

Library Management System

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in
The Department
of
Computer Science and Engineering



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Approval Certificate

This project titled "**Library Management System**" submitted by **Md. Tanzir Ahsan Rakib**, Student ID: **012152019**, has been accepted as Satisfactory in fulfillment of the requirement for the degree of Master of Science in Computer Science and Engineering on 15 December, 2018.

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Declaration

This is to certify that the work entitled “**Library Management System**” is the outcome of the research carried out by me under the supervision of **Dr. Mohammad Nurul Huda**, Professor, Department of Computer Science & Engineering (CSE), United International University, Dhaka.

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In my capacity as supervisor of the candidate’s project, I certify that the above statements are true to the best of my knowledge.

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Abstract

The software **Library Management System** with some advance features is to support the librarian of an institute. The users (i.e. librarian, student) will find it very user friendly, where user can be serviced with more ease. This software presents an effective way through that authority can save more time & provide more facilities.

Every application software has its own extension or capacity which is very much practical. This project is also bounded in a few cases. Right now the application has some scope with extensible scheme to add on or integrate future demand also. The main purpose of this system is to assist the user more easily & make the functioning of a library faster. At present days it is not very easy to find a convenient library management system for users.

This **library management system** is constructed & developed using C# platform with mandatory security in order to overcome some problems. It (software application) operates convincingly. The future of this **library management system** can be more extended with more advanced features.

Acknowledgement

Thanks to the Almighty Allah who poured his kind grace in during the completion of this project. It has been an immense pleasure for me to develop this desktop based application **Library Management System**. I have gathered a few experiences during the completion of this project.

Now I would like to thank my respectable teachers & supervisor of this project **Dr. Mohammad Nurul Huda**, Professor, Department of Computer Science & Engineering, United International University, who guided me to analysis the system & helped me to develop a dynamic system. His limitless patience, intellectual guidance, endless inspiration, continual supervision, valuable advices & correcting them at all stages have made it possible for me to complete this project. I must also convey my special thank & gratitude to all of the respected teachers of my department for giving me their valuable suggestions. I would also like to give special thanks to my friends, colleagues & brother for their helpful suggestions & cooperation to complete this project.

Finally, I must acknowledge with due appreciation the constant support & patience of my parents.

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Chapter 1

Introduction

Now a day the term “Digital Bangladesh” has become a very familiar word. Bangladesh now is recognized as a developing nation after fulfilling the criteria set by United Nations. The country has already advanced forward to integrate & digitalize its entire sector. The people of this country are now very much awake & familiar with the use of software, internet, mobile app & websites. Every company or commercial organizations either big or small also becoming digital with the stride of time. They are using various software for different purposes & want more software to complete the rest of the tasks more easily. It is important to note that different organizations have different structures & rules of their own. So, it’s challenging to match suitable software for their daily activities. This project work is to help the work of a librarian of an institute & make the functioning of a library faster with some advanced features. It will also erase the paper work of a librarian & will also save more time & costs.

Chapter 2

Background and Literature Review

Bangladesh is an immensely populated country of south East Asia. There are a huge number of educational institutions with a large number of students here in the country. Each of these educational institutions has a library of their own. So, these institutions are in need of software to eliminate the paper work of a library & also to record every transaction of a library in computerized system.

On the other side a lots of Software Company as well as some software developers has made this software for different organizations & also to earn money. But due to the demand of various organizations it has been made with different features each time. But none of them weren't able provide the full support with all the features.

We want to provide a software where the users of this software (**Library Management System**) will find the software very user friendly & also with some of the advanced features.

For the last few years it has been noticed that the number of organizations or company are increasing very fast. The software sectors can be a good solution for the unemployment problem of our country. At present we are lagged behind in the way of digitalization rather than the other developed countries. Use of different computers, software & all kinds of electronic gadgets can be the one way of digitalization. Issue books, return books, calculate fine, book stock report, automatic email sent to the students & faculty, reading PDF books in the library, students & books record is the challenging task. Thus I chose **library management system** software first.

Every software application has its own extension & feature. It can also be expanded in the feature if needed. This project is also limited in some way. At present the software has the following features:

- Login with different user's type
- Password recovery option(by email) for every registered user
- Add, view, edit/update, delete books detail
- Search books by author name or publication name
- Add, view, edit/update, delete students detail with image
- Search students info by students id
- Barcode generate for student id
- Add, view, edit/update faculty info
- Issue books for both students & faculty
- Return books from student & faculty & add the books into the stock
- Students can read PDF books from the system
- Admin & Librarian can see the report who have taken the books
- Automatic email send to both faculty & students who have issued books to remind them to return the book in the library
- Etc.

My Project paper on **Library Management System** is organized into five chapters. These are:

Chapter-1 Introduction: In this chapter I have already discussed about Library Management System for librarian i.e. Introduction of the project, Background, main objectives, current state & prospect of the project. This preliminary chapter describes the primary description about the project.

Chapter-2 System Analysis: In this chapter we deal with software requirement specification, in which I will discuss about Functional & Technical requirement. I will also discuss about the model which is used in the project.

Chapter-3 System Design: In this chapter I will describe the **Library Management System** features in detail & will also include work flow diagram, use case diagram & database diagram.

Chapter-4 Implementation & Experiments: In this chapter I will illustrate the development of the project & testing. Finally I will mention & discuss about experiments with some inputs & will study the output. Lastly I will discuss about the deployment plan of this project.

Chapter-5 Conclusion & Future works: This chapter concludes the project work also mentioning the goal which is achieved after completion of the project. Furthermore the future works are also mentioned in this chapter.

2.1 System Analysis (Introduction)

The main goal of the system analysis is to figure out where the problem lies, in an attempt to fix the system. This step relate breaking down the system in many pieces in order to study the situation, analyzing the project goals, breaking down what needs to be created & attempting to enlist users so that the definite specification can be defined.

The business requirements are gathered in this phase. It (this phase) is the main focus of the project managers & stake holders. After the completion of requirement gathering these requirements are studied for their validity.

2.2 System Analysis

The sub-sub headings here have a different format (“heading 3”) than the sub headers.

2.2.1 Software Requirement Specification

2.2.1.2 Functional Requirement

This application can be a desktop based or web based application. This application requires dynamic features using both admin & librarian. Everyone can access the same application in different computer by using their own id.

Functional Requirement:

- Easy registration/log in with different user type
- Password recovery option by email for registered user
- Option for book searching by author name or publication name

- Add, update/edit, view book details
- Add, update/edit, delete, view student details
- Search student information by student id
- Add, update/edit, view faculty details
- Issue books for both faculty & student
- Return/receive books from faculty ,student & add in available stock
- Students can read PDF books from the system
- Automatic email send to both faculty & students who have issued books to remind them to return the book in the library
- Admin & Librarian can see the report who have taken the books

2.2.1.3 Application Analysis

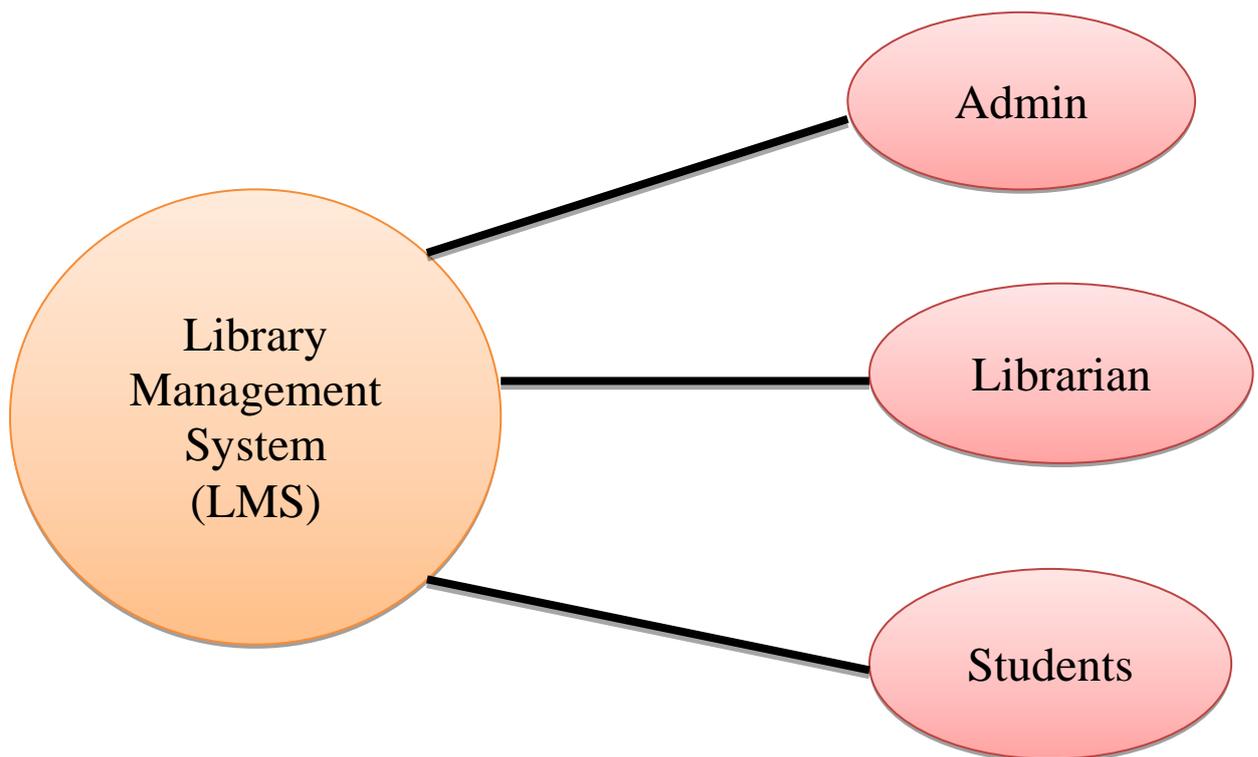


Fig 2.1: Different Level of user's

2.2.1.4 Technical Requirement

Considering the full requirement the software needs to be fast & reliable. So that the user can perform their activities very easily. So it is fixed that the software will be developed by using Visual C#. It supports in the maximum operating system.

At the beginning the solution will have the SQL server 2008 database which is very easy to code & maintain.

Technical Requirement:

- Desktop based
- User friendly design
- Very simple workflow
- Supporting the reports
- Authenticate users
- Many users can access the application at the same time

Chapter 3

Methodology

A software development methodology specifies the framework that is used to design, plan & control the process of developing of a system. A lot of frameworks have emerged over the years. Each of the available method is suited for specific types of project.

In order to advance this type of project I choose the “Waterfall Model” as software development life cycle.

3.1 Waterfall Model

This model is a sequential design process. It is usually used in software development process. In this process the progress is seen as flowing regularly downwards like a waterfall through the phases of conception, initiation, analysis, design, construction, testing, Implementation & Maintenance.

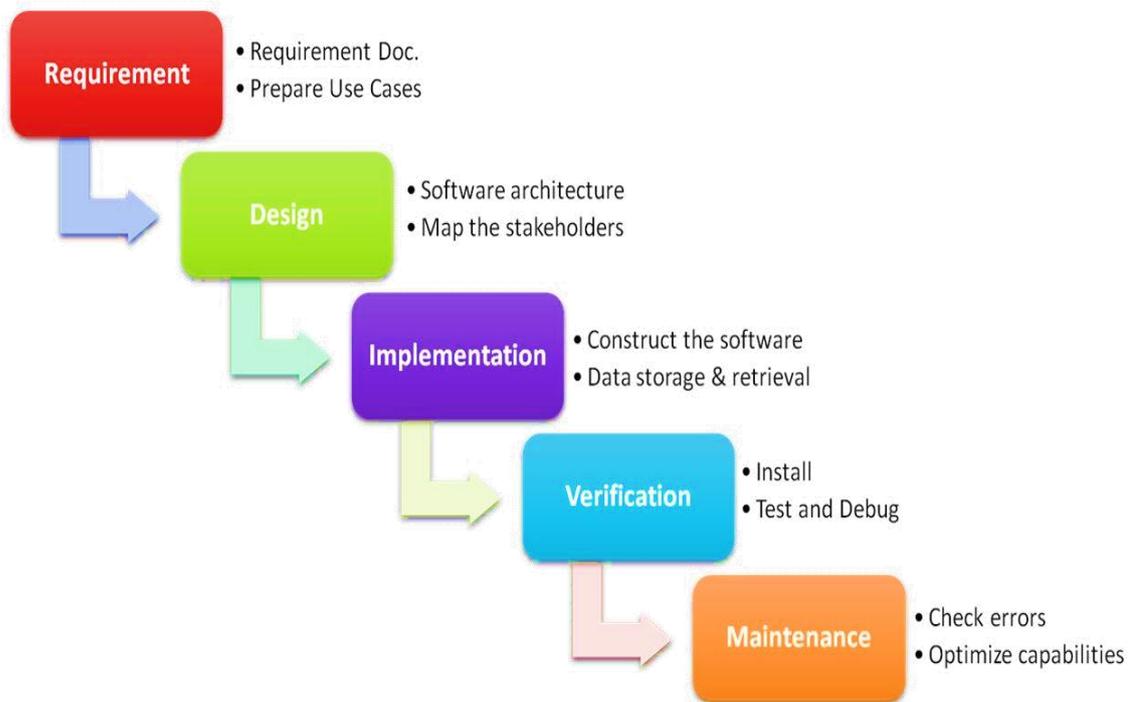


Fig 3.1: Waterfall Model

This model derives in the manufacturing & construction industries. The first proper description of waterfall model is generally refer to as an article by Winston W. Royce. Royce presented this model as an example of a flawed. At that time W. Royce didn't use the term "waterfall" in this article. He presented this model as unreliable, non-working model. In fact this is how the term is used in writing about the software development.

3.2 Advantage of Waterfall Model

1. This model is very simple to implement. It requires minimal amount of resources comparing to the other models.
2. It has high visibility & the output is generated after each stage. Both the client & project manager gets a feel that there is a considerable progress.
3. Here deadline can be set for the completion of each stage & the evaluation can be done in order to check the project is going as per breakthrough.
4. It provides a template where methods like analysis, design, coding, testing & maintenance can be placed.
5. Waterfall methodology is liked in the projects where the quality is more important than to schedule or cost.

3.3 System Design

3.3.1 Introduction

The design function & operation are described in detail in system design. The design stage takes as its basic input the requirements which are identified in the approved requirement documents. It is the technique of defining the components, modules, interfaces & data for a system to satisfy the stated requirements. System development is the procedure of describing the modules, components, interfaces & data for a system to satisfy particularized requirements.

The design elements explain the desired system features in detail. These design components are designed to describe the system in detail, so that the skilled Engineers & developers may develop & deliver the system quite easily.

3.3.2 Workflow Diagram

3.3.2.1 Admin's Workflow

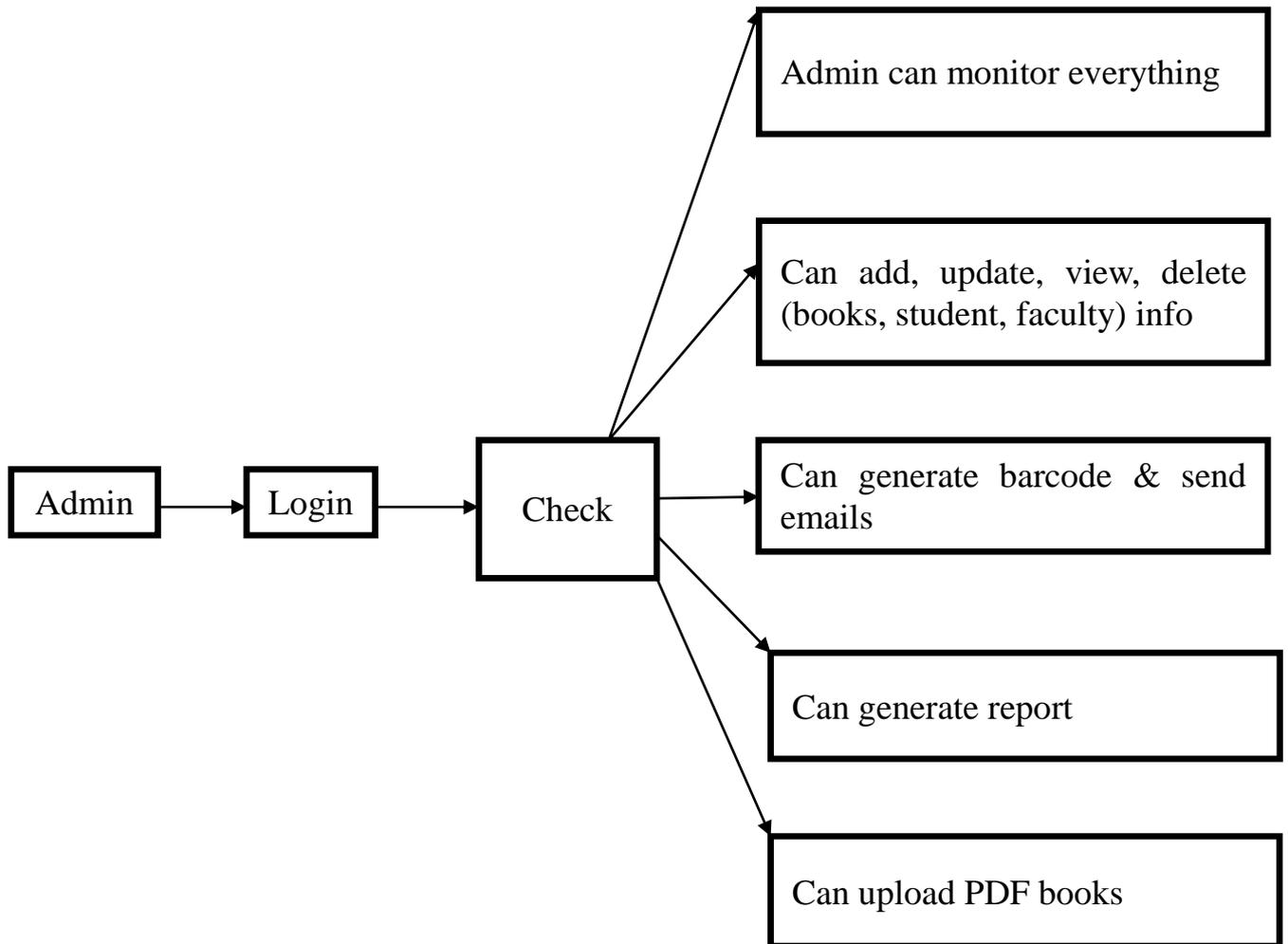


Fig 3.2: Admin workflow

3.3.2.2 Librarian's workflow

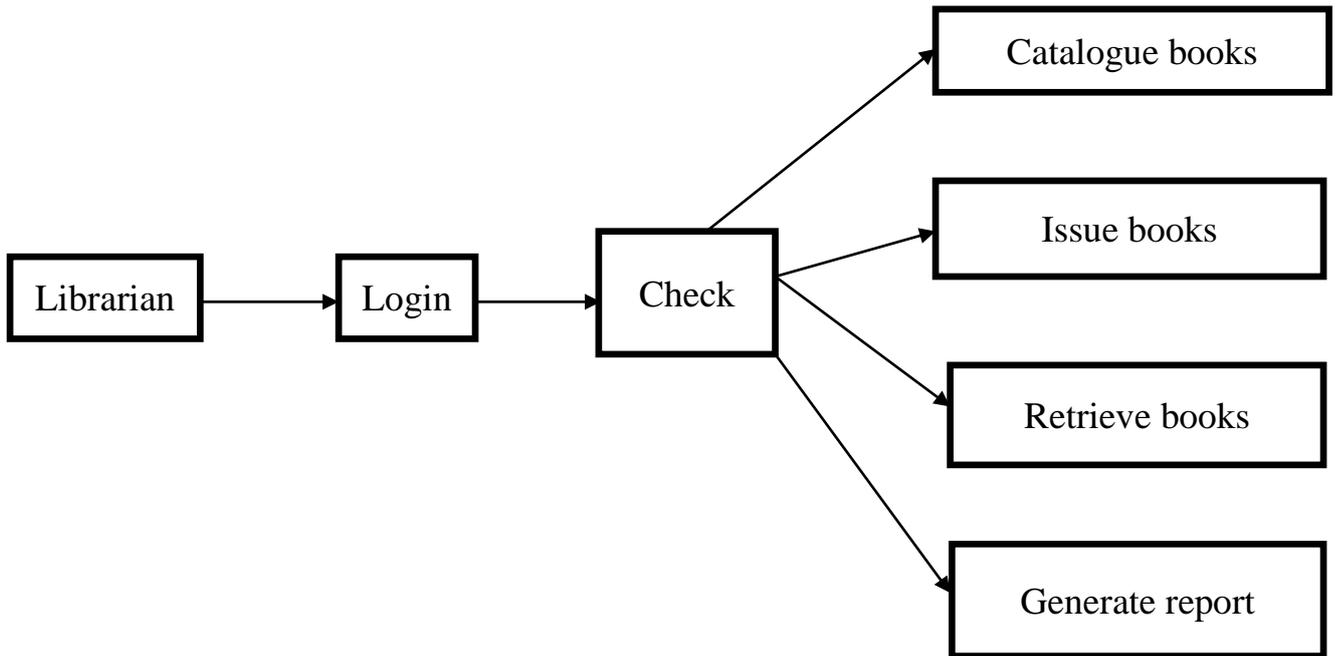


Fig 3.3: Librarian workflow

3.3.2.3 Student workflow

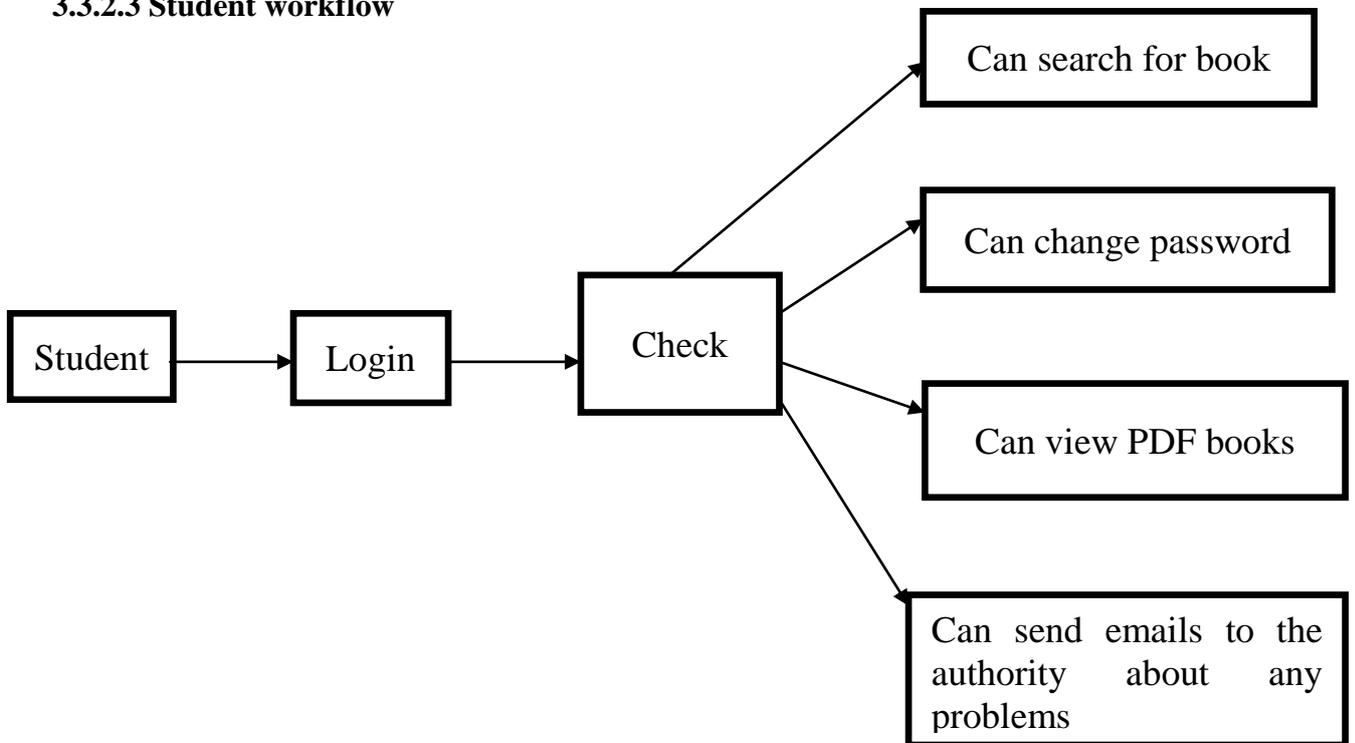


Fig 3.4: Student workflow

3.3.2.4 Use Case Diagram

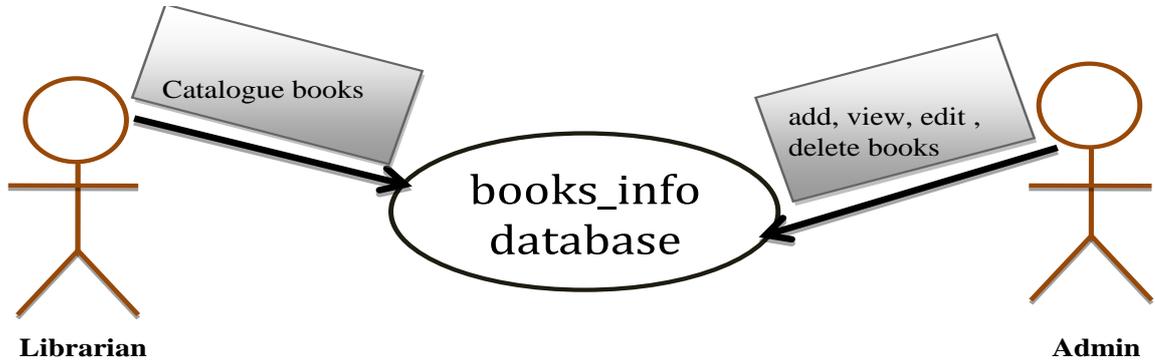


Fig 3.5: Book Catalogue

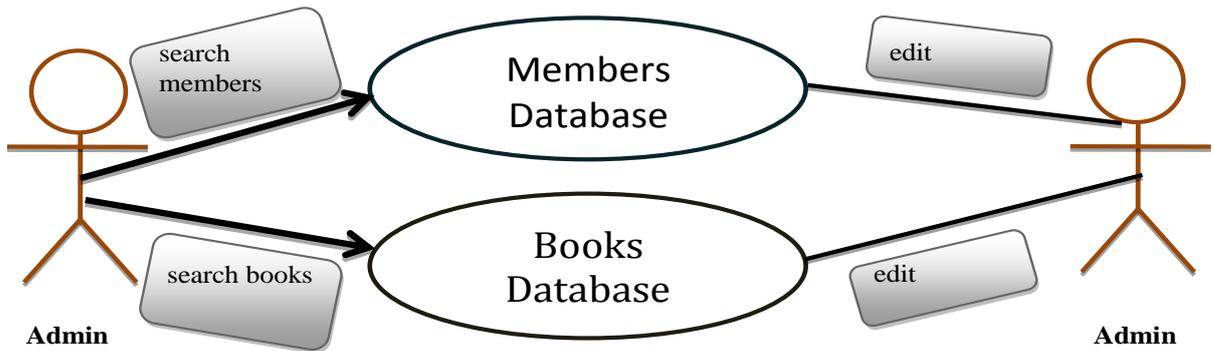


Fig 3.6: Member & Book Search

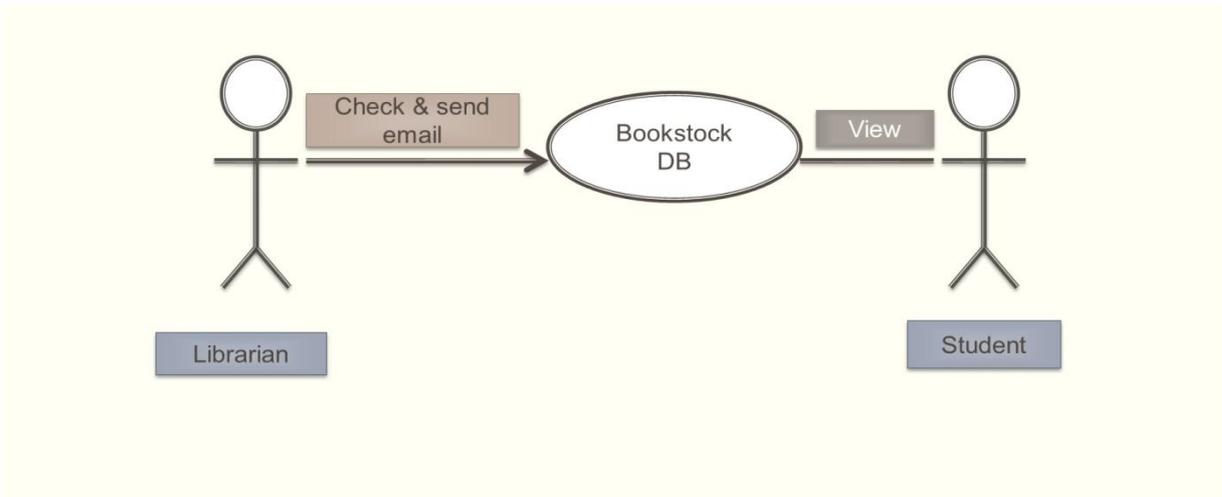


Fig 3.7: Email sends

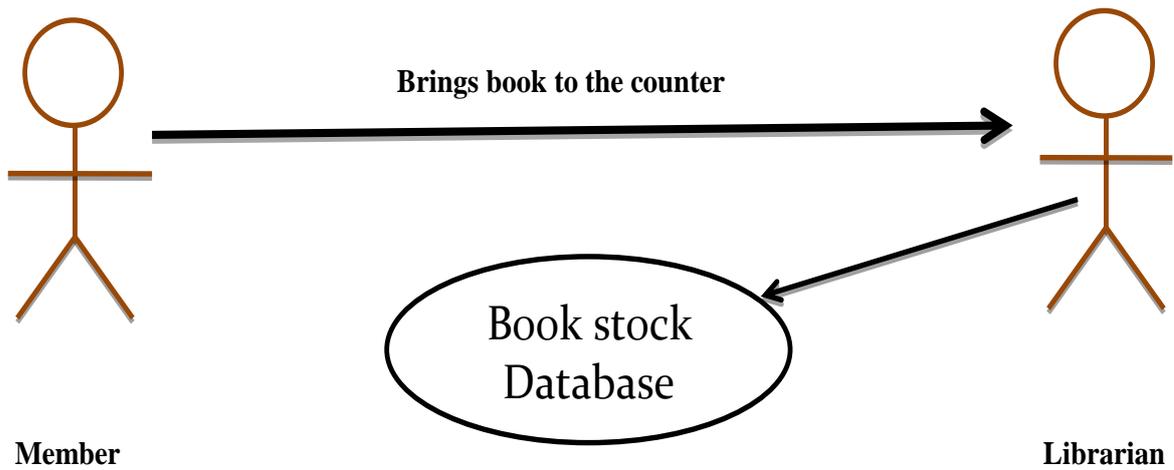


Fig 3.8: Books Issue/Retrieve

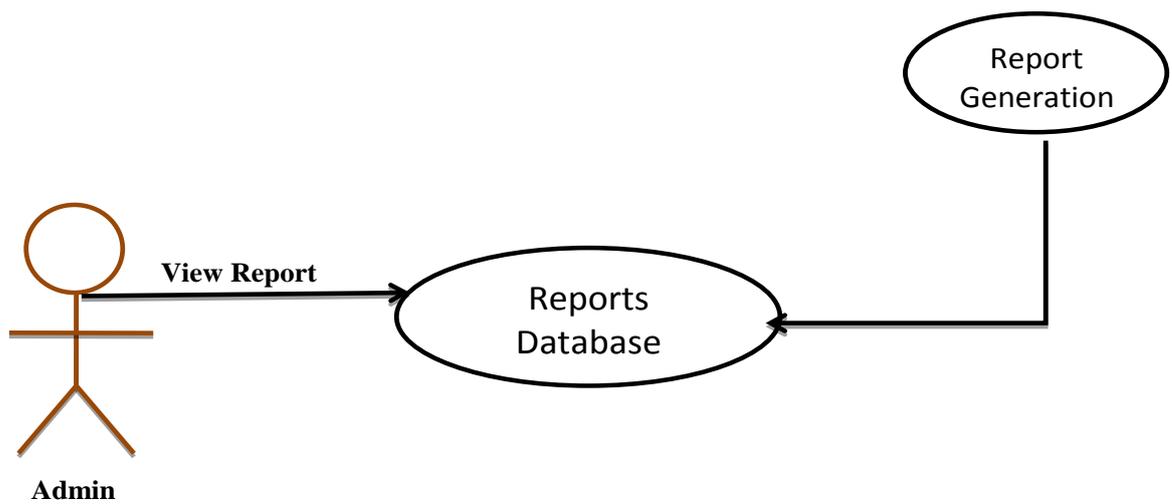


Fig 3.9: Report Generation

3.3.2.5 ER Diagram

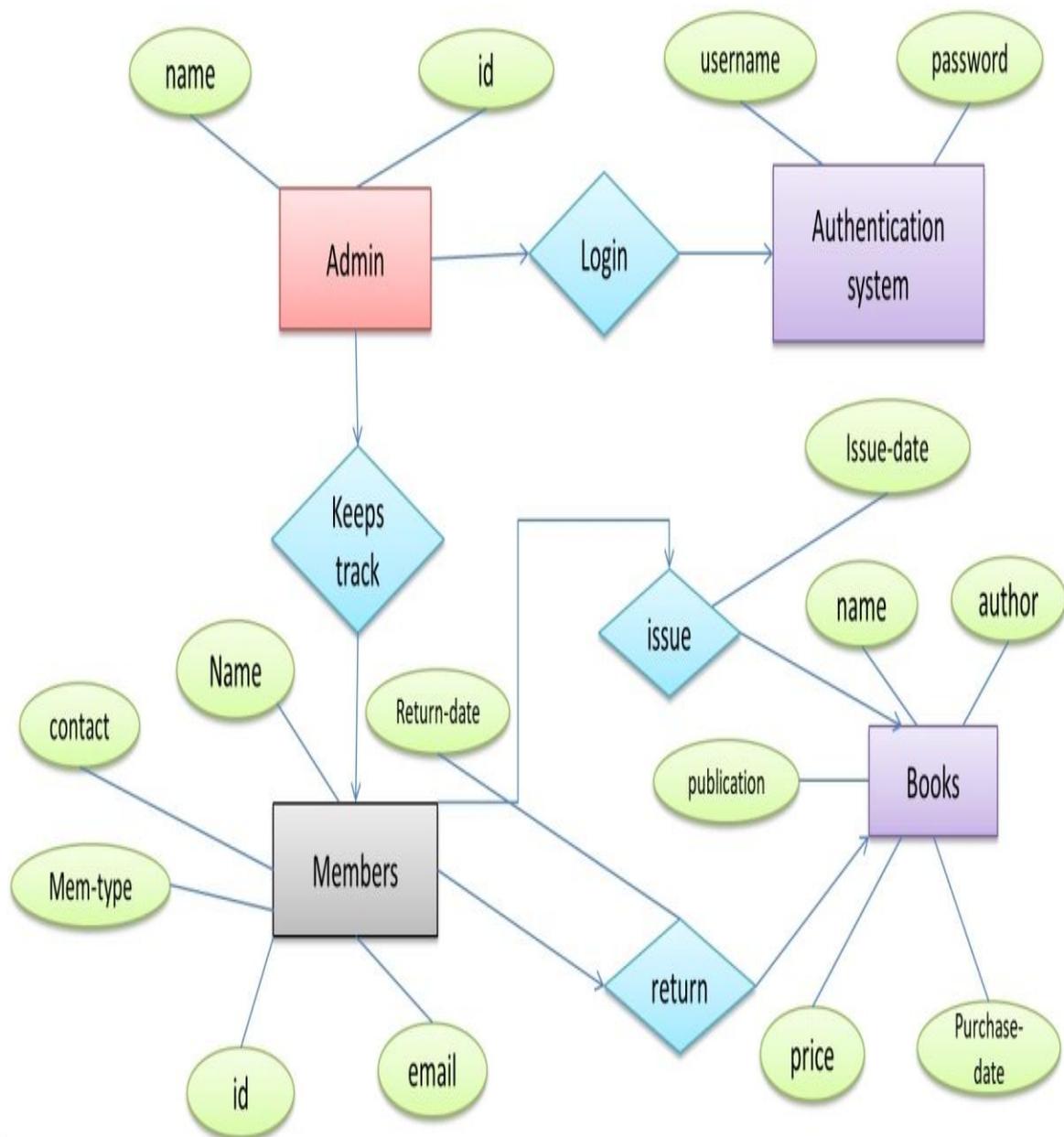


Fig 3.10: ER Diagram

Chapter 4

Implementation & Experiments

4.1 Introduction

In order to make the software more fast, robust, modern technology is used to implement the **library management system**. Now in this chapter I will describe about the development, testing, implementation & experiments. By giving some input I will also observe the desired output.

4.2 Development

Development Environment

SQL Server: It is a database server by Microsoft. It is also known as Microsoft relational database management system (RDBMS).The SQL server is a database server that implements the Structured Query Language which is known as SQL. The SQL statements are used to perform some task such as insert data, update data or retrieve data on a database. The Microsoft SQL server ran exclusively in windows for more than 20 tears. But, in the year 2016 Microsoft said it planned to make the DBMS available on Linux, starting a new version later it was named as SQL Server 2017. The root component of Microsoft SQL Server is the SQL Server Database Engine, which controls data storage, processing & security. It comprises a relational engine that process command & queries.

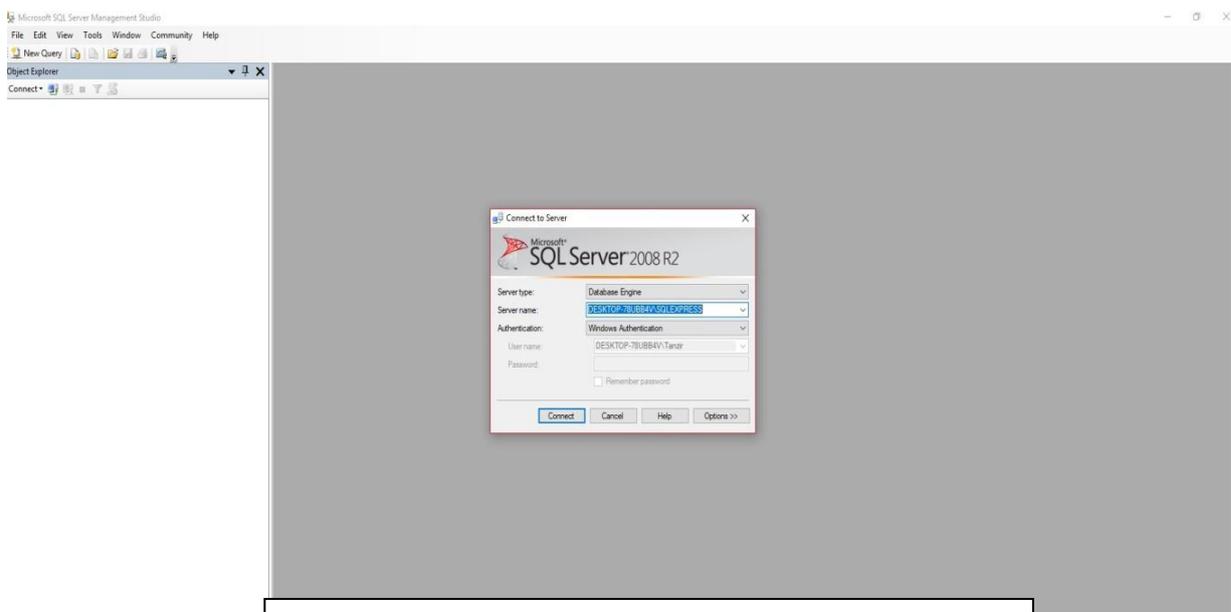


Fig 4.1: SQL Server R2

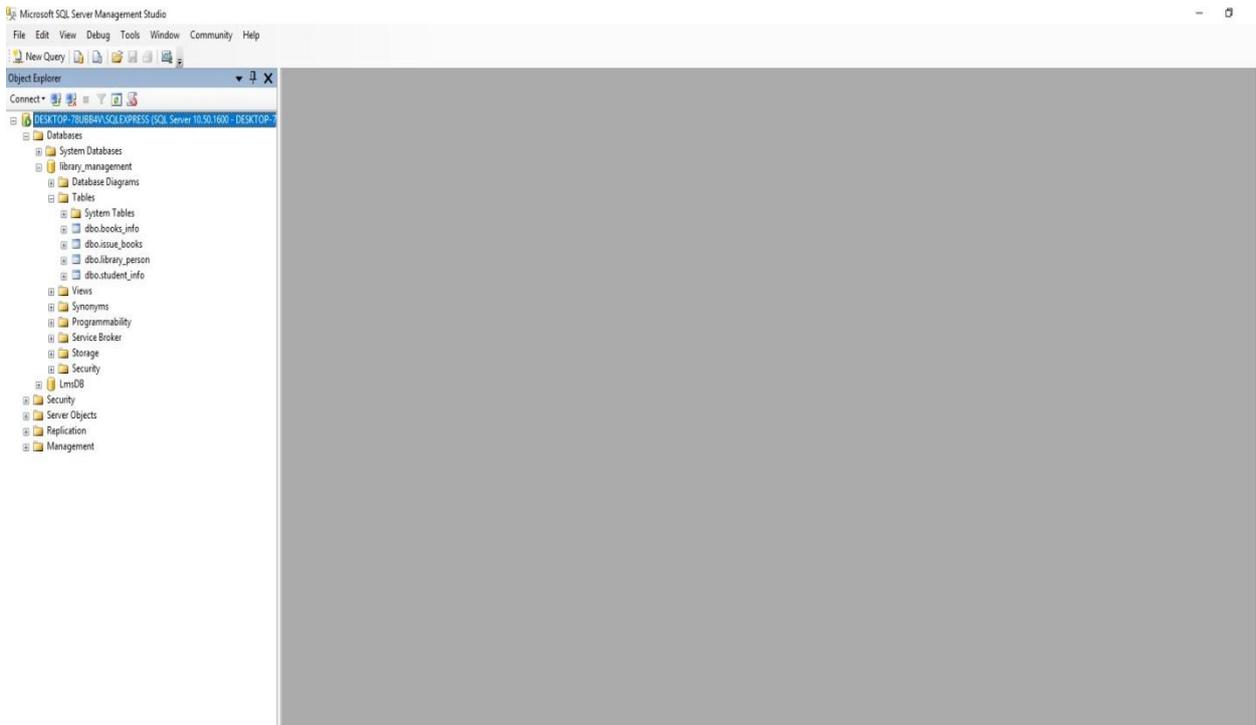


Fig 4.2: SQL Server R2

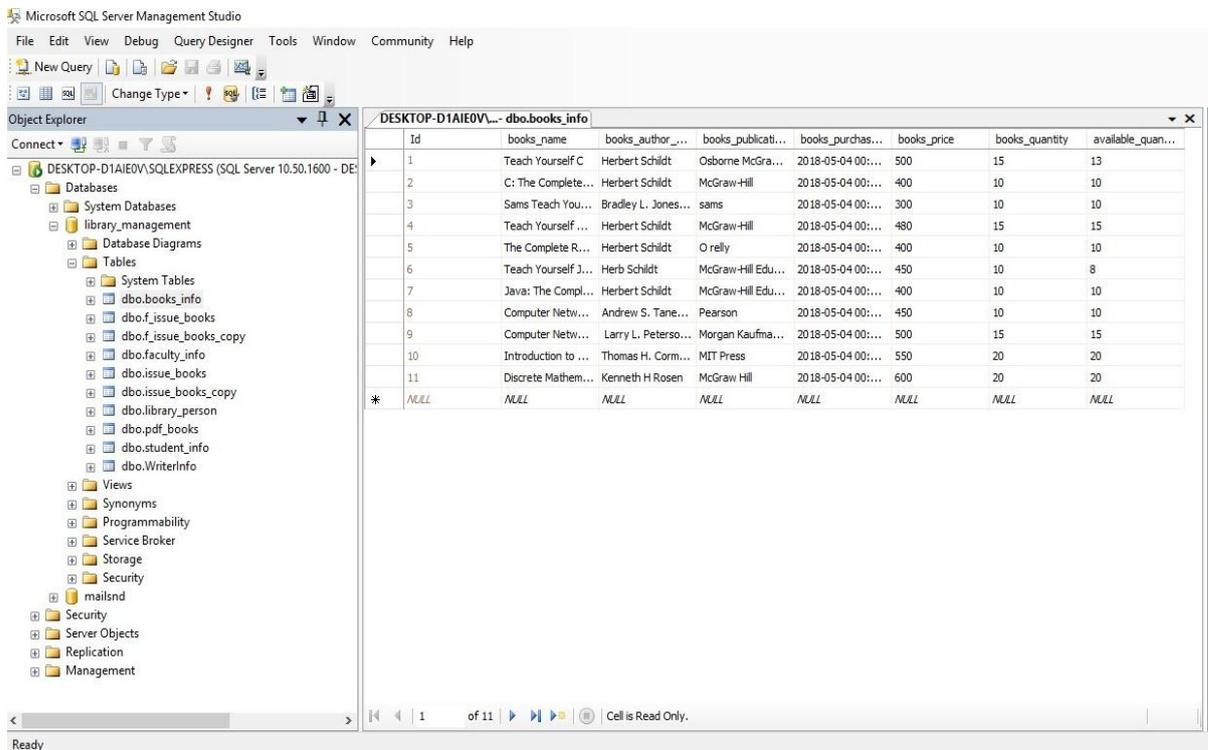


Fig 4.3: Database SQL Server

4.3 Software Testing

Software Testing is an analysis attends to provide the shareholder with the information about the feature, quality of the product under test. It can also support an objective, autonomous sight of the software to allow the business to appreciate & know the risks of implementing the software.

The software testing can be told as the system of verifying & approving that a software program:

1. Meets all the specification
2. Works as expected
3. Can be carried out with the same attributes
4. Satisfies the demand of stakeholders or shareholders

Depending on the testing method the software testing can be implemented at any time of the development procedure. Normally most of the test exercise occurs after all the specification has been described & coding process has been finished.

4.3.1 Testing Methods

Static vs. Dynamic Testing: There are so many approaches for the software testing. Static testing is also known as dry run testing. In software development static testing can be stated as software testing method where the testing is done without executing the code. On the other hand the dynamic testing is software testing method where the testing is completed with executing the code.

4.3.2 The box approach

The software testing methods are normally divided into the white & black box testing methods.

White box testing: This testing method is also known as clear box testing, code based testing, transparent testing or structural testing. It is a software testing process in which the internal design of the component being tested. Here the tester chooses the inputs to study paths over the code & to decide the proper output.

Methods involved in white box testing are:

- Application Programming Interface- testing of the application
- Code coverage- creating some tests to content some principal of code coverage
- Fault injection method- deliberately offer faults
- Static testing methods
- Mutation testing methods

Black box testing: It is known as behavioral testing. It is a testing process in which the internal design of the item is known to better. In black box testing the tester is only aware of only what the software is supposed to do. The tester doesn't know how it does it.

Visual Testing: The purpose of visual testing is to support the developers with the capability to study what was happening at the point of software failure by displaying the data in a such way that the developer can easily find the information he needs.

4.4 Experiments



Fig 4.4: Login Panel

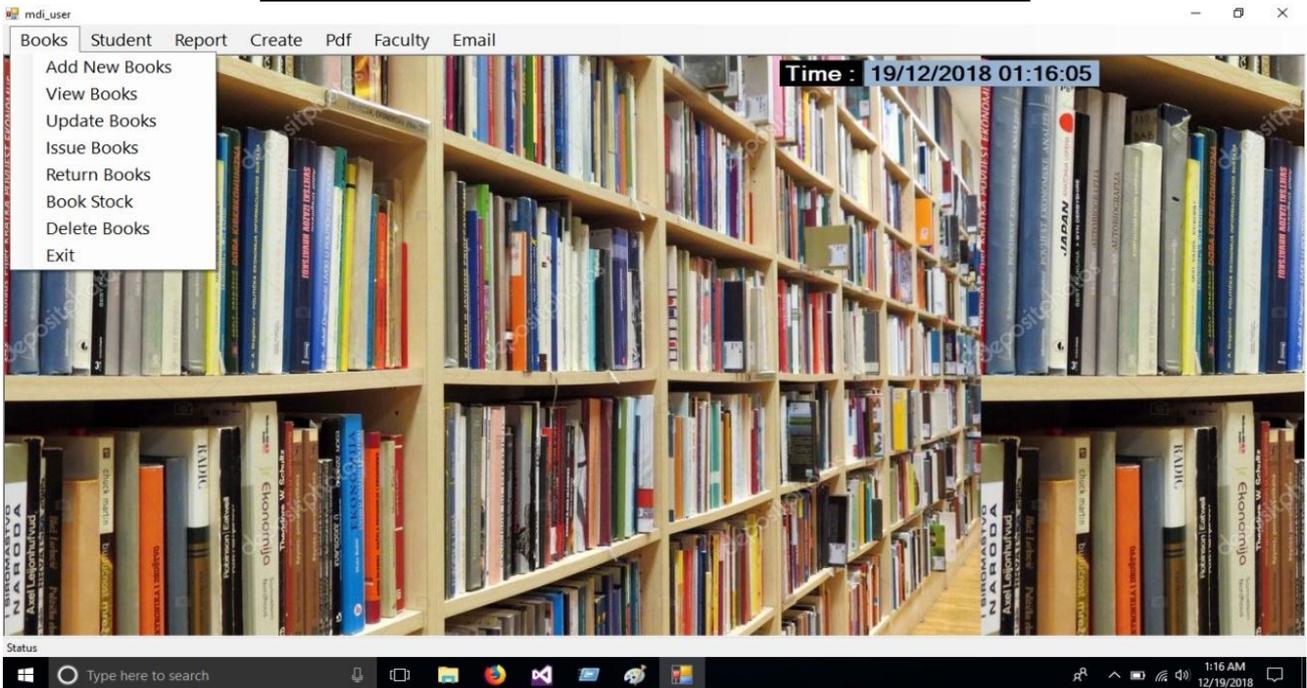


Fig 4.5: Menu UI (Log in as Admin)

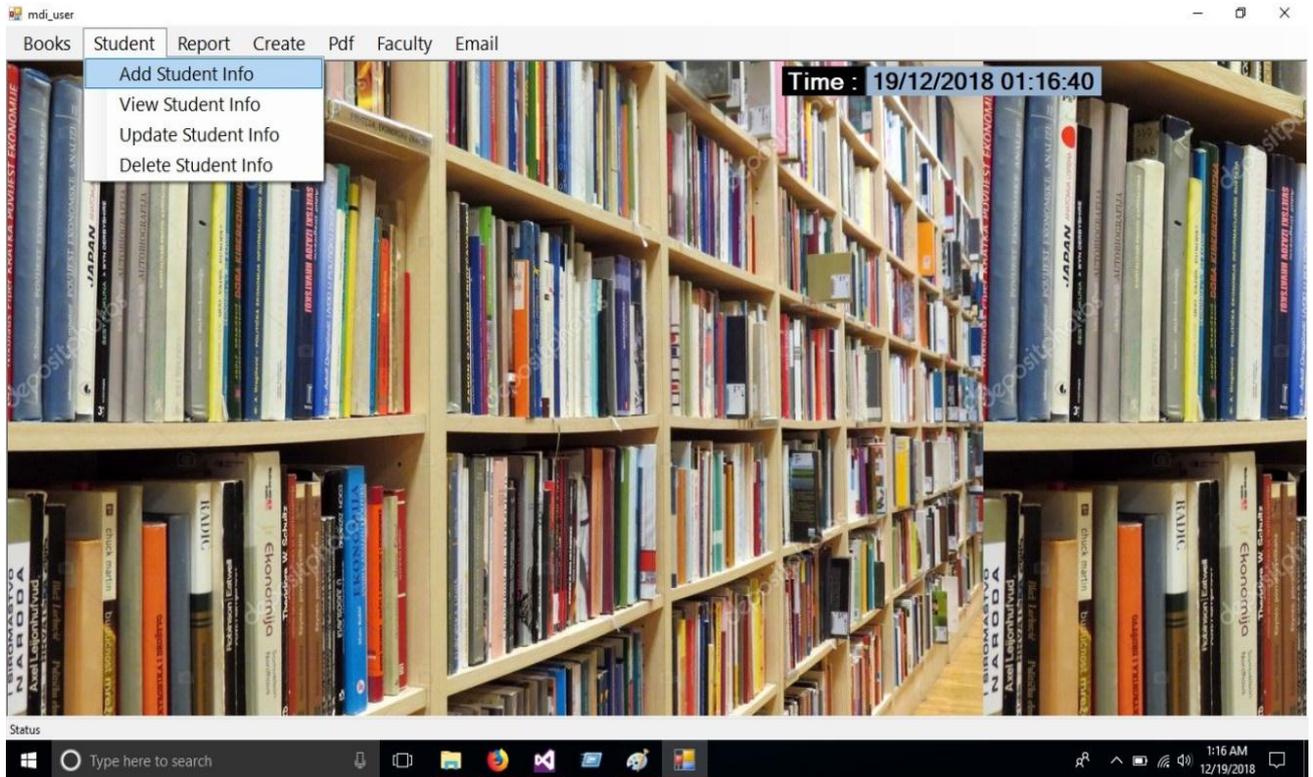


Fig 4.6: UI (Log in as Admin)

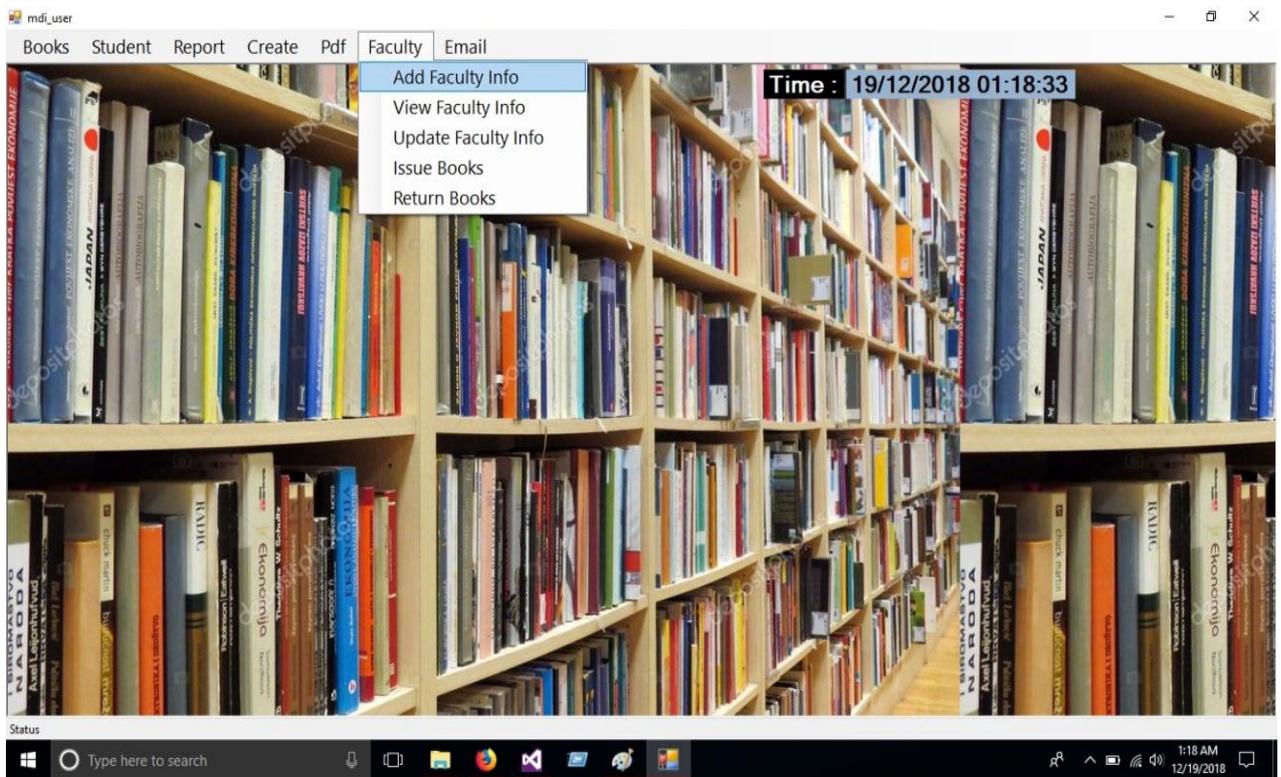


Fig 4.7: Menu UI (Log in as Admin)

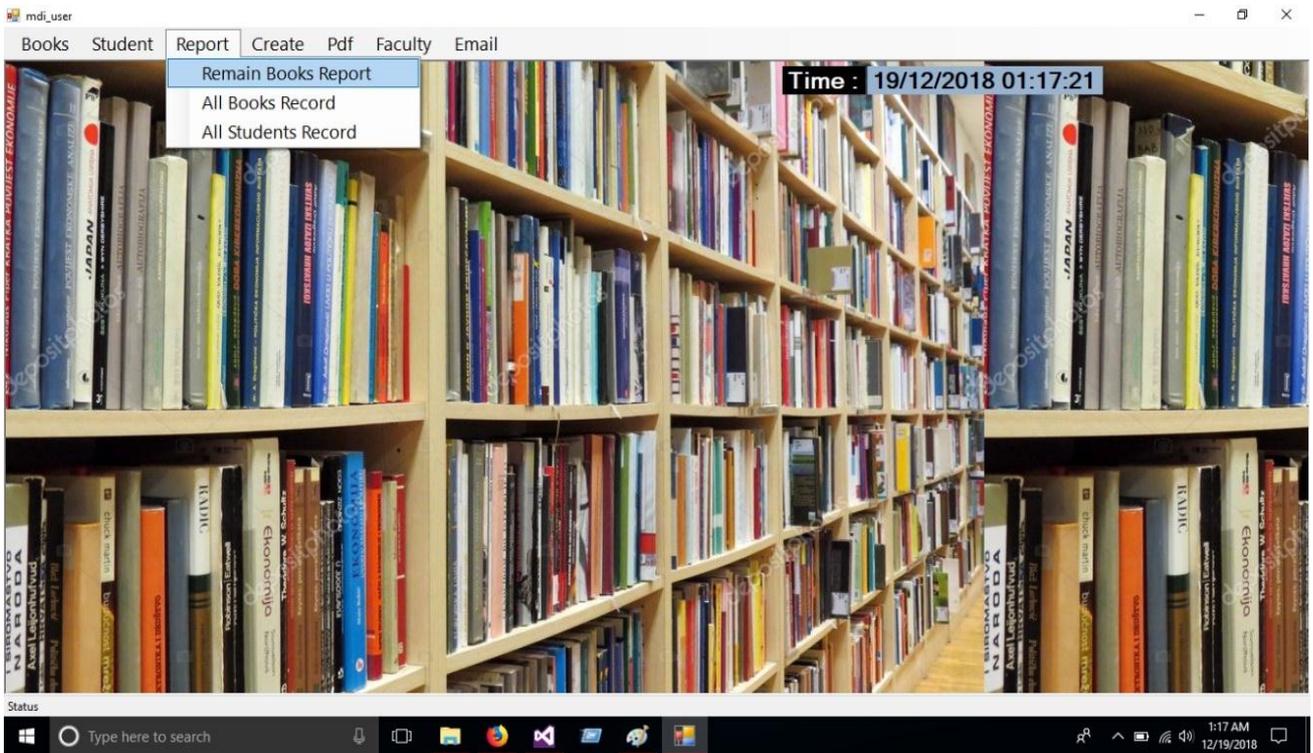


Fig 4.8: Menu UI (Log in as Admin)

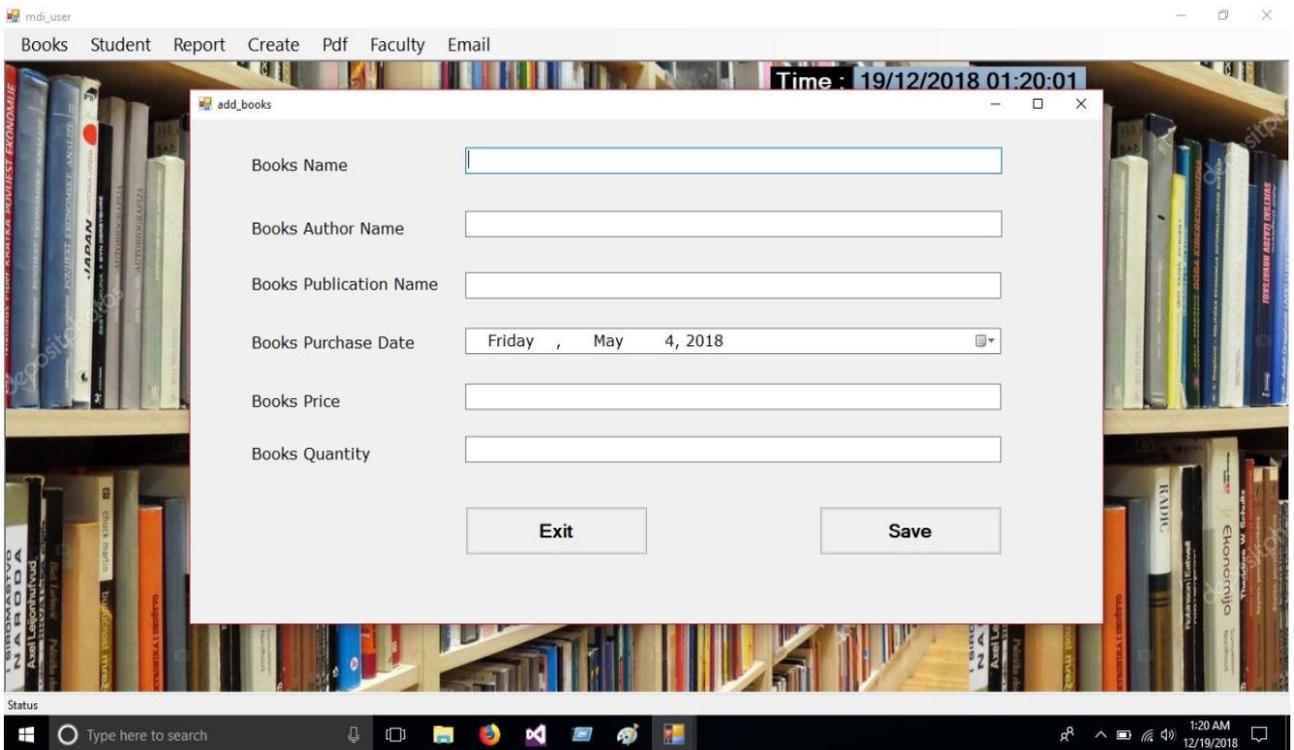


Fig 4.9: Add Book UI (Log in as Admin)

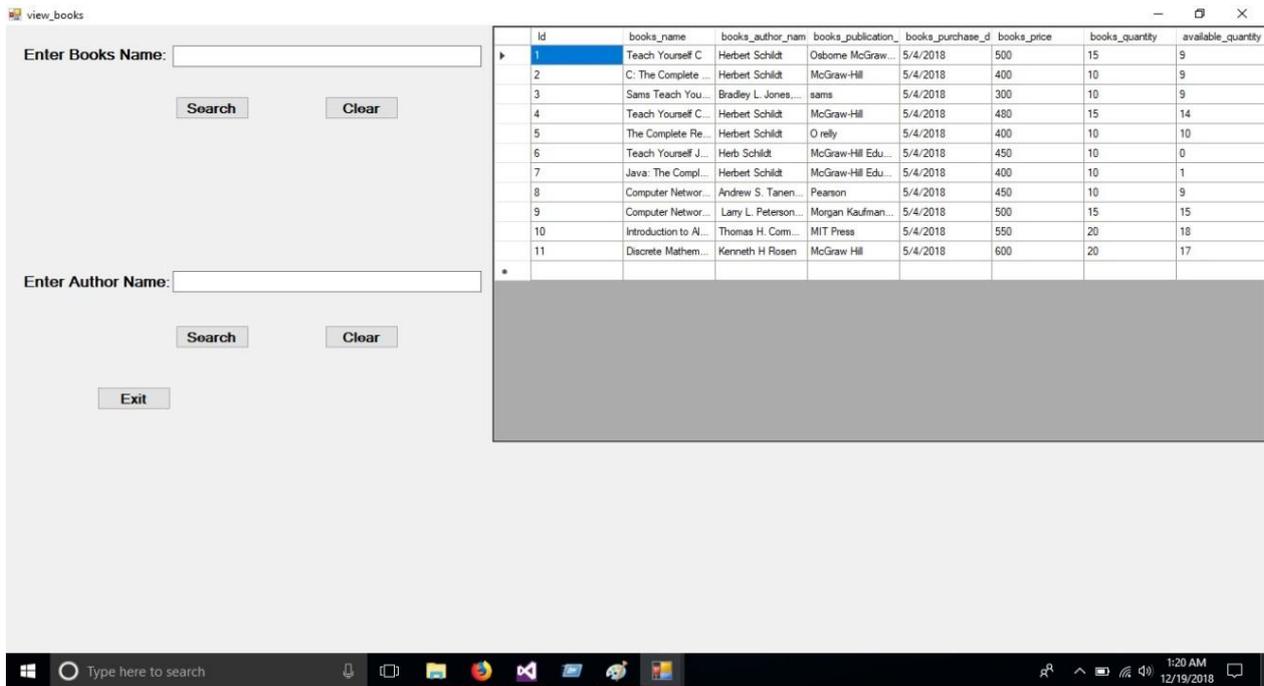


Fig 4.10: Book Search UI

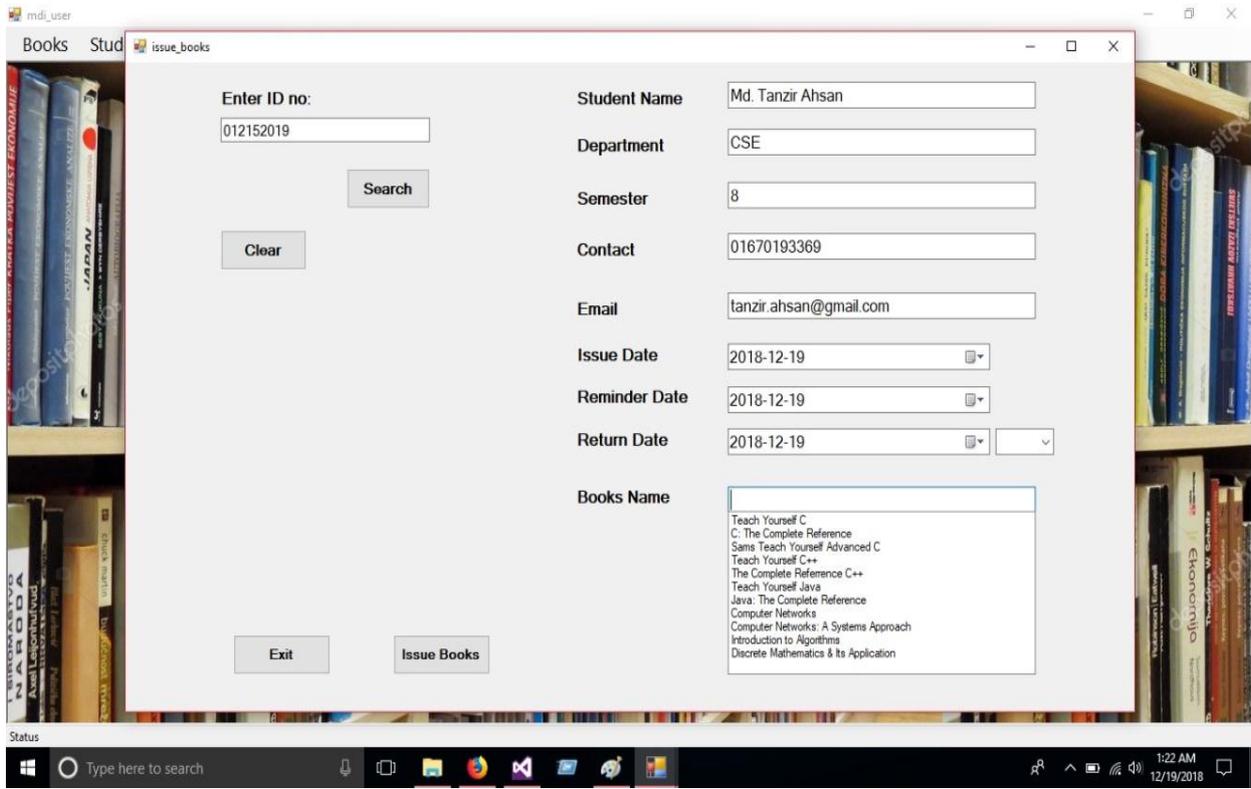


Fig 4.11: Issue Book UI (Log in as Admin)

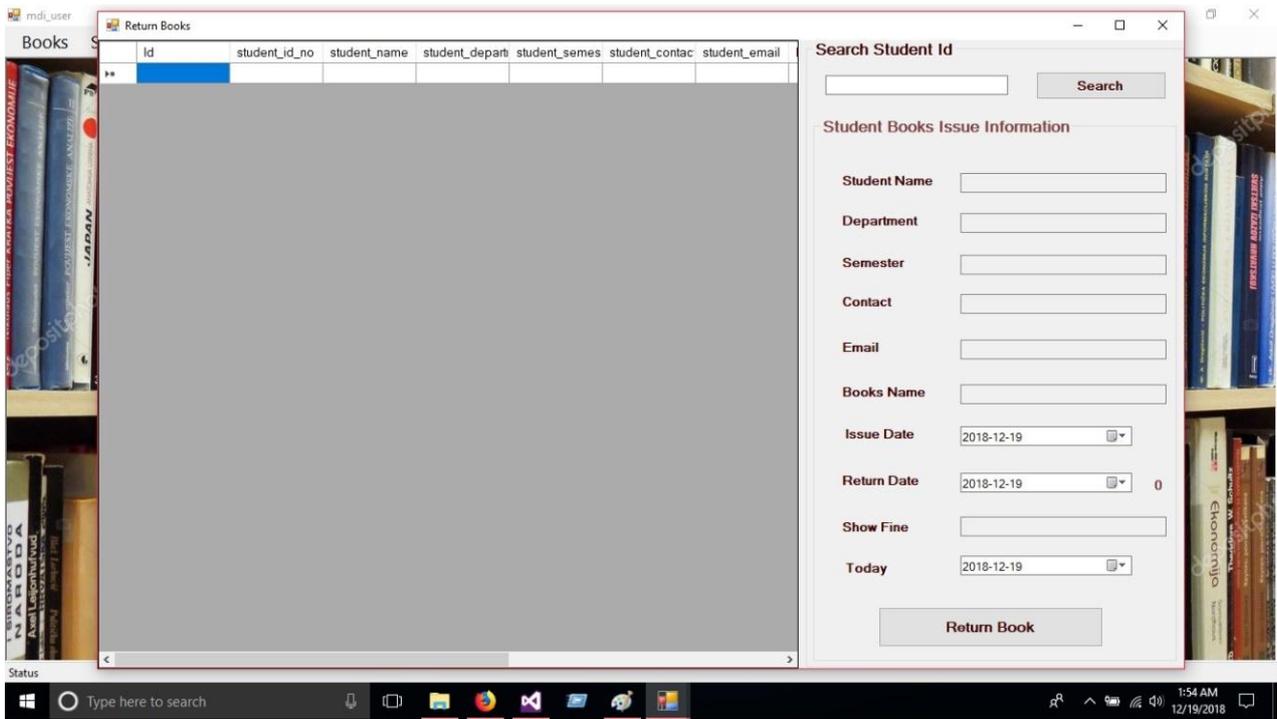


Fig 4.12: Return Book UI (Log in as Admin)

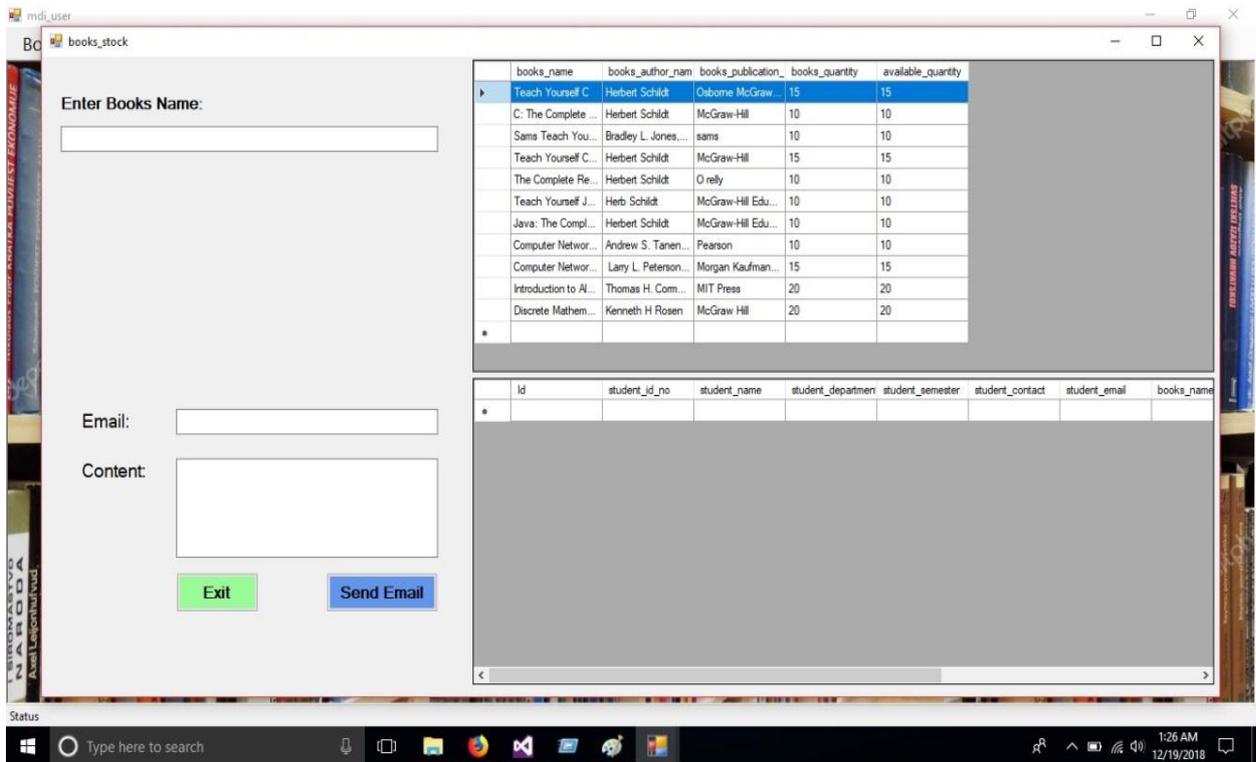


Fig 4.13: Book Stock UI (Log in as Admin)

Chapter 5

Conclusion & Future work

5.1 Conclusion

In the end we can say that the implementation of the software application **Library Management System** is very crucial. This software will be very essential for the librarian of an institute & also for the software developers. It will not only increase the efficiency but also remove the paperwork. The system has been developed using C# (Microsoft Visual Studio 2015) & SQL server 2008 R2. The system was able to process & update the database with more ease. It helped in developing a total integrated system.

5.2 Future Work

If any new requirements come from the authority then it can be combined to the software easily. At present I have some idea in my mind to add to this software in near future-

- Make the software online based
- SMS alert system for all user
- Barcode generation for all the information

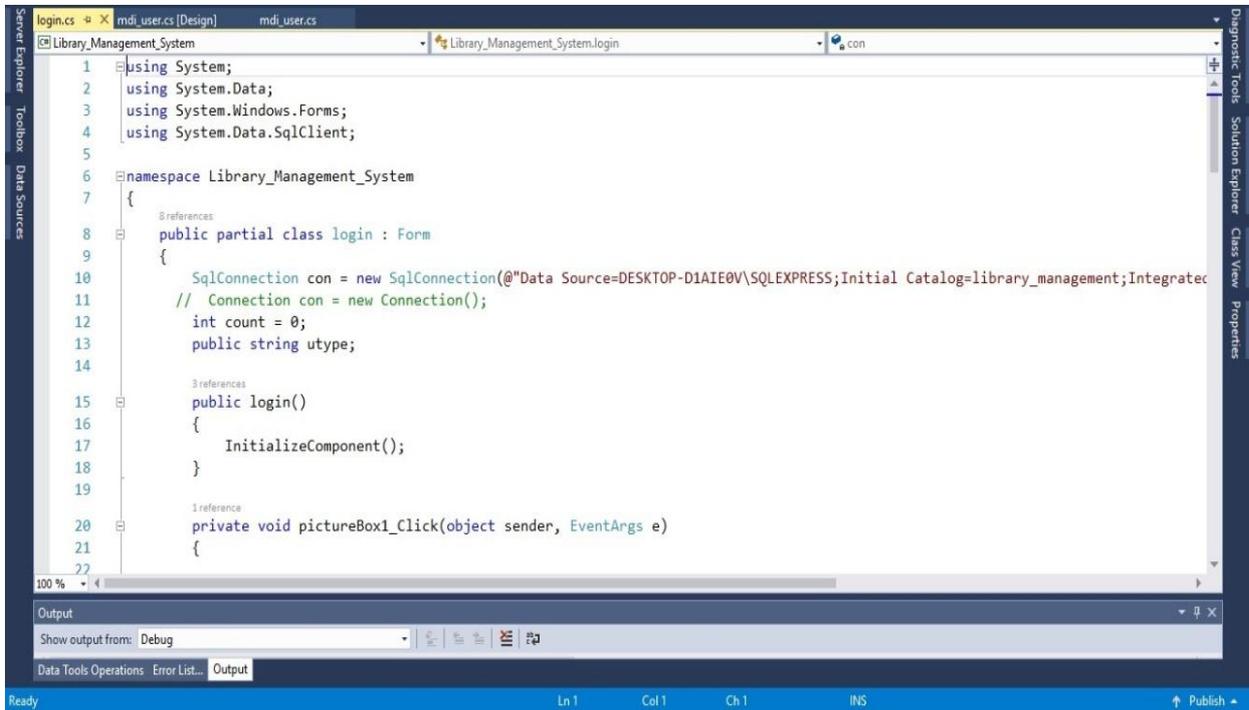
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- [2] Zhang Guangquan, Liu Yan, "Modeling Software Architecture and Their Implement Based on UML of Library Management System," Journal of Chongqing Normal University (Natural Science Edition), vol. 22, 2005, pp. 1-5.

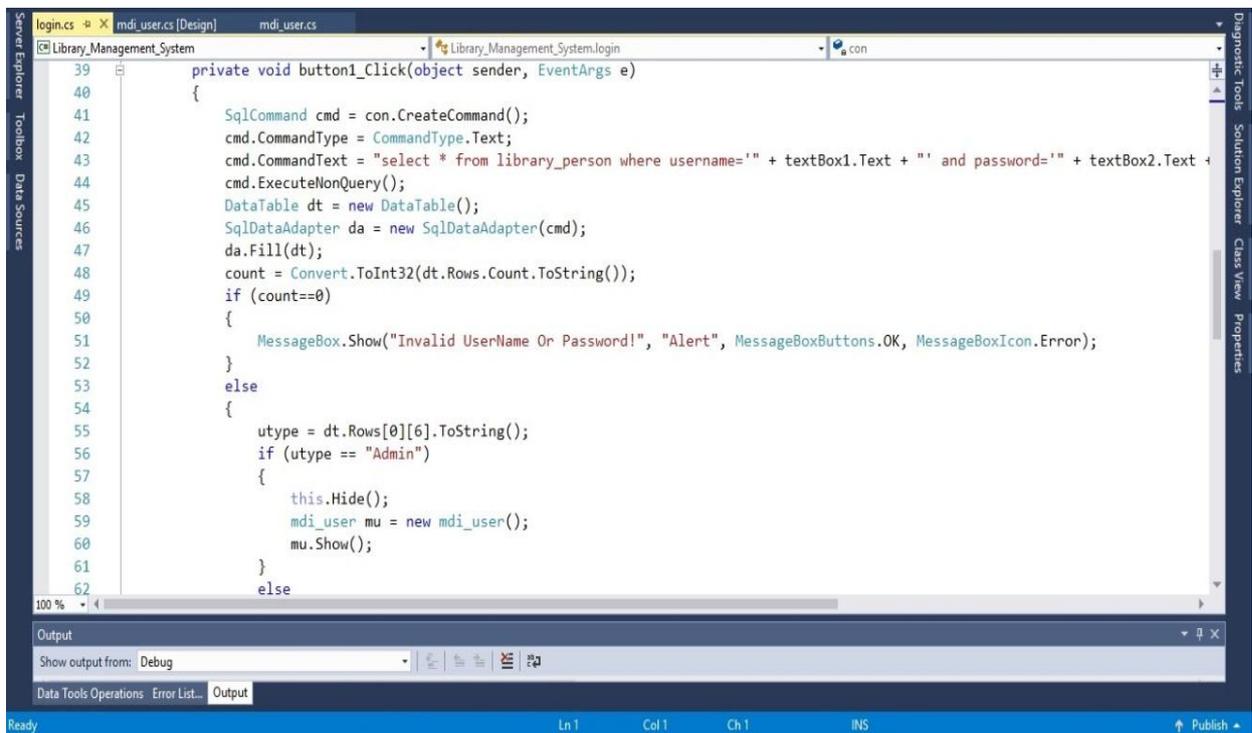
Appendix

Some Sample Source code of the project

Login UI creating code



```
1 using System;
2 using System.Data;
3 using System.Windows.Forms;
4 using System.Data.SqlClient;
5
6 namespace Library_Management_System
7 {
8     public partial class login : Form
9     {
10         SqlConnection con = new SqlConnection(@"Data Source=DESKTOP-D1AIE0V\SQLEXPRESS;Initial Catalog=library_management;Integrated Security=SSPI;Persist Security Info=False;User Instance=False;Encrypt=True;TrustServerCertificate=False;Connection Timeout=30;");
11         // Connection con = new Connection();
12         int count = 0;
13         public string utype;
14
15         public login()
16         {
17             InitializeComponent();
18         }
19
20         private void pictureBox1_Click(object sender, EventArgs e)
21         {
22
```



```
39     private void button1_Click(object sender, EventArgs e)
40     {
41         SqlCommand cmd = con.CreateCommand();
42         cmd.CommandType = CommandType.Text;
43         cmd.CommandText = "select * from library_person where username='" + textBox1.Text + "' and password='" + textBox2.Text + "'";
44         cmd.ExecuteNonQuery();
45         DataTable dt = new DataTable();
46         SqlDataAdapter da = new SqlDataAdapter(cmd);
47         da.Fill(dt);
48         count = Convert.ToInt32(dt.Rows.Count.ToString());
49         if (count==0)
50         {
51             MessageBox.Show("Invalid UserName Or Password!", "Alert", MessageBoxButtons.OK, MessageBoxIcon.Error);
52         }
53         else
54         {
55             utype = dt.Rows[0][6].ToString();
56             if (utype == "Admin")
57             {
58                 this.Hide();
59                 mdi_user mu = new mdi_user();
60                 mu.Show();
61             }
62         }
63     }
64 }
```

```
login.cs * X mdi_user.cs [Design] mdi_user.cs
Library_Management_System Library_Management_System.login con
77 {
78     this.Hide();
79     forgot_password fp = new forgot_password();
80     fp.StartPosition = FormStartPosition.CenterScreen;
81     fp.Show();
82 }
83
84 1 reference
85 private void login_FormClosed(object sender, FormClosedEventArgs e)
86 {
87     Application.Exit();
88 }
89 1 reference
90 private void linkLabel2_LinkClicked(object sender, LinkLabelLinkClickedEventArgs e)
91 {
92     this.Hide();
93     change_password cp = new change_password();
94     cp.StartPosition = FormStartPosition.CenterScreen;
95     cp.Show();
96 }
97 }
98
100%
Output
Show output from: Debug
Data Tools Operations Error List... Output
Ready Ln 1 Col 1 Ch 1 INS Publish
```

Add book UI creating code

```
add_books.cs * X mdi_user.cs [Design] mdi_user.cs
Library_Management_System Library_Management_System.add_books con
52 1 reference
53 private void button1_Click(object sender, EventArgs e)
54 {
55     if(textBox1.Text == "" || textBox2.Text == "" || textBox3.Text == "" || dateTimePicker1.Text == "" || textBox5.Text == "")
56     {
57         MessageBox.Show("Please Fill up the form Completely!");
58     }
59     else
60     {
61         con.Open();
62         SqlCommand cmd1 = con.CreateCommand();
63         cmd1.CommandType = CommandType.Text;
64         cmd1.CommandText = "select * from books_info where books_name='"+textBox1.Text+"' ";
65         cmd1.ExecuteNonQuery();
66         con.Close();
67         SqlDataAdapter da = new SqlDataAdapter(cmd1);
68         da.Fill(ds);
69         int i = ds.Tables[0].Rows.Count;
70         if (i > 0)
71         {
72             MessageBox.Show("Book Name " +textBox1.Text+ "Already Exists.");
73             ds.Clear();
74         }
75     }
76     else
77     {
78     }
79 }
100%
Output
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```

```
add_books.cs x mdi_user.cs [Design] mdi_user.cs
Library_Management_System Library_Management_System.add_books con
76     try
77     {
78         con.Open();
79         SqlCommand cmd = con.CreateCommand();
80         cmd.CommandType = CommandType.Text;
81         // dateTimePicker1.Text = System.DateTime.Now.ToString();
82         // cmd.CommandText = "insert into books_info values('"+textBox1.Text+"','"+textBox2.Text+"','"+textBox3.Te
83         cmd.CommandText = "insert into books_info values('" + textBox1.Text + "','" + textBox2.Text + "','" + textBc
84         cmd.ExecuteNonQuery();
85         con.Close();
86
87         textBox1.Text = "";
88         textBox2.Text = "";
89         textBox3.Text = "";
90         textBox5.Text = "";
91         textBox6.Text = "";
92         MessageBox.Show("Books Info are added Successfully!");
93     }
94     catch (Exception ex)
95     {
96         MessageBox.Show(ex.Message, "Error Message");
97     }
98 }
```

Output

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Reading PDF book creating code

```
view_pdf_books.cs x mdi_user.cs [Design] mdi_user.cs
Library_Management_System Library_Management_System.view_pdf_books con
23     try
24     {
25         //SqlDataAdapter da = new SqlDataAdapter();
26         SqlCommand cmd = con.CreateCommand();
27         cmd.CommandType = CommandType.Text;
28         cmd.CommandText = "select id,Name from WriterInfo";
29         cmd.ExecuteNonQuery();
30         DataTable dt = new DataTable();
31         SqlDataAdapter da = new SqlDataAdapter(cmd);
32         //DataSet ds = new DataSet();
33         //da.Fill(ds);
34         da.Fill(dt);
35
36         cmbWriterName.DataSource = dt;
37         cmbWriterName.DisplayMember = "Name";
38         cmbWriterName.ValueMember = "id";
39         //cmbWriterName.SelectedIndex = -1;
40         // dataGridView1.DataSource = cmd.ExecuteReader();
41         //GridView1.DataBind();
42     }
43     catch (Exception ex)
44     {
45         MessageBox.Show(ex.Message, "Error Message");
46     }
```

Output

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