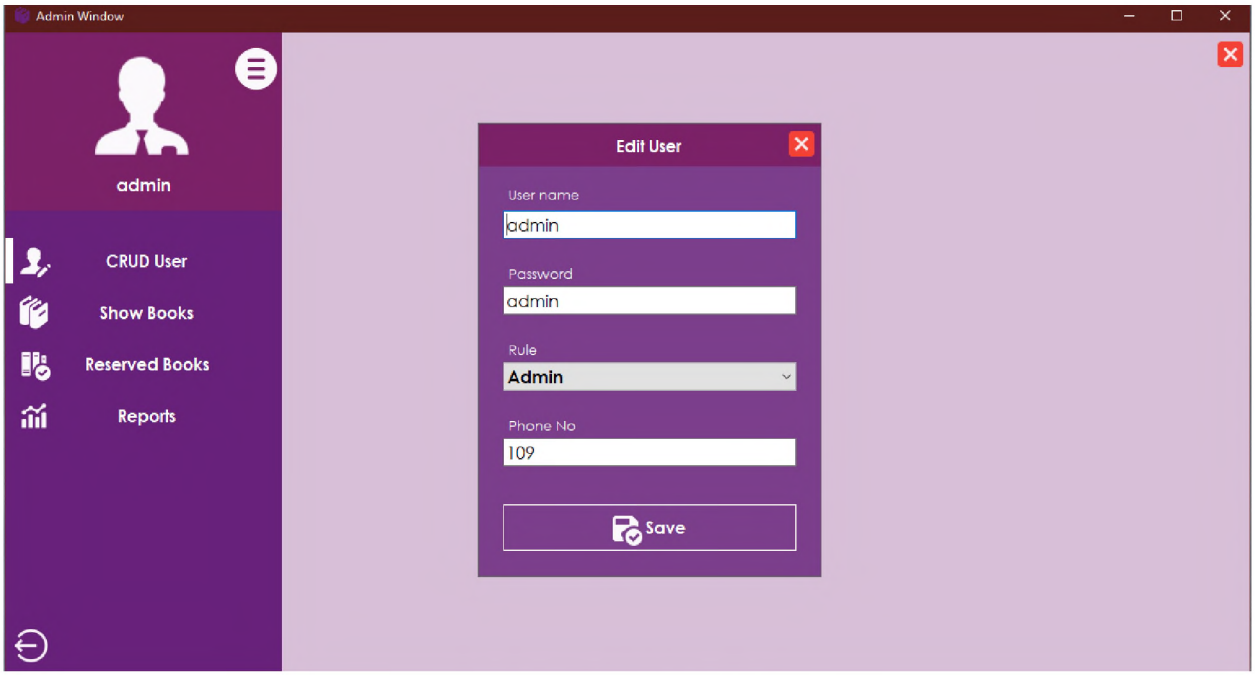

Fig. 31. Admin page

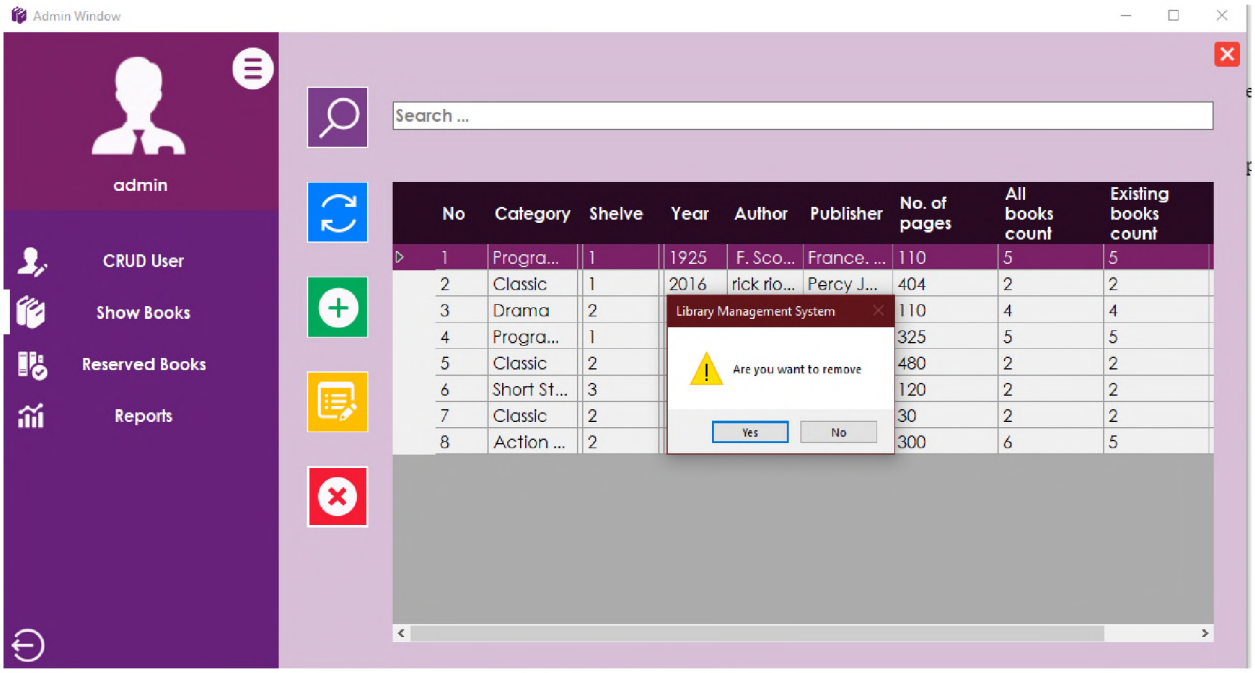

Fig. 32. Admin

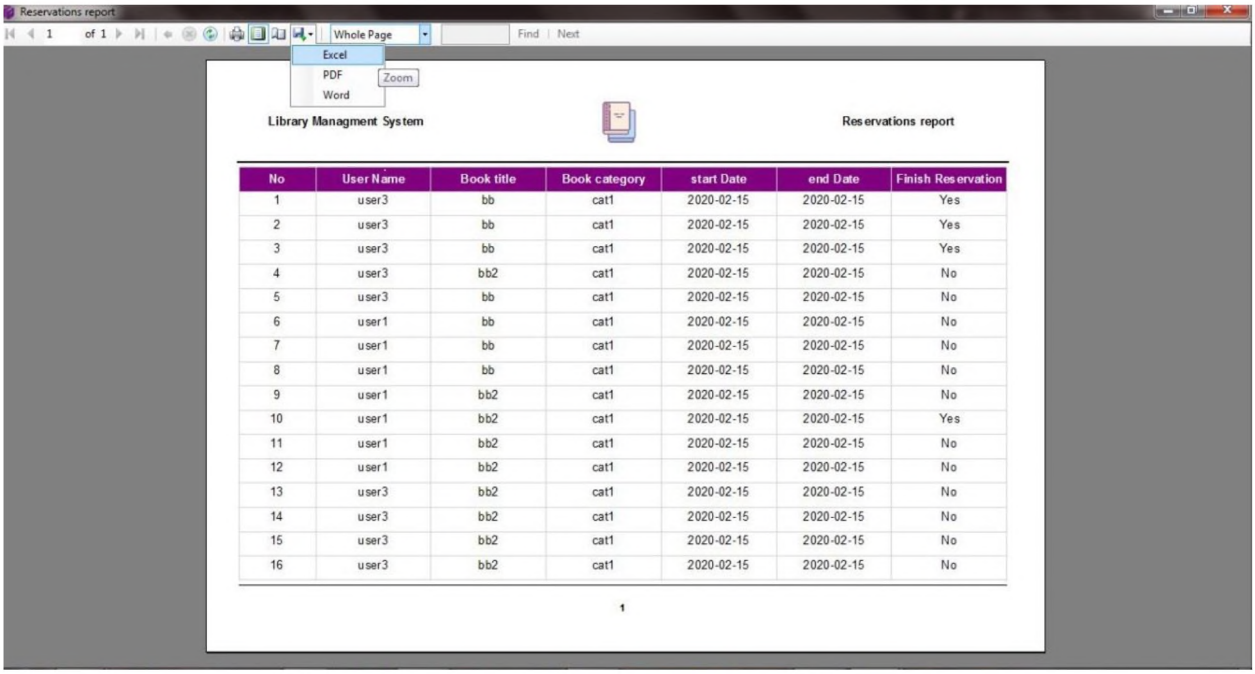

Fig. 33. Report

Librarian interface

The figure 7 shows the login interface of the librarian that can be created by

the librarian (fig. 34).

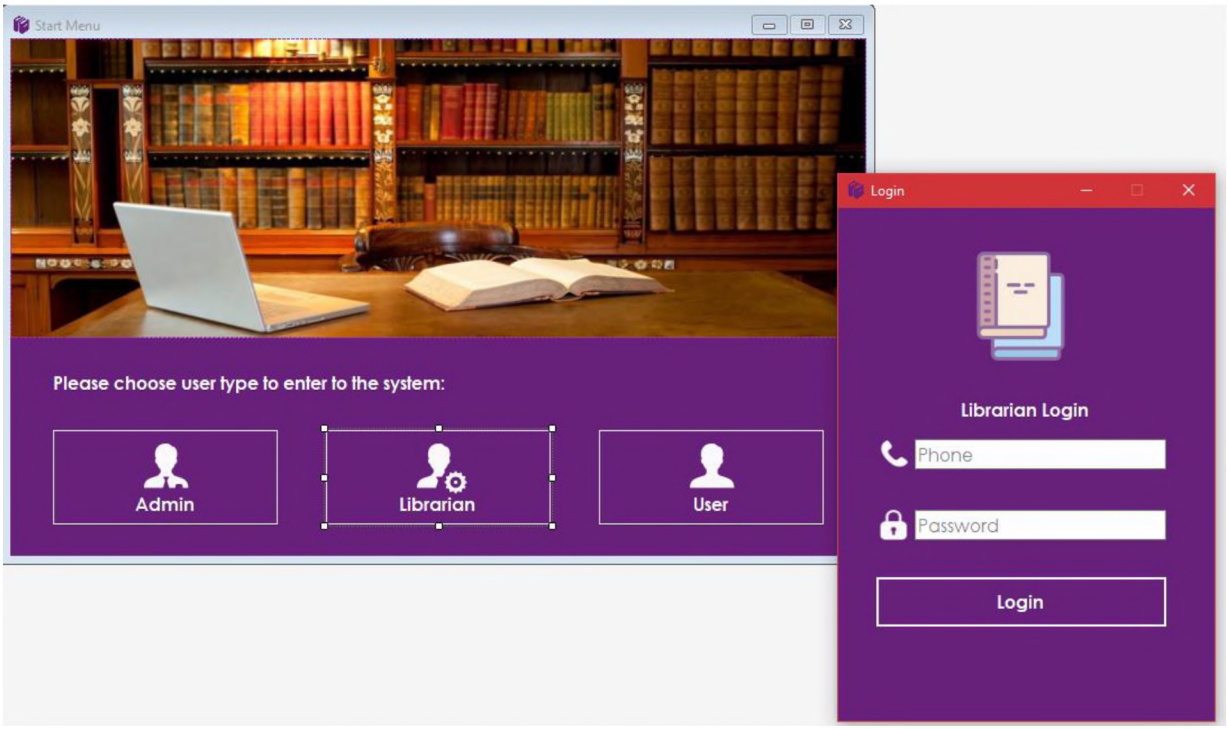

Fig. 34. Librarian login interface

After logging in the librarian will have a multiple functions to use (“CRUD boos”, “CRUD shelves”, CRUD floor”, “CRUD category”) – fig. 35.

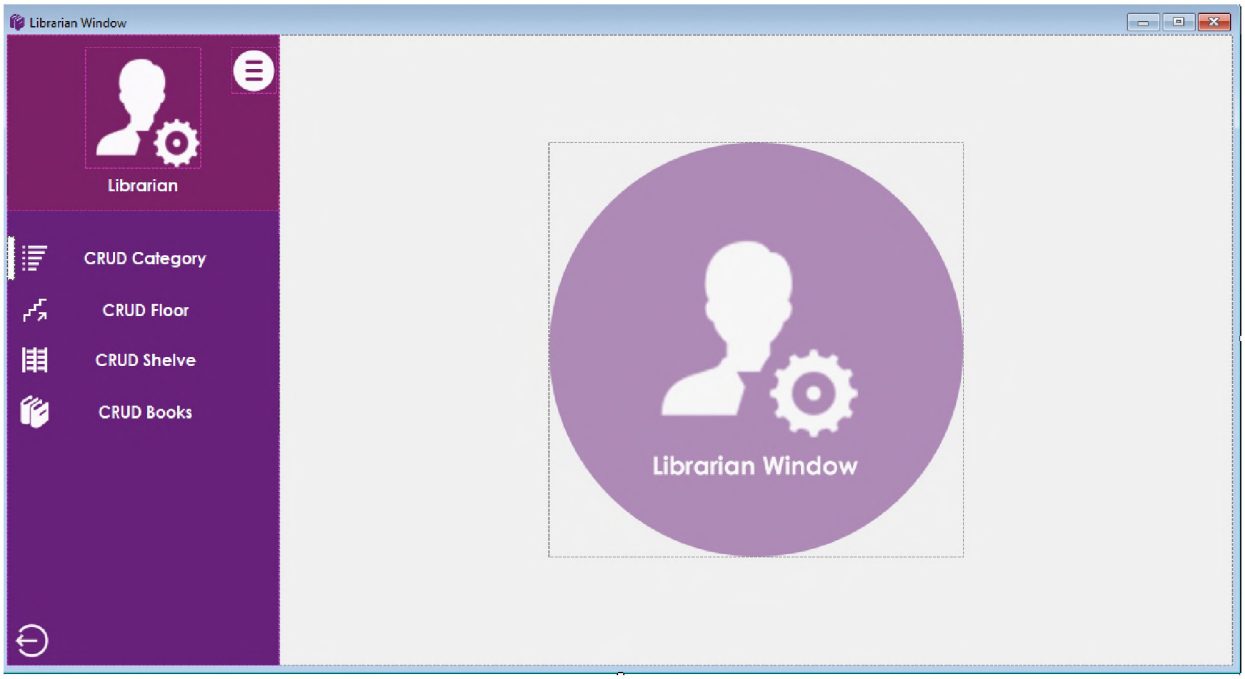

Fig. 35. Librarian interface

The librarian can create a huge selections of a category for books, it can be a politic or a science books and so on.

Create or modify the floor which the book is located in.

Create or modify the shelves on the floor where the book located

Create or delete exacting or new book

The librarian can add category and save it for other uses or in time use (fig. 36).

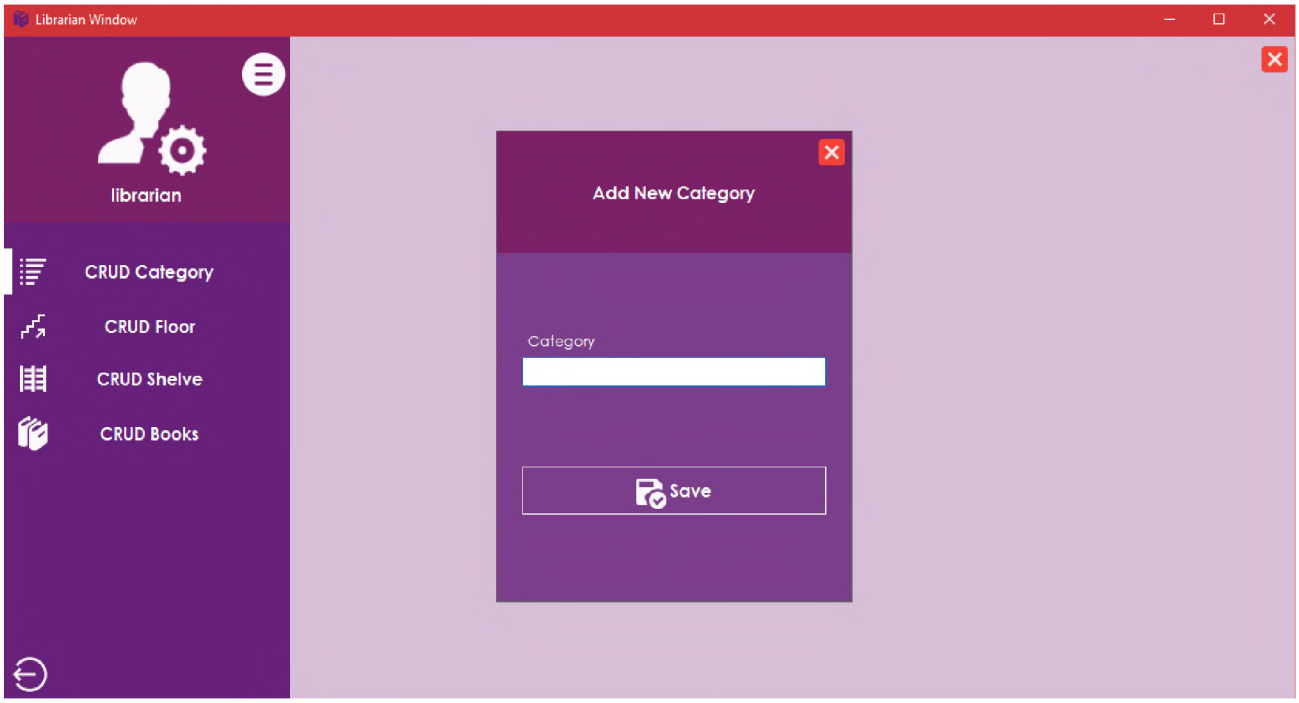

Fig. 36. Category

Also the same thing for floor and shelves we can see our information already we can surf it and see how many floors we have and we can add new floor (fig. 37).

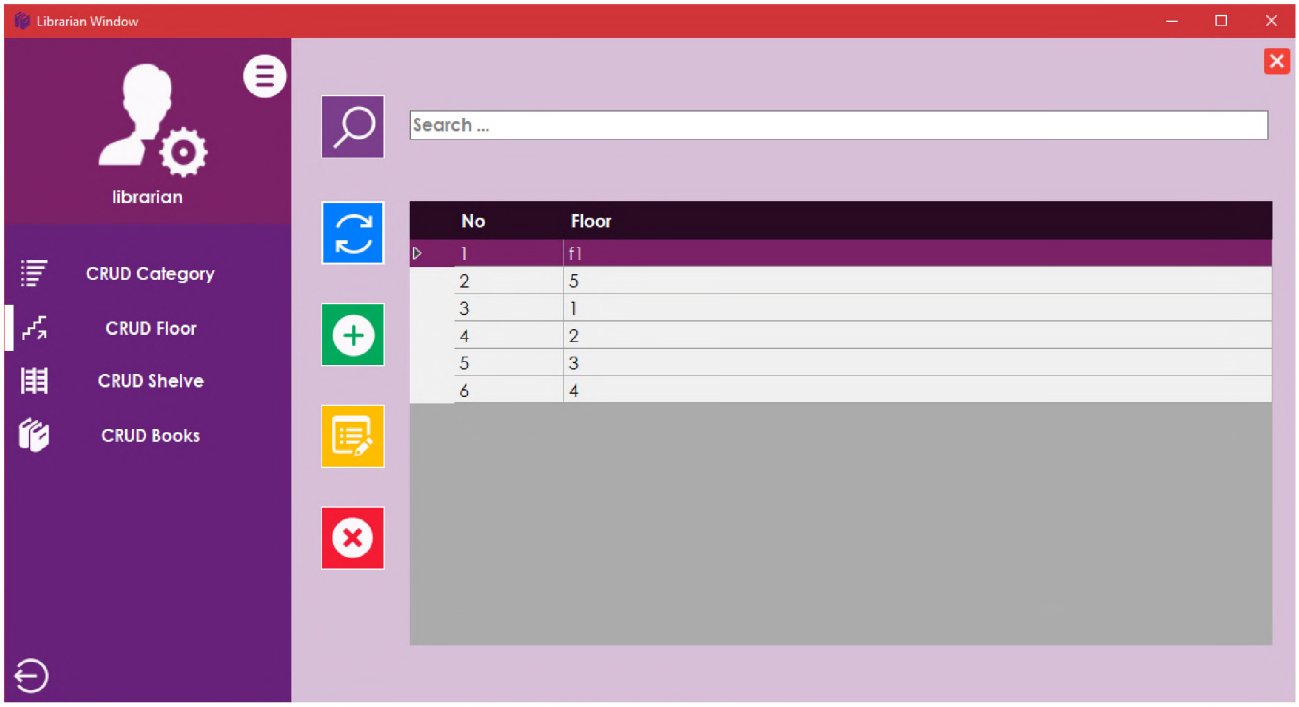

Fig. 37. Floor

In the book section as shown in the fig you will have the ability to add all information related to book for example (name of book, author, year and so on).

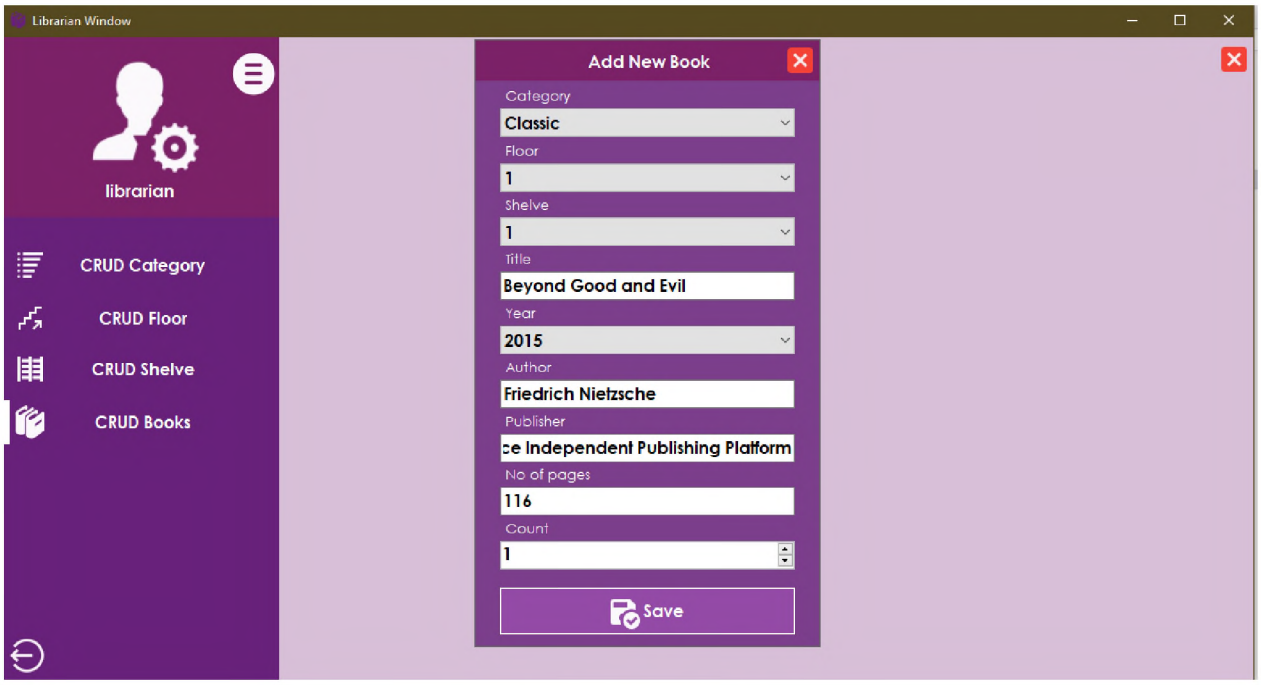

Fig. 38. Book add

4.2. Testing the application

Software testing is defined as an activity to check whether the actual results match the expected results and to ensure that the software system is working probably. It involves execution of a software component or system component to evaluate one or more properties of interest [23].

As software applications been more complicated and interlaced and with the difference of platforms and devices that needed to be tested, it is more important than ever to have a testing methodology for making sure that software products or systems that developed have been fully tested and to be sure they meet the specific requirements and can successfully operate in different environments with the required usability and security Therefore, we compare the actual results with the expected results (tab. 1).

Tab. 1. Testing results

No.	Function	Expected result	Obtained result	Conclusion
1	To show the main GUI interface	Any user can see the page with a list of the main logins	Any user can see the page with a list of the main logins	The function works
2	Register a new user in the database of the registration interface	The user can insert his mobile number and password to register	The user can insert his mobile number and password to register	The function works
3	Showing error message while registering a new user	If the user, while writing his mobile number ,and password, enters a number or password which are not registered in the database, the system shows the error message	If the user, while writing his mobile number ,and password, enters a number or password which are not registered in the system	The function works
4	The system must show the total number of books that are available	Any registered user can see this page with total number of books	Any registered user can see this page with total number of books	The function works
5	Make a search for specific book	Any registered user can search for books	Any registered user can search for books	The function works
6	Make an advance search With specific parameter	Any registered user can use the advance search	Any registered user can use the advance search	The function works

No.	Function	Expected result	Obtained result	Conclusion
7	Make a reservation with specific date	The user of the system can reserve any book that available	The user of the system can reserve any book that available	The function works
8	At the login section "Admin" the user has the permission to insert his special username and password to validate his data and see the list of functions in the admin main page	The administrator can see the list of functions in the "Admin" page	The administrator can see the list of functions in the "Admin" page	The function works
9	The admin must be able to modify information about users' accounts.	The administrator can Modify users deleting and adding with the list of the main admin function	The administrator can Modify users deleting and adding with the list of the main admin function	The function works
10	The admin will be able to modify information about books exist in the library.	The admin can Modify books	The admin can Modify books	The function works
11	The admin can view the reserved books	The admin can interface with the reserved books	The admin can interface with the reserved books	The function works
12	At the login section "librarian" the user has the permission to insert his special username and password to validate his data and see the list of functions in the librarian main page	The librarian can see the list of functions in the "Admin" page	The librarian can see the list of functions in the "Admin" page	The function works
13	The librarian will be able to modify information about books exist in the library.	The librarian can Modify books	The librarian can Modify books	The function works
14	The librarian must be able to add new books to the database	The librarian can see the page "Add book" with the list of the main library function	The librarian can see the page "Add book" with the list of the main admin function	The function works
15	The librarian must be able to add new floors to the database	The librarian can see and add floor	The librarian can see and add floor	The function works
16	The librarian must be able to add new categories to the database	The librarian can see the page "Add Category" with the list of the main librarian function	The librarian can see the page "Add Category" with the list of	The function works

No.	Function	Expected result	Obtained result	Conclusion
			the main librarian function	
17	The librarian must be able to add new shelves to the database	The librarian can see the page "Add shelve main	The librarian can see the page "Add shelve main	The function works
18	The librarian must be able to delete information about categories exist in the library.	The librarian can "Modify categories " with the list of the main librarian function	The librarian can "Modify categories " with the list of the main librarian function	The function works
19	The librarian must be able to delete information about books exist in the library.	The librarian can "Modify book " with the list of the main librarian function	The librarian can "Modify book " with the list of the main librarian function	The function works
20	The librarian must be able to delete information about floor exist in the library.	The librarian can "Modify floor " with the list of the main librarian function	The librarian can "Modify floor " with the list of the main librarian function	The function works
21	The librarian must be able to delete shelves exist in the library	The librarian can "Modify shelves " with the list of the main librarian function	The librarian can "Modify shelves " with the list of the main librarian function	The function works
22	The admin must be able to delete information about users exist in the library.	The admin can "Modify users " with the list of the main admin function	The admin can "Modify users " with the list of the main admin function	The function works
23	The admin must be able to delete information about users exist in the library.	The admin can "Modify users " with the list of the main admin function	The admin can "Modify users " with the list of the main admin function	The function works
24	The user must be able to check whether the book is available to borrow.	Any registered user can see this function	Any registered user can see this function	The function works
25	The admin must be able to generate reports when needed	The admin can make a reporting	The admin can make a reporting	The function works
26	The admin can see all returned books.	The admin can see all returned books.	The admin can see all returned books.	The function works
27	The user can access system using phone number with the add of user name	The user can access it using user interface	The user can access it using user interface	The function works
28	The user can reserve a book for a specific date entered	The user can make any reservation in reservation section	The user can make any reservation in reservation section	The function works

No.	Function	Expected result	Obtained result	Conclu-sion
29	The user must return the book after use	In the reservation section user can end the reserva-tion	In the reservation sec-tion user can end the reservation	The function works
30	The system return book count automatically	Due to the developed sys-tem book count will be re-turned to first stage	Due to the developed system book count will be returned to first stage	The function works
31	The librarian must be able to register books to return for specific user.	The librarian can add books in book section	The librarian can add books in book section	The function works
32	User can search For specific pages	User can search for no pages	User can search for no pages	The function works

CONCLUSION

After we have completed the project we are sure the problems in the existing system would overcome. The “LIBRARY MANAGEMENT SYSTEM” process made computerized to reduce human errors and to increase the efficiency. The main focus of this project is to lessen human efforts. The maintenance of the records is made efficient all the functions work easy for any user to use friendly gui to make the program easy for any user to use even without big knowledge in computer

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