

E-Library Application for Institutional Uses

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Abstract-The rapid growth of electronic resources and the e-learning technology brings the necessity for implementing an application that can organize the digital resources in a good manner so they can be easily found and retrieved. Over the years, the digital libraries and e-libraries have been implemented as tools for facilitating the method of organizing and saving the electronic resources such as e-journals, papers, lectures, videos, e-books, ..., etc. Because of the Coronavirus disease (COVID-19) pandemic in the last years, most educational institutions depended on the e-learning and blended learning to help the students to continue the way that they have started to get knowledge and degrees. Therefore, a huge number of electronic resources have been generated by instructors which highlights the necessity for implementing e-libraries that can be adaptive to the institutional uses. Most of the available e-libraries are not available for free and they need connection to the internet. In this paper, an e-library application has been designed and implemented which can be easily improved to meet the requirement of the institution. The implemented e-library can be used for electronic archiving process in any institution. Visual Basic (VB.net) and SQL server have been used in the practical implementation of the proposed application. The experiments of testing the implemented e-library proved that the implemented application is user friendly and practical. The implemented application can be uploaded in the local server of the institution to be accessed by the users connected to the local network.

Keywords- *E-Library Application, E-Archieving Application, E-Learning Data Archiving*

I. INTRODUCTION

Over the years, the higher educational institutions have been considered as the heart of any society and they played a key role in improving its future [1], [2]. With the rapid growth of information and communication technology (ICT), the traditional libraries in these institutions have been improved from close access libraries to open access libraries [3], [4]. The methods of finding resources have been also changed from manual to automated. Later on, the automated library has been improved to electronic library (e-library) which can be defined as an automated library that can be accessed through Local

Area Network (LAN). Thereafter, the e-libraries have been developed to be accessible over the Wide Area Network (WAN) and internet [5]–[9].

Since the concept of digital libraries has been introduced to the world by ICT society, enormous number of digital resources has been comprised in digital libraries [10]–[12]. The terms “digital libraries”, “electronic library”, and “virtual library” are usually referred to a service or an application that provides the digital resources in an organized and easy to use way [13]. The COVID-19 pandemic influenced the education processes and shifted the fashion of teaching from traditional to technology-based methods where the digital resources have been generated in different kinds such as e-lectures, e-books, e-journals, e-papers, reports, images, videos, infographics, and many others [1], [13], [14].

The general characteristics of the e-library or digital library are as follows [15]:

- Well organized digital resources.
- Not limited to text-based information.
- The resources are available and viewable in their digital form.
- The processes of collecting, storing, viewing, and retrieval of resources are all performed using digital technology.
- Access to the resources is available locally or globally according to the type of the implemented library.
- There are many special characteristics which may differ from one library to another.

The need for digital libraries has been increased because of many factors such as: a) information explosion where everyday a huge number of digital resources is created and shared especially in electronic learning and blended learning techniques [10], [16], [17], b) searching problems in traditional libraries [11], [18], c) low-cost technology [12], and d) environmental factors, where storing and transporting resources in their digital form is much easier than dealing with them in their printed form [19].

The basic requirements for a digital library or e-library are: hardware, software, storage devices, scanner, network, and

printer [20]–[22]. Basically, the hardware refers to the Personal Computer (PC) or laptop and the Uninterruptible Power Supply (UPS). The software refers to the programming languages and applications that are used to implement the library. Storage device such as CD-ROM, DVD, flash memory, hard drive, ...etc. The network refers to LAN, WAN, and internet. The printer may also be required to print some resources when necessary.

The process of digitalizing the resources in institution is very important and can reduce cost and efforts. Nowadays, because of the digital resources that are available in the networks, the students can easily learn and gain skills without moving from their places [7], [8]. Over the years, thousands of digital libraries have been introduced [9], [19], [23]–[25], however, there are some problems which can be considered as a motivation to design and implement a new e-library application. Some of the limitations and problems are as follows:

- Most of the available e-libraries are not free.
- Most of the e-libraries need connection to the internet.
- During the last years and especially during the COVID-19 pandemic, many digital resources have been generated by the instructors in the colleges and these are considered as valuable sources of information which need to be well stored and organized.
- The available libraries are not dynamic and cannot meet all the requirements in the institution.

The main aim of this paper is to design and implement an electronic library application that is suitable for educational institutions and can meet the following targets:

- Providing a well-organized e-library application.
- Providing a user-friendly interface to make the process of finding electronic resources easier for the students and other users.
- Providing a dynamic e-library that can be improved according to the requirements in the departments or the colleges.
- Providing an electronic library with rich resources that can be accessed without the need for the internet connection.
- Reducing the cost by exchanging the printed copies of the material with their electronic version.

The following sections of this paper contain the details of the design and implementation, the experimental results and discussion, the conclusions, and the suggestions for the future work.

II. E-LIBRARY DESIGN AND IMPLEMENTATION

The practical design, implementation, and usage of the proposed e-library application can be explained in three main stages that are:

- E-library software development stage,
- E-library management stage,
- E-library usage stage.

These three stages are explained in details in the following subsections.

A. E-library software development stage

The E-library development stage requires many important points that must be taken into consideration in order to produce the suitable and effective design. First of all, the E-library system users must have permissions as follows:

- 1- Super admin, who has the following permissions:
 - Create, delete, and update information of admins and users.
 - Upload, delete, and view all the resources available in the E-library.
- 2- Admin, who has the following permissions:
 - Create, delete, and update information about users, but he/she cannot create admins.
 - Upload, delete, and view all the resources available in the E-library.
- 3- User, who can only view or download specific resources.

The E-library developers must also decide to choose the suitable software to implement the system. In this project, the visual basic.net and SQL database server have been used to implement a user-friendly interface that is easy to understand and use. Since the project contains button in Arabic language, we put a definition Table V in Appendix A (it is better to have a look to the table before proceeding).

The steps of the software development stage are explained in the following steps:

Step 1: Setup visual studio 2015 (several instructional resources are available in the internet to teach the users about the method of setting up this application).

Step 2: Setup SQL server 2014 (several instructional resources are available in the internet to teach the users about the method of setting up this application).

Step 3: Design the E-Library user’s interface windows:

- Login window: in which the user must enter the username and password to open the e-library application.
- Super admin window: in which the resources administration and view, admins and users’ administration, and the exit from the application are included.
- Admin window: in which the resources administration and view, the users’ administration, and the exit from the application are included.
- Users window: in which the user can view the resources, open the resource by clicking on its name, and save the opened file. The exit from the application is also included in this window.

- Resources administration window: this window will be available for the super admin and the admins in which the user can add or delete resources. The super admin or the admins can select the level and the subject from the drop-down list, then can upload the file to the e-library. The unwanted resources can be selected by clicking the name of the reference in the table then clicking the delete button.
- Resource's view window: in which the user can view the resource by a single click on the name of the resource in the table.

Step 4: Programming and Software implementation:

1) Creating the database in SQL server: the users' information and the resources tables are created in SQL server as follows:

The users table contains seven columns as follows:

- Id: contains a unique number that is generated automatically for each user,
- Full name: contains the full name that has been entered in the text box related to this field.
- User name: contains the user's name that has been entered in the text box related to this field.
- Password: contains the password that has been entered in the text box related to this field.
- Privilege: is automatically generated using the program code according to the type of the account that has been generated.
- Department: contains the selected department name in the users' administration window.
- Stage: contains the selected stage in the users' administration window.

The resources table contains five columns that are: Id, Stage, Subject, Resource file, and the File name.

2) Programming the windows that have been designed in step 3.

- Programming "Login" window (Table I).
- Programming "Super admin" window (Table II).
- Programming "Admin" window (Table III).
- Programming "Users" window (Table IV).
- Programming "Resources administration" window (explained within the steps of Table II).
- Programming "Resources view" window (explained within the steps of Table II).

3) Connecting the visual basic programs and the SQL database.

B. E-library management stage

In this stage, the super admin of the implemented e-library creates the admins accounts. Then admins can upload the materials such as lectures, books, pictures, ... etc. The admins can also create, modify, or delete users' accounts.

C. E-library usage stage

In this stage, the users can visit the library to find the references that they need, therefore, at this stage all the users should have their own accounts.

TABLE I. LOGIN WINDOW PROGRAMMING ALGORITHM

Step	Description
Step 1	Read the user's name and password from their related text boxes in the login window.
Step 2	Read the SQL Users_Table.
Step 3	Compare the entered username and password with the database information in Users_Table: - If the entered account is not correct then show a message box to inform the user that the entered information is not correct. - If the entered account is correct then continue to the next step.
Step 4	Open the window that is related to the user's permissions. If the entered account is for super admin, then the super admin window will be opened and so on for the other accounts.

TABLE II. SUPER ADMIN WINDOW PROGRAMMING ALGORITHM

Step	Description
Step 1	Open the connection between the VB.net and the SQL database in order to read and write information.
Step 2	Read the full name of the entered account and display it in a text box
Step 3	Read the contents of the chosen level and subject from their text boxes, the file name and path for the chosen resource and save the information in SQL Resources_Table
Step 4	If the upload button is pressed, then save the file to a folder that is connected to the e-library application. If the delete button is pressed, then the resource is removed from the database
Step 5	If the admins administration button is pressed, then its related window is opened.
Step 6	If the add button is pressed, then the entered full name, username, and password from the text boxes are saved into the SQL Users_Table.
Step 7	If a user is selected from the users' data table and the delete button is pressed, then the user data is removed from SQL Users_Table.
Step 8	If a user is selected from the users' data table and the update button is pressed, then the old user's data is replaced by the new information entered in the text boxes.
Step 9	If the resources view button is pressed, then the resources window is opened and read the SQL Resources_Table
Step 10	If exit from system button is pressed, then the application is closed.

TABLE III. ADMIN WINDOW PROGRAMMING ALGORITHM

Step	Description
Step 1 to 4	The same steps that have been mentioned in Table 2 (step 1 to step 4)
Step 5	If the users' administration button is pressed, then its related window is opened.
Step 6 to 10	The same steps that have been mentioned in Table 2 (step 6 to step 10)

TABLE IV. USERS WINDOW PROGRAMMING ALGORITHM

Step	Description
Step 1	Open the connection between the VB.net and the SQL database in order to read information.
Step 2	If the file name is clicked in the resources table, then open the file for viewing process
Step 3	If exit from system button is pressed, then close the application.

III. EXPERIMENTAL RESULTS AND DISCUSSION

In this section, the results of executing and entering the data in the E-Library are illustrated which proved the efficiency of the implemented application. All the processes of entering users' data and resources data have been successfully executed. The SQL databases have been successfully connected to the application and all the data have been updated according to the pressed buttons that have been explained in the previous section.

A. Testing super admin's windows

First, the user's name and password of the authorized super admin must be entered in the login window shown in Fig. 1. When the "login" button is pressed, the application will open the window shown in Fig. 2. If the level and subject are selected from the drop-down lists and the file choose button is pressed, a window is opened and through which the super admin can choose the resources files (pdf, ppt., video. ...). When the open button is pressed, the name of the chosen file will appear above the file choose button as shown in Fig. 3 and Fig. 4.

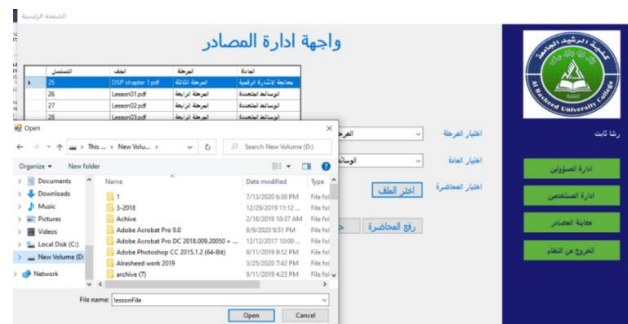


Figure 3. Selecting file to be added in the E-Library

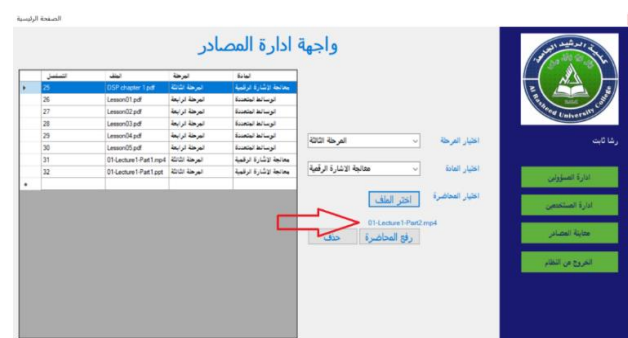


Figure 4. Displaying the name of the uploaded file

After pressing the upload button, the chosen file name is added to the list of resources as shown in Fig. 5.



Figure 1. Login window

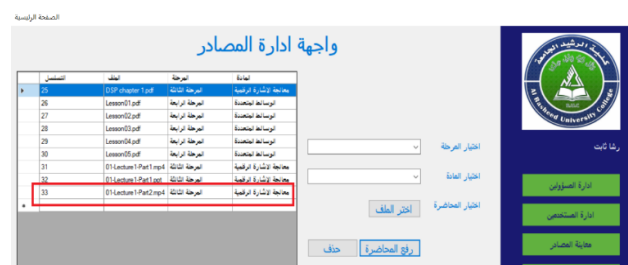


Figure 5. Resources added to the E-Library

To delete any resource from the library, the file row is selected by a single click on the file name and then the "delete button" is pressed to delete the file as shown in Fig. 6 and Fig. 7.

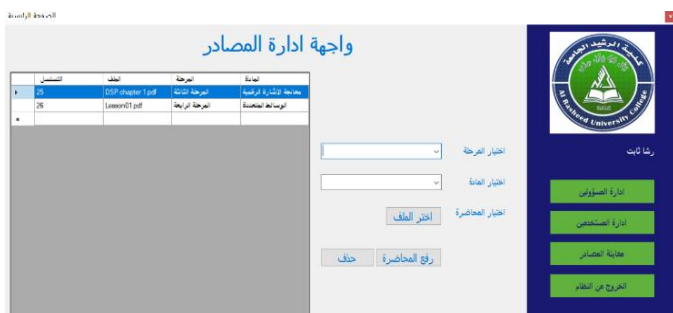


Figure 2. Adding resources to the E-Library

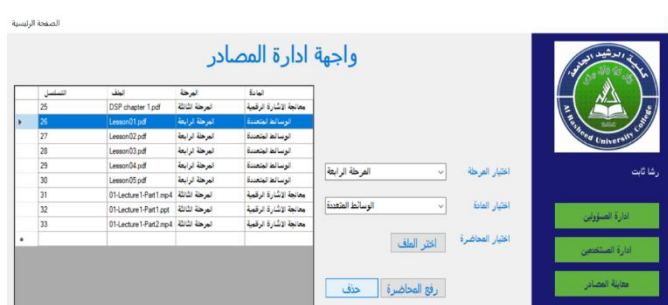


Figure 6. Deleting resource from the E-Library



Figure 7. The selected resource has been removed from the E-Library

When the “view resources” button is pressed, the list of the available resources will appear, and the user can open any file by a single click of the file name. Multiple files can be opened at the same time using the suitable application for the file type as shown in Fig. 8.

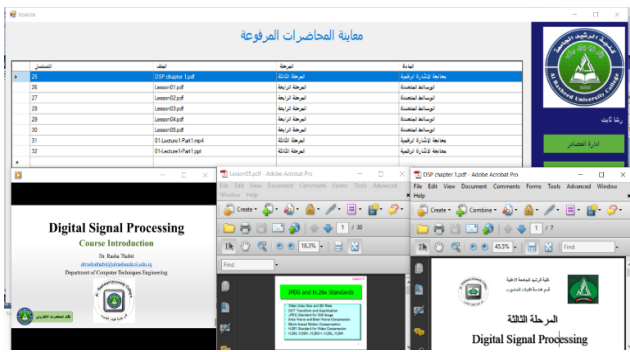


Figure 8. The opened resources from the E-Library

When the “admins administration” button is pressed, the window shown in Fig. 9 will appear and from which the admins can be added to the SQL Users_Table, deleted from the database, or edited as shown in Fig. 10, Fig.11, and Fig. 12.

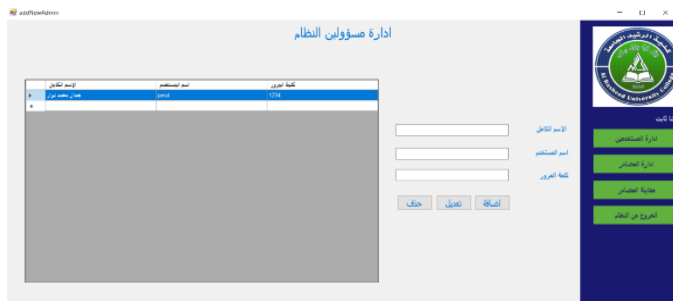


Figure 9. The admins administration window



Figure 10. The admins added to the database

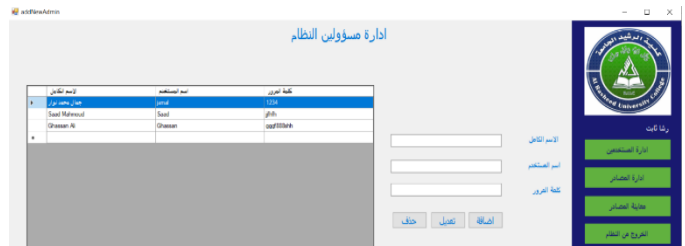


Figure 11. One admin has been deleted from the database

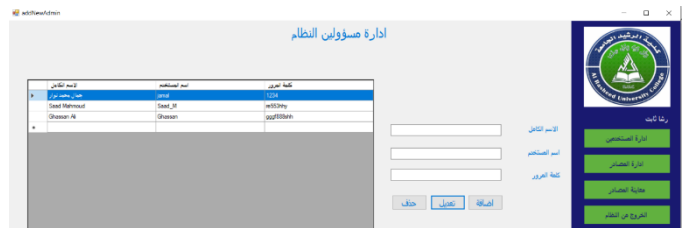


Figure 12. One admin “Saad” has been edited in the database

When the “users administration” button is pressed, the window shown in Fig. 13 will appear and from which the users can be added to the SQL Users_Table, deleted from the database, or edited as shown in Fig. 14 to Fig. 17.

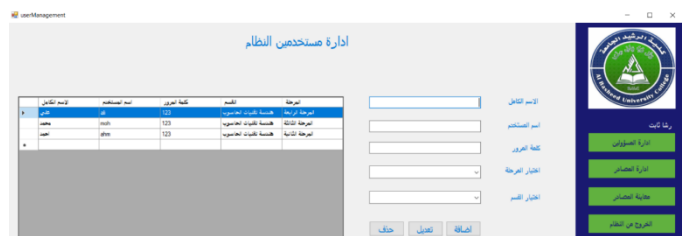


Figure 13. The users’ administration window



Figure 14. The user's information entered



Figure 18. The admin's window

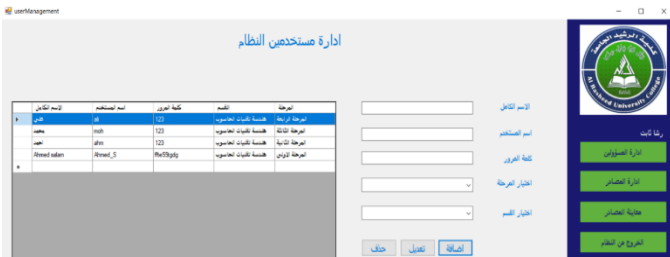


Figure 15. One user has been added to the database

The admin cannot create admins therefore the “admins administration” button is not included in this window. The other buttons work as explained before.

C. Testing the user's window

When the user's name and password of the authorized user are entered and the login button is pressed the application will open the window shown in Fig. 19. The user can view the list of resources and open any resource by clicking its name in the database table.

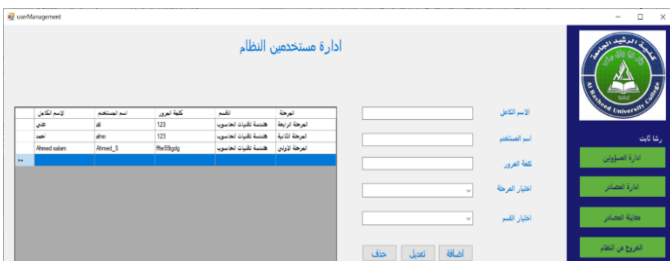


Figure 16. One user “محمد” has been deleted from the database



Figure 19. The admin's window

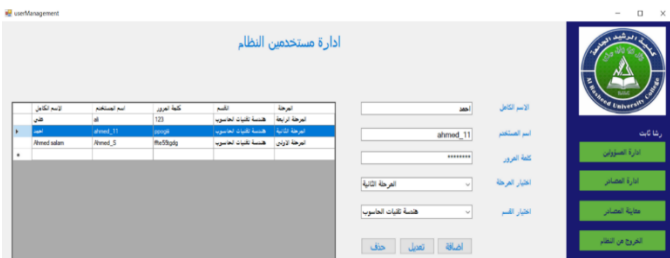


Figure 17. One user “احمد” has been edited in the database

IV. CONCLUSION

The E-Library application is very important for organizing and sharing the electronic resources for any institute. In this paper, the proposed e-library application has been implemented using VB.net and SQL database server. Implementing an e-library for a specific institute will make it useful for the users since they can find the references that they need without the restrictions of the internet service. The implemented e-library can be improved or upgraded to meet other archiving requirements such as archiving the exported and imported documents of a specific institute, or archiving the resources for a specific user. The practical design and implementation of the application proved that the more the developer works on the design, the better the quality of the final implemented application. The future research should be included in the upgraded version to facilitate the process of finding users and resources.

B. Testing super admin's windows

When the user's name and password of the authorized admin are entered and the login button is pressed the application will open the window shown in Fig. 18.

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APPENDIX A

TABLE V. DEFINITION OF THE BUTTONS IN THE E-LIBRARY WINDOW OF THIS PROJECT

Button	Window name	Definition
	Login	The login button
	Super admin	Admins' administration button
	Super admin & Admin	Users' administration button
	Super admin & Admin	Resources view button
	Super admin & Admin	Exit from application button
	Super admin & Admin	Select resource button
	Super admin & Admin	Upload resource button
	Super admin & Admin	Delete resource button Delete admin or user
	Super admin & Admin	Add admin or user
	Super admin & Admin	Edit admin or user

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