

Secured Library Management System (LMS) for Public Library of Jaffna, Sri Lanka

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Abstract: Public library of Jaffna is universally recognized and one of the biggest libraries in Asia. Currently it consists of several sections with millions of books and other reading materials. Since, entire system of library governed through manual system, a research work carried out with an objective; to develop software to automate the existing system of public library of Jaffna. Library Management System (LMS) was developed with the user management account, search record account, book borrowing system, report generator, inventory management system. LMS was successfully developed as a secured and computerized system to overcome the problems of existing system. This digitalization helps to reduce the paper documentation and enable quick access without any corruption of data or information.

Key words: Library Management System (LMS) · Jaffna Public Library

INTRODUCTION

One of Asia's biggest libraries is located in Jaffna, Sri Lanka [1]. The Jaffna Public Library began as the private collection of the scholar K.M. Chellapha, his home in 1933 with 1000 of books. However in 1959 public library main building was ceremonially opened. The children's section and an auditorium were added later. Public library of Jaffna well recognized universally and was popular among Sinhalese and Tamil scholars and the general public [2]. Sivathamby mentioned, public library of Jaffna is the major repository for all known literary source materials of the Tamil people [3]. However the Public Library of Jaffna was set fired during the civil war by the Sri Lankan police in 1981; almost 100,000 books were destroyed [4]. It included rare Tamil books, old manuscripts and documents; some were written on dried palm leaves and stored in fragrant sandalwood boxes. Some books were literally irreplaceable: the "*Yalpana Vaipavamalai*", a history of Jaffna, was the only existing copy [5]. The library consisted of miniature editions of the Ramayana epic, yellowing collections of extinct Tamil-language newspapers [6].

Even though nowadays public library of Jaffna has several sections such as lending, references, children section, periodical section, special documentation section, special collection section, computer section and youth corner section, over 30,000 books from different subject fields such as novels, translated novels, short stories and philosophy books, Biography and history books, literature books and several interesting books on various subjects in English, Tamil and Sinhala available in the lending section. Reference section used by university students, researchers and scholars to promote their research and educational activities, here more than 21000 books are obtainable. Nearly 100 periodicals and 15 Newspapers available in Periodical Section and Children Section, with more than 10000 books in English and Tamil. Special Documentation Section, old local newspapers and periodicals are preserved for the future references. Special Collection Section contains about 10000 books and other Publications; the publications have been published in and outside the island. These publications related to Sri Lanka [7].

Public Library of Jaffna, Sri Lanka faced many problems with existing system such as documentations are done through paper work, too many racks to maintain and difficulties in finding books, consuming lots of space, taking lots of time for documenting paper works; maintaining books history and where they are located in the racks, in case of any disaster can't be restored, hard to maintain the membership details and hard to find those details when needed and it is time consuming. Thus the LMS is introduced to reduce the work load of the employees.

Existing system of public library is computerized in order to overcome the disadvantages and to reduce the work in the Library. Such as maintaining the membership details, instead of searching, the books can be easily found, Library e-books which save time and also prevent the damages to books. In case of any disaster data can be retrieved from the backup Microsoft SQL Server [8]. Since, a study designed software using language C#.Net [9] runs on the Microsoft platforms [10]. With an objective “to

develop a software to automate the existing system of public library of Jaffna”.

MATERIALS AND METHODS

The proposed system consists of books' details (author, ISBN, book weight) and membership details (Name, Date of Birth, National Identity Card, Address, Phone no, E-mail ID) which are easily stored in the database. Modern world it's our duty to keep the historically seldom books in a safe place for future generation. Since, LMS also acts as a digital library; E-books and scanned book documents can be saved and user is able to access the book inside the library. LMS facilitates the data maintenance in a safe and secured time saving way.

System Description: Library Management System (LMS) was developed as shown in figure 1. Each module of the LMS was developed according to the flowchart shown in figure 1.

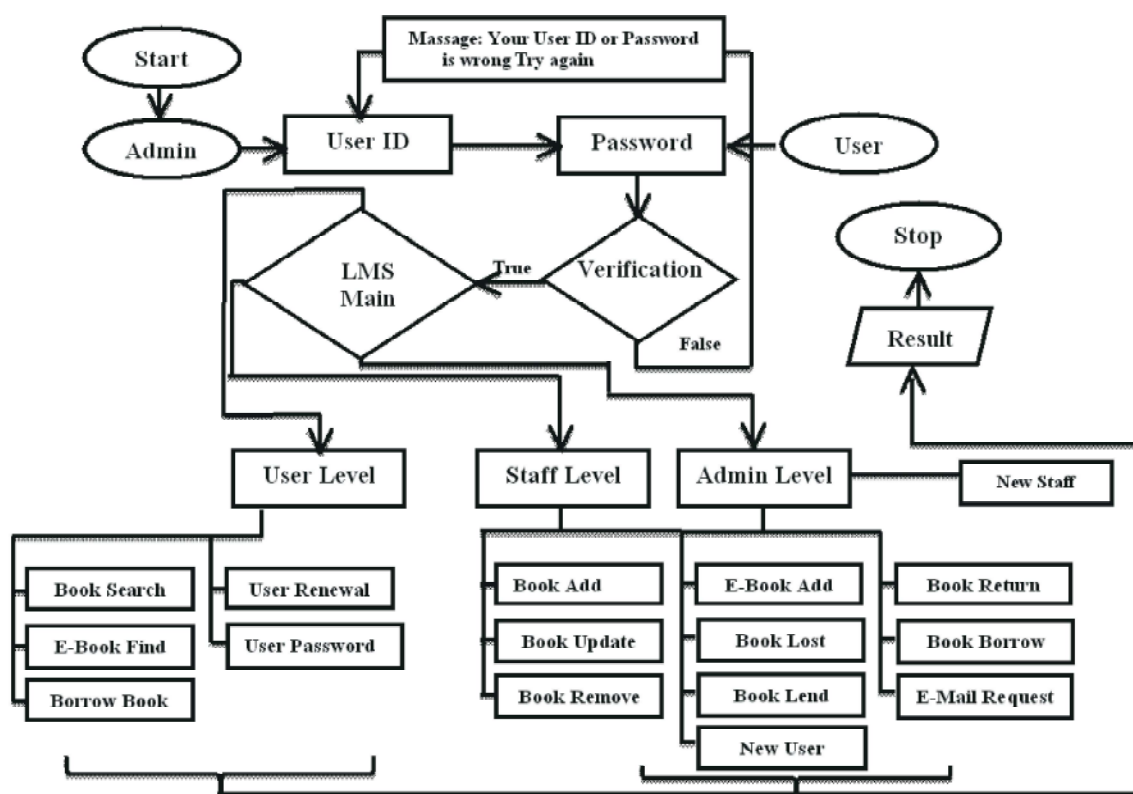


Fig. 1: Follow of the modules in LMS

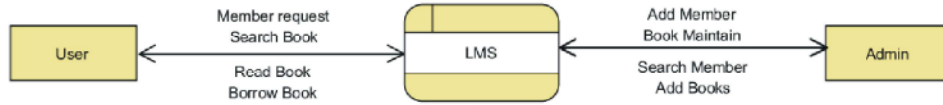


Fig. 2: Level 0 Data follow of the LMS

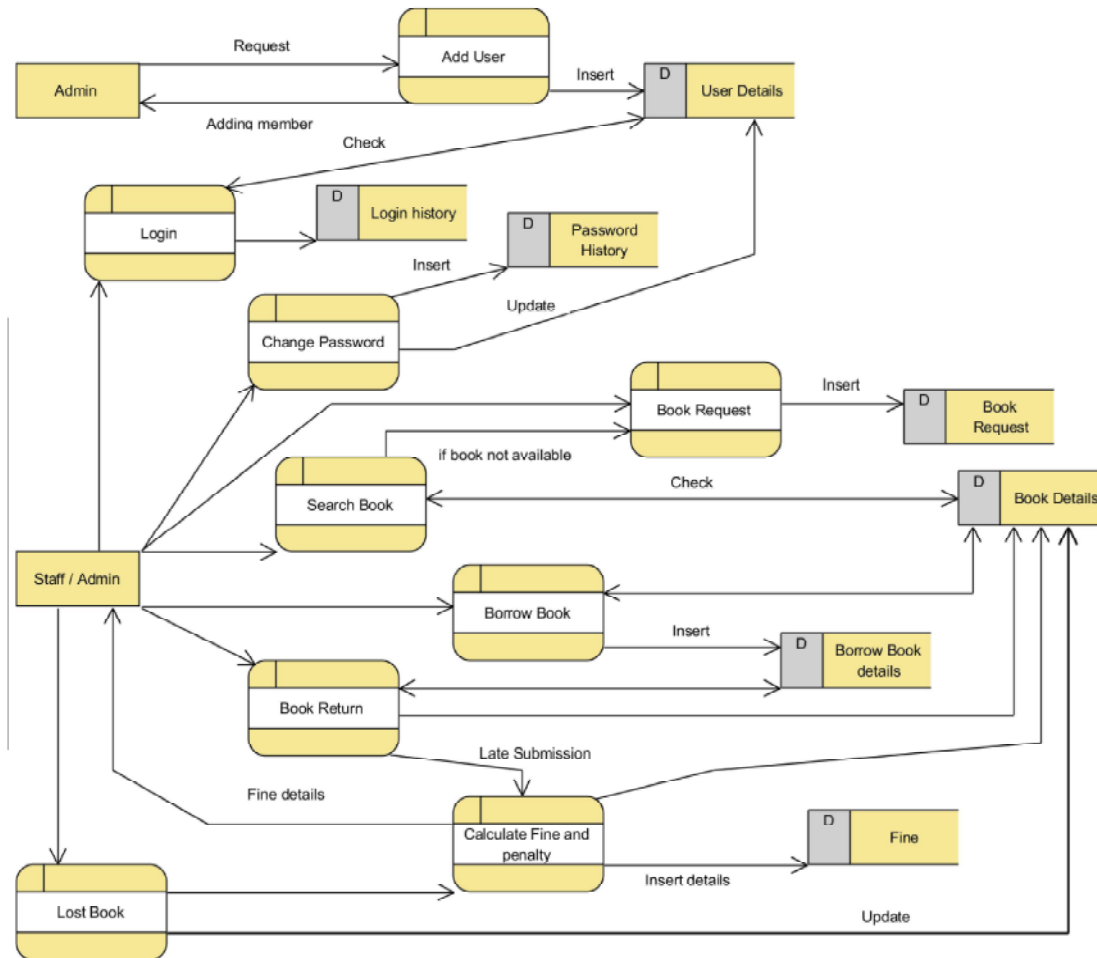


Fig. 3: Level 1 Dataflow of the LMS

Figure 2, simply represented the level 0 dataflow the total database system of LMS and Figure 3, reveals that the level 1 data flow of the LMS. Figure 3, also showed the interaction between the data table in the database and the module.

System Testing: The system was developed with the modules such as add book entry module, add a new member module and book borrowed module. Above mentioned modules were tested independently as a unit testing according to the procedure mentioned by Ammann and Offutt [11]. Field validation was done by the

procedure according to the Jain, *et al.* [12], Each and every data field validation was done by entering correct and wrong values or text. Initially, few errors were detected on negative values testing and then it was overcome by including appropriate error handling message. In addition to field validation, the function of each command button was tested. Few run-time errors were encountered during testing and it was resolved by adding proper loops and other methods. The integration testing was done to ensure any action in a module resulted in the appropriate data maintenance in another module.

In the LMS all the modules were tested by using acceptance testing method. Each acceptance test represents expected result from the system [13].

Coding for password change

```
private void button1_Click(object sender, EventArgs e)
{
    //random number generate
    string code;
    int min = 200000, max = 999999;
    Random r = new Random();
    code = r.Next(min, max).ToString();
    txtcode.Text = code;
    //Check user id
    sqlc.Connection1();
    cmd = new SqlCommand("Select User_ID from
    user_details WHERE User_ID=" + txtid.Text +
    "";", Sql_Connection.sc);
    SqlDataReader x = null;
    x = cmd.ExecuteReader();

    if (x != null && x.HasRows)
    {
        //check Email id
        sqlc1.Connection1();
        cmd1 = new SqlCommand("Select Email_ID
        from user_details where User_ID=" +
        txtid.Text + """, Sql_Connection.sc);
        SqlDataReader rr = cmd1.ExecuteReader();
        while (rr.Read())
        {
            txtmail1.Text = (rr["Email_ID"].ToString
            ());
        }

        if (txtmail1.Text == txtmail.Text)
        {
            // Send mail
            MailMessage mail = new MailMessage();
            mail.From = new MailAddress("ictdbms@
            gmail.com", "Enquiry");
            mail.To.Add(txtmail.Text);
            mail.IsBodyHtml = true;
            mail.Subject = "Change Password in Library
            Management System";
            mail.Body = "We recently received a
            password reset request for this email
            address. Your Library Management System
            Security code is: " + code;
            mail.Priority = MailPriority.High;
            SmtplibClient smtp = new SmtplibClient("Smtplib
            gmail.com", 587);
            smtp.Credentials = new System.Net.
            NetworkCredential("ictdbms@gmail.com",
```

```
"thirusir");
            smtp.EnableSsl = true;
            txtid.Enabled = false;
            smtp.Send(mail);
            MessageBox.Show("We are sent Security
            code in your E-mail, Check Your E-mail &
            Continue Reset Your Password ");
        }
        else {
            MessageBox.Show("This Email ID is Wrong!!");
        }
    }
    else {
        MessageBox.Show("This User ID is not
        Registered!!");
    }
}
}
```

Above mentioned codes were specially established and used for the LMS Login form. It's generating the security codes for the passwords changes and it is sent to the own emails. This kind of facility of the system well aware of the hackers.

RESULTS AND DISCUSSION

Library Management System was developed to overcome the problems effectively without any corrupted data or information and provide a security catalog to store all the information. The following functional modules were developed for LMS such as user manage account module, search record module, book borrowing system, report generator, inventory management system. Manually maintained, records of the book issue, book return from the user, stock maintenance and book search operations were computerized. So the book issue, return, searching will be faster [14, 15].

LMS was developed as a well secured system. Starts with the authorized username and password (Figure 4). Once got the username and password the user of the library able to access the system in the user level, but the admin is the only authorized person to create users passwords for the new users. Figure 5 showed the Login module, facilitates the password recovery option, once the user forgot the password, by using email account user able to receive the code for the new password and after receiving that code user able to reset the password by using that code.

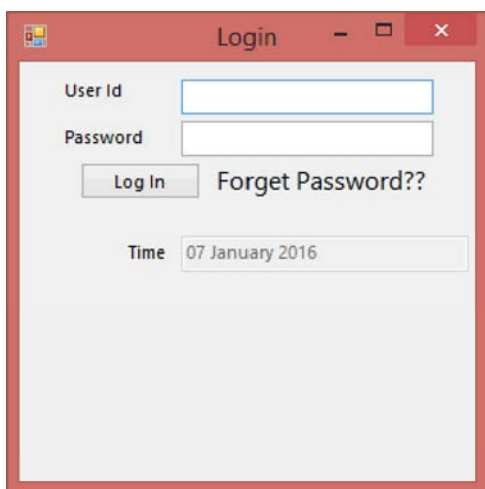


Fig. 4: Module for the Login

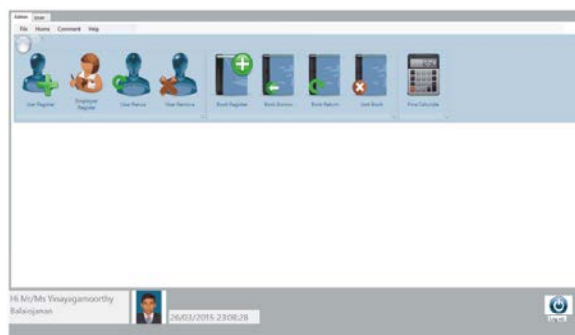


Fig. 6: Main module of the LMS

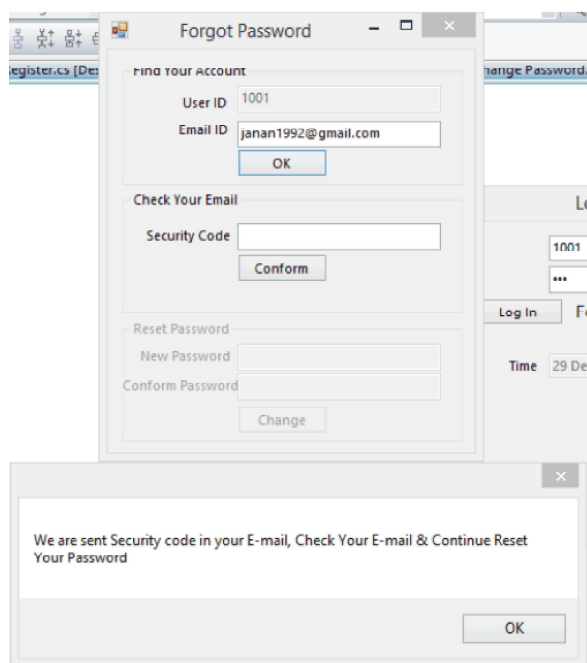


Fig. 5: Module for the password reset

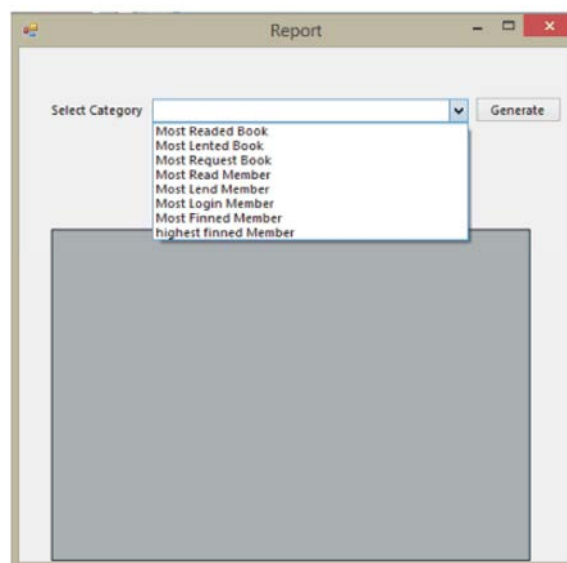


Fig. 7: Module for report generation

Main module of this LMS (Figure 6) was designed as a Multiple Document Interface Container (MDI) including New user registration, Employee registration, User renewal, User removing, Book registration, Book borrow, Book return, Book lost and fine calculation entry modules. Through this page admin or Librarian able to add, delete, update and refresh the book and user details and able to handle all the users details such as creating the new user and removing user from the system. The details that were updated through new entry automatically saved in the database in an efficient manner.

Kamble, *et al.*, [16] stated, for LMS reports are essential for the making of decisions, since, module of the report generation (Figure 7) was designed for the admin of the library. Report generation is done according to their needs such as most read book, most borrowed book, most request book, most read member, most lend member, most login member, most fined member and highest fined member. This module is very helpful to do the different surveying in the library and for the easy preparation of the annual progress reports. This is the most important factor for the strategic development.

Figure 8 reveals that automatic reminder sending mail module. This should send the first mail before two days of due date. Second mails sent if user doesn't return the book after 14 days to due date with the message of "please return the book or you will pay the fine and book price".

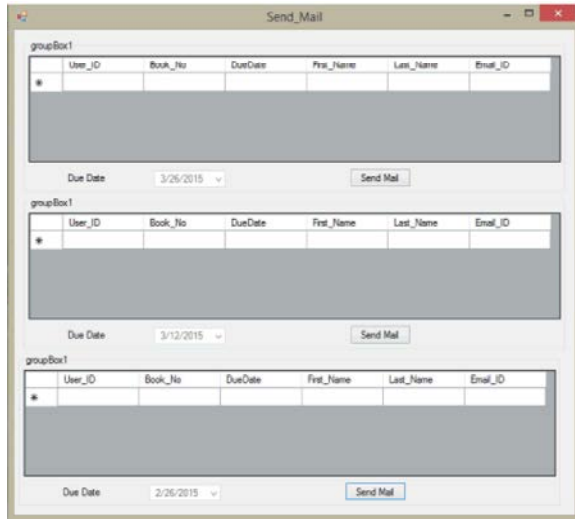


Fig. 8: Module for Automatic remainder sending

Third mail will be sent after 4th week of due date as “your fine + book price= “amount” pay for this amount to the management”. Automatic messages were very helpful to manage the library without much more effort. Basic level of module format already used by Lakshmi and Gowri [17].

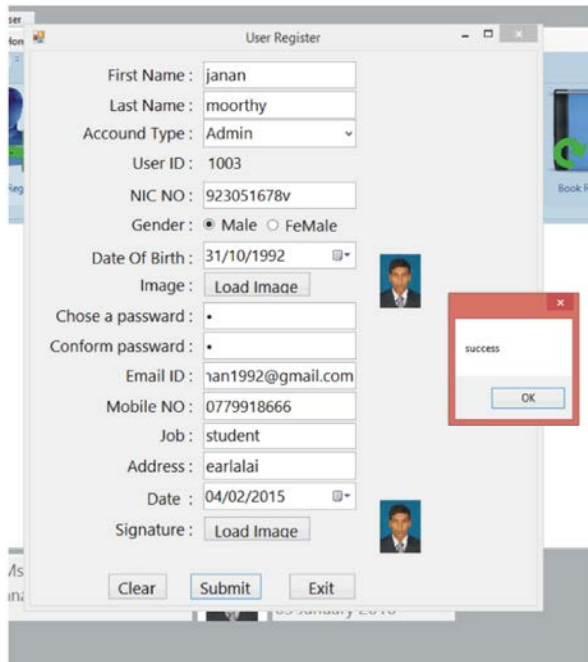


Fig. 9: Module for new user registration

The figure 9 module required all basic and important details of the new user for the registration. After filling all these details with using submit button, admin able to

create the new user account after that user easily access the library. All the mentioned modules were developed with basics of Manjiri *et al.*, [18]

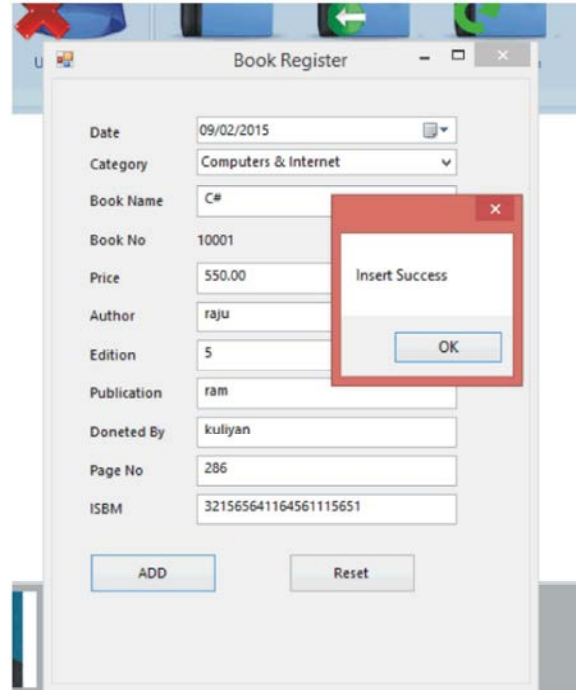


Fig. 10: Module for new book entry

Figure 10 reveals that the module for the new entry of the books. This module was designed also matched with design of Neelakandan, *et al.*, [19].

CONCLUSION

Library Management System with the functional modules was successfully developed as a secured, digitalized and user friendly system for the governing of public library of Jaffna. Manually maintained operations were computerized. Thus the system created to overcome the problems effectively without any corrupted data or information.

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