جامعة حفر الباطن
University of Hafr Al Batin

COMPUTER SCIENCE & ENGINEERING DEPARTMENT

FINAL REPORT (CSE 411)

Used Books Website

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Term:	3rdnd term (2223)
Date:	2023
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Acknowledgment

First and foremost, we would like to thank God. He gave us strength and encouragement throughout all the challenging moments of completing this graduation project. We are truly grateful for the unconditional and endless love, mercy, and grace.

Second, this work would not have been possible without the constant support, guidance, and assistance of our supervisor Dr. Noora Al Khater, her level of patience, knowledge, and ingenuity is something we will always keep aspiring to. She was ready to help with any questions that we had, we extremely grateful to have her as part of our graduation project.

Third, our sincere gratitude goes out to every one of the university's faculty for their support and encouragement during the project.

Fourth, we are so grateful for our parents whose constant love and support keep us motivated and confident. Our accomplishments and success are because they believed in us. Deepest thanks to our siblings since they are always around us.

Last, we would like to thank our team members for their professionalism, accountability, and cooperation.

Abstract

The value of buying books is one of the most important things that may lead us to read, and that is why it is necessary to facilitate everything that does so. The high cost of books is an issue that needs to be addressed and has significant negative impacts on students. As a result, a solution must be found because we, as students, face this problem. The overall objective of this project is to provide a platform that seeks to share used books that have already been dispensed with and gives students who wish to finish their studies the opportunity to buy these books at a low cost. This report is to identify the tasks and activities that we completed over the duration of the project, from March 12, 2023, to June 1, 2023.

The aim of this platform is to make educational book resources available, accessible, and affordable to every student in need. Not only that, but this platform will also help former students financially by letting them profit from the selling process.

This report goes into full detail starting with a brief introduction, followed by an explanation of the main problem, requirements, and specifications, then we moved toward the design methodologies and machine learning concept, where we had used object detection and sentiment analysis, and then followed by testing process. All the issues that arose after the testing phase have been addressed in the report and solved with effective solutions to assist us in achieving our primary goals. The report also highlighted future work for further contribution.

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1. Introduction

Nowadays, education appears to be necessary, as it is crucial and important for making money, living, progressing, and staying current with innovations. Education makes us better individuals by changing our perspective on life and things, improving our style of thinking, and increasing our beneficial impact on society.

Education comprises obtaining knowledge in order to gain a better understanding of the numerous disciplines that will be employed in our daily lives. The ultimate purpose of education is to enable an individual to deal with life and make a difference in society as they grow older. (leverageedu, 2022)

When it comes to education, books are no less important than education because of their significant and effective function in making education better, broader, and more effective. The knowledge contained in books is vast; they teach you valuable lessons about dealing with difficulties in life as well as other aspects of human experience.

Books have been around for millennia, and they offer information about our history, civilizations, and cultures. Books have a big impact on student's lives in the educational area because they motivate them to work hard with courage and optimism. Students' educational experiences are enhanced, and their minds are strengthened. For students, reading books offers many benefits, including expanded vocabulary, improved memory, and enhanced knowledge. (leverageedu, 2022) (singh, 2023)

Unfortunately, despite the availability of books, they are not adequately utilized as necessary by students. Students either discard them after usage or keep them even though they are no longer required. This activity costs other students who require these books to take advantage of them and study from them financially, and it affects them academically when they are unable to have them. As this is a significant issue to take into account and a genuine difficulty

that most students, including us, experience, it motivated us to offer some services that enable those students who require educational books to avoid going to the library and losing both time and money by providing them with a platform that offers them these used books.

Our project seeks to build a website that gives services to students through the exchange of used books between the seller and the needy, which contributes to increasing learning and providing access to easily available educational materials for those who cannot afford to purchase them.

This report is structured as follows:

The first section illustrates system design, where we defined the problem, collected the requirements, and analyzed the system architecture.

In the second section, we described the implementation process of Used Book's website and database, besides evaluating the design.

In the third section, we declared the testing process, the system analysis, and the technical issues that have arisen during the work on the project. Also, we clarified the tools and standards that have been used in the project.

In the last part, we illustrated the work plan, listed the team members' tasks, and set up the conclusion.

2. Problem Statement

There are several issues regarding educational resources. The main issues are the availability, prices, and cost of educational books, whether over the internet or at the library. Our effort seeks to address the issue that some students cannot afford to purchase the necessary books because of the high cost. However, rather than destroy some unused books, their owners prefer to sell or donate them.

Because they can't afford the book, the student finds it challenging to follow along with the teacher's lesson and pay attention. We often address this by narrowing the communication gap between the seller or donor and the students, making the donation or sale procedure simpler, and ensuring that the books are delivered to the students on schedule.

Additionally, we have seen that most students—particularly those in higher education—find it difficult to acquire expensive literature. This led us to think about and propose the following research questions:

How to facilitate education resources?

- **How to reuse old books?**
- **How to make books available and affordable of the students?**

Because of all these issues, our website frequently offers students the chance to buy books in top condition for a reasonable price, and doing so is feasible without having to pay anything. Moreover, a survey has been conducted to confirm the identified educational resource issues and to show the importance of providing a website to facilitate educational resources between students. The number of participants in the survey is 186.

3. Background

Our area of expertise, "Computer Science and Engineering," was created as a result of recent global technology advancement. It is described as a specialty in which students research computer hardware, software, and intricate processes that take place inside a computer, as well as analyze systems and algorithms. Planning, analysis, organization, comparison, the capability to prove, problem-solving, and designing programming languages and websites are among the other talents that are studied in this specialty. Computer science and education are two remarkably dissimilar fields: while education is concerned with providing educational services to a community, computer science is concerned with computers and their intricate

computational processes. In light of this, we made the decision to combine the strengths of these two sectors by applying our existing professional expertise to solve learning challenges.

Reading is an essential act in our lives, so it is important to facilitate everything that leads us to it, and one of the most important things that can lead us to reading is to facilitate the value of buying books. If it is a commodity that requires a high price, the book will then join the category of commodities, and its price will become more commercial than cultural, and this will affect the act of reading in our daily lives.

The high cost of books is a widespread phenomenon in our Arab world and has a great impact on students and their families, and it has become a problem that requires addressing and finding a decisive solution to it, and the concerted authorities of universities, publishing houses, authors and university professors, taking into account the material level of the majority of students, and it has become a problem suffered by university students alike that requires attention to its consequences, and the reason for the high prices of books in universities may be the authorization of certain bodies to sell them, and the absence of a supervisory body over these bodies, in addition to the absence of universities' responsibility for them, which requires these bodies to raise their prices without paying attention to the situation of students and their material. Professor of the university is also responsible, because some of them impose on their students' expensive books that are not readily available, and are only available through websites or at points of sale that have a sufficient quantity and we are as students we faced this problem, so we decided to design an application that serves students by providing them with books at a nominal price and helping them complete their studies.

4. Objectives and Outcomes

The main aims of the project are to facilitate educational resources:

1. Starting by encouraging students to share their old books.
2. Make educational books available online and accessible for students who cannot find them in libraries or live in the countryside.
3. Make educational books affordable at reasonable prices for students who cannot afford to purchase new books.

By the time this project is finished, we should have a complete stack website that will guarantee achieving the following:

1. Facilitating communication between individuals who are selling or donating and those who are in need to make it easier to complete the exchange.
2. Develop a platform that encourages the sharing of books that have already dispensed with.
3. Establishing an interactive environment supported by the Internet of Things that enables people to interact with the system.
4. A user-friendly interface.
5. Make education resources more available, accessible, and affordable for students.

5. Relevant and impact

Books play a vital and useful role in enhancing, extending, and enhancing the effectiveness of education, so they are just as important as education when it comes to education.

Sadly, pupils do not use books as effectively as they could despite their availability. When they are no longer needed, students either keep them or throw them away after using them. Other students who need these books to study from them are financially burdened by this activity, and when they are unable to obtain them, it impacts their academic performance.

Due to the importance of this matter and the fact that most students, like us, actually struggle with it.

Therefore, our project seeks that gives services to students through the exchange of used books between the seller or donor and the students, which contributes to increasing learning and providing access to easily available educational materials for those who cannot afford to purchase them. This solution will have a 60% favorable impact on students.

According to the published questionnaire (186 participants), we discovered that there is a huge need for used textbooks, and all statistics show that there are many students who learn from paper books. This platform is intended to provide solutions and fill global gaps and demands.

- **Preferred method of study**

Most of the participants in this study are preferring studying using books while 26.3% preferring reading from copied books and 14.5% reading using online books as shown in figure 1.

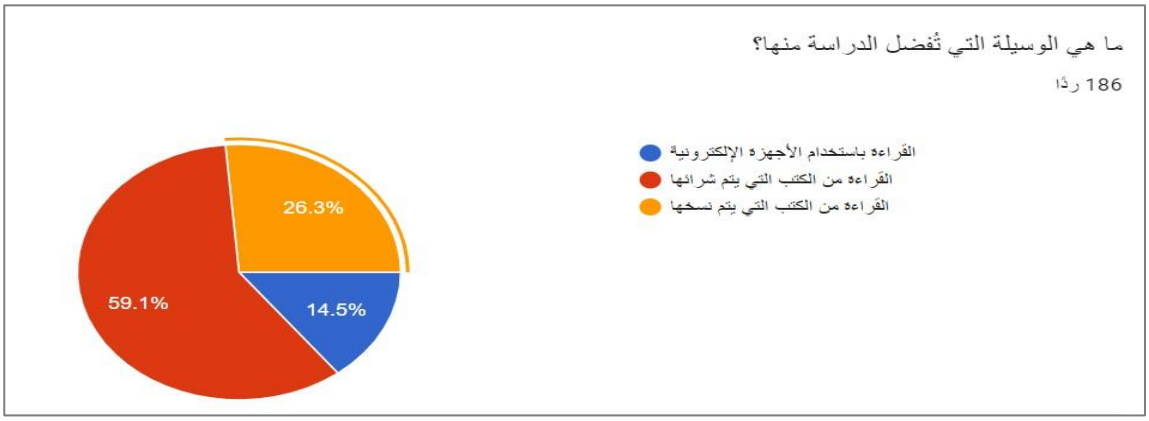


Figure 1: Preferred method of study

- **The availability of textbooks**

The result of the survey shows that books are more available over the internet than in libraries. 40.9% of participants said books are always available via the internet, whereas 17.7% said books are always available in libraries.

However, 75.3% said some of the books are some available in the library and 52.7% are available over the internet, as shown below in figures 2 and 3.

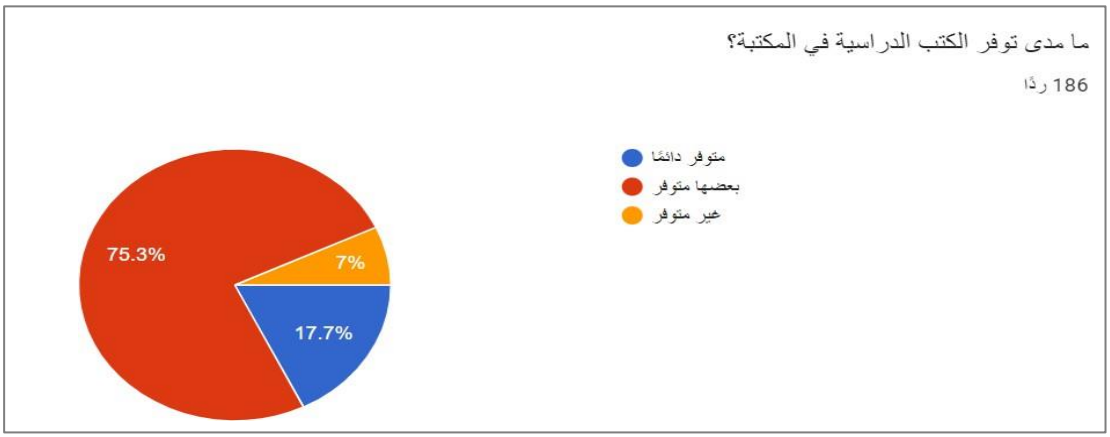


Figure 2: Availability of textbooks in the library

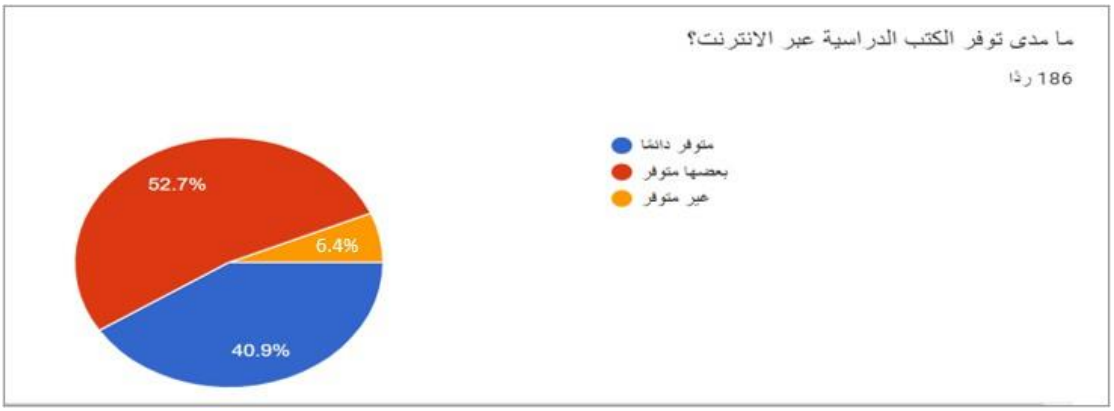


Figure 3: Availability of online textbooks

- **The cost of textbooks**

We found from the conducted survey that buying textbooks from the library is more expensive than buying textbooks online by 67.7%, as shown in figures 4 and 5.

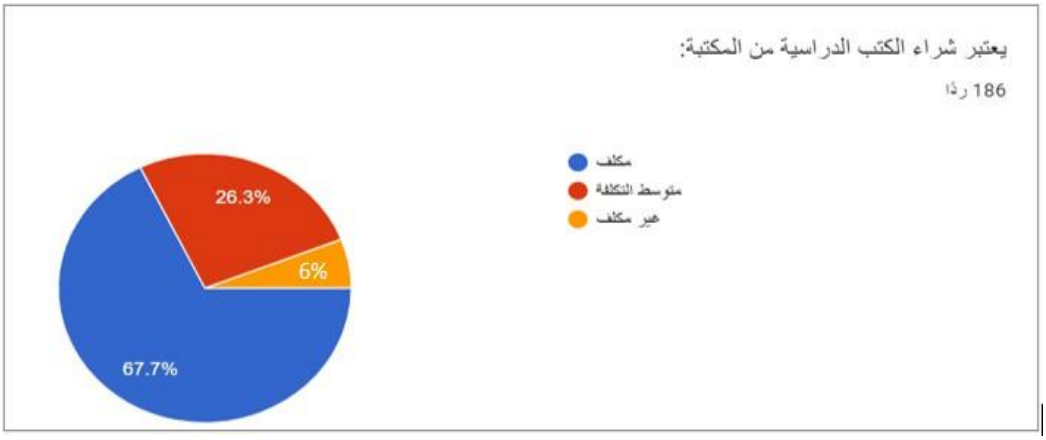


Figure 4: The cost of buying textbooks from the library

Figure 5: The cost of buying online textbooks

- **Old books reused and loan processes:**

We asked further questions like (**what do you do when you finish a previous textbook?**) and (**do you have textbooks from former students?**) to gain more details about old books reused and loan processes, with regard to the first question, most of the participants lend it to a friend, while there are those who keep it in the home library or sell it for used books, others (throw it, too) as shown in figure 6.

For the second question, the majority of the participants find it difficult to obtain textbooks from former students as shown in figure 7.

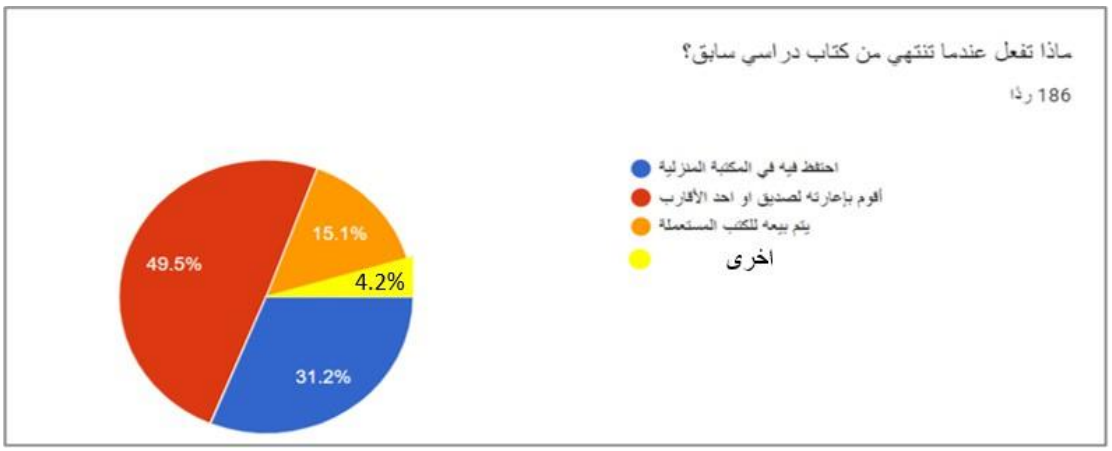


Figure 6: Ways to deal with a previous textbook

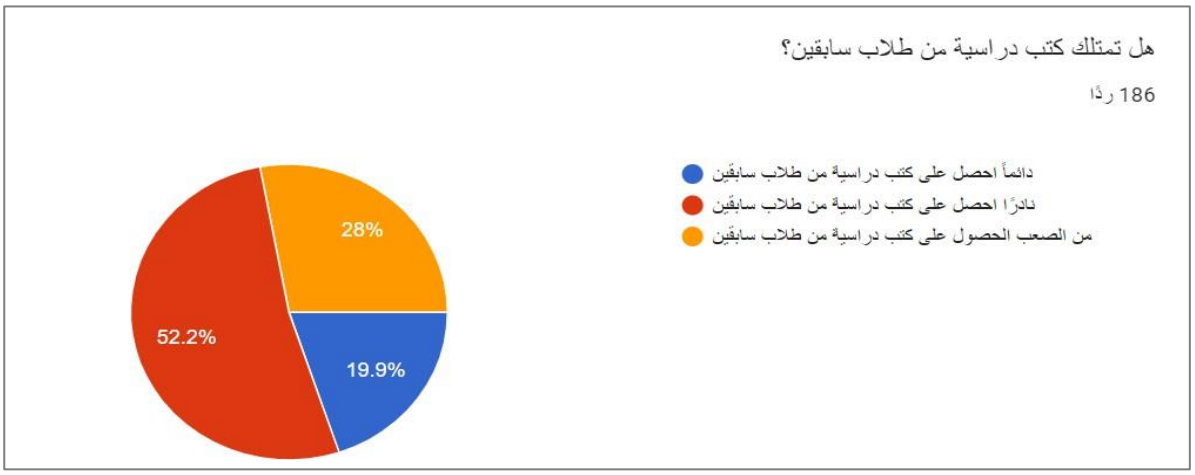


Figure 7: Obtaining textbooks from former students

6. Requirements and Specifications

A requirement is something you must have or accomplish; it is anything that is required. The requirement is most commonly used in formal contexts where achieving a certain status demands you to undertake certain acts or have certain actions.

6.1 Functional requirements:

Functional requirements define how a system behaves under particular circumstances. These are specific project characteristics that outline the work and user actions.

The following are the functional requirements for our project:

Website:

- The website offers three sections for user registration, visitor, and admin.
- Some login restrictions are applied in order to enter correct user information.
- The information is saved in the database.
- The system should be able to provide services for signed users.

User:

- The users will be able to login by their username or email and password.
- The user can register and create his own page, through his page he can upload a picture of the book he wants to donate or sell, and machine learning will be used to verify the uploaded picture.
- The seller is responsible for accepting or rejecting requests to obtain his book.
- The user can purchase discounted books through the needy page.
- The user can check his order page to verify if his request was granted or declined.
- The user can also update the information easily and communicate with the admin by sending an email within the site.

Admin:

- The admin has the right to view all user information, modify it or delete it, and export it to Office programs for statistics.
- The admin can change the book's information as well as export the list of all books to a Word or Excel file.
- The admin has access to all orders and can export them to a Word or Excel file.

Visitor:

- The visitor can browse the home page.
- The visitor can contact the administrator using the contact page.

6.2 Non-Functional requirements:

The non-functional requirements are used to define the system properties and constraints. Additionally, they guarantee the whole system's effectiveness and usability. Failure to meet any of them can lead to systems that are unsatisfactory to both internal business and users.

The following are the non-functional requirements for our project:

Security:

- Applying security on the site by dividing it into three sections, user registration, visitor, and admin.
- Ensure a secure method of authentication for registration and sign-in to the web site.
- Ensuring privacy and confidentiality to protect users data.

Usability:

- By registering into the website, any user can access the system.

Performance:

- Because the system is web-based, its performance is determined by the server, namely by how it responds to requests. The system uses resources like memory, CPU, storage, etc. efficiently.

Response:

- Getting a response to the needs of the device in direction of at most 24 hours.

Maintainability:

- Every week.

Easy to use.

Up to date.

Non-functional requirements examples:

1. The homepage should load within 3 seconds.
2. Moving from one operating system to another doesn’t cause any problems.
3. The request shouldn't take more than 3-5 seconds to process.
4. Increase the security of the system to provide better privacy for users' information.
5. The website has the capacity for 1000 logged-in users at one time.

6.3 Technical specifications:

Before starting the real software development process, every project manager must write a technical specification or documentation. This list of prerequisites must be accomplished before the work may be completed.

- Provide a platform to share books that have already been read and to make sure donated books get to the individuals who need them the most.
- Focus on building a platform that enables students to make money by selling the books they don't need.
- Work to create a platform that facilitates the availability of textbooks for students at a lower price.
- The system will identify any problematic books.

6.3.1 Hardware need:

- Computer device with processor of i5 or above and RAM of at least 16 GB in order to handle the development applications.
- Hard disks of one Tera byte to make backup of the system.

6.3.1 Software needed:

- Diagram Editor (Purpose: UML Diagram)
- MS word (Purpose: Documentation)

- MS PowerPoint (Purpose: Presentation)
- MS SQL server (Purpose: Database design)
- Visual Studio (Purpose: Web page design & development, Language/script: HTML, JavaScript, CSS, jQuery, Bootstrap).

Microsoft SQL Server:

Microsoft SQL Server is a system used for managing relational databases. Numerous applications, such as business intelligence, transaction processing, and analytics, are supported by it. (Adam & Craig, 2019)

The advantages of Microsoft SQL Server include ease of installation, improved performance, a variety of SQL Server editions, high levels of security, excellent data restoration and recovery mechanisms, and a lower total cost of ownership. (tek tools, 2020)

A database is essential for any interactive website. A database's design is the most important aspect of its development. A high-performance application must be designed before any actual coding is done. (Elinsys, 2011)

Visual Studio:

Microsoft's integrated development environment (IDE) is called Visual Studio. It is used to create computer programs such as websites, web apps, web services, and mobile apps. Additionally, you can modify, debug, and build code on it, as well as build and publish an app, using it as a creative launching pad. Compilers, code completion tools, graphical designers, and many other features are included in Visual Studio in addition to the conventional editor and debugger that are offered by the majority of IDEs to improve the software development process. (microsoft, 2022)

HTML:

HyperText Markup Language is what HTML stands for. It is a popular markup language used for the development of web pages. Using HTML elements like tags and attributes permits the construction of sections, paragraphs, and links. Cascading Style Sheets (CSS) and JavaScript are used to construct the majority of the website content, while HTML is utilized to add text components and establish the structure of content.

CSS is in charge of stylistic elements including the background, colors, layouts, spacing, and animations. JavaScript, on the other hand, offers dynamic features like sliders, pop-ups, and picture galleries. (Astari)

7. System Design

7.1 Solution Concept

Creating a website with three sections is the recommended solution. As a guest, you may only access the home page in the first part and won't be able to use any more features unless you register. In the second part, signed users were given the option to post books for sale or donation. The last part is about the admin, who oversees the entire website and contacts, exports, modifies, and displays the users listed.

For our project, we can employ one of the two methodologies: waterfall or agile. With the waterfall methodology, tasks are typically completed in a more linear manner. Agile, on the other hand, is an iterative methodology that includes a circular and collaborative process. (Towner, 2022)

The optimal technique to use in our project is agile because the system will be submitted in stages and we may quickly update requirements without risking release dates. Agile also reduces technological debt, increases customer happiness, and creates high-quality products.

The main reason for choosing the agile model over the waterfall model is the difficulty of responding to changing customer requirements due to the strict division of the project into separate phases.

By dividing the project into smaller parts, project risk can be reduced and the entire project delivery time can be shortened. A team completes the entire software development lifecycle at each iteration, which includes planning, requirements analysis, design, coding, and pre-presentation testing, as listed in figure 8 below.

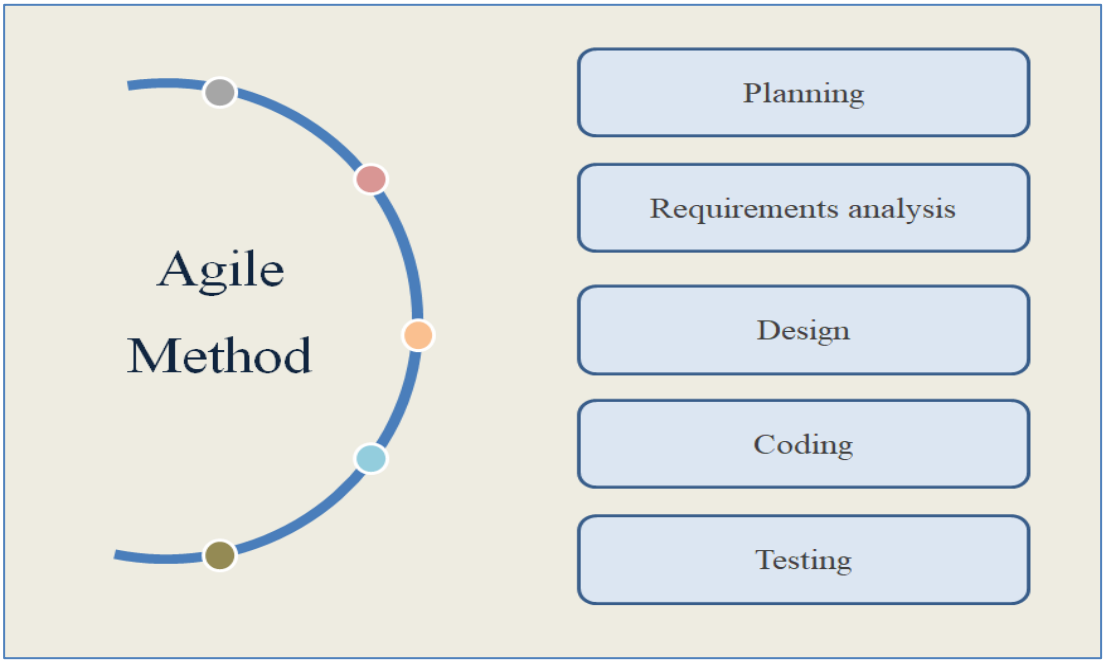


Figure 8 : Agile methodology

7.2 Machine learning

Machine learning will be used to increase efficiency on the website. When users upload books, only educational books that are related to the computer science and engineering major are allowed to be uploaded.

7.2.1 Convolutional Neural Networks (CNN):

Convolutional neural networks, sometimes referred to as CNN or ConvNet, are among the most widely used deep neural networks in deep learning, particularly for computer vision applications. It's used to examine visual imagery.

CNNs have developed into a key component of many computer vision applications throughout the years. CNN could only distinguish handwritten numbers at that time, but now it can identify millions of annotated photos and has a ton of computational power.

Convolutional neural networks are made up of many layers of artificial neurons , as shown in figure 9 below. Artificial neurons are mathematical functions that compute the weighted sum of numerous inputs and provide an activation value. They are a crude reproduction of their biological counterparts. A ConvNet receives an image as input, and each layer produces a number of activation functions that are then passed on to the following layer. (Mandal, 2021)

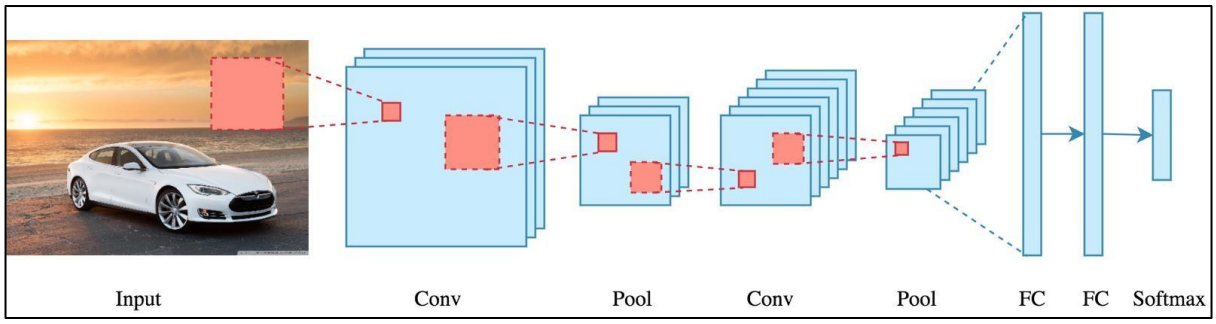


Figure 9: CNN architecture

CNN is appropriate for employing artificial intelligence since it is unaffected by the placement of the items it examines, whether they are at the top, middle, or bottom of the image. But because it requires a huge number of images to learn and train on, we just employed its idea.

7.2.2 VGG16:

With a high accuracy of over 90%, the object identification and classification algorithm VGG16 can categorize 1000 images into 1000 separate categories. It is one of the most common picture classification algorithms and works well with transfer learning.

It is a variant of CNN, and the model's creators used an architecture with incredibly tiny (3x3) convolution filters to examine the networks and improve the depth. which demonstrated a considerable improvement over prior-art setups.

The number 16 in "VGG16" refers to 16 layers with weights, as depicted in the architecture in figure 10. (G, 2021)

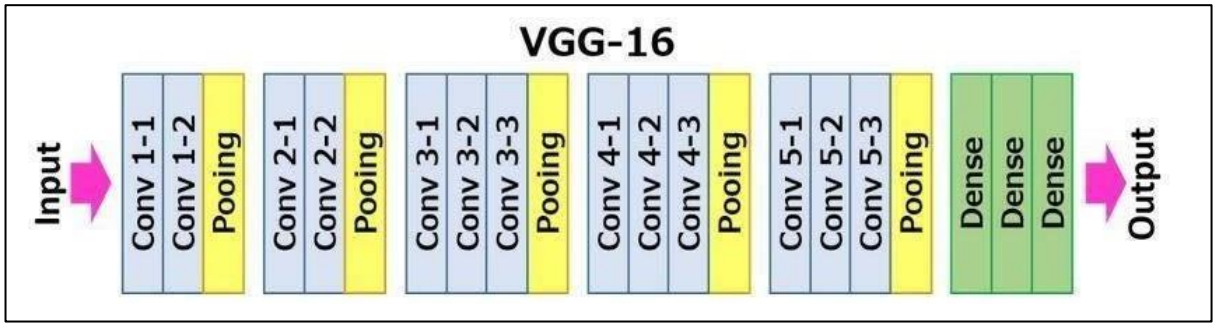


Figure 10: VGG16 architecture

As previously said, VGG16 is based on CNN, thus we incorporate it into our project.

7.2.3 Data augmentation:

Data augmentation is used to overcome the challenge of the limited quantity and diversity of data. This methodology develops (manufactures) its own data using the existing data it has. This is accomplished by displaying the object of interest in various sizes and lighting conditions during the testing (or deployment) phase. (Pai, 2017)

7.2.4 Preparing the AI model:

The first thing we did was create a dataset with two classifications: the first one was for the books that were accepted on our website, which are those related to computer science and

engineering; the other group was made up of random samples that were unrelated to computer science and engineering so that we could train the model to reject them. It will return 1 for books that are accepted and 0 for those that are rejected. A sample of five books from the rejected list and five more from the accepted list are shown in the figure 11 below.

Figure 11: sample of the two AI lists

The figure 12 below shows the code where we employ data augmentation and configure the model to flip each image (horizontally and vertically) and rotate it by 0.5% in order to ensure that the AI model learns as effectively as feasible.

```
from tensorflow.keras import layers
data_augmentation = tf.keras.Sequential([
  layers.RandomFlip("horizontal_and_vertical"),
  layers.RandomRotation(0.5),
])
```

Figure 12: data augmentation code

Then, since the VGG-16 has already been trained on substantial amounts of data, we used the first six layers from it and added seven layers from our method. As you can see in figure 13 below.

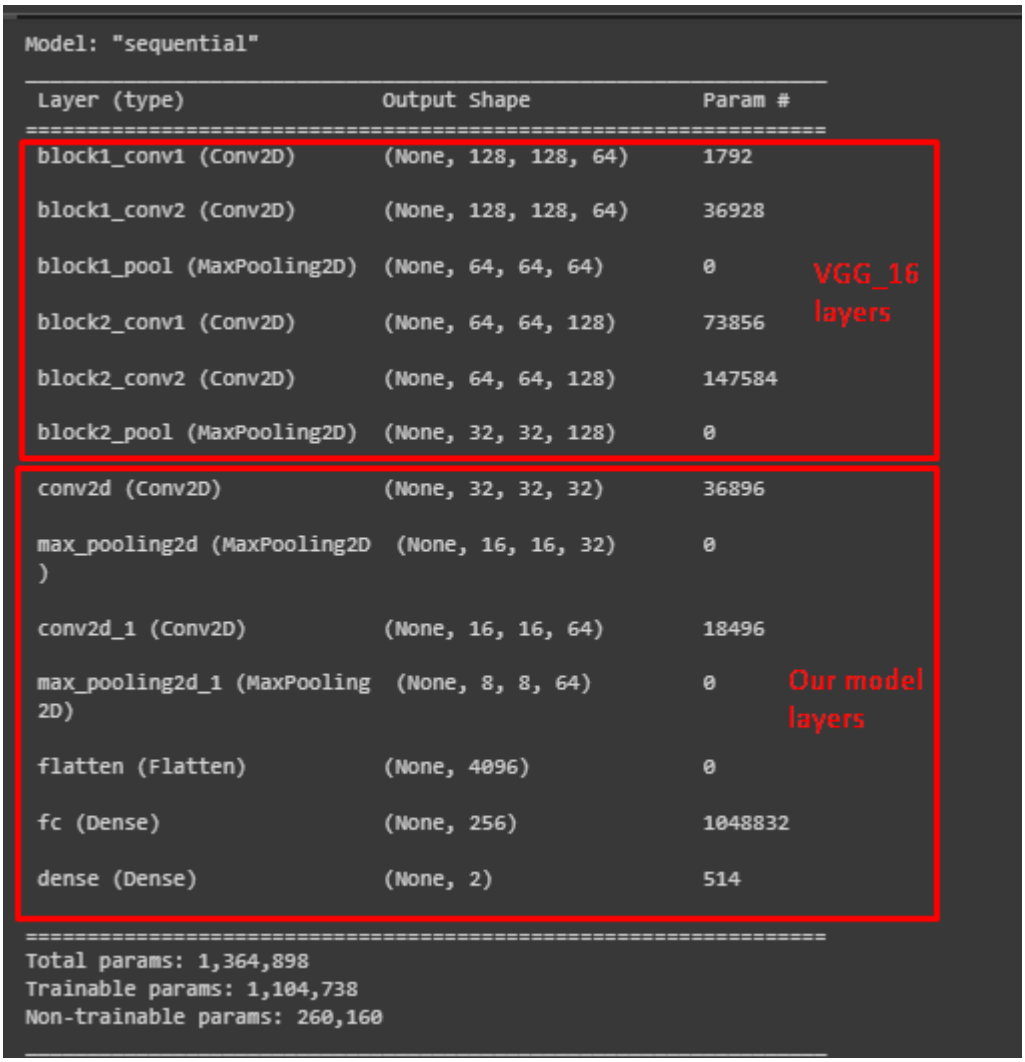


Figure 13: model summary

The model's architecture is shown in figure 14 below. In the Conv2D layers, the model reads data from the picture's block, then inserts the block into the MaxPooling2D layer, where the size is shrunk, and repeats the process until the matrix is flattened and the output is reduced until it is two, either 1 for accepted or 0 for rejected.

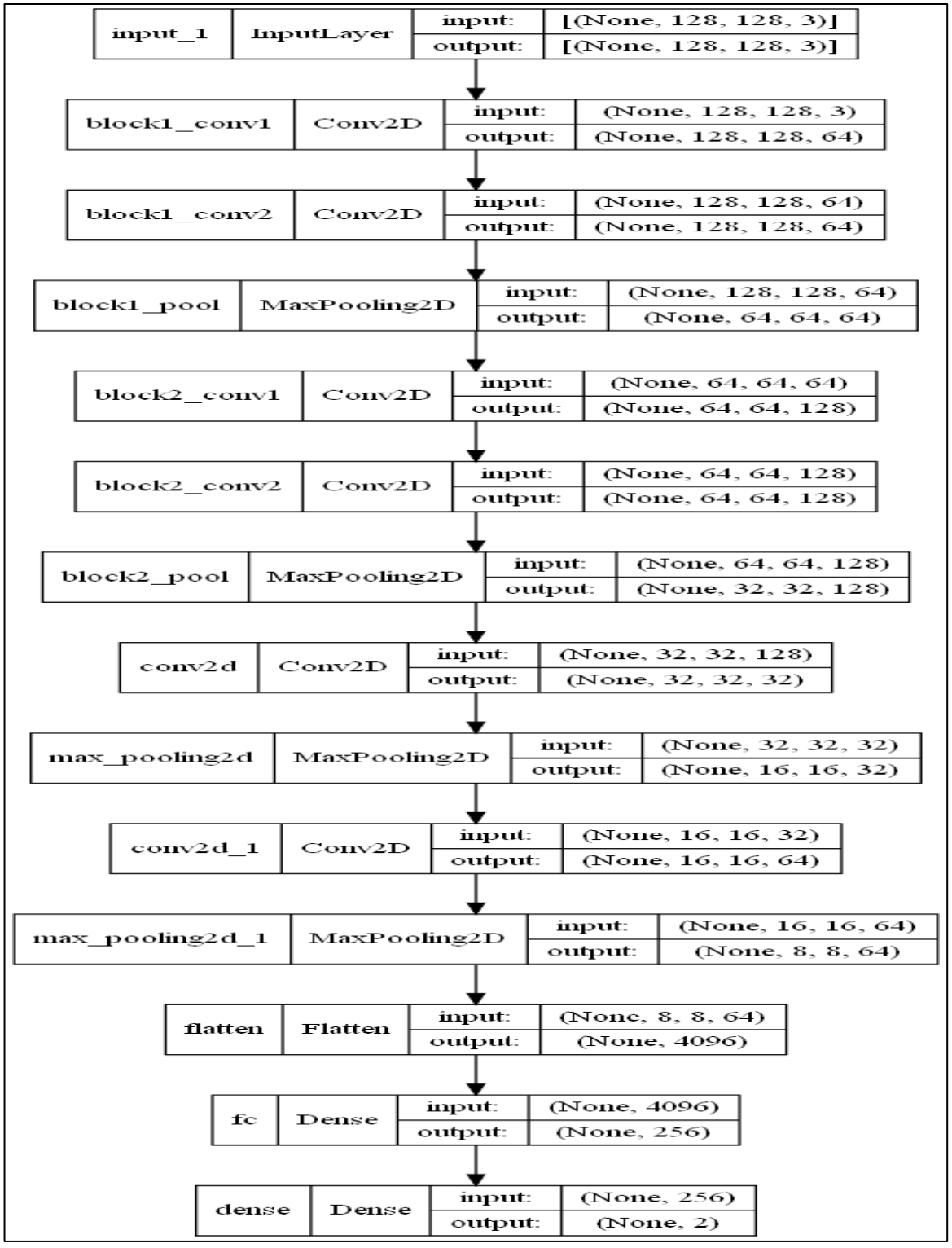


Figure 14: The model's architecture

7.2.5 Connecting AI with Visual Studio:

An API separates the Python code used to create the AI model from the C# code. Figure 15 shows the C# code that links our website's API to the "doners" page so that when a user uploads a book image there, the AI model is used to verify it first. The base64-encoded images can be submitted via the post-type API, which decodes them before returning them as images and inserting them into the AI model after verification. Either target 0 or target 1 will be returned, where 0 denotes that the image was refused and 1 denotes that it had been authorized. The website will check first. If a file exists, the image will be converted to base64 in C# before being sent to the API. Next, a web request is made with the necessary root, the content type set to JSON, and the method type set to POST.

The response is either 0 or 1. If the target is 1, the remaining code will be finished. but the remaining code won't be performed if the target is 0, a return will be made, and an error notice will appear.

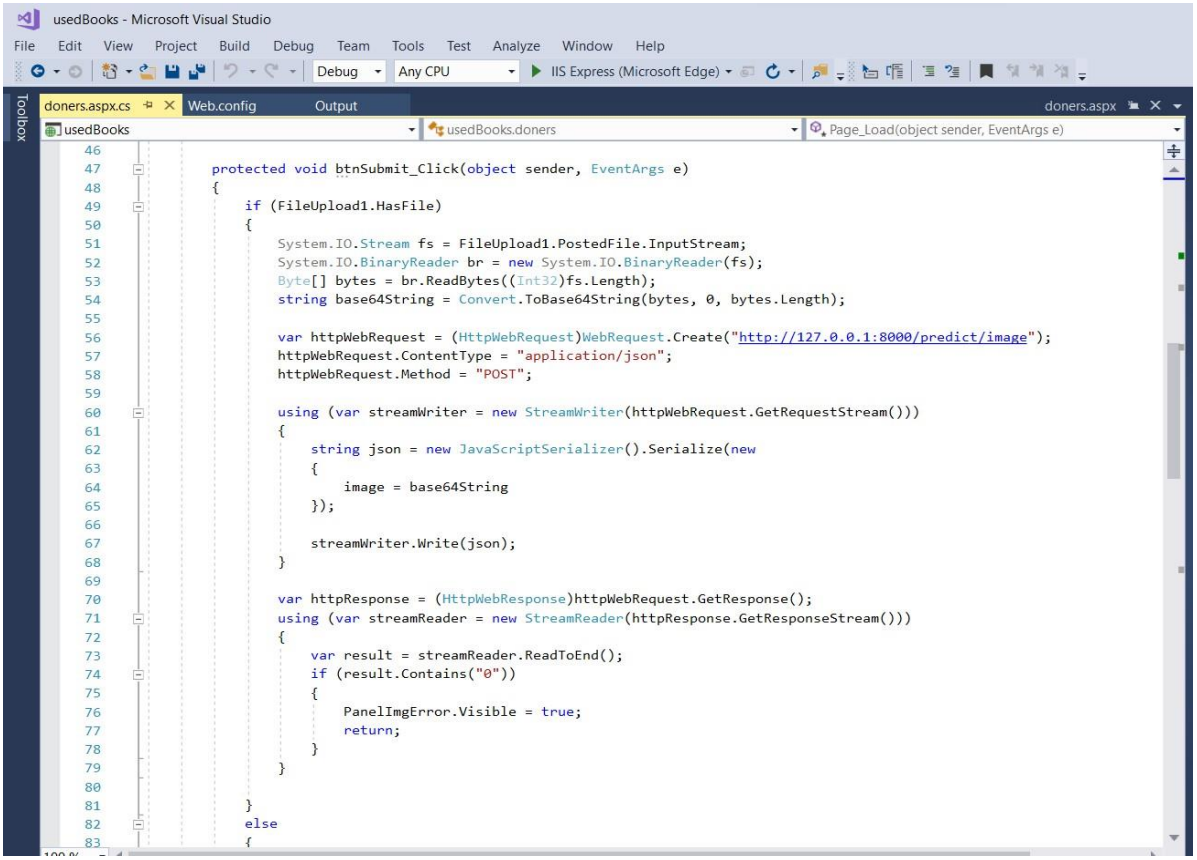


Figure 15 :connecting AI with visual studio

7.3 Architecture

7.3.1 System architecture and components.

The structure, behavior, and viewpoints of a system are described by its conceptual model, or "architecture." A system's formal description and representation—known as its architecture description—is set up in a way that facilitates analysis of its structures and actions. (Jaakkola & Thalheim, 2010)

In order to depict the system in a structural way that is helpful for understanding the system for technical and non-technical users, a system architecture can be made up of system components and the developed sub-systems that will cooperate to implement the overall system. It includes a data-cleansing phase, a machine learning model, a database, and a user interface design to depict a more advantageous viewing method. To make the system's components, features, functionalities, and behavior clear, it explains the system's general design.

In our system architecture, we used Visual Studio to build the user interface and MS SQL Server to create a database. One of the most often used programs for database management is MS SQL server. Database tables can be created, changed, dropped, deleted, imported, and exported there.

Visual Studio offers the ability to perform queries, optimize, repair, and inspect tables, alter collation, and carry out other database management functions. Components for feature scaling and data preparation exist. The three most crucial steps in the data's preparation are cleaning, categorization, and normalization. Machine learning is the study of using algorithms and data to enable computers to carry out tasks without guidance or input from human users. It is characterized by computers performing autonomous improvement using real-world examples and data in place of constant human input. (Arellano, 2020)

Lastly, the UI component is the user interface implemented using Bootstrap is the most popular CSS framework for developing responsive and mobile-first websites (w3schools)

7.3.2 Alternative architectures, comparison, and selection criteria:

Our project required us to choose between the Oracle database and the MS SQL server. And since the Oracle database must be subscribed to, unlike MS SQL Server, we chose MS SQL Server to build our project database with because it is readily available for free, has numerous benefits, and is simple to use and change. Additionally, MS SQL Server is the strongest transactional database engine currently on the market. It is the preferred option for total data integrity because of characteristics like complete atomicity, consistency, isolation, persistent transaction support, multi-version

transaction support, and unconstrained row-level locking, as shown in figure 16.

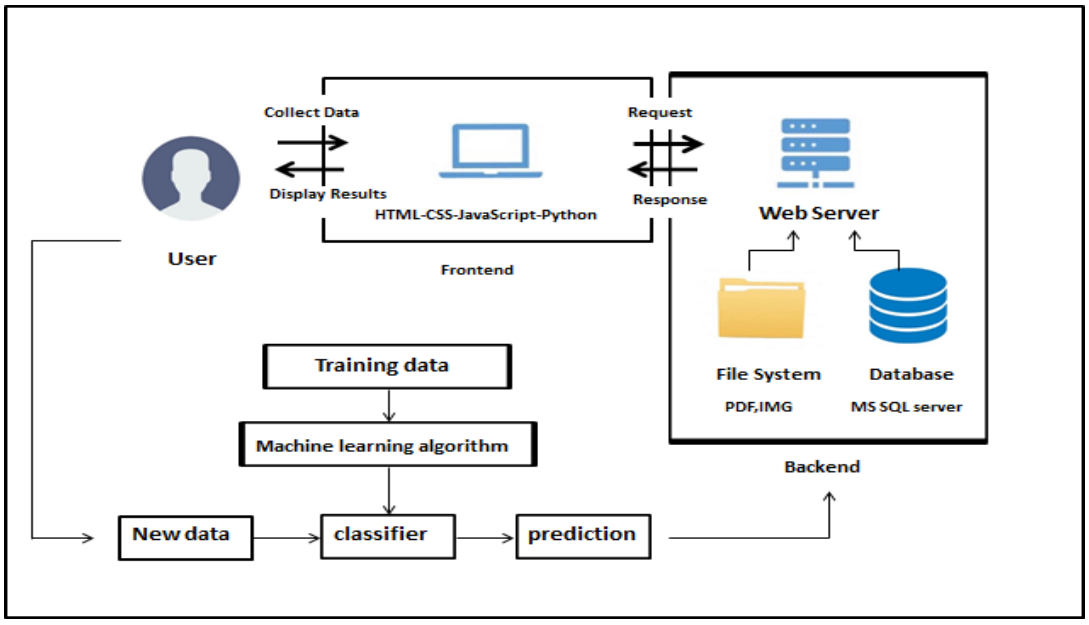


Figure 16: System architecture components

7.4 Component Design

7.4.1 Hardware component:

Table 1 shows the Off-the-shelf components:

- Laptop: in order to download the programs needed for setting up the used books system.
- Hard disk: in order to make a backup of the system.

The need	Chosen Component	Alternative Component	Selection criteria
Laptop	Lenovo ideapad 330s	Apple MacBook	Because most of our software programs are not supported by Mac OS, we chose to use the Lenovo ideapad 330s with Windows 10.
Hard disk	Seagate Backup Plus Slim 1 TB	LaCie 1TB rugged SSD pro	Our decision to go with the Seagate Backup Plus Slim 1 TB was based on its compatibility with our computing equipment.

Table 1: Off-the-shelf Hardware components

7.4.2 Software component:

Table 2 shows the Off-the-shelf components:

- Documentation program: in order to share the system design, needs, and specifications with our team members and keep track of them.
- UML Diagram: in order to create the diagrams that define the functionality and initialize the system's components.
- Presentation program: to serve as a representation of our project's final presentation.
- Database server: in order to set up the database for the system.
- Software development kit: in order to express the system concept into code.

The need	Chosen Component	Alternative Component	Selection criteria
Documentation	MS word	Google Docs	Because Google Doc only has the basic features of MS Word, we decide to use MS Word to benefit from all of its features.
UML Diagram	Diagram Editor	Flowdia Diagrams	We chose Diagram Editor, which offers the same capability for free, rather than paying for the Flowdia diagram software subscription due to its exorbitant cost.
Presentation	MS PowerPoint	Keynote	Because keynote

			software cannot be uploaded to all of our devices, we opt for MS PowerPoint.
Database server	SQL SSMS	Google Cloud SQL	Because of its straightforward interfaces and clear syntax, we decided to create the system database using the SQL SSMS server.
Software development kit	Visual Studio	Xcode	Because Xcode is only available for iOS devices, we are unable to use it on laptops and desktop computers. Instead, we opt for Visual Studio, which also supports a wide variety of programming languages.

Table 2: Off-the-shelf software components

7.4.3 Custom components:

Design and implementation:

The state machine diagram, a type of UML diagram, is used to represent a system's dynamic nature. Typically, state machine diagrams are used to describe an object's state-dependent behavior. Depending on the state it is in, an object reacts to the same event in different ways. The figures below represent four different state machine diagrams of our site; see Appendix A for the codes of each operation.

- The state machine of the signing-up operation is shown in figure 17 below.

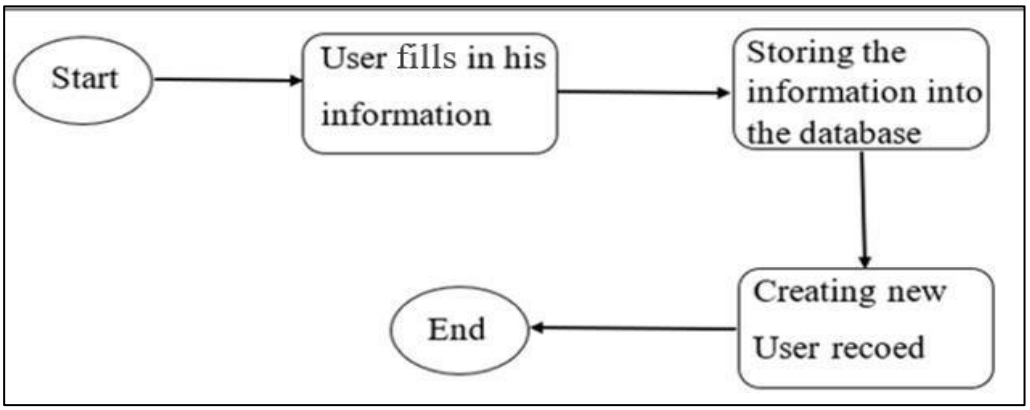


Figure 17: Signing up operation

- The state machine of the change password operation is shown in figure 18 below.

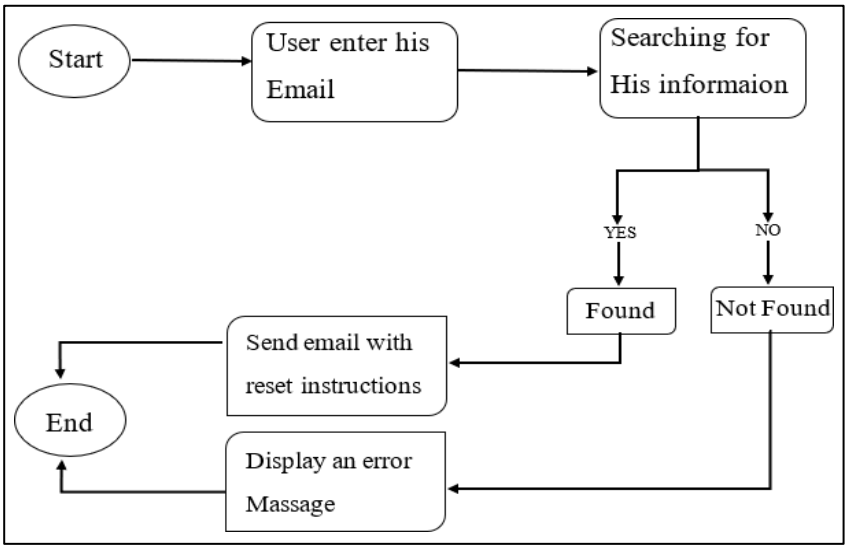


Figure 18: Change password operation

❖ The state machine of the upload content operation is shown in figure 19 below.

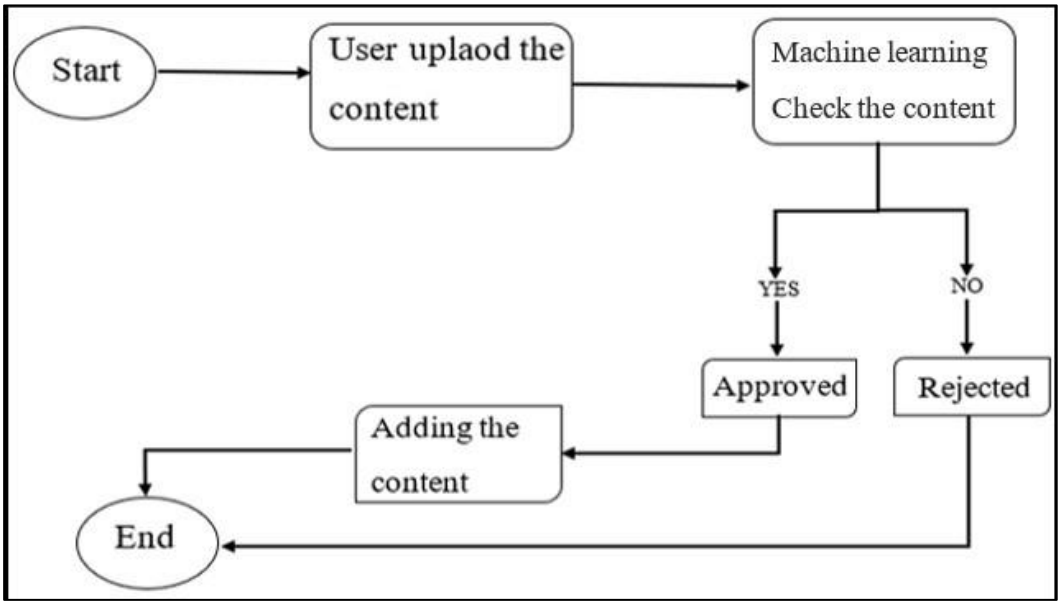


Figure 19: Upload content operation

❖ The state machine of the buying a book operation is shown in figure 20 below.

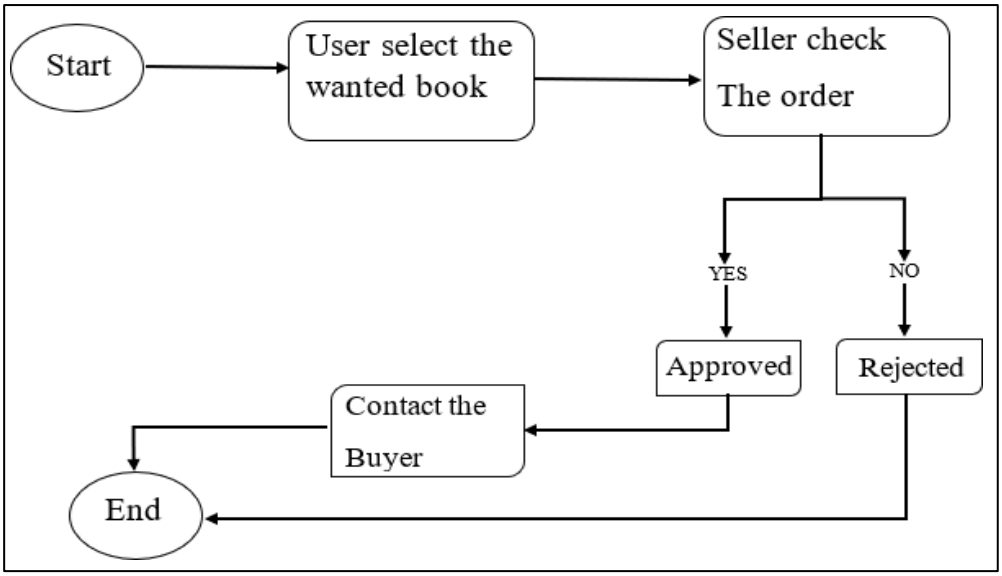


Figure 20: Buying a book operation

7.4.4 Custom Design

The structure of our system pages is shown in the figure below. The home page is the first page that appears to any user when they visit our website. It contains the about us section, which has a brief description of our website idea. It also contains a Q&A section for the most common questions to be answered faster. If the visitor of the website wishes to ask any other question, the contact us page may be helpful, where he can contact the admin using his email. After signing up successfully on our website, the user will be able to benefit from our services. donate or sell the book he no longer needs from the "donate" page, or order a book he needs that another user has uploaded from the "buy" page. If another user orders a book you have sold, you can check the order from the "new order" page, and as a seller, you have the right to accept or reject the order. As for the buyer, you can check the state of your orders from the "orders" page.

With regard to the admin, he has three pages to manage. user management, book management, and order management. He can look at all the information associated with the page, modify or delete existing data, or export these data for statistical purposes.

The website's pages are organized into three primary classifications:

First, the admin pages, which are unavailable to regular users.

Second, the user pages, which are accessible to everyone who has registered on the website.

Third, the public pages which are available to anyone who visits the website.

Figure 21 below is a class diagram showing the structure of the website system.

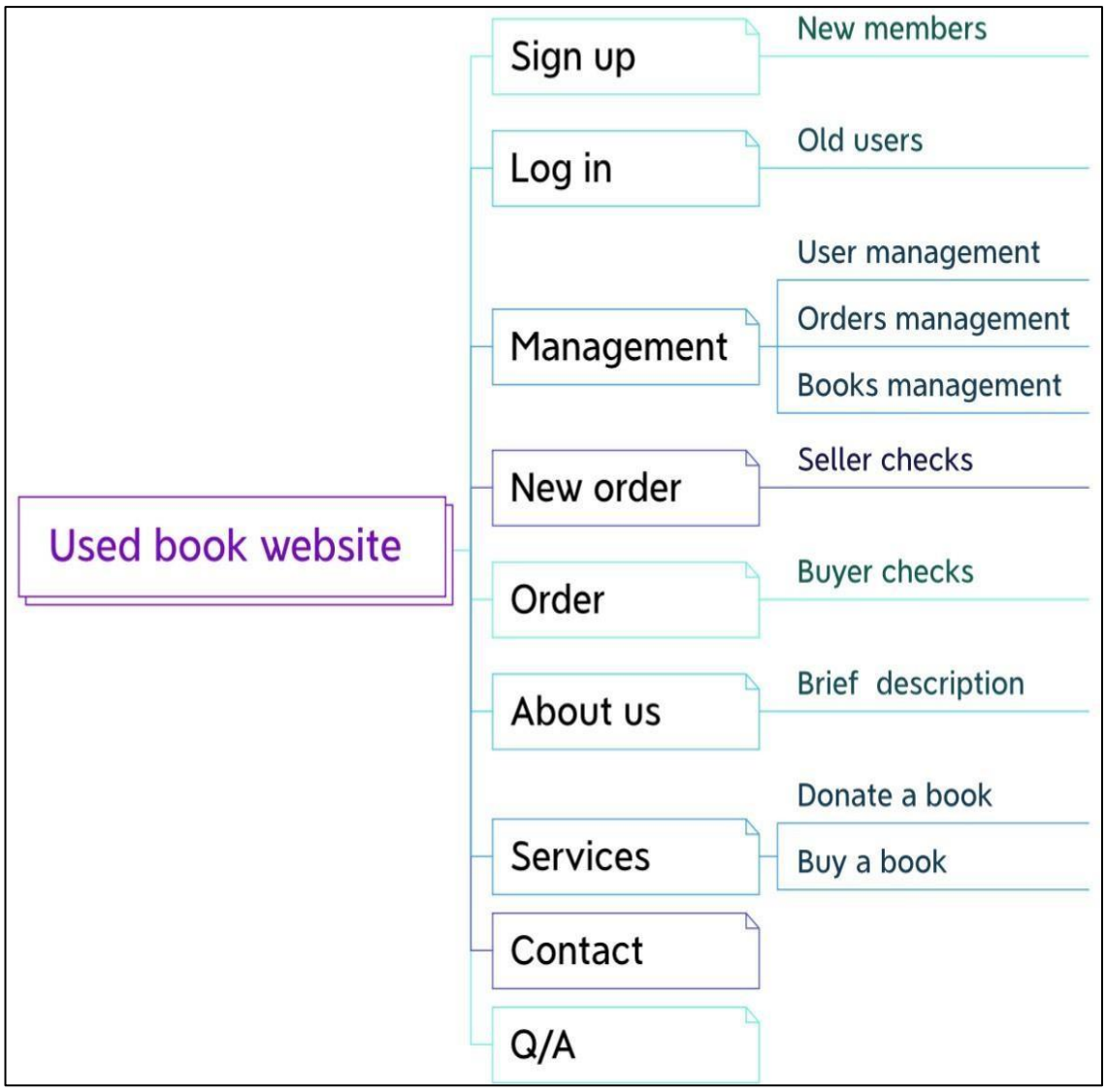


Figure 21: Used book class diagram

The object diagram demonstrates the relationship between these system objects as well as the relationship between the declared class and the instantiated classes. Figure 22 below shows the object diagram of our project. (visual-paradigm)

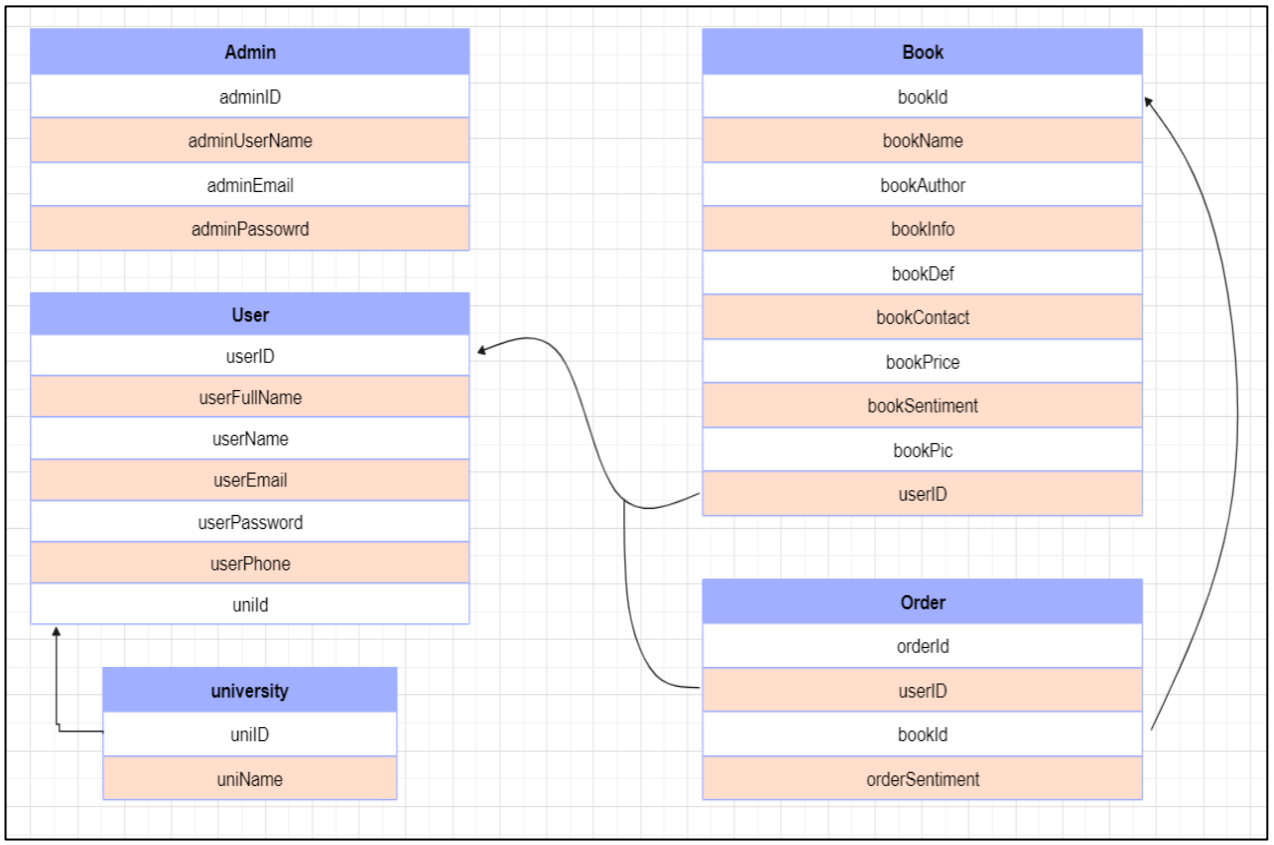


Figure 22: Used Books Object Diagram

8. System Integration

8.1 Use Case Diagram:

Use case diagrams are a behavioral UML diagram type that are commonly employed to evaluate different systems. They make it possible for you to see how various roles interact with a system and their various subtypes. Use cases describe the desired action, not the precise steps to take to make it happen. (creately, 2022)

Use case diagram for Used books (user), as shown in figure 23:

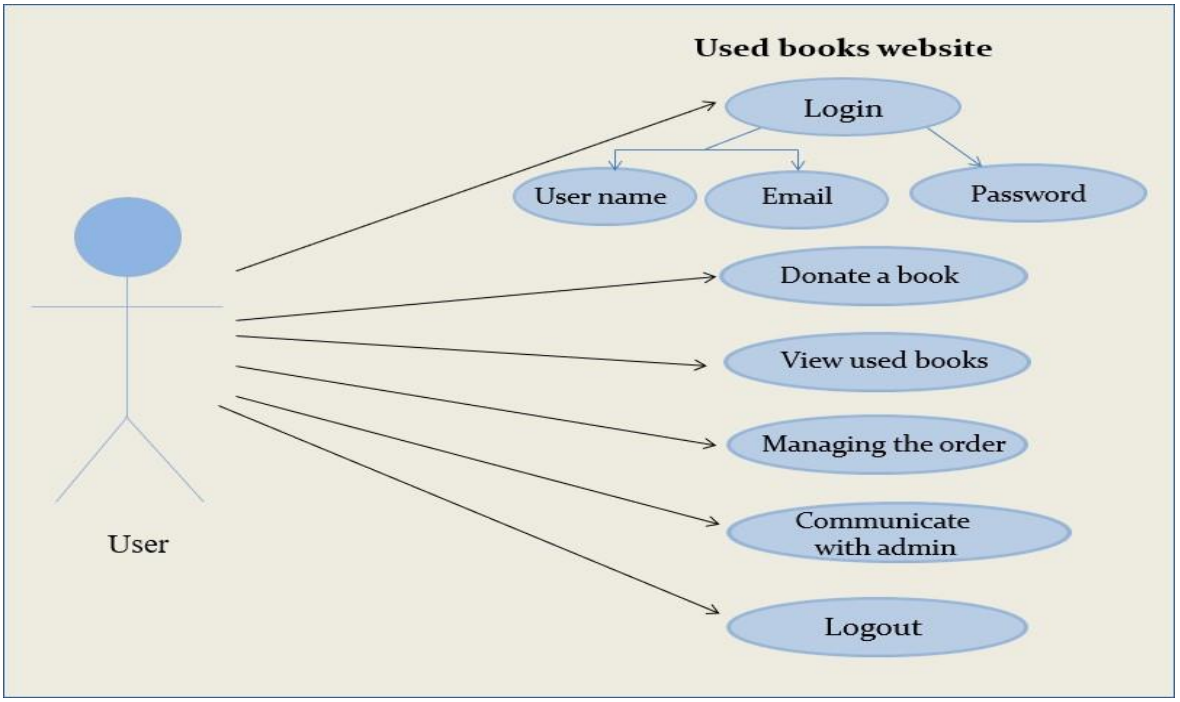


Figure 23: Use Case Diagram for user

A. Login

- Use: If the user wants to use any of the functionalities of the Used books website, he must login with his email or user name and password.
- Actor: donor/ needy.
- Input: email or user name and password.
- Output: if the email or user name and password are correct then he is redirected to the home page, else prompted to re-enter the user details.

B. Donate a book

- Use: if the user wants to donate the books.
- Actor: Donor / needy.
- Input: The user must insert details in the book information. Which includes:
    - Upload the picture of the book.
    - Book name.
    - Author name.
    - Book information.
    - Book defects.
    - Price.
    - Contact number.
- Output: If the user uploads a picture and the other fields are filled correctly, he is redirected to the home page; otherwise, he is prompted to fill out all the fields, including a picture of the book.

C. View used books

- Use: When the user wants to see the books, he / she will press the services at the top of the list.
- Actor: Donor / needy.
- Input: At the top of the page the user clicks on the services button.
- Output: Two services the user's whole book donation history would be displayed, as well as a buy list if the user needed one.

D. Communicate with admin

- Use: It allows the user to communicate with the admin.
- Actor: user.

- Input: by press the contact us button the user will communicate with admin by using email notification.
- Output: When the user sends a comment, it is viewed by the admin then processed, and immediately responded to the user.

E. Logout

- Use: When the user wants to end the session and to sign out of the website, he/ she may use the logout button.
- Actor: Donor/ needy.
- Input: user presses the button to logout.
- Output: The account session of the user expires.

F. Managing the order:

- Use: When the seller has a request for books donated.
- Actor: Admin / donor.
- Input: manage button.
- Output: approval or rejection of the request.

Use Case Diagram for Used books (Admin), as seen in figure 24:

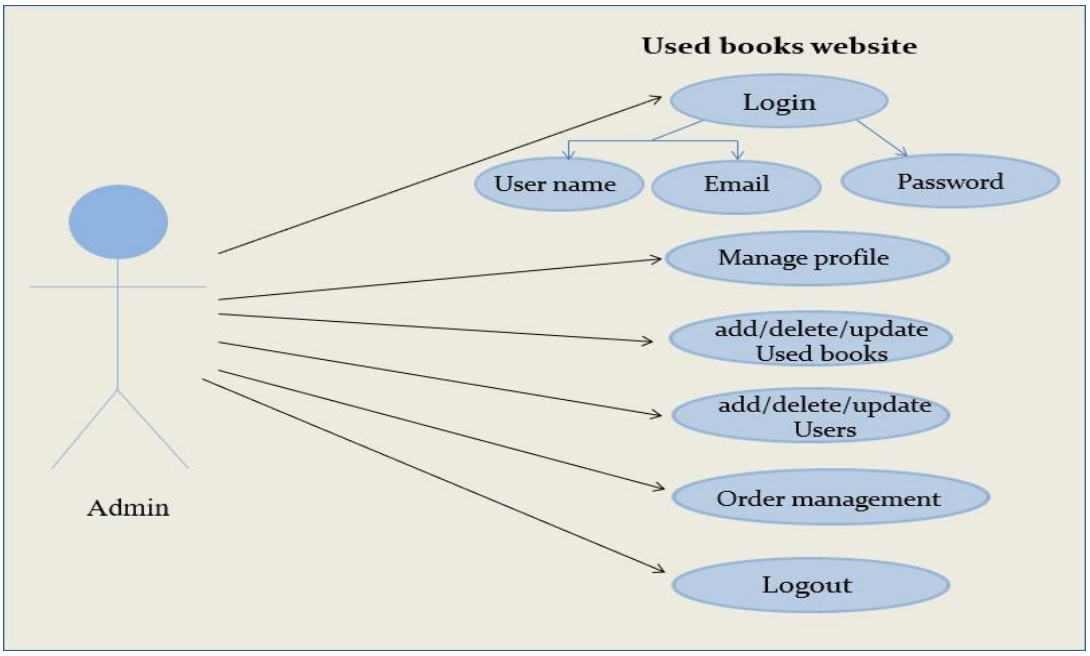


Figure 24: Use Case Diagram for Admin

A. Login

- Use: allows the Administrator to access all the functionalities of Used book by logging into the account using email and password.
- Actor: Admin.
- Input: The email or user name and password of the administrator.
- Output: if the email or user name and password are correct then he is redirected to home
- page else prompted to re-enter the login details.

B. Add or delete the used books and users

- Use: allows admin to add or delete the used books and users by using the rights of the administrator, the information will be updated in the website and database.
- Actor: Admin.
- Input: The Administrator can add/delete /update a used books and users by clicking the buttons then the changes will update in website and database.

- Output: The new update is displayed on the website under the category specified by the administrator.

C. Order management

- Use: Displays information about all orders on the website and their status in terms of acceptance or rejection
- Actor: Admin / donor.
- Input: manage button.
- Output: Export the order to Excel file or to Word file.

D. Logout

- Use: Used to end the admin session from the website by clicking logout option.
- Actor: Admin.
- Input: By clicking the logout.
- Output: When the admin clicks the logout button the account session comes to an end.

8.2 Sequence diagram:

The sequence diagram aims to show how the user interacts with the components of the system and how the system will interact in different scenarios. in figure 25 The login procedure is the first point of contact between the user and the system. The user must first enter the username or email and password before pressing the login button. If the data they entered is genuine, the system will then grant them access to location services. If the username or email is not stored in the system, the system will display the registration page.

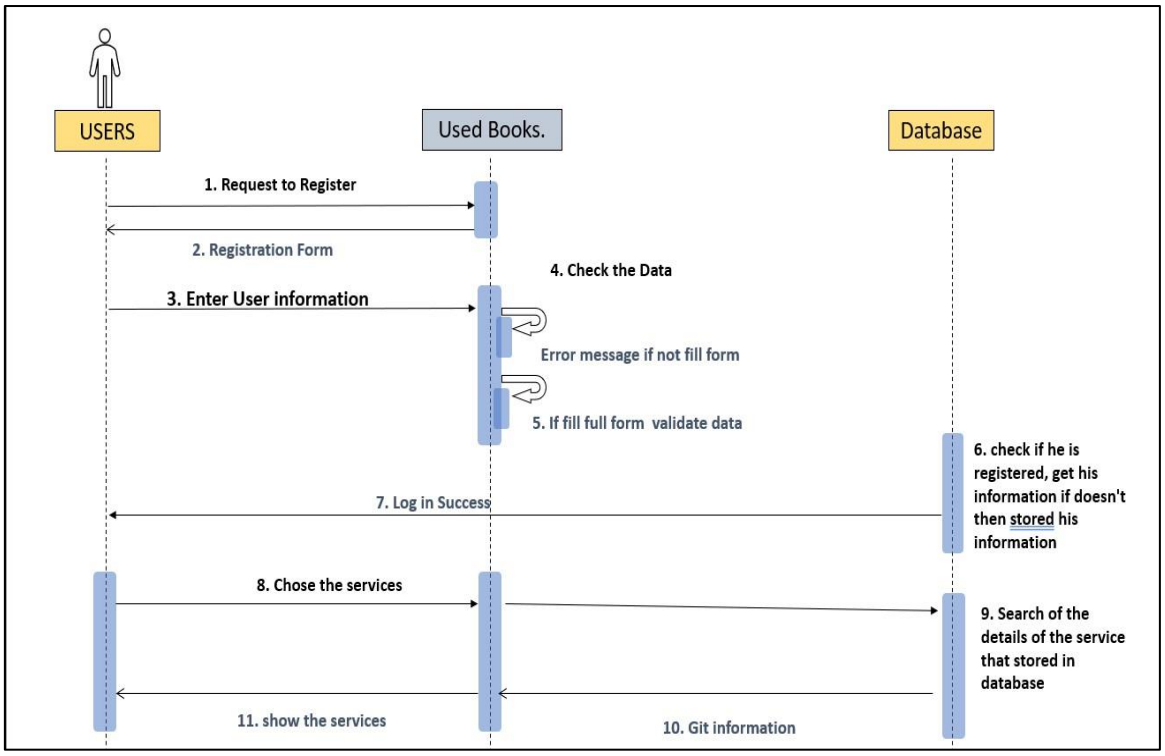


Figure 25: sequence diagram

9. Design Evaluation

Table 3, illustrates the strengths and weaknesses points of the design components.

Design components	Strengths	Weaknesses
ASP.NET Web Forms	- Rapid development. - Simple to understand and use.	- less control over the page's lifecycle and its code.
Used Book's database	- Spend less time on data management. - Enhance access methods, information security, and consistency.	- High hardware costs are necessary. - Take up a sizable storage area.
Used Book's website	- The use of graphics and icons makes the objective simple to understand. - Simple for beginners to utilize. - Well-designed to reflect the system's functioning.	- Adding fonts and icons from external sources.

Table 3: Strengths and weaknesses

10. Implementation

10.1 Implementation Plan:

In figure 26, illustrates the timeline of the project implementation progress which will take five weeks to complete.

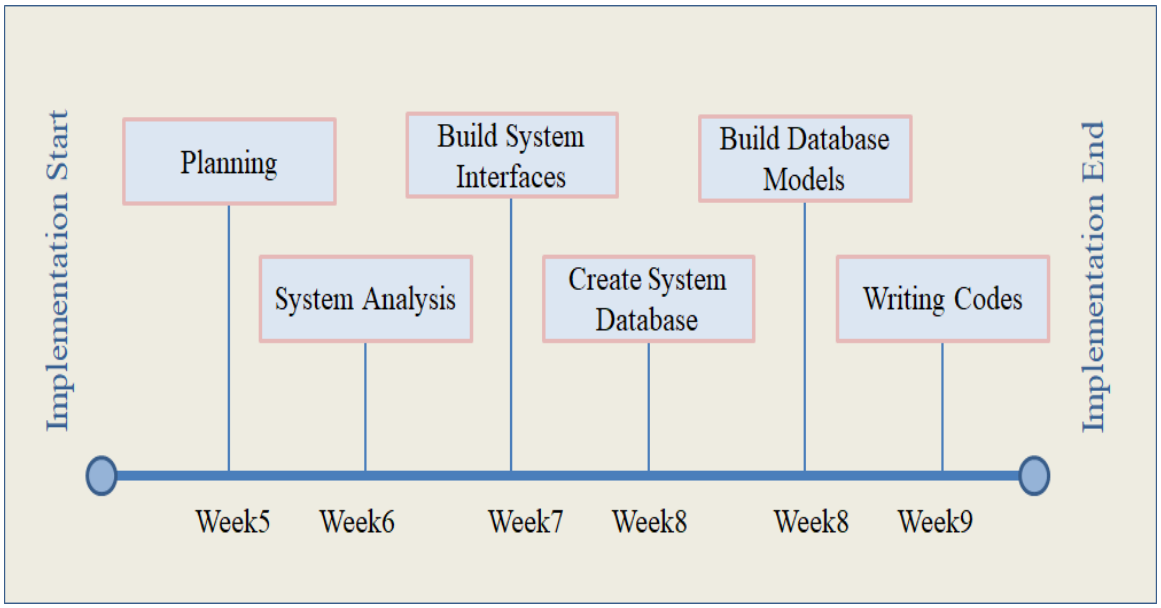


Figure 26: Implementation timeline

10.2 User Analysis:

User analysis was the first thing we conducted when designing the system to make sure of the following:

1- Recognize that a user's needs vary depending on their level of experience.

2- Set the user interface goals and requirements.

Table 4 describe the characteristics of the users of Used Books system.

User Characteristics	UI Requirements
Age	The system targets all students
Gender	Both males and females can access Websites
Little or no experience in computer/IT Use	The system UI should be easy to use.
Education background	May have only minimum education qualification can access the system

Table 4: user interface characteristics

Table 5 describes the characteristics of the admin who will use the system to make modifications.

Admin Characteristics	UI Requirements
Age	Used Book System UI will provide easy access to the system DB
Gender	Both males and females can access the System
Education background	Should have qualifications in computer science or any related major

Table 5: admin interface characteristics

10.3 User interfaces goals and requirements:

- Make sure the website's user interface is appropriate and comfortable at the beginning.
- A website's design must make the info displayed simple for users to understand.
- The information architecture and the visual design should be integrated into the design.
- To make it simple to remember and enable users to do their tasks while adhering to consistency and structure principles, all pages should be designed with a consistent usage of fonts, images, and colors.
- For the purpose to lighten the load on the user, the displayed information shouldn't fill the entire screen but should instead be presented in an appropriate manner.
- Ensure that the design of UI is simple and satisfy the simplicity principles.
- Make sure that the UI is designed in a way that prevents user error as well as helps in user recover from mistaken actions.

10.4 Websites pages:

Master page:

The first step in designing the website pages is to write the master page in Microsoft Visual Studio. It is a non-printing page that you can use as the template for the rest of the pages in your manuscript. It can contain text and graphic items that will appear on all pages. Within the master page, we have written the navigation menu because we want it to appear on all pages, as well as selected a new logo and chosen the appropriate bootstrap design as you can see in figure 27.

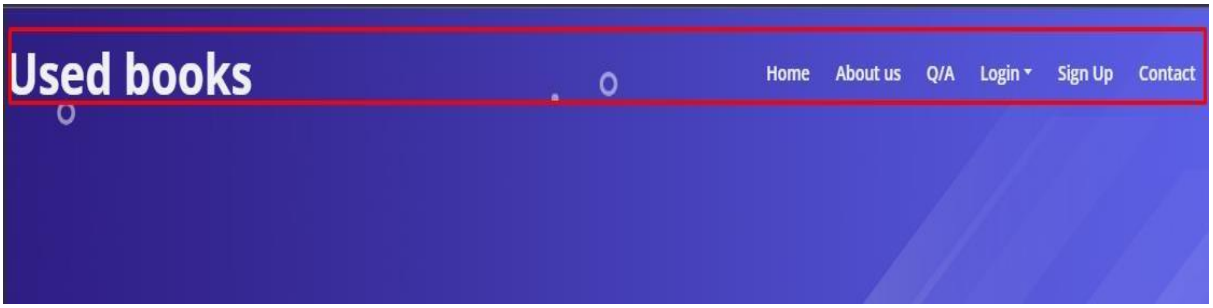


Figure 27: Navigation menu view

The footer is also designed in the master page and appears at the bottom of each page of the website, containing the copyright and an arrow directing us to the top of the page when we click on it, as shown in figure 28 below.

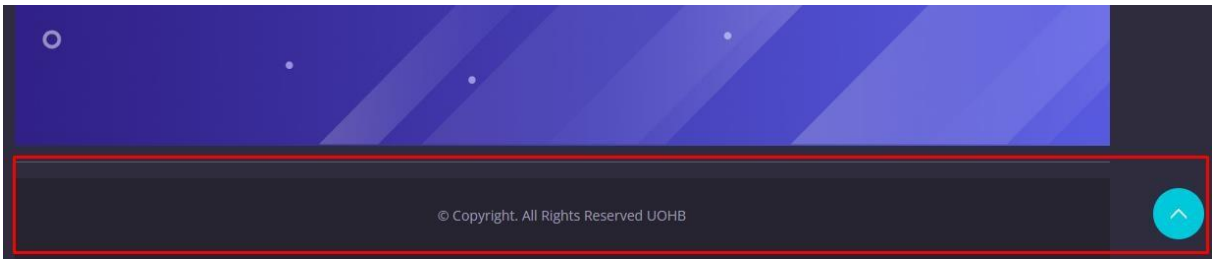


Figure 28: The footer view

Home page interface:

The home page is the main page of the website that appears to anyone who visits it. It contains several sections, starting with the "about us" section that gives the new visitors a brief description of us and what the website has been designed for, which is shown in figure 29 below.

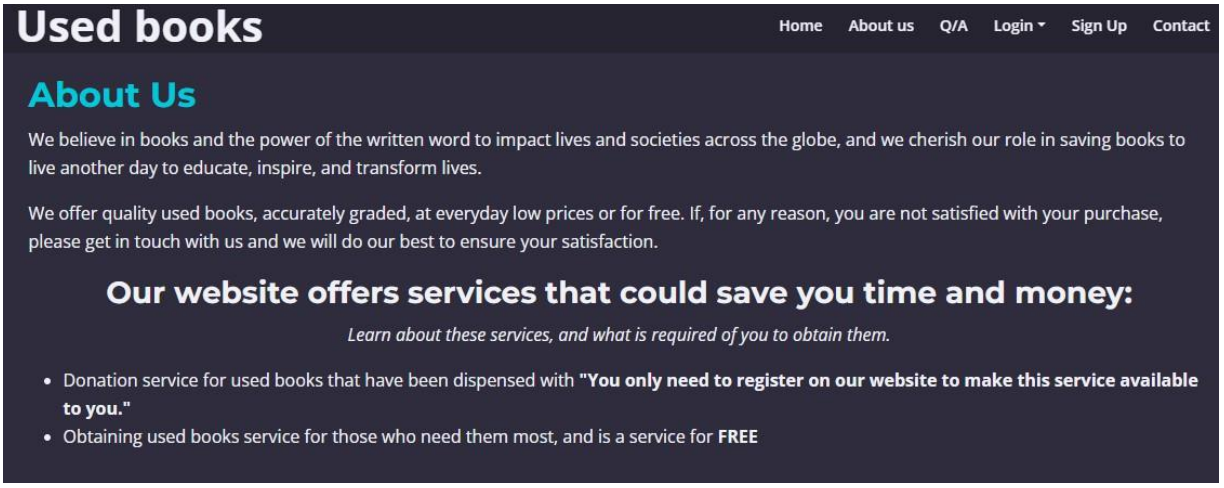


Figure 29: About Us section

The home page also contains some advice for the users, as shown in figure 30 below.

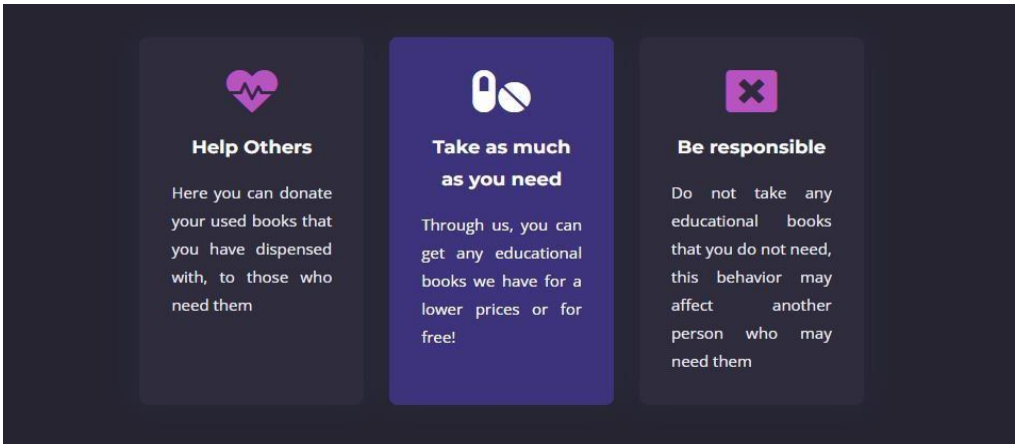


Figure 30: home page advice

After that, there is a slide that contains samples of the books our website has, as shown in figure 31 below.

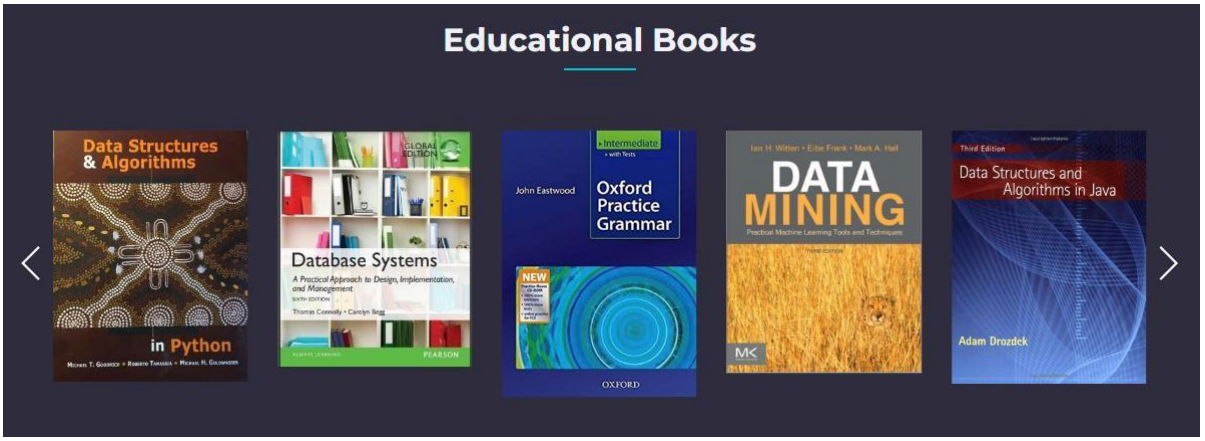


Figure 31: books slide

The Services section, which is shown in figure 32 below, contains the services that we offer. The name of the service is a link button that leads to the page for this service, and the pages can be accessed only when the user logs in to the website successfully.

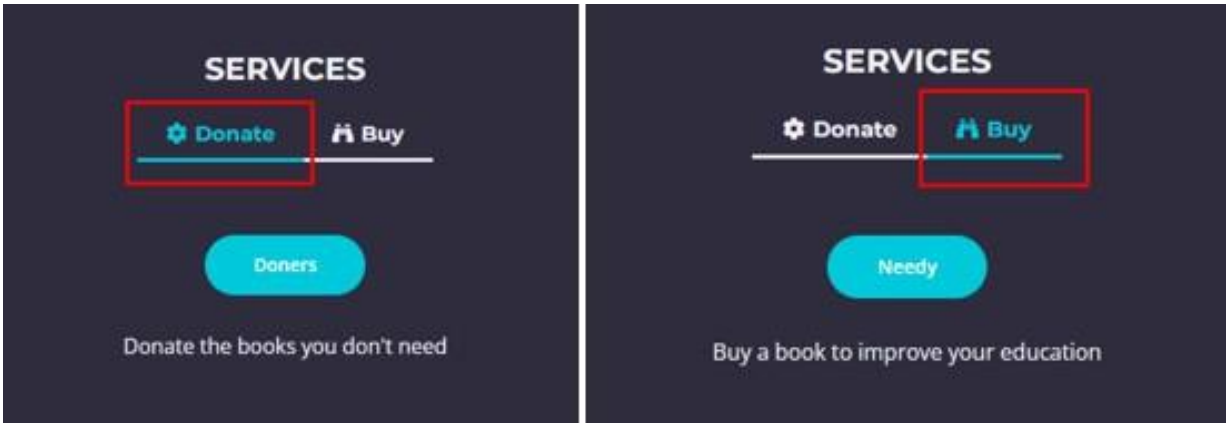


Figure 32: The Services section

Also, the members of our team are shown on the homepage. As shown in figure 33 below.

Figure 33: Team member section

The last section on the home page is the frequently asked questions for the user and their answers. As shown in figure 34.

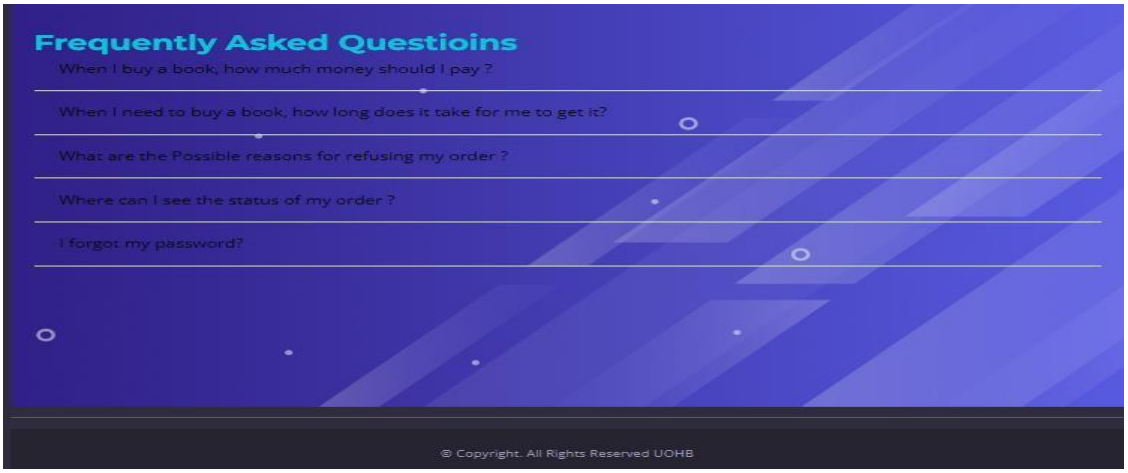


Figure 34: Frequently asked questions section

Log In and Sign-Up interface:

As you can see in figure 35 you cannot access our services if you visit our website without logging in; you can only see our home page, login page, sign-up page and contact us page .

Figure 35: Log In and Sign-Up page

Forgot and Reset Password interface:

Forgetting the password is one of the most frequent issues on any website. To make things easier for the user, we had to construct a new page named "Forget Password ", and through the user's email, they will receive a link to change the password as shown in figure 36.

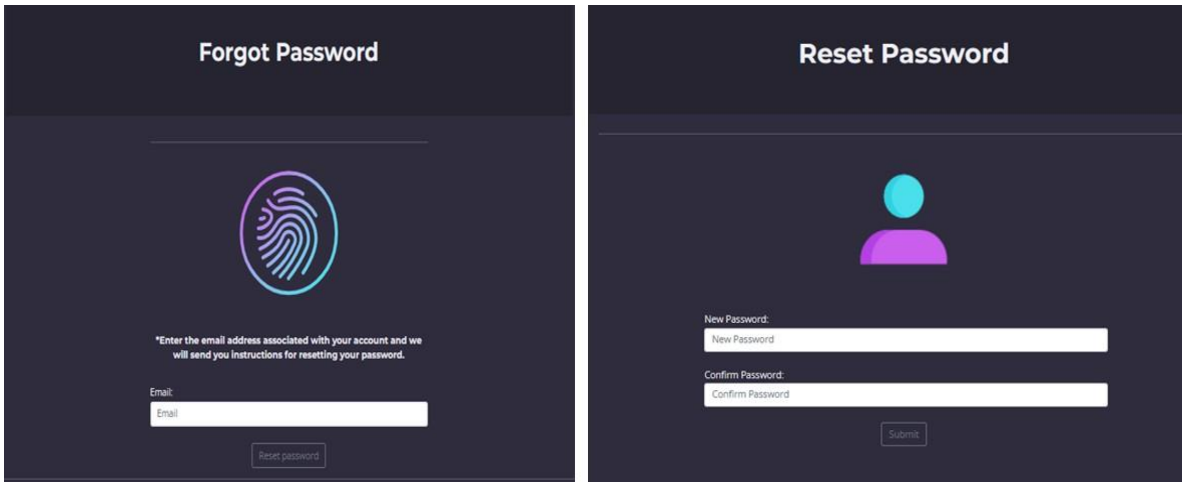


Figure 36: Forgot and Reset Password page

Contact us interface:

The user can communicate with us through the contact us page by writing his email and the subject and a message, and his message will reach the email of the site as shown in figure 37.

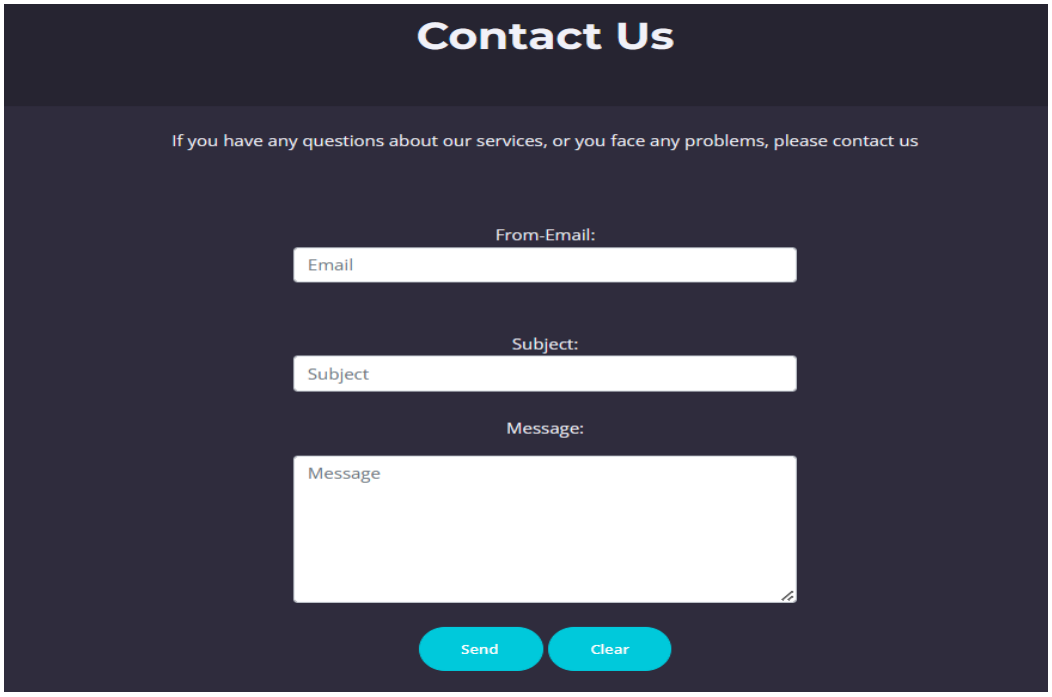


Figure 37: contact us page

Donate page interface:

On the donation page, you can upload the book picture and then fill in the name of the book and author, book information, book defects, and price, as shown in figure 38.

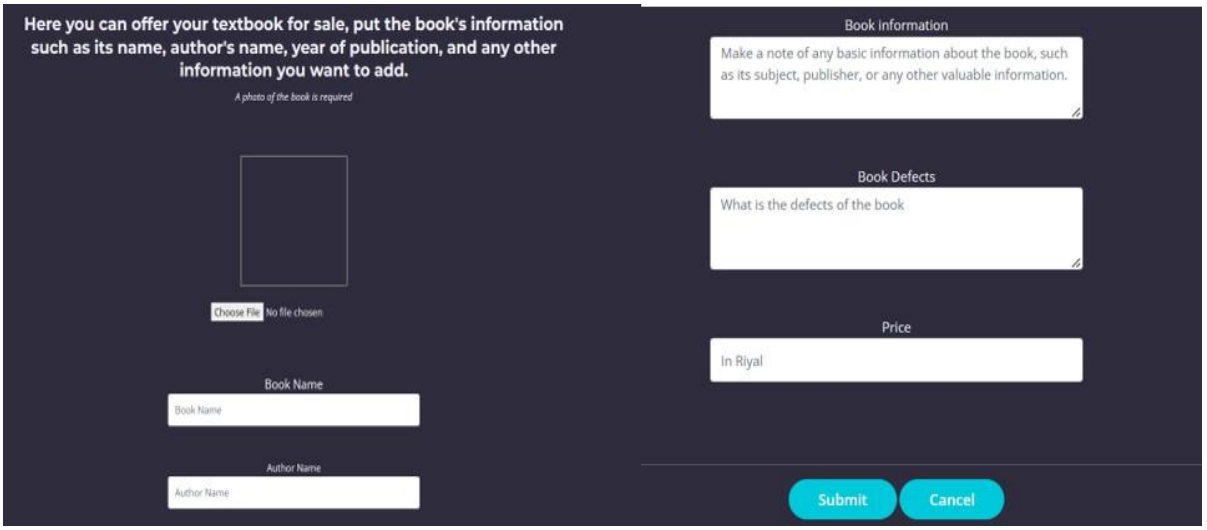


Figure 38: Donate Page

Needy page interface:

As shown in figure 39 on Needy page you can see the available books that you can buy with all the information about them.

Figure 39: Needy page

New order interface:

The new order page is designed for the seller. When a new order for a book you have uploaded to the system gets booked from another user, you can check the details of the buyer, including his contact information. As a seller, you have the option to reject or accept any order from the buttons on the right, as shown in figure 40 below.

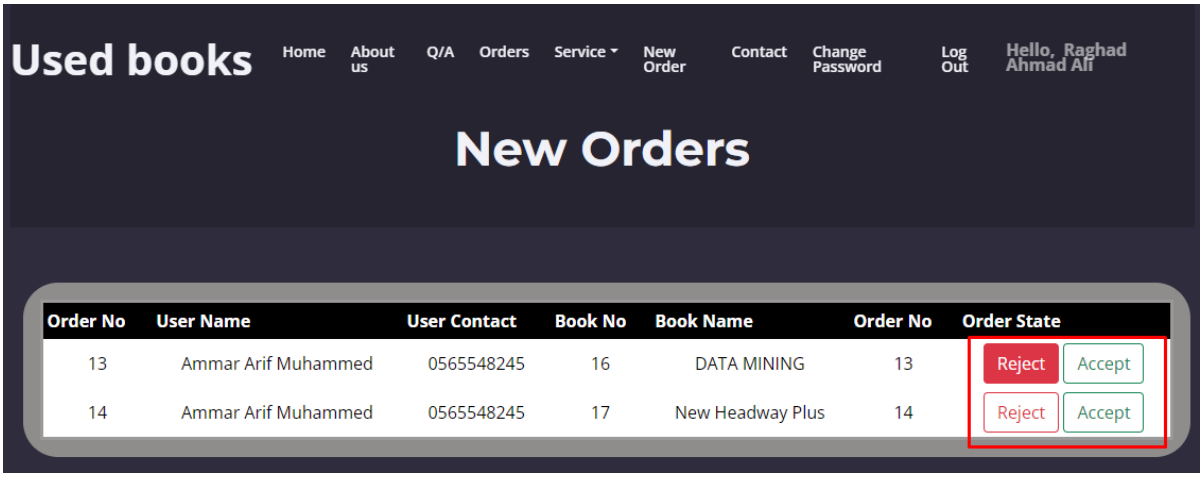
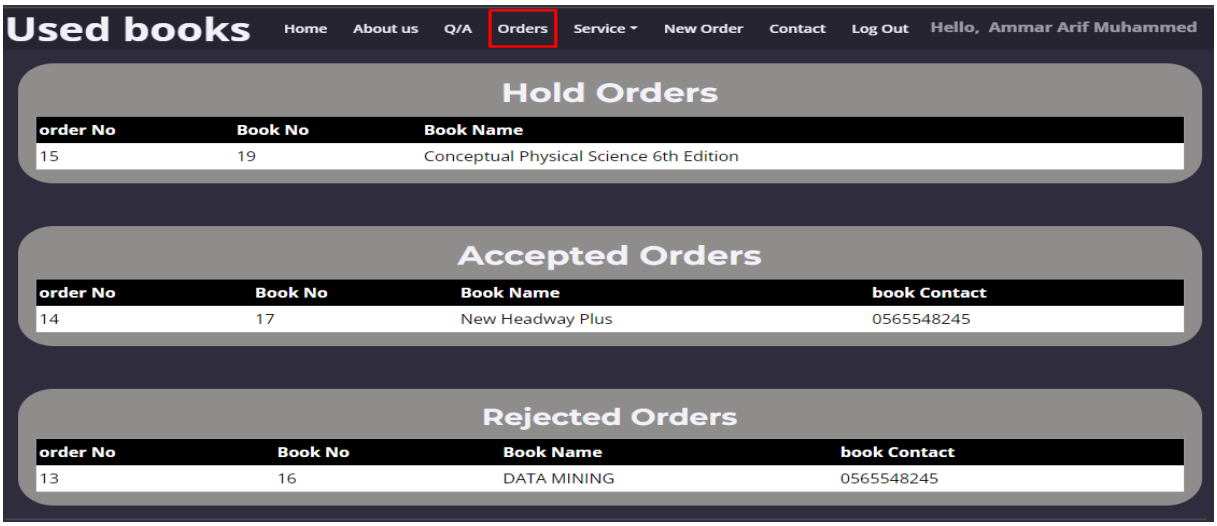


Figure 40: New order interface

Orders interface:

The order page is designed for the buyer. It contains three tables, as shown in figure 41 below. First table for the orders that are still on hold when the seller has not yet accepted or rejected the order. The second table is for the accepted orders, and the last table is for the rejected ones

Figure 41: orders page interface



User Management interface:

As you can see in figure 42, on the user management page, the admin can see all the information about the users. Also, he can edit or delete the user.

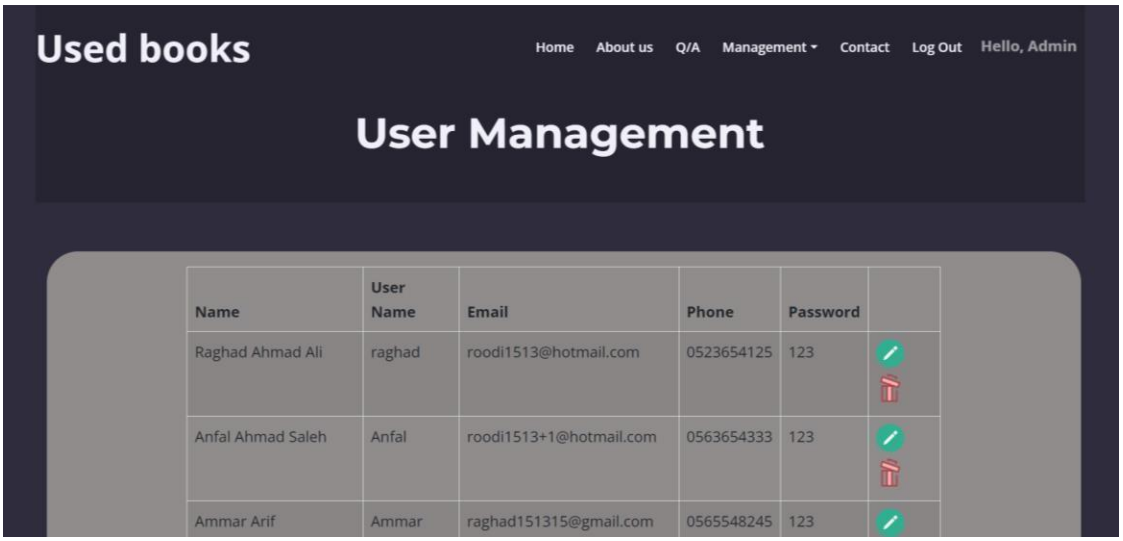


Figure 42: User Management page

Book Management interface:

On the book management page, the admin can update, clear, or delete the book data, and you can also show all books in the database and export them as a Word or Excel file, as seen in figure 43.

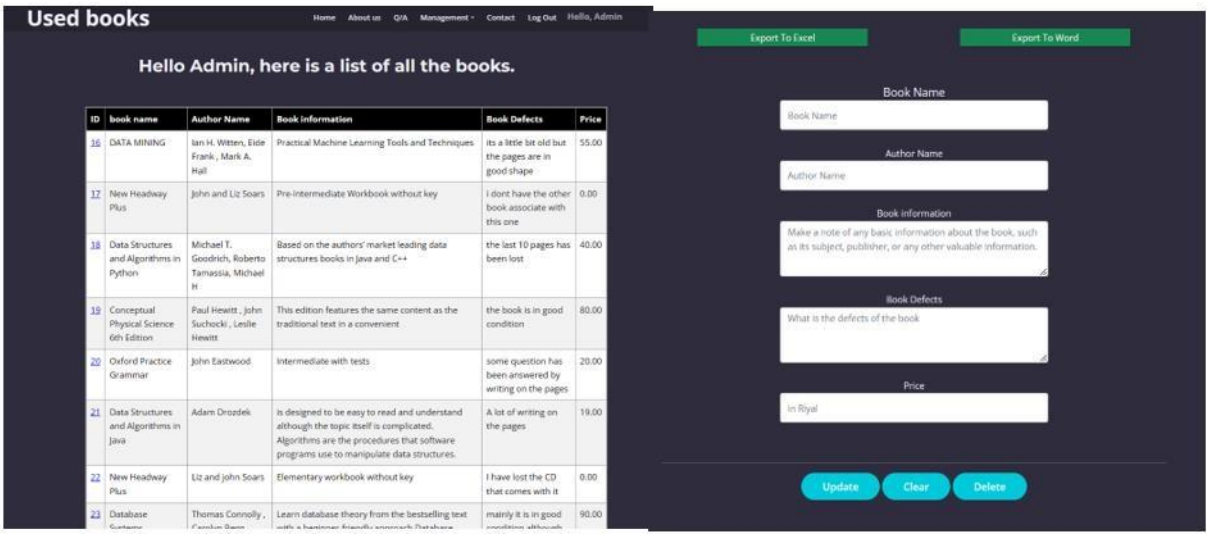


Figure 43: Book Management page

Orders Management interface:

As you can see in figure 44, on the orders management page, a grid view of all orders will appear containing the information (order ID, user ID, Book ID, Sentiment), and the file can be exported as Word or Excel.

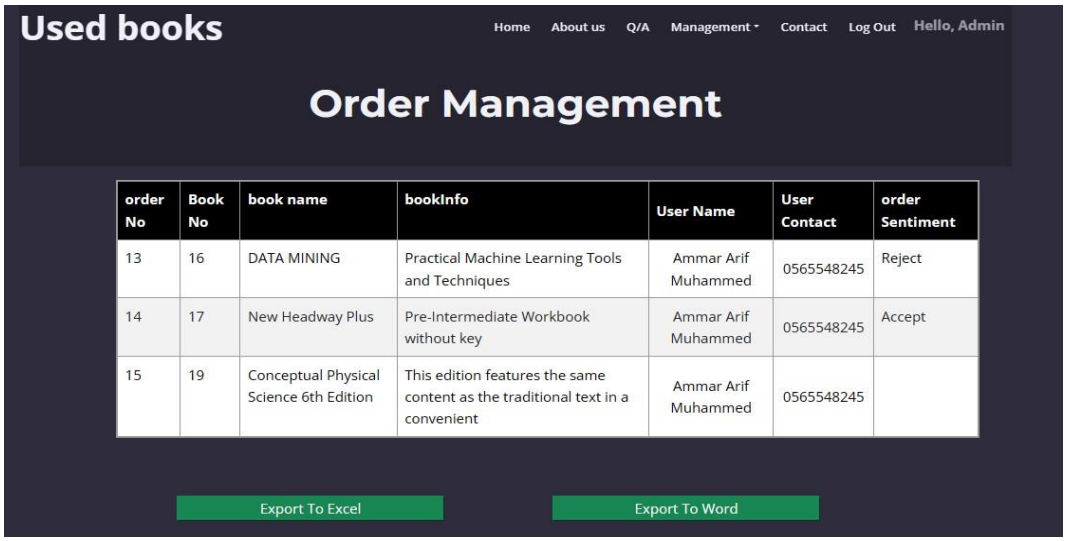


Figure 44: Order management page

User profile page interface:

The user can make some changes to his profile, like updating his information, for example, his full name or the user's university, as shown in figure 45.

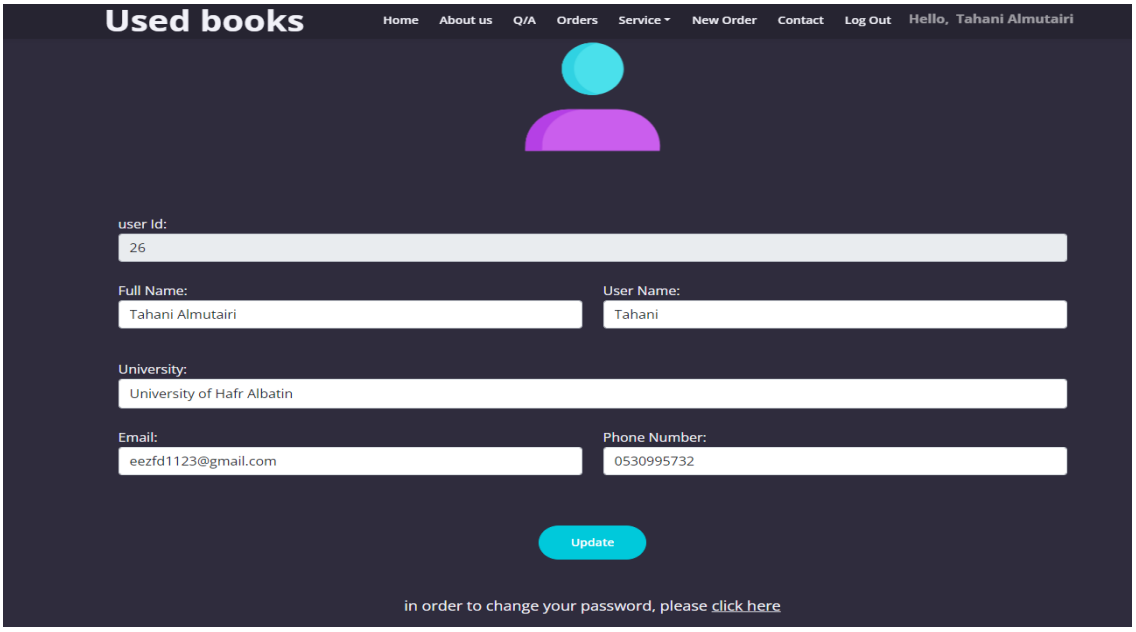


Figure 45: User profile page

If the user wants to change his password, he has to click on (**click here**) in the profile page to redirect him to the change password page, as you can see in figure 46 below.

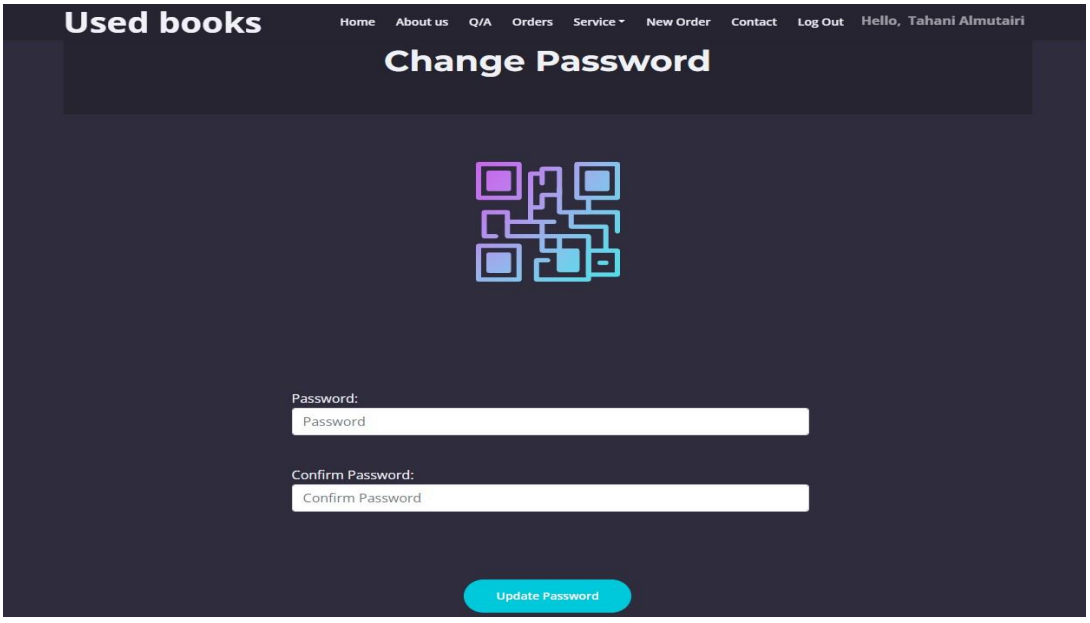


Figure 46: Change password page

10.5 Database implementation:

Database Requirements

The database requirements illustrated in ER diagram for used book as shown in figure 47 below.

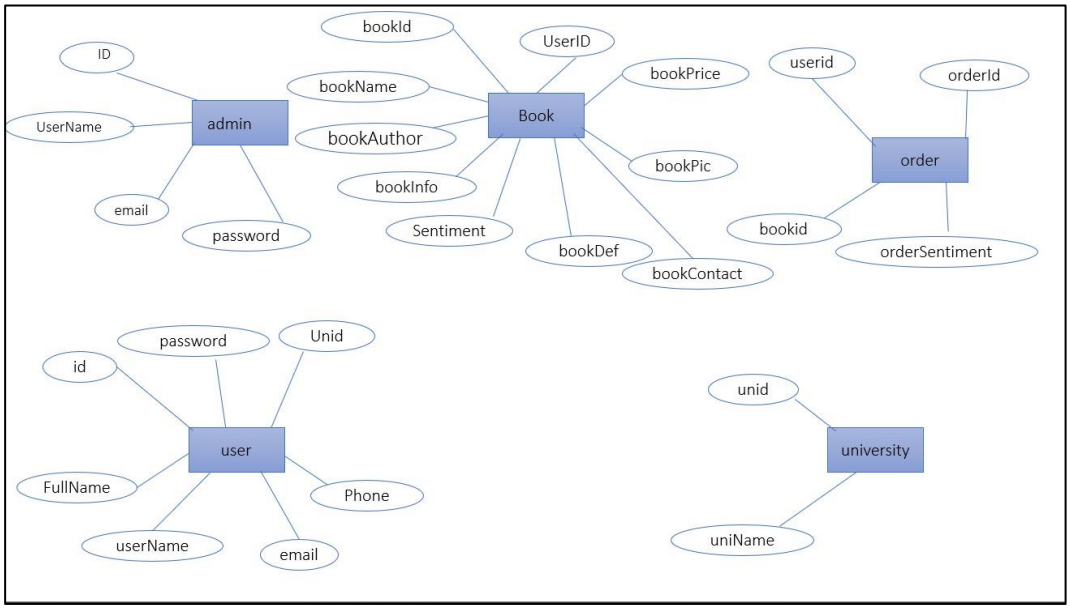


Figure 47: ER diagram used book.

Entities

The database's entities and accompanying characteristics were identified using the requirements and definition of the problem statement.

Admin:

The system's administrator has access to all the data and has the ability to edit, delete, and update it. The primary key for the admin table is adminID. Other attributes are adminUserName, adminEmail, and adminPassword.

User:

Users who use the Site and have the ability to register their data. The primary key for the user table is userId. Other attributes are User's full name, username, user's email, user's password, user's phone, and uniId.

Books:

The book table stores the information of the books that have been made available on the website. The primary key for the book table is bookID, and other attributes are userId, bookName, bookAuthor, bookInfo, bookDef, bookContact, bookPrice, bookSentiment, bookPic.

Order:

The order table contains the user's order data. The primary key for the order table is order id, and other attributes are user id, book id, and orderSentiment.

university:

It is a lookup table that contains the names of universities. The primary key for the university table is uniId. The other attribute is uniName.

Relationship:

The first relationship between user AND university. The type of the relation is many to many.

The second relationship between user AND order. The type of the relation is one to many.

The third relationship between user AND Book. The type of the relation is one to many.

The fourth relationship between order AND Book. The type of the relation is many to one.

Data Dictionary:

A data dictionary contains metadata i.e., data about the database. The data dictionary is very important as it contains information such as what is in the database, who is allowed to access it, where is the database physically stored etc. The users of the database normally don't interact with the data dictionary, it is only handled by the database administrators. (Meador, 2020).

Database Tables:

Entity: Admin		
Field Name	**Data Type**	**Constraint**
adminId	int	primary key
adminUserName	Nvarchar(50)	
adminEmail	Nvarchar(50)	
adminPassword	Nvarchar(50)	

Table 6: Admin table

Entity: User:		
Field Name	**Data Type**	**Constraint**
userId	int	primary key
userFullName	Nvarchar(50)	
username	Nvarchar(50)	
userEmail	Nvarchar(50)	
userPassword	Nvarchar(50)	
userPhone	int	
uniId	int	foreign key

Table 7: User table

Field Name	**Data Type**	**Constraint**
uniId	int	primary key
uniName	Nvarchar(50)	

Table 8: University table

Entity: Order		
Field Name	Data Type	Constraint
orderId	int	primary key
userId	int	Foreign Key
bookId	int	Foreign Key
orderSentiment	Nvarchar(50)	

Table 9: Order table

Entity: Book		
Field Name	**Data Type**	**Constraint**
bookId	int	primary key
bookName	Nvarchar(50)	
bookAuthor	Nvarchar(50)	
bookInfo	Nvarchar(MAX)	
bookSentiment	Bit	
bookDef	Nvarchar(MAX)	
bookContact	Nvarchar(50)	
bookPrice	money	
bookPic	image	
userId	int	Foreign Key

Table 10: book table

11. Testing

11.1 Testing progress

The timeline for the project's testing progress, which begins on May 7 and ends on May 20, is shown in Figure 48 below.

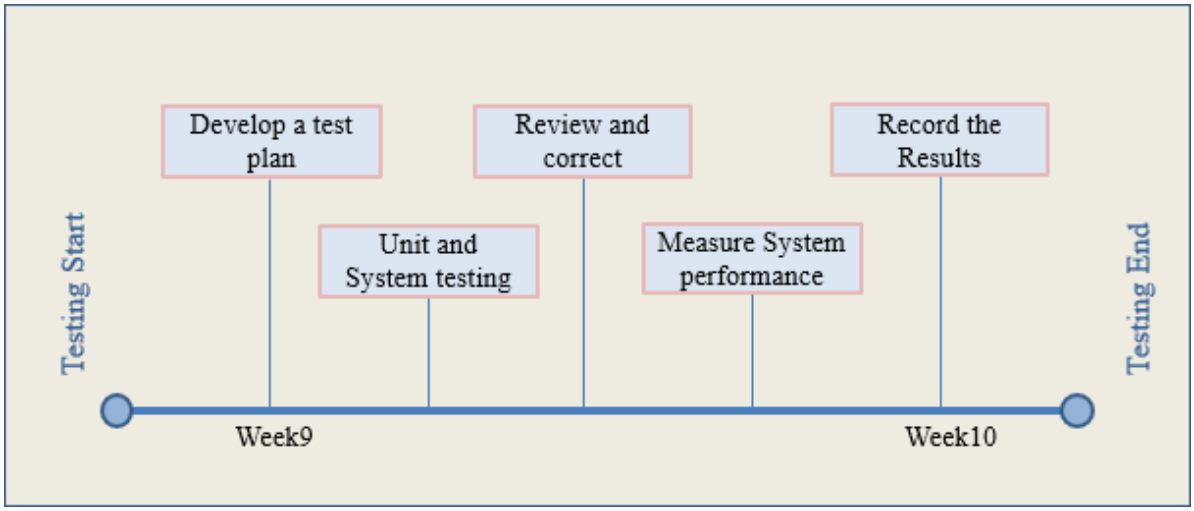


Figure 48: Testing progress

11.2 Testing plan

Table 11, displays the testing plan of the Used Books system.

Task No.	Task name	Author	Prerequisite	Test Description	Result
1	Create new account	All users	Non	To test, make a new user account for the new user	Pass
2	Log in to the website	All users	Have an exist account	To test the admin and user authentication	Pass
3	Donate\selling a book	All users	Logged in as user	To test, the user can upload books as a donor or	Pass

				seller	
4	Buy a book	All users	Logged in as user	To test, users can see the books that the donors or sellers have uploaded	Pass
5	Accept\reject an order	A user is selling a book	Logged in as user	To test the functionality of accepting and rejecting orders	Pass
6	Contact us service	Guest	Non	To test email sending functionality	Pass
7	Changing password	User	Logging in as a user	To test, Changing password for users	Pass
8	Update user profile	User	Logging in as a user	To test, user profile	Pass
9	Users checking their orders	User	Logging in as a user	To test, if the users can check their orders if reject or accept	Pass
10	Admin	Admin	Logging in as	To test, if the	Pass

	modifying information		an admin	admin can manage all of Users, Books and Orders information	

Table 11: Testing plan table

Task No.1: Create new account

Input: Full name, phone number, university, email, username, password, and confirm password, as illustrated in figure 49.

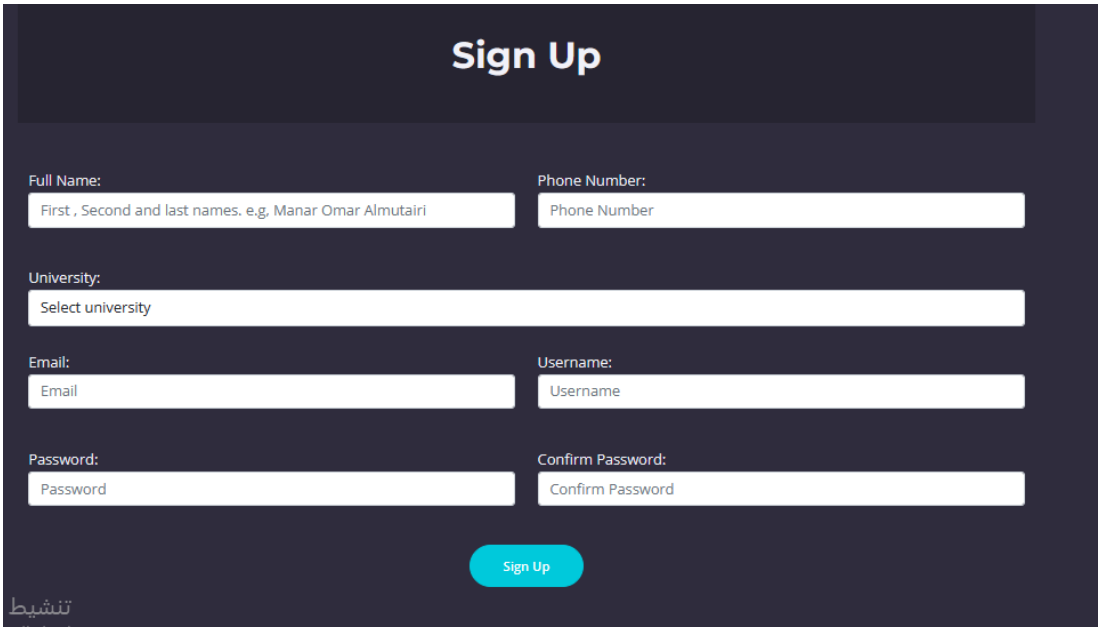


Figure 49: Sign up interface

Output: If the user enters the necessary data, the system will display a success message as shown in figure 50 and redirect the user to the home page.

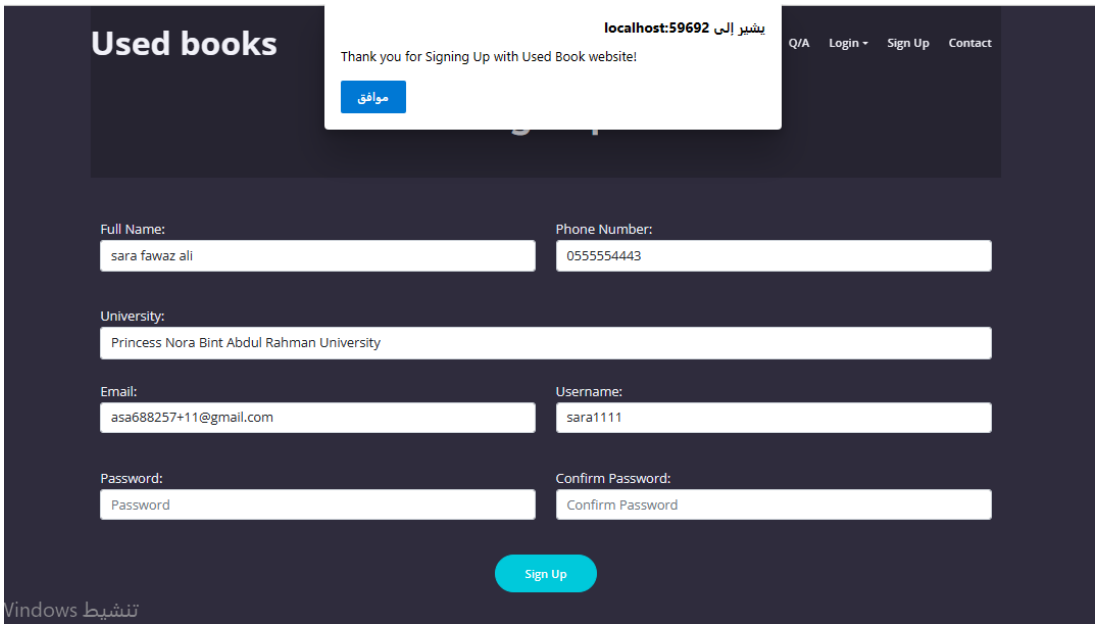


Figure 50: Sign up successful message

If the user fails to supply the necessary data, the system will display a failure notice as seen in figure 51.

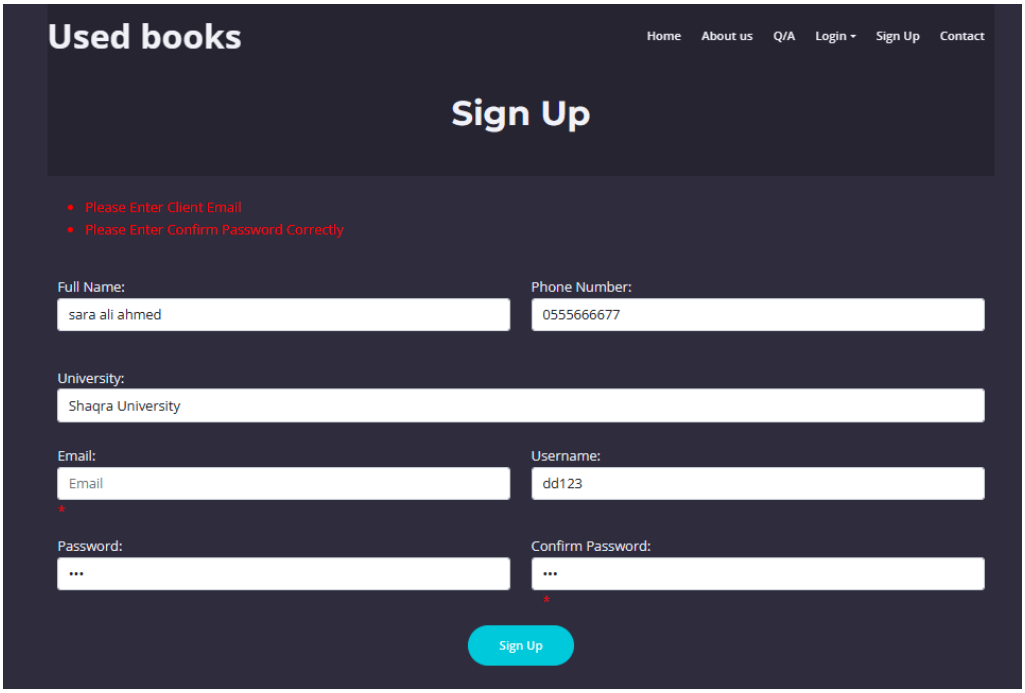


Figure 51: sign up failure message

Task No.2: Log in to the website

Depending on whether you are an administrator or user, you have two options when logging in, as shown in figure 52.

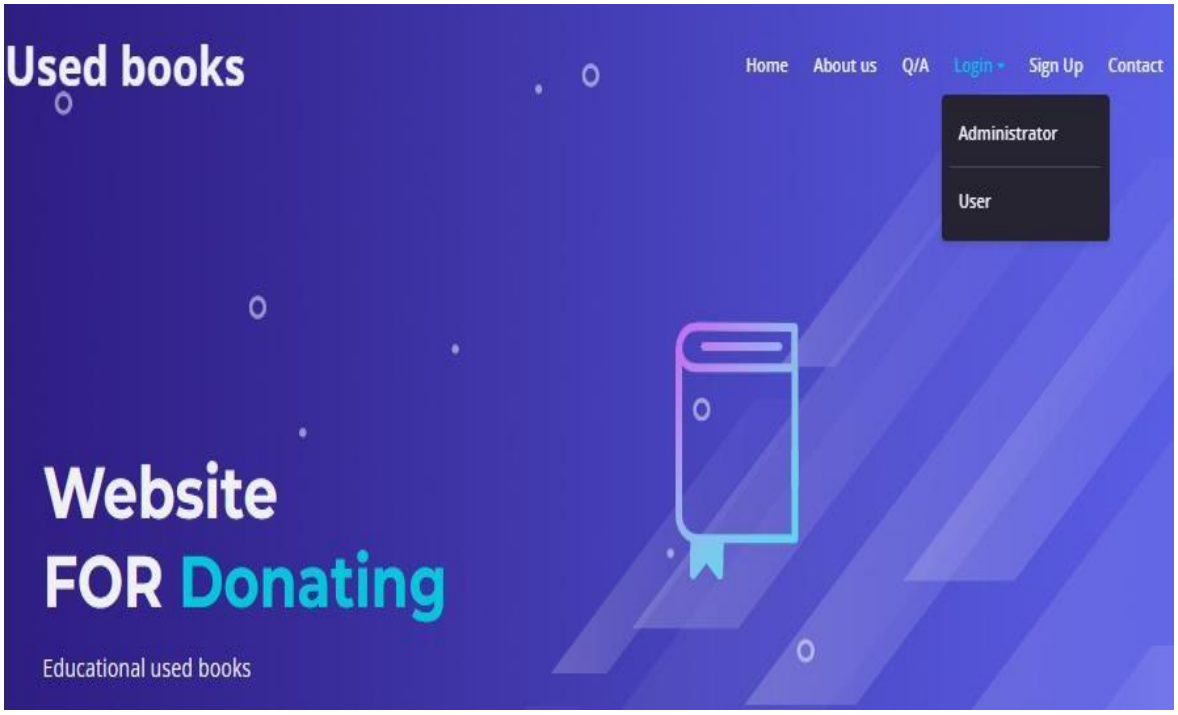


Figure 52: two options when logging in

Input: Email or username, and Password as shown in figure 53.

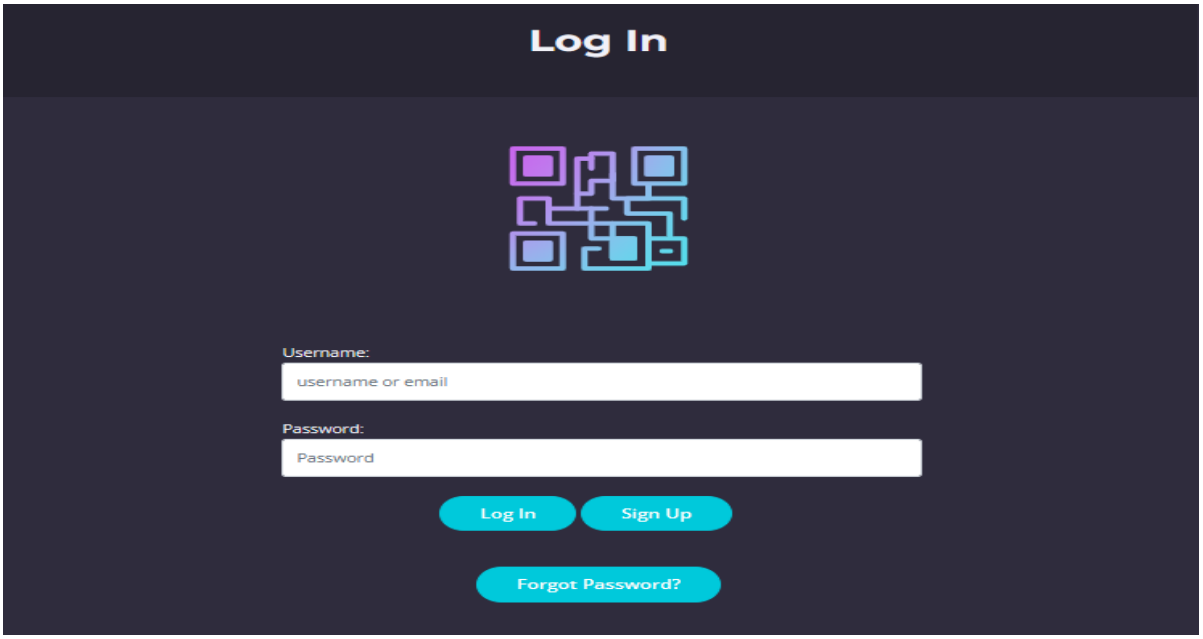


Figure 53: Login interface

Output: If the provided information is correct, the system will display a success message as shown in the figure 54 and redirect the user to the home page.

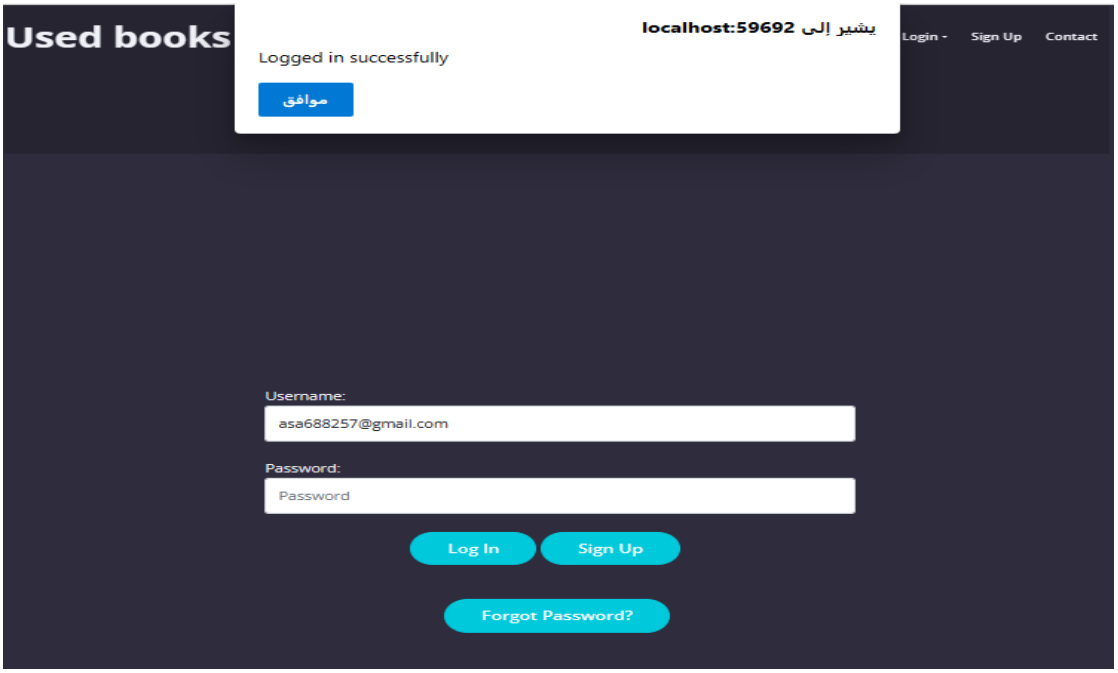


Figure 54: Log in successful message

The system will produce a failure notice as seen in figure 55 if the supplied information is incorrect.

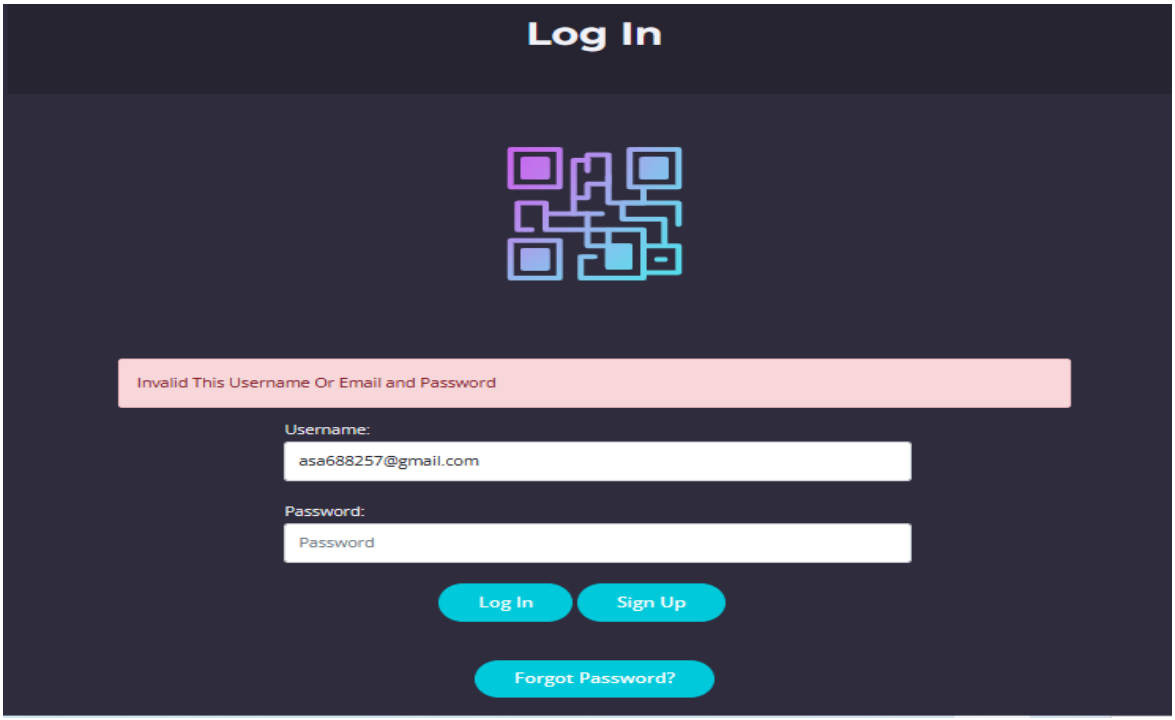


Figure 55: Login error message

Task No.3: Donate\selling a books

To test, user can upload books as a donor or seller.

Input: uploads the picture, Book name, Author name, Book information, Book defects and Price as shown in figure 56.

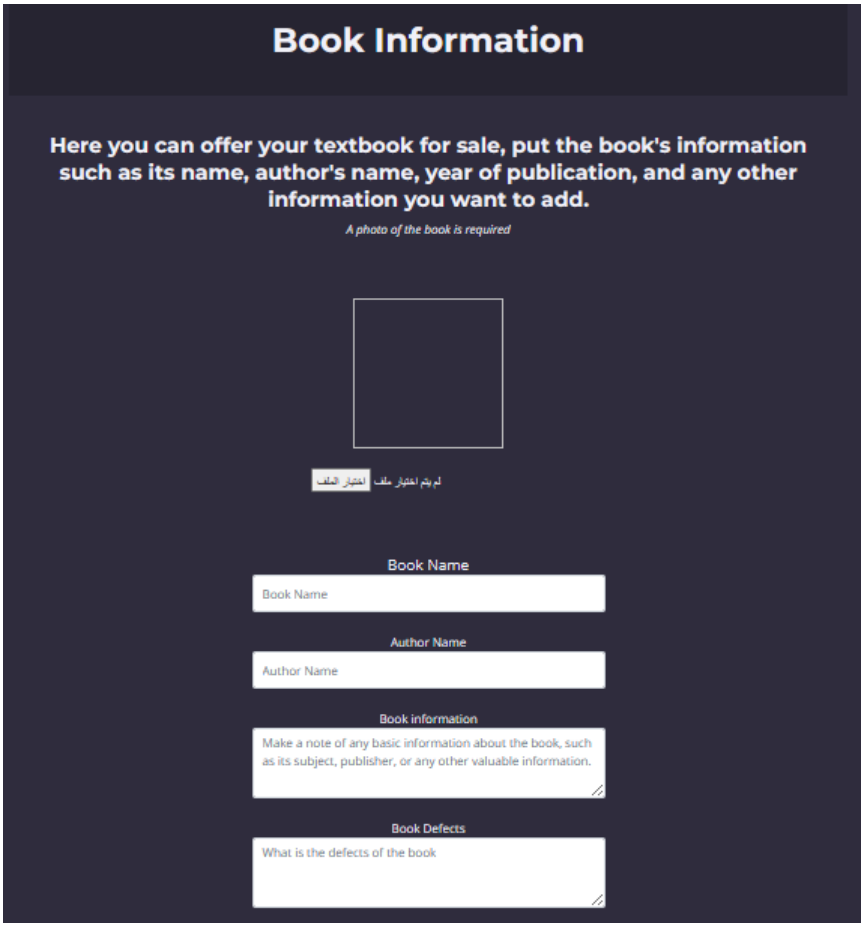


Figure 56: Donate interface

When the donor uploads the picture, the image is verified by machine learning.

Output: End messages/Result

- If the image is of an educational book that is related to computer science and engineering, an educational book is detected, as seen in figure 57.
- If no educational book that is related to computer science and engineering is detected, please upload another image, as seen in figure 58.

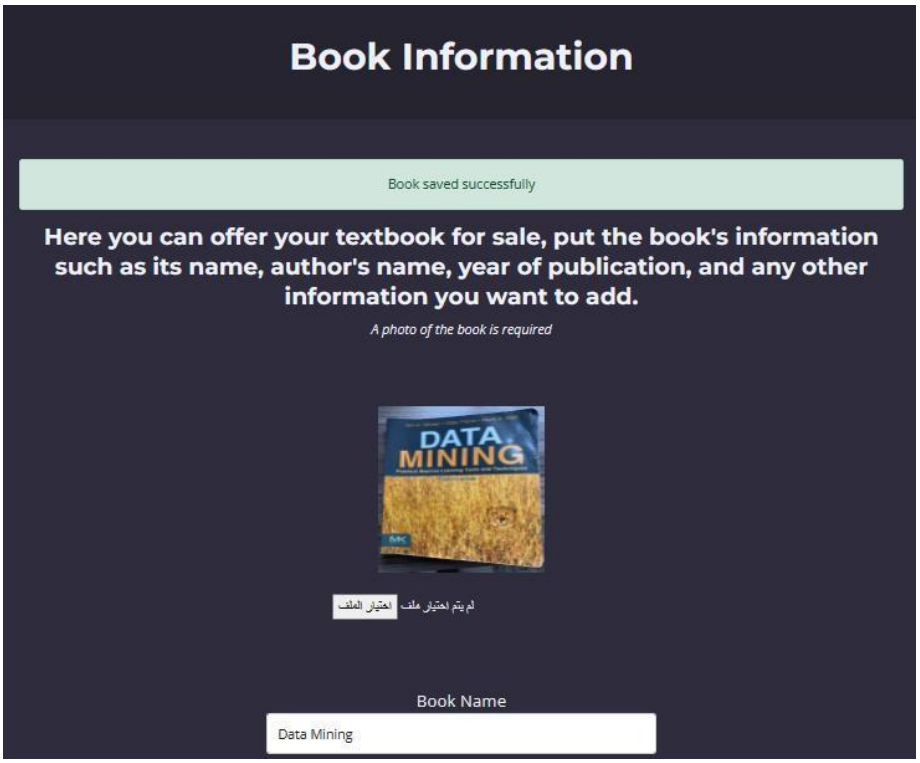


Figure 57: Educational book

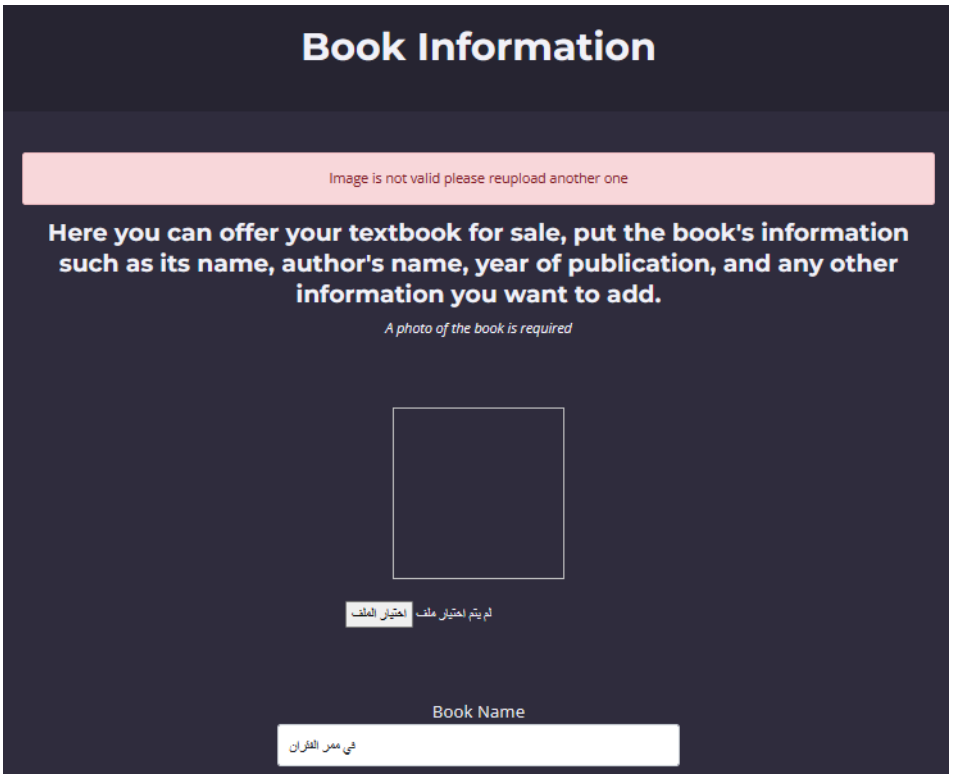


Figure 58: No Educational book

Task No.4: Buy a book

Users can see the books that the donors \ sellers have uploaded. When the user enters the buy page, all books and the information for each book appear to him, as shown in figure 59.

Figure 59: Buy page

Task No.5: Accept\reject an order

Input: Requests will be displayed for the seller, as shown in figure 60.

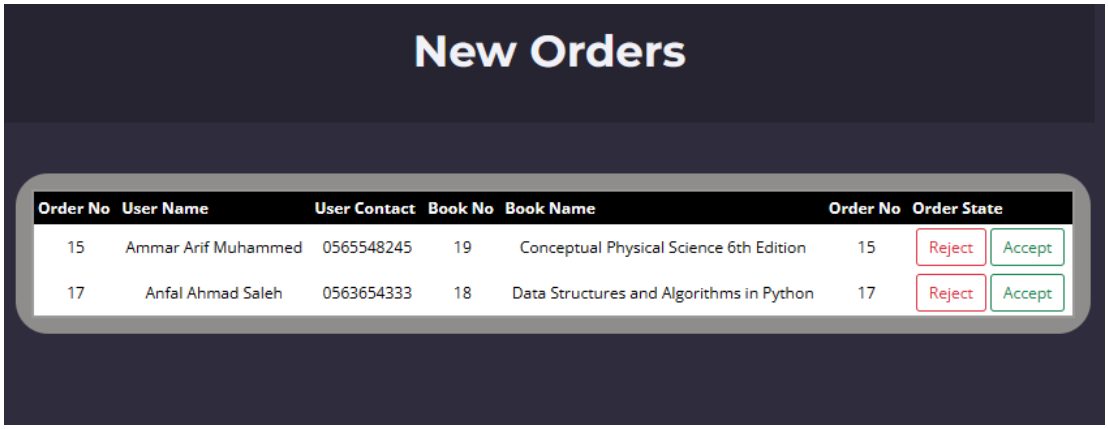


Figure 60: New order page

Output: The system will provide a success message if the seller approves or rejects the request, as seen in figure 61.

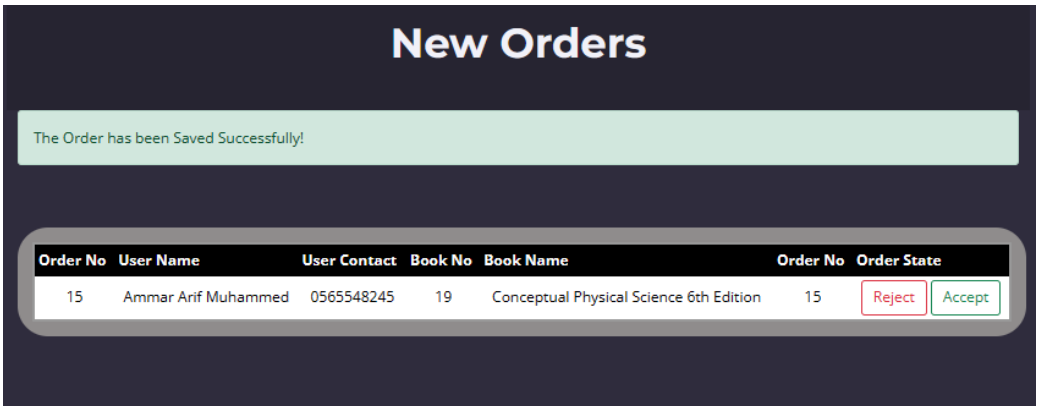


Figure 61: Approve order

Task No.6: Contact us service

Input: Message, Email, and Subject as shown in figure 62.

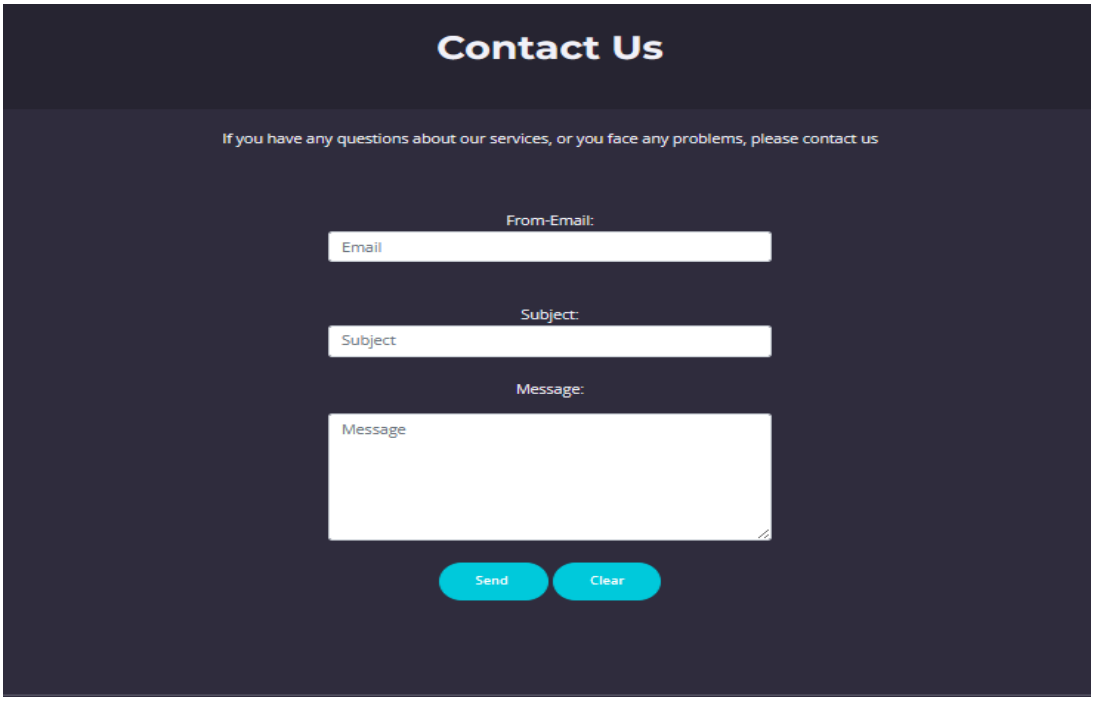


Figure 62: Contact us page

Output: The system will display a success message as seen in figure 63 if the user provides the necessary information.

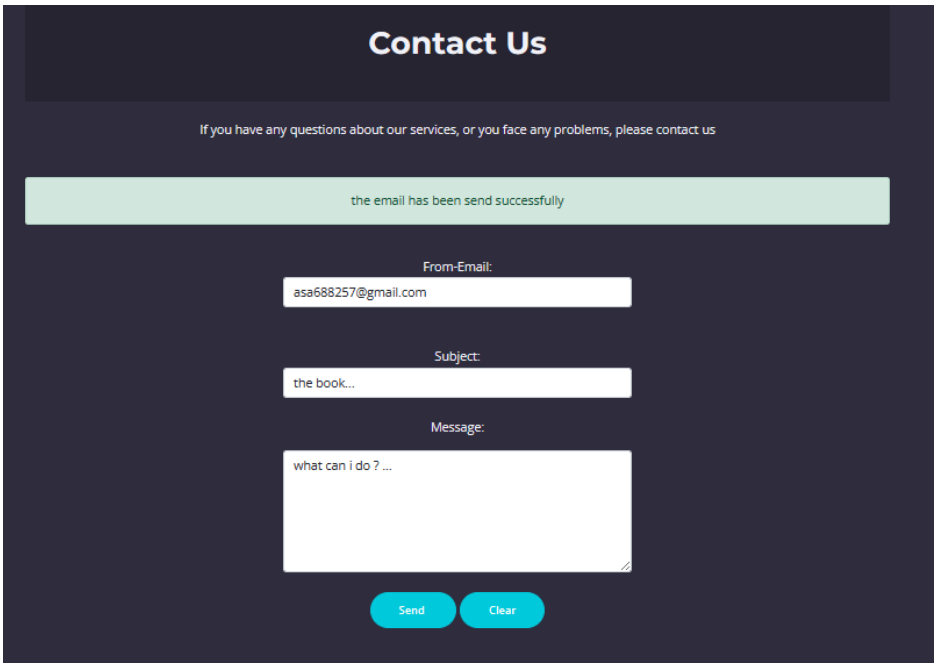


Figure 63: Email successful message

The system will produce a notice, as seen in figure 64, if the user fails to supply the necessary information.

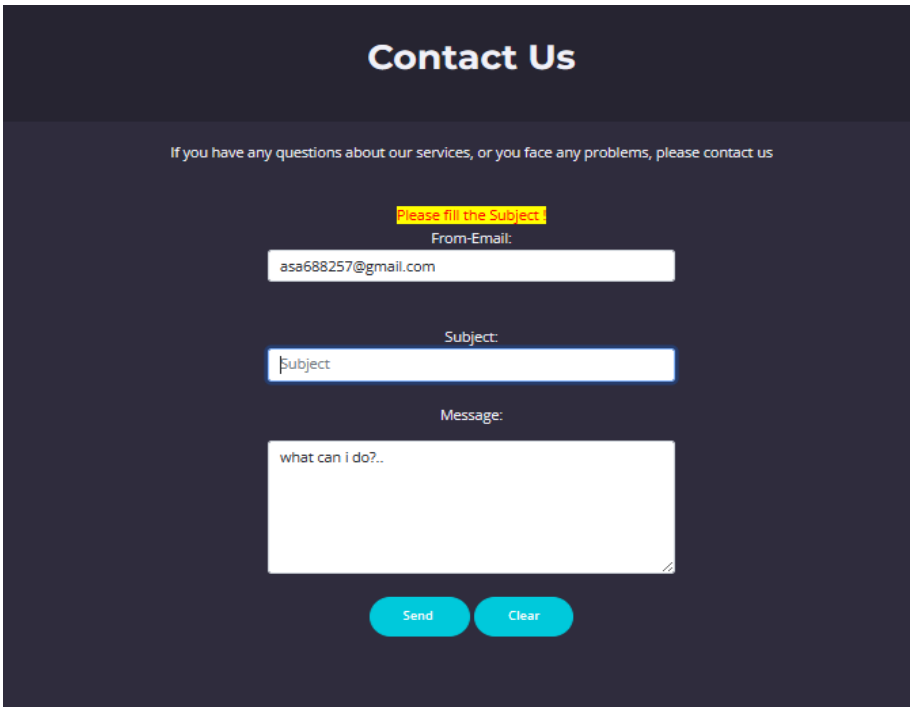


Figure 64: Email error message

Task No.7: Changing password

Inputs: new password and confirm password, as shown in figure 65 below.

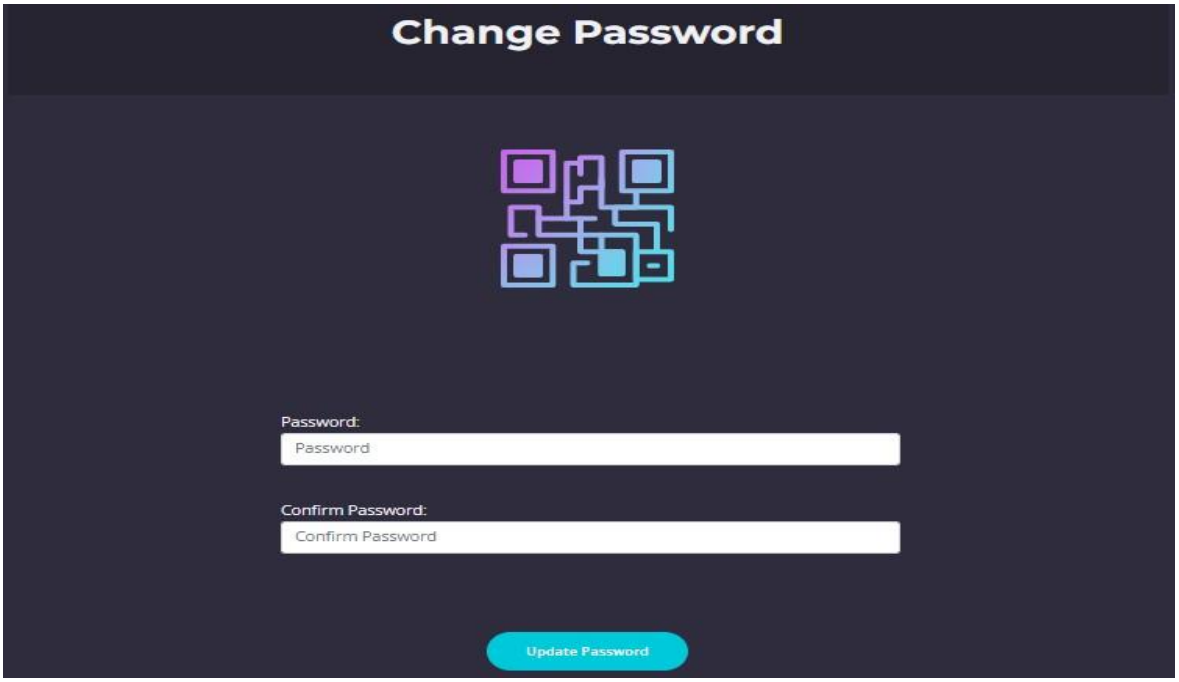


Figure 65: Changing password interface

Output: If the two passwords match, the system will show the success message, which is shown in figure 66, and save the new password for the user.

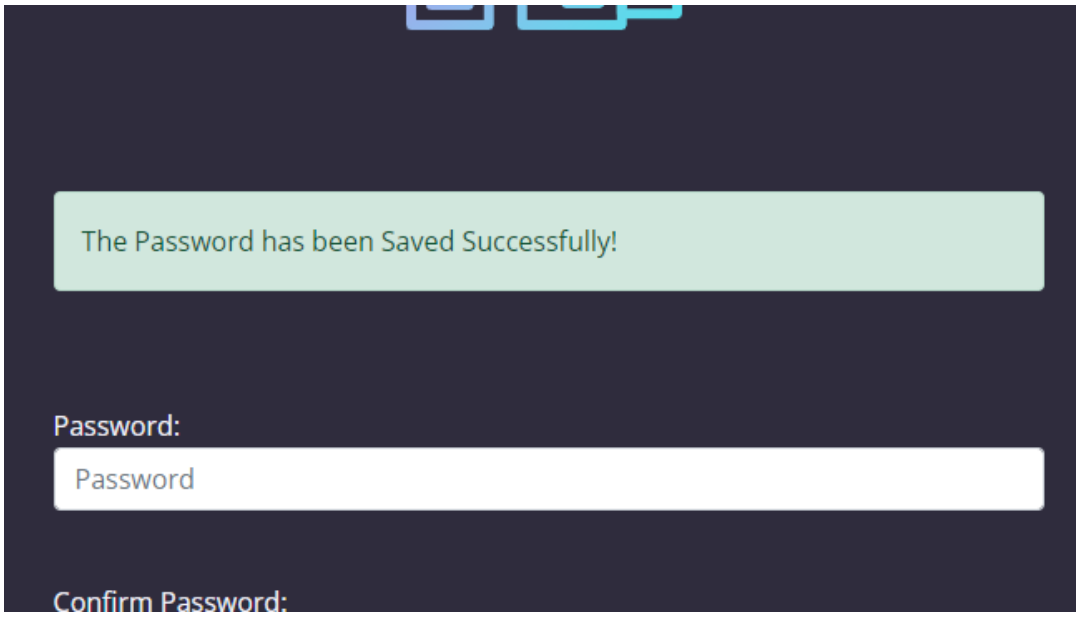


Figure 66: change password success message

If the two passwords do not match, then the system will show the error message, which is shown in figure 67, and no changes in the user data will be made.

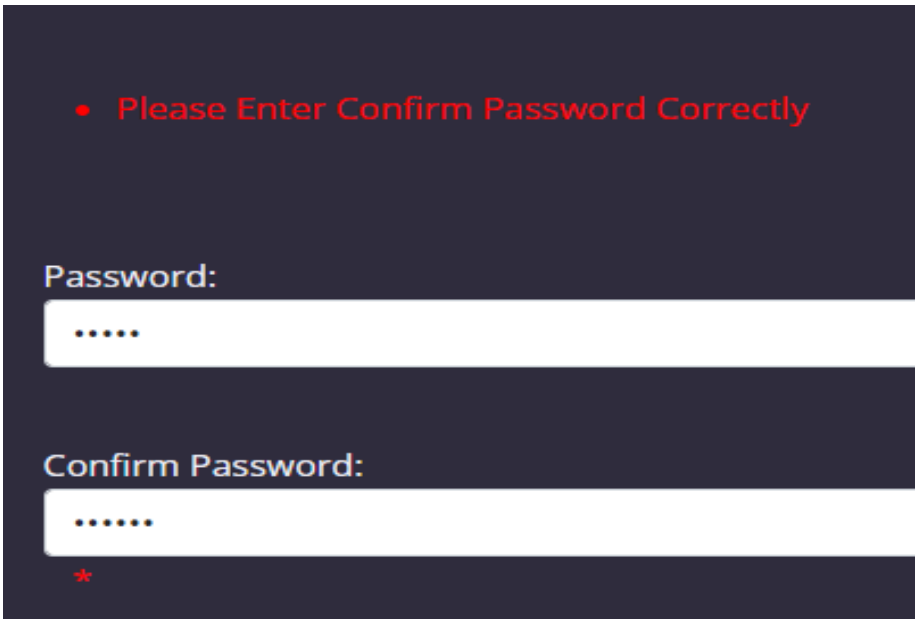


Figure 67: change password error message

Task No.8: Update user profile

By clicking on "hello, user name" on the navigation bar, it will open the user profile page, which is shown in figure 68 below, where he can modify any of his information.

Inputs: the information that the user wants to modify.

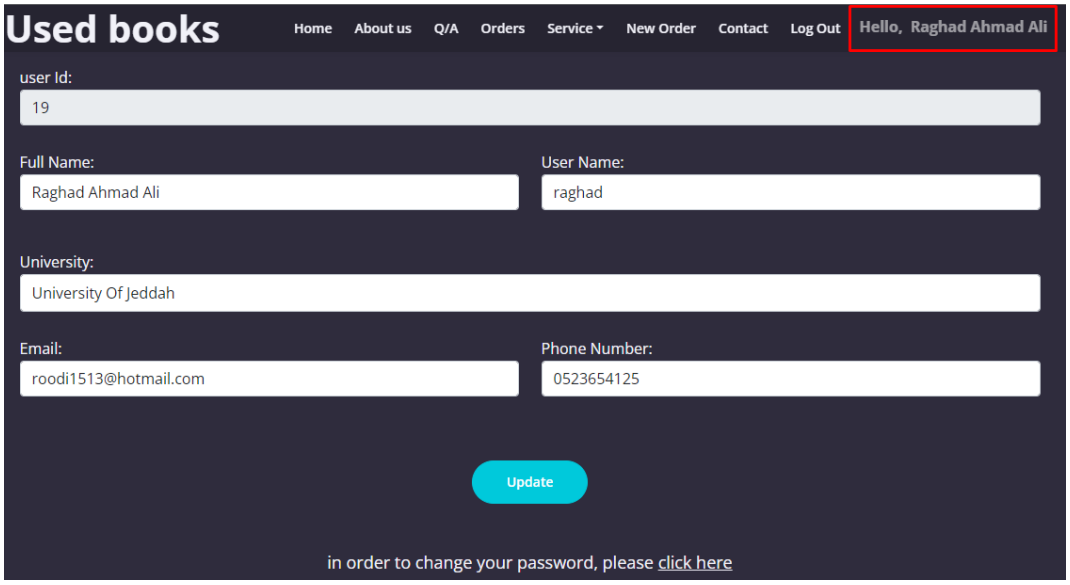


Figure 68: Update user profile interface

Output: If the user entered the information correctly and clicked on the "Update" button, the success message will be shown, as in figure 69 below, and the modified information will be saved.

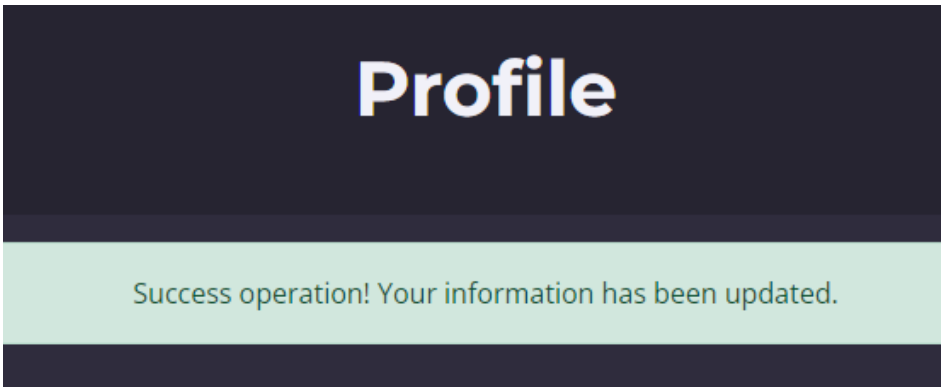


Figure 69: Update user profile success message

If the user clicked on the "Update" button before filling out all of the text boxes, an error message would appear, as shown in figure 70 below, and no information would be modified.

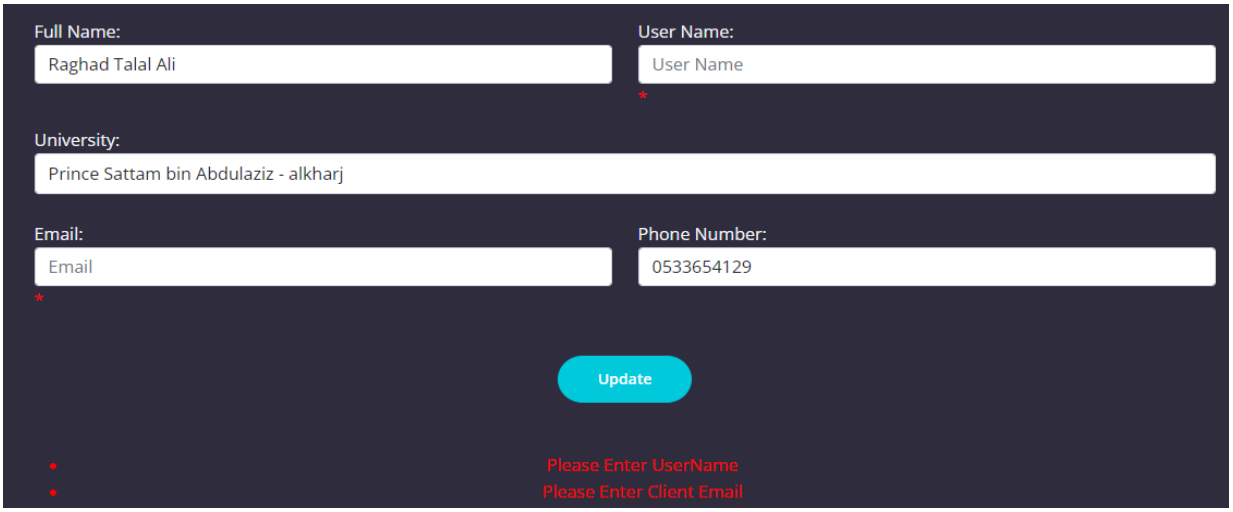


Figure 70: Update user profile error message

Task No.9: Users checking their orders

Inputs: when the user orders a new book from the "Buy" page. By clicking on "Orders" on the navigation bar, it will open a page containing three tables, where he can check if his order is still on hold, rejected, or accepted by the seller. As shown in figure 71 below.

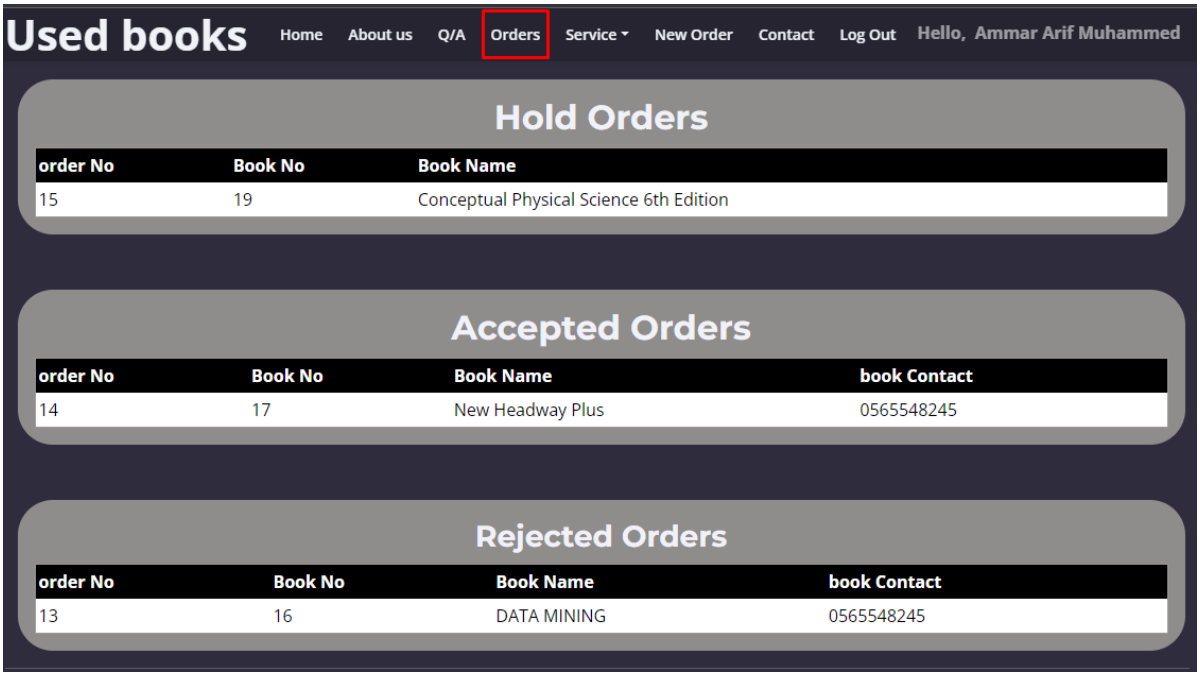


Figure 71: Orders page interface

Task No.10: Admin modifying information

User management:

Inputs: the admin can modify or delete any user data from the user management page, which is shown in figure 72 below.

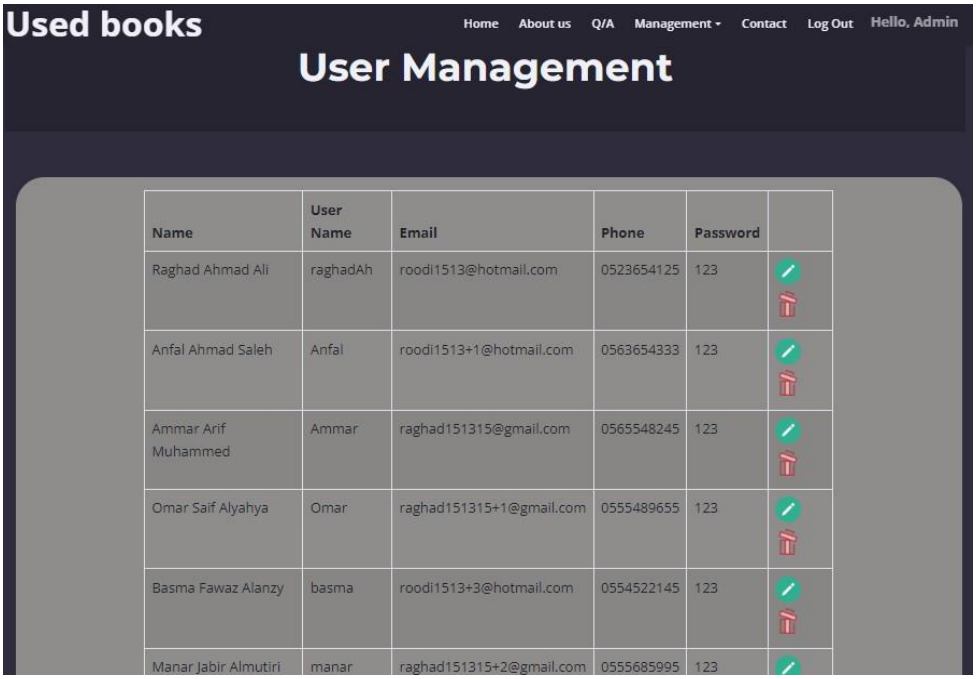


Figure 72: user management interface

Output: After editing the desired information, the admin can save it by clicking on the save-changing icon shown in figure 73 below.

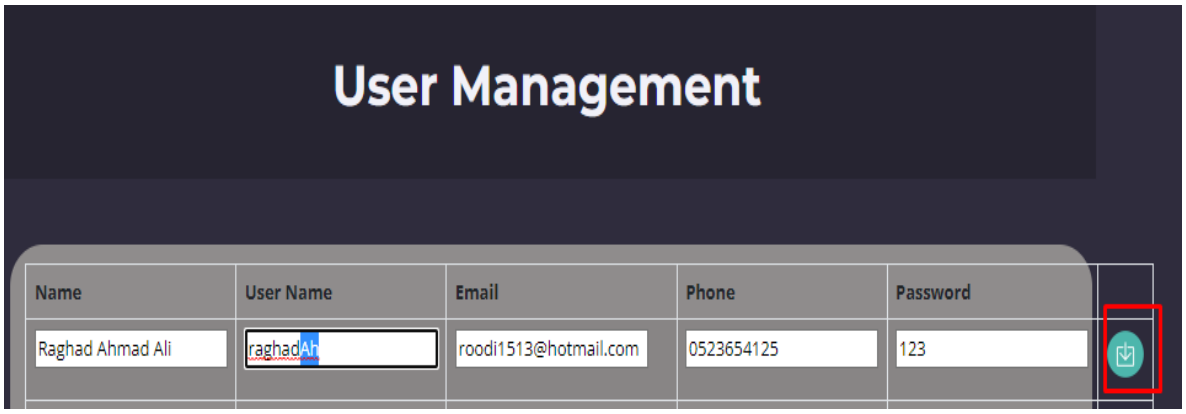
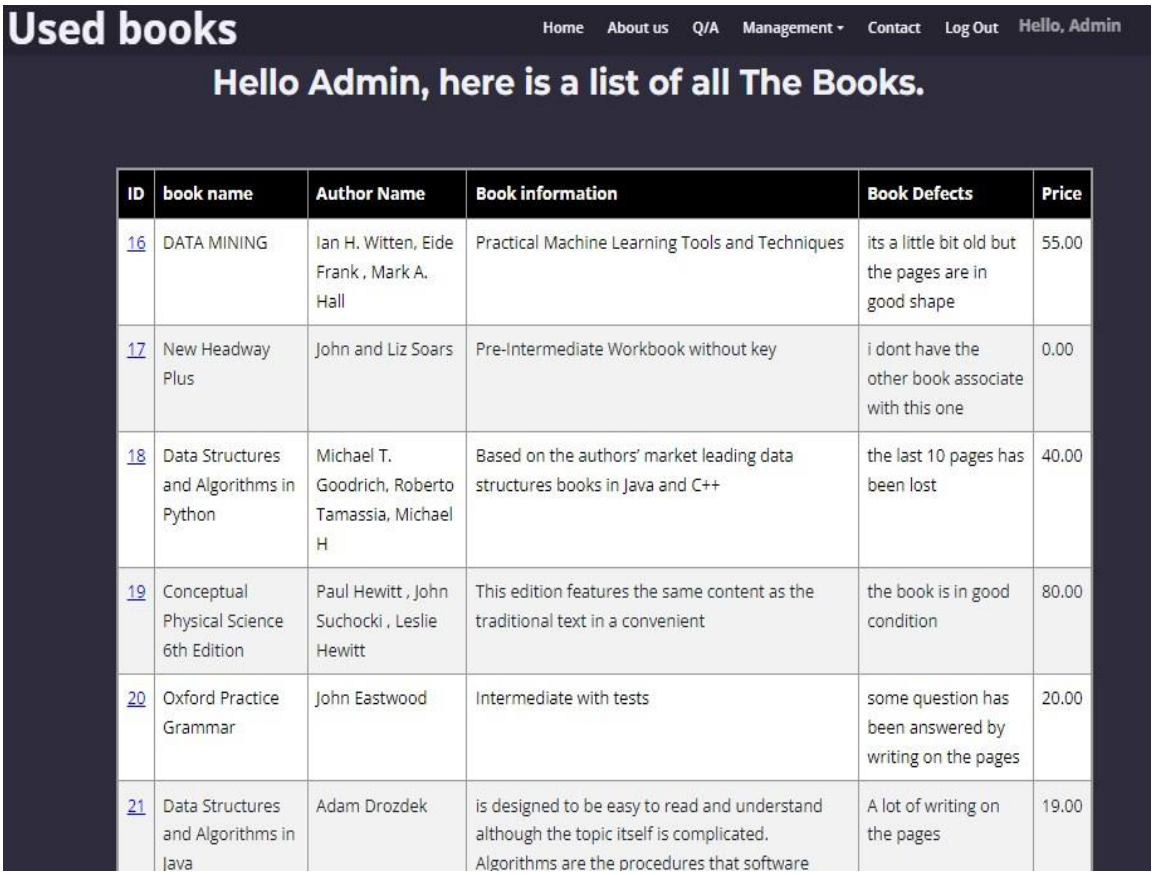


Figure 73: save modified information

Books management:

Inputs: the admin can view all the books where he can modify or delete any data, as shown in figure 74.



ID	book name	Author Name	Book information	Book Defects	Price
16	DATA MINING	Ian H. Witten, Eide Frank , Mark A. Hall	Practical Machine Learning Tools and Techniques	its a little bit old but the pages are in good shape	55.00
17	New Headway Plus	John and Liz Soars	Pre-Intermediate Workbook without key	i dont have the other book associate with this one	0.00
18	Data Structures and Algorithms in Python	Michael T. Goodrich, Roberto Tamassia, Michael H	Based on the authors' market leading data structures books in Java and C++	the last 10 pages has been lost	40.00
19	Conceptual Physical Science 6th Edition	Paul Hewitt , John Suchocki , Leslie Hewitt	This edition features the same content as the traditional text in a convenient	the book is in good condition	80.00
20	Oxford Practice Grammar	John Eastwood	Intermediate with tests	some question has been answered by writing on the pages	20.00
21	Data Structures and Algorithms in Java	Adam Drozdek	is designed to be easy to read and understand although the topic itself is complicated. Algorithms are the procedures that software	A lot of writing on the pages	19.00

Figure 74: Books management interface

Output: After editing the desired information about the book, the admin can save it by clicking on the update button or delete it by clicking on the delete button, as shown in figure 75 below.

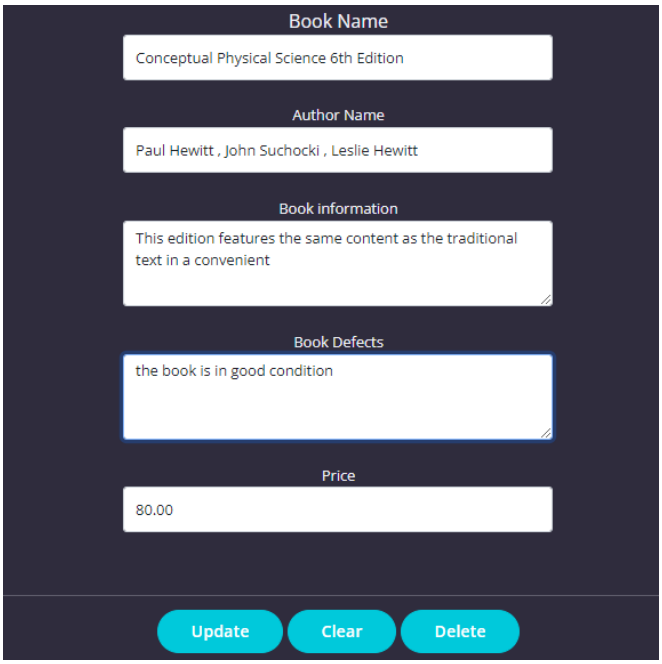


Figure 75: modify book information

Orders management:

Inputs: the admin can check the status of the orders

Output: For statistical purposes, the admin can export it either to Word or Excel. By clicking on the button shown on figure 76 below.

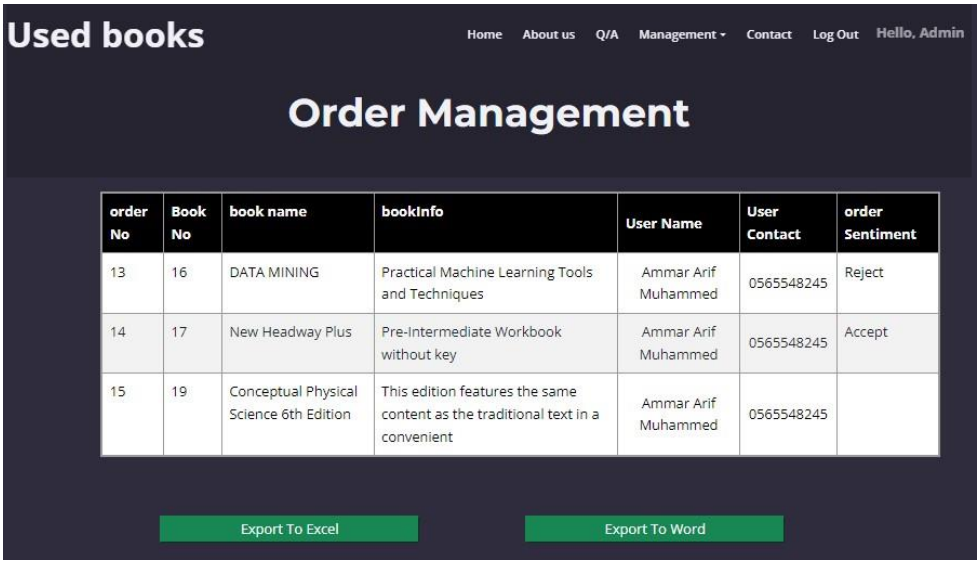


Figure 76: Orders management interface

11.3 Analysis, and Evaluation

We implemented security measures, requiring the user to sign up before he could access the services, to improve the effectiveness and safety of the website by applying a session with an if condition. A session keeps the value on the server because it stores the data user-based, or separately for each user, and it is stored on the server. A session is one of the best methods for state management. It can support any type of object to be stored alongside our own custom objects, as shown in Figure 77.

```
public partial class SiteMaster : MasterPage
{
    protected void Page_Load(object sender, EventArgs e)
    {
        if (!IsPostBack)
        {
            if (Session["role"] == "user")
            {
                PanelLogin.Visible = false;
                PanelSignUp.Visible = false;
                PanelMang.Visible = false;
                PanelService.Visible = true;
                PanelNewOrders.Visible = true;
                PanelOrder.Visible = true;
                linkLogout.Visible = true;
                linkMsg.Visible = true;
                LinkChang.Visible = false;
                linkMsg.Text = "Hello,  " + Session["userFullName"].ToString();

            }
            else if (Session["role"] == "admin")
            {
                PanelLogin.Visible = false;
                PanelSignUp.Visible = false;
                PanelMang.Visible = true;
                PanelService.Visible = false;
                PanelNewOrders.Visible = false;
                PanelOrder.Visible = false;
                linkLogout.Visible = true;
                linkMsg.Visible = true;
                LinkChang.Visible = false;
                linkMsg.Text = "Hello, Admin";
            }
```

Figure 77: Analysis and Evaluation

We used artificial intelligence to train the site by feeding it many pictures of textbooks related to computer science and engineering, and it showed high efficiency in determining whether the pictures were related or not.

The figure78 shows the percentage of errors that can occur when intelligence recognizes books.

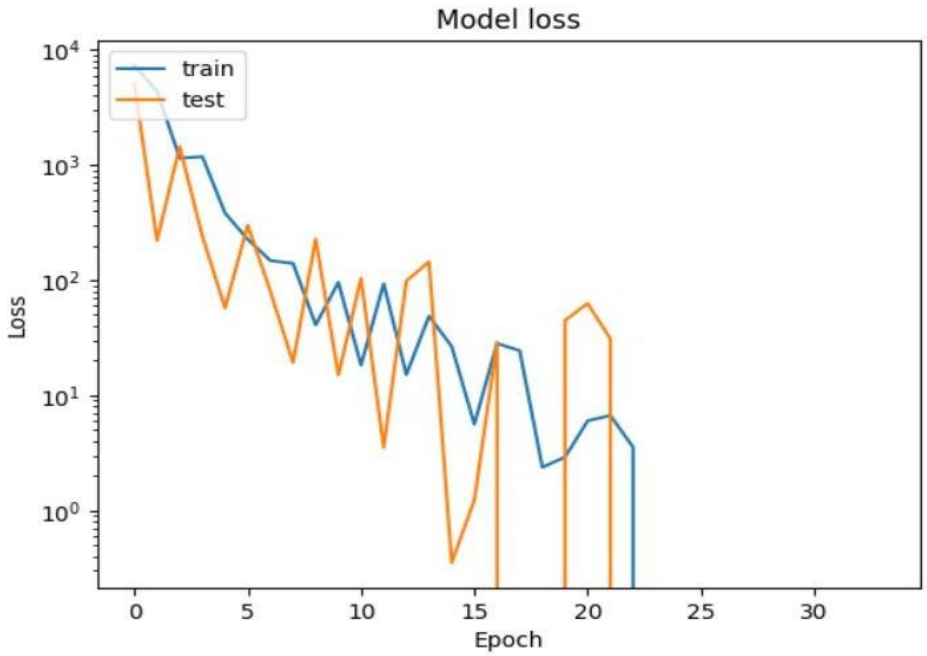


Figure 78: percentage of errors

The figure 79 shows the increase in accuracy from 50% to 100%.

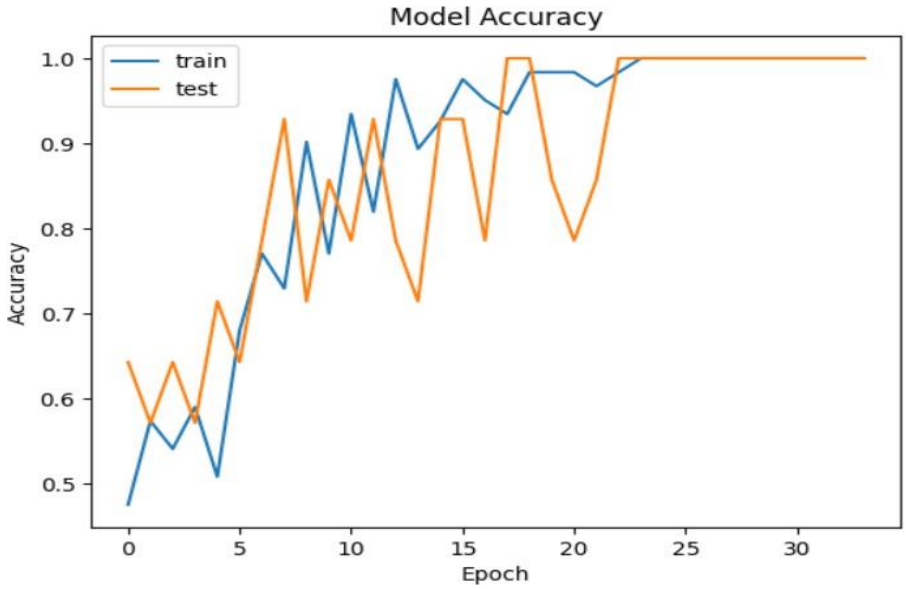


Figure 79: an accuracy

12. Issues

Following the testing phase, a few problems surfaced that needed to be resolved in order to improve the site's effectiveness. We have outlined the problems and the applied solutions to fix the errors, as illustrated in the following sections.

12.1 Improper register information

Clients must provide accurate information about themselves in the registration form; however, we have noticed that some clients submit symbols or digits in place of the required information. The solution consisted of including a Regular Expression Validator control to Microsoft Visual Studio. which forces the client to fill out each form with the proper syntax.

We added this feature in the Client Full Name and Phone Number so the user should enter three names in the Full Name box and ten numbers in the Phone Number box, as shown in figure 80 and figure 81.

```
div class="col">
    <div class="form-outline">
            <asp:Label ID="lbluserFullName" runat="server" Text="Full Name:" meta:resourcekey="lbluserFullNameResou
            <asp:TextBox ID="txtuserFullName" CssClass="form-control" runat="server" placeholder="Full Name" meta:r
             <asp:RegularExpressionValidator ID="RegularExpressionValidator1" runat="server" ControlToValidate="txt
      ForeColor="Red" ValidationExpression="^[a-zA-Z]+[\s|-]?[a-zA-Z]+[\s|-]?[a-zA-Z]+$" meta:resourcekey="RegularExpre
```

Figure 80: Full name validation expression code

```
120     <div class="form-outline">
121             <asp:Label ID="lbluserPhone" runat="server" Text="Phone Number:" meta:re
122             <asp:TextBox ID="txtuserPhone" CssClass="form-control" runat="server" pl
123             <asp:RegularExpressionValidator ID="RegularExpressionValidator3" runat="
124                 ForeColor="Red" ValidationExpression="^[0-9]{10}$" meta:resourcekey=
```

Figure 81: User phone validation expression code

The output for the validation expression shown in figure 82.

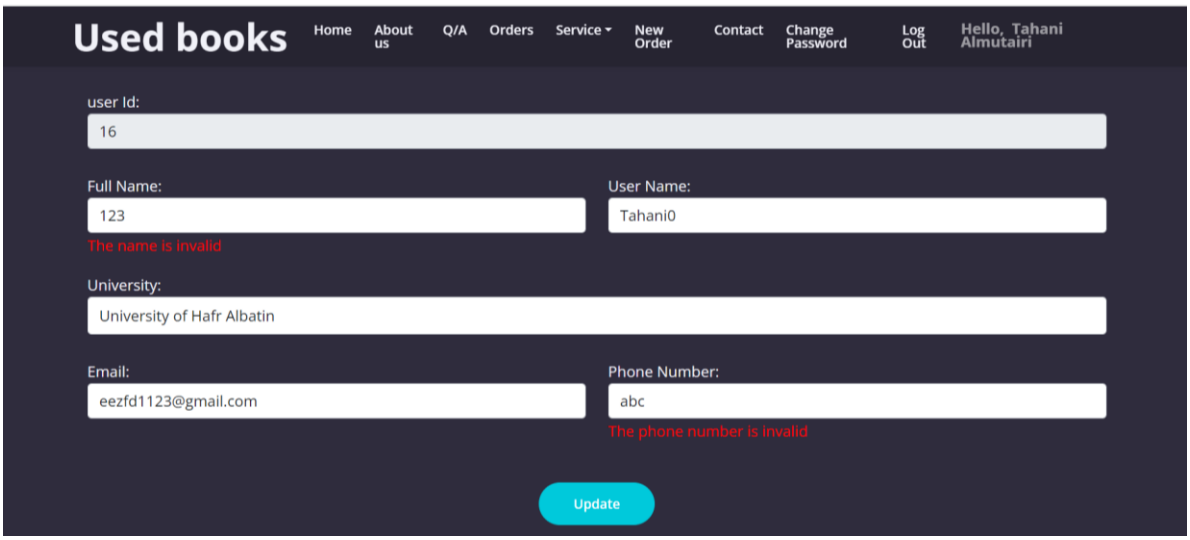


Figure 82: Error message in register information

12.2 Session user Id

Each user has a unique "order page" where it displays the status of his order, including whether it has been accepted or rejected. The challenge was managing this page and selecting a listed order in accordance with the signed user. The solution was to save the user's Id from the login page in a session and pass these sessions in the query of showing the orders state, as shown in figure 83.

```
{

    CRUD myCrud = new CRUD();

    string mySql = @"SELECT [order].orderId, [order].userId, [order].bookId, [user].userFullName, [order].orderSentiment,
                    book.bookName, [user].userFullName
                    FROM  [order]
                    INNER JOIN book
                    ON   [order].bookId = book.bookId
                    INNER JOIN [user]
                    ON [order].userId = [user].userId
                    where [user].userId ='" + Session["userId"].ToString() + "' " +
                    "and [order].orderSentiment Is NULL ";
```

Figure 83: Session client Id code

12.3 Authorization bug

We noticed that the admin pages are visible to users, which is a problem because it means that any user can manage the users, books, and orders.

The solution was to place a condition on the controllers for admin pages, preventing anyone other than admin from accessing admin pages as shown in figure 84.

```
try
{
    SqlConnection con = new SqlConnection(strcon);
    if (con.State == ConnectionState.Closed)
    {
        con.Open();
    }
    SqlCommand cmd = new SqlCommand("select * from admin where (adminEmail='" + txtEmail.Text.Trim() + "' OR adminUserName='" + txtEmail.Text.Trim()
        + "') AND adminPassword='" + txtPassword.Text.Trim() + "'", con);
    SqlDataReader dr = cmd.ExecuteReader();
    if (dr.HasRows)
    {
        while (dr.Read())
        {
            Session["adminEmail"] = dr.GetValue(1).ToString();
            Session["adminPassword"] = dr.GetValue(2).ToString();
            Session["role"] = "admin";
        }
        Response.Write("<script>alert('Logged in successfully');</script>");
        Response.Redirect("Home.aspx");
    }
```

Figure 84: Controllers code

12.4 Confirm password:

If the user mistypes his password, he won't recognize it, so we added the confirm password feature to avoid this issue by using the compare validator control, which is used to compare the value of an input control against the value of another input control on the basis of a specified operator, as shown in figure 85.

```
107            <asp:CompareValidator ID="CompareValidator1" runat="server" ControlToValidate="txtclientPassword"
108                ForeColor="Red" ErrorMessage="Please Enter  Confirm Password Correctly"
109                Text="*" ValidationGroup="x" ControlToCompare="txtConfirmPassword"></asp:CompareValidator>
110        </div>
```

Figure85: conform password code

Figure 86 depicts an error message that will show up if the two passwords are not compatible.

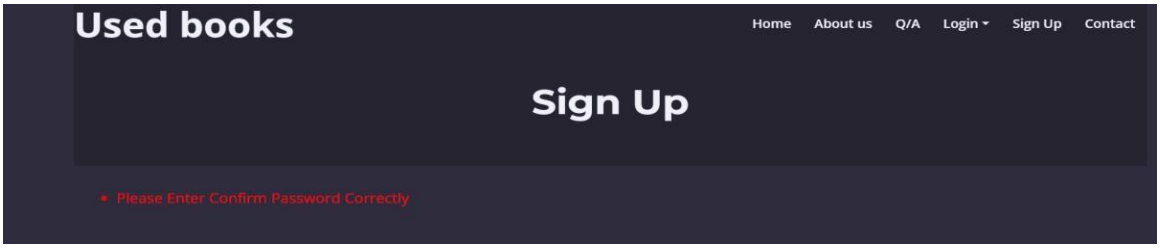


Figure 86: confirm password output

12.5 Limitation and Constraints:

Because we lacked a sizable data set, we chose not to use the cloud due to its high cost; rather, we used CNN and VGG16 to illustrate our theory, which was a better option than the cloud.

13. Engineering Tools and Standards

13.1 Google chrome developer tools:

A collection of tools that are built into the Google Chrome browser to let developers examine HTML coding and test CSS styling. (Kanai, 2022)

13.2 Sublime text:

A text editor with support for a wide variety of programming languages, including HTML, CSS, and JavaScript. The programming process is facilitated by a number of features like syntax highlighting, sidebars, macros, and file type detection. (KUMAR, 2022)

13.3 MS SQL server:

Microsoft SQL Server is a system used for managing relational databases. Numerous applications, such as business intelligence, transaction processing, and analytics, are supported by it. It is classified as a server because it can be operated on the same or different

devices by uploading to the network and granting others authorization access. It allowed other software applications that connected to the database to save, retrieve, and edit data as needed. (Adam & Craig, 2019)

13.4 Visual Studio:

Visual Studio is used to create computer programs such as websites, web apps, web services, and mobile apps. We have worked with ASP.NET Web Forms, which is a component of the ASP.NET web application framework and is available with Visual Studio.

Users of our website can request web forms through their browsers. Both server code and HTML can be used to create these pages. The framework compiles and executes a page that users request on the server, and then it creates the HTML markup that a browser may display. Any browser or client device can access information on an ASP.NET Web Forms page. You may construct ASP.NET Web Forms in Visual Studio. You can drag and drop server controls onto your web form page. (microsoft, 2022) (microsoft, 2022)

13.5 Nu HTML checker:

An online tool for checking the structure of HTML and CSS and catching unintentional issues. The code can be entered directly on the tool page or by adding a code file. (github)

13.6 Python:

Python is an Interpreted language, that does not require compilation into machine language instructions prior to execution and may be used directly by the programmer to execute the program. Python is one of the best languages for AI since it has prebuilt libraries like Numpy for performing scientific calculations, Scipy for high-end computation, and Pybrain for machine learning. (javatpoint)

14. Work plan

The actions required to finish a project are laid out in a solid work plan to improve teamwork among all parties. Our work plan outlines the key activity streams or deliverables that will help us achieve the intended outcome.

As you can see in table 12, each phase was given ample time to complete before moving on to the next, which helped us fulfill our objective of achieving our requirements in 12 weeks.

Task Name	Description	Timespan	
		Start	**End**
Start	- Project start	Week1	Week1
Requirements	- Project Proposal. - Specify the requirements. - Gather the information. - Determine the features.	Week1	Week3
Designing	- Architectural design. - Component design. - System integration. - Design the interfaces. - Design the database.	Week3	Week5
Implementation	- Writing the code. - Apply security. - Reporting.	Week5	Week9

Testing	- Unit and system testing. - Review and correct. - Measure system performance.	Week9	Week10
Final	- Final report draft. - Final report. - Final representation.	Week10	Week12

Table 12: work plan

15. Teamwork

It is always advisable to work as a team rather than one individual while performing tasks that require computer science and engineering experts. Our goal is to be part of a team that has the correct balance of talents and technical personalities, and that everyone is flexible in collaborating.

Because team member interactions are a major factor in team performance and the caliber of work, our team was motivated to establish a cohesive and productive team. And the choice of the project topic was a decision that was made by the entire group after a long discussion.

We always look forward to our daily meetings, whether they take place virtually or in person on campus, where we can discuss our progress on the projects from the previous works, assign new duties, and divide them up according to skill and experience.

We were committed to meeting deadlines and cooperating well as a team. As well as to accomplish our individual objectives through the acquisition of technical, time-management, communication, and teamwork abilities.

Table 13 outlines the team and roles for each member.

Sr. #	ID	Name	Roles
1	2191003426	Manar	Project Manager, Requirements Analyst.
2	2191003834	Anfal	Development Engineer.
3	2191003371	Basmah	System Designer.
4	2191003328	Tahani	System Architect.
5	2191003836	Raghad	Test Engineer.

Table 13: team and roles

Table 14 shows the responsibilities that have been given to each member.

Task	Owner
Form the team and generate ideas	All the team members
Discuss and select the project idea	All the team members
Working in the project plan	All the team members
Analyzing the system	All the team members
Specify the requirements Gather the information Determine the features	All the team members
Architectural design	All the team members
Component design	All the team members

System integration	All the team members
Design the interfaces	All the team members
Design the database	All the team members
Design system component	All the team members
Perform testing techniques	All the team members
Final report draft Final report Final representation	All the team members

Table 14: Teamwork

16. Conclusions and Future work:

16.1 Conclusions

This report illustrates in detail the intensive technique and non-technique works to develop a graduation project for CSE students. The project is a used books website that aims to solve issues regarding students' access to the necessary educational books that are available with past students and how to simplify book acquisition and facilitate educational resources by making these books available.

On the social side, this project aims to enhance the idea of sharing instead of leaving old books on shelves or discarding them by making these books more affordable for students who can't afford them.

As a project that cares about the value of sharing books between students, we strive to reach the largest possible number of needy people. Our vision for the site revolves around helping every person with a need, we seek to raise the education level and make the study progress effective. In the future, we look forward to seeing our site as one of the most popular sites that students throughout our region utilize.

16.2 Future work:

The work we will undertake in the future provides a preview of what we will do to ensure the Used books project is conducted with the utmost professionalism.

- Allow users to donate or sell books across a variety of subject areas.
- Make our website available throughout the Kingdom and all over the world.
- Use artificial intelligence by enhancing machine learning algorithms to detect all educational books of all kinds and assist users.
- Notify the seller immediately if there is any new order of book.

- Provide the opportunity for teachers to volunteer and offer free lessons to the students in need.

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Appendices

APPANDIX A:

Operations Source Code:

The code shown in figure 87 below illustrates the front-end code for the signing-up operations, where the system takes the inputs from the user and saves them to the database.

```
void signUpNewMember()
{
    CRUD myCrud = new CRUD();
    string mySql = @"insert into [user] (userFullName,userName,userPassword,userEmail,userPhone,uniId)
            values(@userFullName,@userName,@userPassword,@userEmail,@userPhone,@uniId)";
    Dictionary<string, object> myPara = new Dictionary<string, object>();
    myPara.Add("@userFullName", txtclientFName.Text);
    myPara.Add("@userName", txtUserName.Text);
    myPara.Add("@userPassword", txtclientPassword.Text);
    myPara.Add("@userEmail", txtclientEmail.Text);
    myPara.Add("@userPhone", txtclientPhone.Text);
    myPara.Add("@uniId", ddlUniversity.SelectedValue);
    int rtn = myCrud.InsertUpdateDeleteViaSqlDic(mySql, myPara);
    if (rtn >= 1)
    {
        ScriptManager.RegisterStartupScript(this, this.GetType(), "alert",
            " alert('Thank you for Signing Up with Used Book website!'); window.open('Home.aspx');", true);
    }
    else
    {
        Response.Write("<script>alert('Please try again!');</script>");
    }
}
```

Figure 87: Sign-up page code

The code shown in figure 88 below illustrates the front-end code for the changing password operation, where the system takes the email provided by the user and sends it the reset instruction.

```
protected void sendEmail(int intId, string strEmail, string strGuide)
{
    try
    {
        String EmailBody = "Hello " + strEmail + ",<br/><br/> Click on the provided link to reset your password. <br/><br/>" +
            "  http://localhost:59692/resetPassword?userId=" + strGuide;
        MailMessage PassRecMail = new MailMessage("area3846@gmail.com", strEmail);
        PassRecMail.Body = EmailBody;
        PassRecMail.IsBodyHtml = true;
        PassRecMail.Subject = "Reset Password";
        PassRecMail.Priority = MailPriority.High;
        SmtpClient SMTP = new SmtpClient("smtp.gmail.com", 587);
        SMTP.DeliveryMethod = SmtpDeliveryMethod.Network;
        SMTP.UseDefaultCredentials = false;
        SMTP.Credentials = new NetworkCredential()
```

Figure 88: change password page code

The code shown in figure 89 below illustrates the front-end code for the uploading content operations, where the system takes the inputs from the user after being approved to be valid by the machine learning and saves them to the database.

```
CRUD myCrud = new CRUD();
string mySql = @"  INSERT INTO book(bookName,bookAuthor,bookInfo,bookContact,bookPrice,[bookPic],[userId],bookDef)
            VALUES(@bookName,@bookAuthor,@bookInfo,@bookContact,@bookPrice,@bookPic,@userId,@bookDef)";
Dictionary<string, object> myPara = new Dictionary<string, object>();
myPara.Add("@bookName ", txtbookname.Text);
myPara.Add("@bookAuthor", txtAuthorName.Text);
myPara.Add("@bookInfo", txtbookinfo.Text);
myPara.Add("@bookPic", FileUpload1.FileName);
myPara.Add("@bookDef", txtbookDef.Text);
myPara.Add("@bookContact", "");
myPara.Add("@bookPrice", txtbookPrice.Text);
myPara.Add("@userId", Session["userId"]);
```

Figure 89: donate page code

The code shown in figure 90 below illustrates the front-end code for the buying book operations, where the system takes the inputs from the user data and saves the new order into the order table in the database.

```
protected void Button1_Click(object sender, EventArgs e)
{
    CRUD myCrud = new CRUD();
    string mySql = @"INSERT INTO [dbo].[order] ([userId],[bookId]) VALUES (@userId,@bookId)";
    Dictionary<string, object> myPara = new Dictionary<string, object>();

    int BookID= Convert.ToInt32(((Button)sender).CommandArgument);
    myPara.Add("@userId ", Session["userId"]);
    myPara.Add("@bookId", BookID);
    int rtn = myCrud.InsertUpdateDeleteViaSqlDic(mySql, myPara);
    if (rtn >= 1)
    {
        ScriptManager.RegisterStartupScript(this, this.GetType(), "alert",
           " alert('Your request has been send successfully'); window.open('Home.aspx');", true);
    }
    else
    {
        ScriptManager.RegisterStartupScript(this, this.GetType(), "alert",
           " alert('Error The book has not been bought successfully');", true);
```

Figure 90: needy page code