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BACHELOR THESIS

By

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Information and communication technology

Title:

Eco Shop Website

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LIST OF ABBREVIATIONS

UI/UX	User Interface/User Experience
e-commerce	electronic commerce
DOM	Document Object Model
SDK	Software Development Kit
HTTPS	Hypertext Transfer Protocol Secure
API	Application Programming Interface
JWT	JSON Web Token
URL	Uniform Resource Locator
ID	Identification
PK	Primary Key
FK	Foreign Key

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ABSTRACT

In this day and age, because of the pollution of the environment, eco-friendly products are getting more and more attention from humans. But it's quite difficult to find a shop or website that sells eco-friendly products because of lesser-known environmental brands and products. To solve this problem, we were building a website that only sells eco-friendly products, so people could easily learn about them and find a place to buy them.

This website will be designed to follow the use case diagrams and sequence diagrams. The website is built on the ReactJS framework for user interface (UI), and Firebase for storing the database. For the server side, we also use MySQL to store user information and authentication.

This system is user-friendly and it can make people's lives easier, safer, and time-saving, especially in the "green product" demanding period of e-commerce.

Keywords: E-Commerce, ReactJS, Firebase, use case diagram, sequence diagram, UI, MySQL.

1. Introduction

Introduce the context, motivation and the problem that are trying to solve & also the project's objective regarding the solution. This part describes some definitions that are related to our website. Moreover, the system survey is also described in this part.

1.1. Context and Motivation

Nowadays, the environment is very polluted by the widespread use of plastic bags and single-use items, so we want to create a website to sell products that are good for the environment. To solve that problem, "Eco" products were born and developed day by day, such as second-hand items, bamboo items, organic items, etc. These products help reduce a lot of plastic and disposable waste discharged into the environment. However, people don't know too much about these products or have few opportunities to have access to "Eco" products. Each e-commerce website usually sells different products, and so does our website. We want users to have access to many different products and in many price ranges. Our website only sells products that are beneficial to the environment, that is, products made from materials that are not harmful to the environment or are 100% biodegradable. In addition, our website also has handmade and second-hand products.

So, in this project, we built an e-commerce website that focuses on and sells environmentally friendly products from as many brands as possible so everyone can easily find a place to watch and find the product they want.

For introducing the Eco Shop Website, the website focuses on selling "Eco" products. The website sells the product of a shop with the same name. This Website was created with the goal of creating a single place to sell "Eco" products of the shop, helping the Eco shop to sell goods online. This helps the shop to focus on selling only one type of item, which is green products, it will be a website for those interested in green products to access and attach. The website is also a place to promote products for the actual main shop, a place for people to come and buy directly through the shop.

The e-commerce website is focused on selling "Eco" products. "Eco" products, or what we can call green products, are products that are beneficial to the environment, made from products that are beneficial to the environment such as 100% compostable products, products made from bamboo, or products made from discarded things, no longer used - second-hand items,...

The website is divided into two roles, which are user role and admin role. The user and admin roles are distinct sets of permissions and responsibilities assigned to different types of users to manage and interact with the e-commerce website. These roles help ensure the efficient operation of the website and provide appropriate access to various features and functionalities.

User role (User site/side), or Client role (Client site/side), refers to individuals or entities who visit the website with the intention of making purchases or transactions. This role represents the primary target audience for the e-commerce platform and includes various types of users, like shoppers/buyers, guest shoppers, registered customers,...

Admin role (Admin site/side), refers to a user or group of users who are in charge of maintaining and supervising various elements of the e-commerce platform. The efficient running of the website, handling customer orders, managing products, and preserving the general integrity and security of the platform are all crucial functions performed by admins.

1.2. System Survey

There is numerous popular and readily e-commerce website available on the internet, where sell the products of where sold products of own shop. Some great examples include sapchangsen, Phucanh.vn, bigC,... these e-commerce websites sell products of their shop, they already have their shop in real life, and their e-commerce website allows customers to buy the product online, remotely. They often have two main roles, as well as two sides of the website, which are the client side and the administrator side. For the client side, customers can access the website and buy a product; and for the administrator side, the admin can manage the website, in order to manage the product, manage the order, manage the account,...

As an example of an e-commerce website, consider Phucanh.vn:

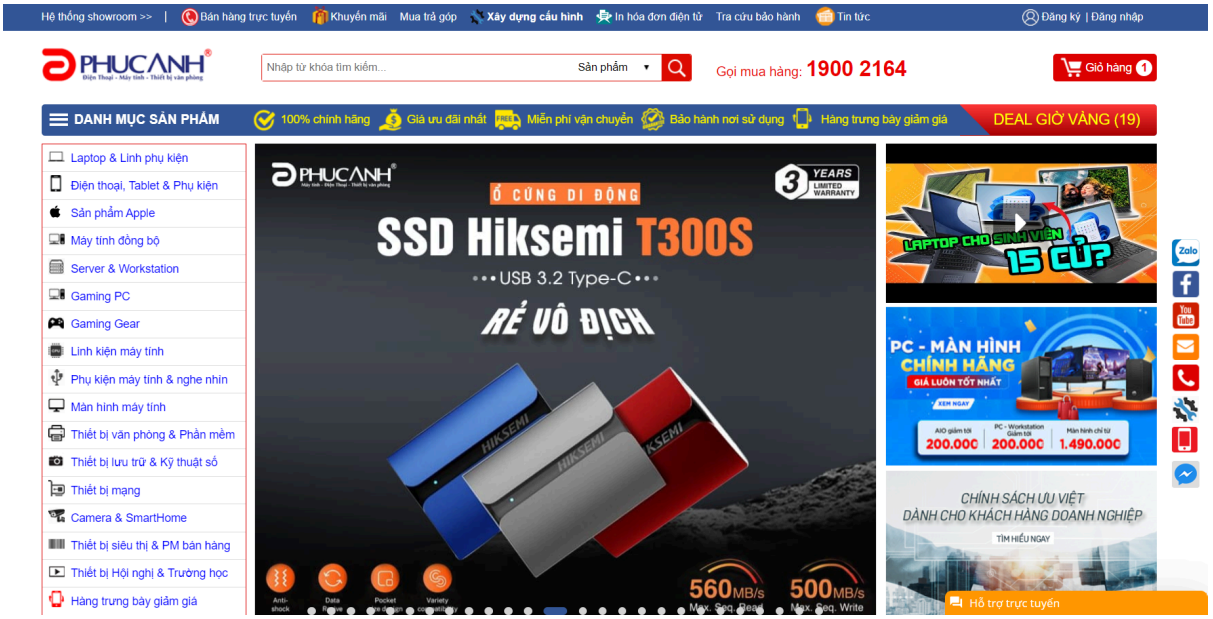

Figure 1. Phucanh.vn Interface (1)

Figure 2. Phucanh.vn Interface (2)

This e-commerce website primary features are as follows:

- User Registration and Login (Register/Login/Logout)
- Product Listing

- Notification (Notify about hottest event of the shop)
- Shopping Cart (Add to cart, change the quantity, delete product from cart, calculate price,...)
- Search Functionality (Search Filter)
- News (News about promotions, reviews, technology,...)
- Product Detail (Show detail of each product)
- Secure Checkout (Secure checkout and combined with multiple payment methods: ATM, VISA, MASTER, …)
- Payment Processing (Securely process payments, handle refunds, and store payment information,...)
- Inventory Management (Update product availability in real-time, display out-of-stock notifications)
- Customer Support (Online Support, FAQs, …)
- Customer Reviews and Rankings (Review and ranking about product)
- Analytics and Reporting (Update hot deals day by day)
- Promotions and Discount (Offer promotions, discount, coupon codes and allow users apply discounts code during checkout)
- Social Media Integration (Integration e-commerce website with multiple social media like Facebook, Zalo, Youtube,...)

This e-commerce website common strengths and flaws are:

- Strengths: this ecommerce website looks very nice and professional. Features are really diverse and almost fully functional; easy to search, view, and find out about products; safe and diverse transactions; have many instructions on how to use the functions in the website, combined with online help and social media.
- Flaws:
    + About features: Lack of some features like Wishlist and Favorite; Shipping, Real-time Tracking, and Delivery.
    + About usage: It requires a deep understanding of how e-commerce websites work and requires complexity in the payment process, requires resources from the seller, and provides quite abundant products; and may have difficulty responding and providing service to customers quickly and effectively.

1.3. Project Objective

The goal of this project is to create an e-commerce website, where customers can buy these “green” products, learn more about them, and make them more and more popular. This sales website will be a website dedicated to one store, where only that store's products are sold. We also hope our e-commerce website can be widely known by everyone and can be a familiar place for people who like green products.

1.4. Report Structure

This thesis will contain all the information about the report and the project.

- **Session 1: Introduction**: This session provides overall information about the project.

- **Session 2: Requirement Analysis:** This session provides information about requirements, workflow, use cases, and use case descriptions.

- **Session 3: Methodology**: This session provides the tools and techniques that are used in the project, system architecture, sequence diagram, and database diagram.

- **Session 4: Results and Discussions**: This session provides information about what has been done/ not done in this project.

- **Session 5: Conclusions and Future Works**: This session contains information about what will be done in this project.

- **Session 6: APPENDIX**: This session provides supplementary material for the project.

2. Objective

After analyzing the required activities of the Eco Shop Website for businesses, this part will provide basic information on the website's expected functions.

2.1. Functional Decomposition

This section is designed to provide an overview of the system's structure and function as well as a detailed description of how e-commerce works on both user and admin sites.

Our e-commerce website will be split into two primary sites: the user site and the admin site. They have a close relationship with each other, and below, I will present the main, important functional groups suitable for current e-commerce website trends and used by many large websites.

For the User Site

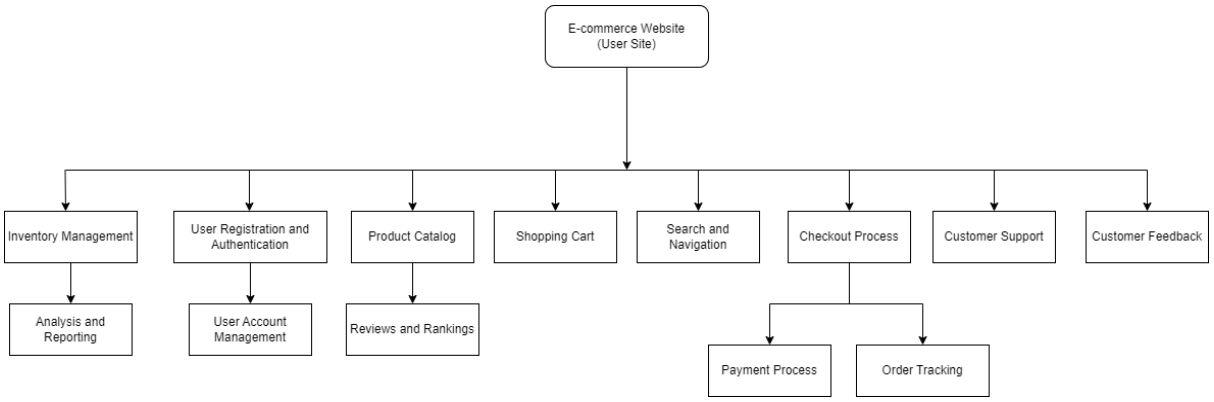

Figure 3. Functional Decomposition of User

The first role is the User.

1. F1: User Registration and Authentication: The E-commerce website's register and authentication for users ensures that only registered users can access the features that are only for registered users.
2. F2: User Account Management: Enables User to manage their personal profile information and customize their account.
    - User can see the order history;
    - User can manage setting process;
    - Manage wishlist,.etc.
3. F3: Product Catalog: Enables User to see the product with product listing, related and recommended goods, and product reviews and ratings.
4. F4: Reviews and Ratings: Enables User to review and rating the product.
5. F5: Shopping Cart: Enables User to add product to the cart, delete from the cart, and save for the later or wishlist options. In the cart, User can adjust the quantity and see the subtotal with total calculations.
6. F6: Search and Navigation: Enables User to find the product by name, sort product by options, and recommend searches.

7. F7: Inventory Management: Enables User to track stock in real-time, he/she can know the availability status of products. This process includes the Analysis and Report function.
8. F8: Analysis and Report: Enables User to know about inventory management reports.
9. F9: Checkout Process: Enables User to check out, including order summary, shipping options, payment options,...
10. F10: Payment Process: This process is inside of the Checkout Process. It includes secure payment gateways, handling of refunds,...
11. F11: Order Tracking: This process is inside of the Checkout Process. It enables users to track the order with shipment in real-time and receive order status updates via email or SMS from the administrator. For the email, we use OAuth2 combined with the Nodemailer module in NodeJS. Then, from the admin website, the administrator can send the email to the user via the user's email. On the other hand, for the SMS, the administrator, or the salesman can send the SMS to the user by his/her phone number.
12. F12: Customer Support: Enables User to contact the administrator, get the FAQs,...
13. F13: Customer Feedback: Enables User to feedback to improve the website by form or survey.

For Admin Site

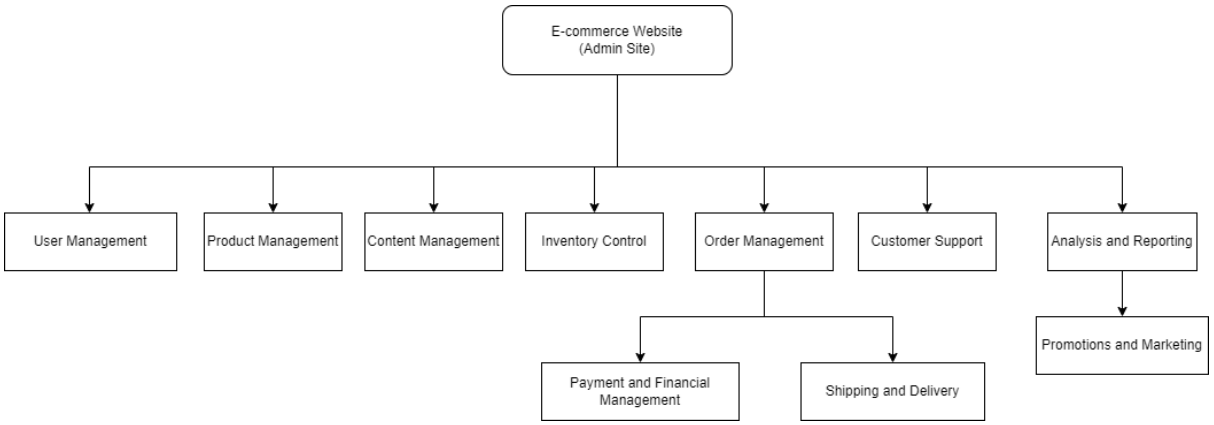

Figure 4. Functional Decomposition of Admin

The second role is the Admin.

1. F1: User Management: Enables Admin to manage the user information and user account.

2. F2: Product Management: Enables Admin to manage the product of e-commerce websites.
3. F3: Content Management: Enables Admin to manage the content of the website, including banners, promotions, and announcements.
4. F4: Inventory Control: Enables Admin to monitor and update product availability in real-time.
5. F5: Order Management: Enables Admin to manage the order of users. It includes the Payment and Financial Management function and Shipping and Delivery function.
6. F6: Payment and Financial Management: Enables Admin to handle financial transactions, invoices, and refunds and ensure secure payment processing.
7. F7: Shipping and Delivery: Enables Admin to track the shipping status, handle shipping options and shipping time.
8. F8: Customer Support: Enables Admin can send email/SMS to user email, or respond to customer inquiries and issues.
9. F9: Analysis and Report: Enables Admin to monitor website performance and user behavior.
10. F10: Promotions and Marketing: Enables Admin to create and manage marketing campaigns, and implement discounts, coupons, and promotions.

2.2. Desired Functionalities

Based on the outlined functional decompositions, we will build a system to encompass a diverse array of functions that are needed for ensuring an efficient e-commerce website. These are all functions that we desire for our e-commerce website:

- For user role:

- User Registration and Authentication: this function contains the register and sign in with email, password, and social media, and we also have the password recovery and security features for User..
- Product Catalog: this function contains clear product listings with high-quality images, descriptions and prices, categories and filters for easy navigation, product reviews and ratings, and related and recommended goods.
- Shopping Cart: this function contains the add or remove products from the cart, adjust the quantity, save for later or wishlist options, and see the cart subtotal and the total calculations.

- Checkout Process: this function contains the shipping options with real-time cost calculations, multiple payment options(credit cards, digital wallets, Paypal, etc.), the secure and streamlined checkout process with progress indicators, the order summary and confirmation page, and the guest checkout for quick purchases.
- Payment Process: this function contains the integration with secure payment gateways, SSL encryption for data protection, and the handling of refunds and cancellations.
- Inventory Management: this function contains the real-time stock tracking, the low-stock notifications, and the product availability status.
- User Account Management: this function contains the user profiles with order history, the address book for multiple shipping addresses, the wishlist management, and the setting process.
- Search and Navigation: this function contains the search functionality with filters, the sorting functionality with options, and the autocomplete and suggested searches.
- Reviews and Ratings: this function contains the customer-generated reviews and ratings, and the moderation and spam prevention tools.
- Customer Support: this function contains FAQs and self-help resources, the contact forms and email support, the live chat and chatbots for immediate assistance.
- Order Tracking: this function contains the order status update via email or SMS, and the real-time tracking of shipment.

- For admin role:

- User Management: this function contains the functions to view and delete user accounts.
- Product Management: this function contains the functions to add, update, and delete product listings, set product prices, descriptions, and images.
- Inventory Control: this function contains the monitor and update product availability in real-time, the receive and process stock updates, and the handle product discontinuation or removal.

- Order Management: this function contains the view and manage customer orders, the confirm and process orders for shipment, and the handle order cancellations, returns, and refunds.
- Payment and Financial Management: this function contains the configure and manage payment gateways, ensure secure payment processing, and handle financial transactions, invoices, and refunds.
- Customer Support: this function contains the respond to customer inquiries and issues, the resolve disputes and complaints, and the provide assistance with order-related problems
- Shipping and Delivery: this function contains the configure shipping options and carriers, the set shipping rates and policies, and the track and manage shipping status and delivery times.
- Analytics and Reporting: this function contains the monitor website performance and user behavior.
- Promotions and Marketing: this function contains the create and manage marketing campaigns and implement discounts, coupons, and promotions.

2.3. Expected Outcome

This project has been implemented since early March. After learning and being taught by my supervisor in my company about the React JS framework, we built this website. With the front end, we decided to use React JS. For the back end, we used Node JS Express, and we used MySQL to store the database. There are three specific objectives:

- Developing a UI and UX for customers that provides an interesting and smooth experience.
- Creating an Admin Page to manage the product, order, notification, send Email,.... which can help the administrator easily interact with users and sales websites.
- Using Mysql to store all the data.

3. Requirement Analysis

We will look at a brief summary of the project's functions as well as the scenarios and use cases for the system after establishing the desired functionalities of the

e-commerce website. This entails comprehending stakeholder needs and expectations and converting them into functional and non-functional requirements.

3.1. Overall System Requirement

This session is about workflow diagrams (also known as workflows). It provides a graphic overview of the e-commerce website from the user side and admin side.

For Admin side

From the Admin Interface, the administrator can access the manage order, which contains view order, track order, process order and notify by sending the email parts. The administrator can access the manage product function, which can help the administrator to create, view, update and delete products. Moreover, he/she can access the send notification to all users and view the user details via MySQL.

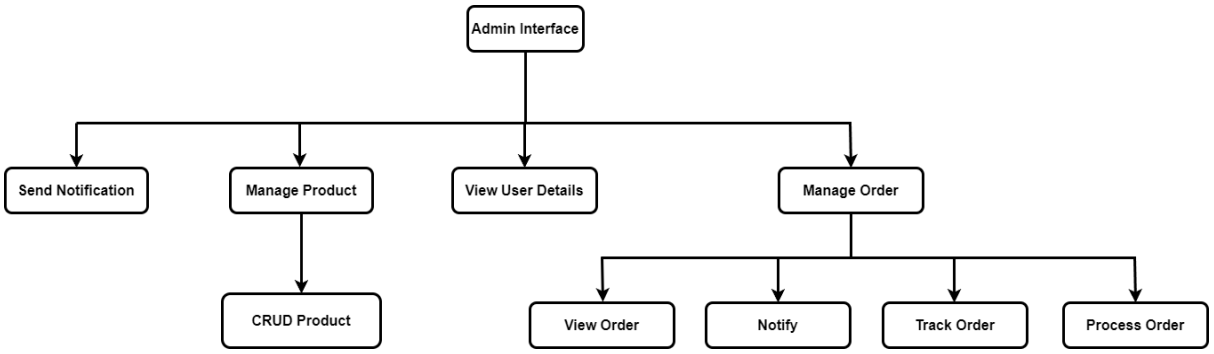

Figure 5. Workflow Diagram for Admin Side

For User side

As you can see the workflow diagram for the user side, from the Home Page, the user can access functions like filter product, review and rating, view product, customer support, notification even if the user can buy and order products without signing in. But if the user accesses the login/register to sign in, he/she can access other functions, which are quite essentials, such as view purchase history, or update his/her information.

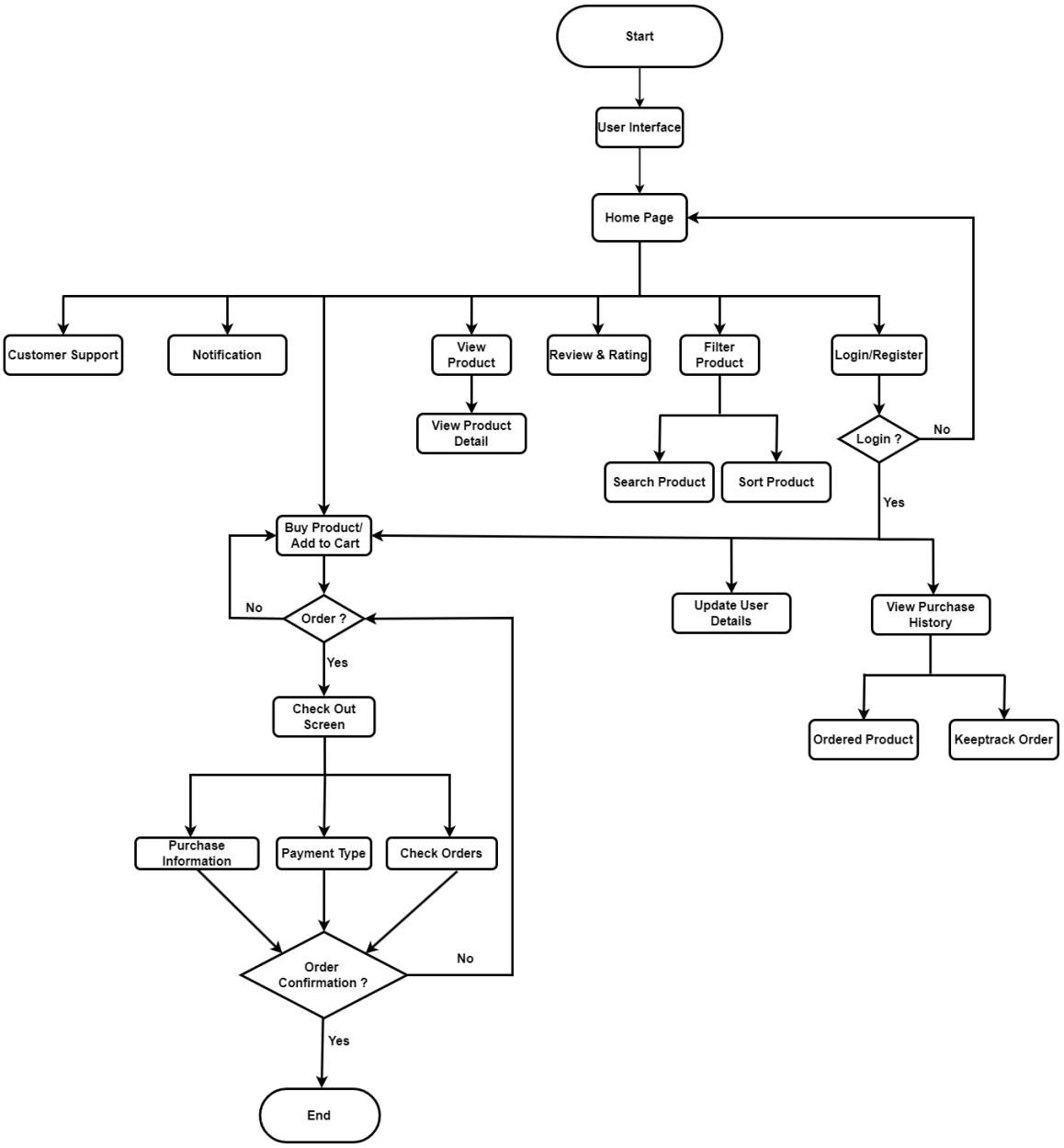

Figure 6. Workflow Diagram for User Side

3.2. Functional Requirements

This session is about the functional requirements. This website is developed with plenty of functions.

3.2.1. For user

- **Product Functions:** The following list of function descriptions explains the major features of the Eco Shop.
- **Account Registration:** The registration function enables users to create new accounts. The account will keep track of the user's name, phone number, email, and password for current/future use.
- **Account Login:** The account login function enables account members to enter their email and password. Once verified, users will be able to access the website with more privileges, purchase goods online, and update their account information.
- **Search:** The search function enables users to search products by name.
- **Sort:** The sort function enables users to sort products by price.
- **Add to Shopping Cart:** The add to shopping cart function enables users to temporarily save “Eco” products in a list that are being considered for purchase.
- **Delete from Shopping Cart:** The delete from shopping cart function enables users to remove any unwanted “Eco” product from the cart.
- **Checkout:** The checkout function enables users to purchase “Eco” products online securely.
- **Update Account Information:** The update account information function enables current account members access to edit their stored information.
- **Account Purchase History:** The account purchase history function enables account members to see previous purchases made under their username, and helps users keep track of their orders also.
- **Notification**: The notification function enables members to get notified from order status and the update on shipping status.
- **Account Logout:** The account logout function enables account members to exit their account and end their current session.

3.2.2. For administrator

- **Product management**:
  + **View product function**: Enables administrators to view the list of products.

    + **Add product function**: Enables administrators to create a new product to list.
    + **Remove product function**: Enables administrators to delete a product from the product list.
    + **Update product function**: Enables administrators to update the information of a product in the product list.

- Order management:

    + **View order function**: Enables administrators to view the list of orders from users.
    + **Update order status function**: Enables administrators to update the status of order.

- View user information function: Enables administrators to view the user information and the list of users.

- Send email function: Enables administrators to send emails to the customer email.

- Send Notification function: Enables administrators to send notification to all users.

3.3. Non-Functional Requirement

3.3.1. Security

- After creating an account, systems may save it into a database. When users log in to their accounts, they can not log in successfully if they enter the wrong password or email.

3.3.2. Performance

- The website is accessible to anyone with a public domain name and an Internet connection.
- The website should handle and notify the user if an error occurs while performing tasks.

3.3.3. Usability

- When a user uses the website, he/she can easily navigate its interface.
- Users can easily determine what a feature is and what it can do.

3.3.4. Reliability

- The system will not work without an Internet connection.

3.4. Use Cases

Based on the use case diagram, this section will give a general overview of the system's functionality.

3.4.1. Use Case Diagram

There are two types of roles who interact with the system: Admin and User
User: Users can only access certain functions of the system, such as filter products, view products, check out, etc. Users can use other features of the website such as purchase history products, update user details,...
Admin: the admin can access management functions such as product management, order management, and view user details.

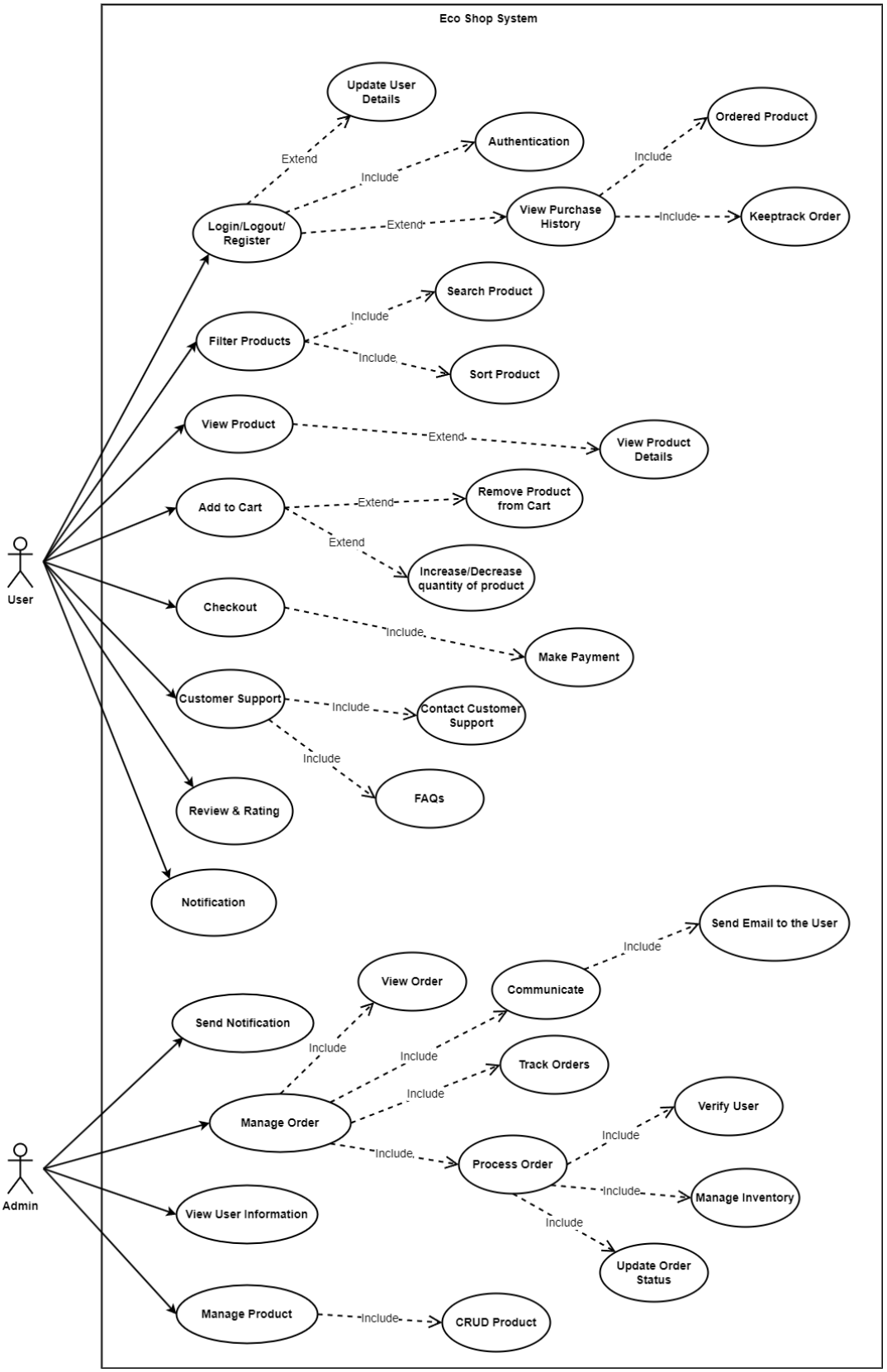

Figure 7. Overall Use Case Diagram

3.4.2. Use Cases and Scenario Description

During the requirements analysis phase, it is crucial to comprehend the anticipated functionality of the system and to identify users' demands. The system's primary functions will be briefly described in the section after this.

3.4.2.1. Login/Logout

Use Case Name	Login/Logout to the Client-side
Brief Definition	Users can sign in to the website with their pre-registered email and password on the login page, and users can sign out.
Brief Flow	1. Users open the Eco e-commerce website 2. Users click the “Login” button to move to the Login page 3. Users enter their email and password 4. Users click the “Login” button to log in to the website and return to the Homepage 5. Users click the “Logout” button to log out to the website.
Alternative Flow	1. The website will display an error message if the user enters the wrong email or password. 2. If the user doesn’t have an account, he/she can press the button “Register” to create a new account. 3. The website will announce this error with red text if the user fills out the missing information.
Precondition	The user hasn’t logged in to the website or has logged out of the previous login session.

3.4.2.2. Register

Use Case Name	Register
Brief Definition	The user can sign up for the website on the registration page if he/she does not have an account
Brief Flow	1. After opening the website, the user can press the “Register” button. 2. The user enters his/her “username”, “email”, “Phone number”, and ”Password”, 3. The user presses the “Create” button to sign up for the website.

Alternative Flow	1. If the user enters the phone number too long (greater than 10 digits) or has characters other than numbers, the website will announce this error with red text 2. The website will announce this error with red text if the user fills out the missing information.
Precondition	No

3.4.2.3. View Product Detail

Use Case Name	View Product Detail
Brief Definition	Users can go to the "Product Detail" page of each product to see more information about its details.
Brief Flow	1. After opening the website, the user can see many products in the shop. 2. If the user wants to have more detail about a product, he/she can hover over that product and find the icon “Search”. 3. When you press the “Search” icon, it will go to the single product page, which has product details.
Alternative Flow	No
Precondition	No

3.4.2.4. Update User Details

Use Case Name	Update User Details
Brief Definition	Users can update their user details after registering and login to the website.
Brief Flow	1. After login to the website, users enter the “Setting” icon to go into the update user details form. 2. In the form, users need to enter information to update. 3. Then, users click on the “Update” button in the form, and the new user’s information can be updated in the database.
Alternative Flow	No
Precondition	Users need to pre-register and login to the website, if they

	want to update their information.

3.4.2.5. Add To Cart

Use Case Name	Add To Cart
Brief Definition	The user can add products to a cart to see how many products he/she already added to the cart.
Brief Flow	1. On the single product page, the user presses the “Add to Cart” button. 2. On the top of the website, the user can see the “cart” icon with the quantity of the number of goods that he/she picked, and if they press that icon, then the user will be taken to the Cart Item page.
Alternative Flow	No
Precondition	When no products have been added to the cart or the user doesn’t have any products in the cart, the quantity in the cart icon on the top of the website will disappear.

3.4.2.6. Increase/ Decrease Quantity and Remove product from Cart

Use Case Name	Increase/ Decrease Quantity
Brief Definition	The user can increase/decrease the quantity of each product that he/she wants to buy, delete the product from the cart, see the price corresponding to the quantity, and calculate the total price he/she needs to pay for all products.
Brief Flow	1. On the Cart Item page, the user can see all the products that he/she has chosen, along with the name, brand, price, and quantity of those goods. 2. The user can decrease or increase the quantity of the product. ● The user presses the “add” icon button to increase the quantity of the product. ● The user presses the “minus” icon button to decrease the quantity of the product 3. The user can see the price of each product with its quantity and the total price of all products each time the quantity of a

	product changes. 4. Users can remove a product from cart if they reduce the quantity of that product to “0”.
Alternative Flow	No
Precondition	No

3.4.2.7. Checkout

Use Case Name	Checkout
Brief Definition	Users have to go to the Checkout screen and fill out all of the missing information to pay for products.
Brief Flow	1. After adding products to cart, users need to press on “Check Out Now” to go to the check out screen. 2. Users need to fill in all the information and choose the shipping method, then users press on the “Check Out” button. 3. The data about users' order will be added to the database.
Alternative Flow	No
Precondition	Users can make an order with or without the login.

3.4.2.8. Search/Sort Filter

Use Case Name	Search/ Sort Filter
Brief Definition	Users can search products by their name; and can sort the products by their price.
Brief Flow	1. Users open the Eco e-commerce website. 2. To do the Search and Sort Filter: 2.1. Search Filter: In the Search bar, users need to enter the name of the product to find this product. 2.2. Sort Filter: In the Sort part, users can choose the “ASC” to arrange all products to increase in price and “DESC” to arrange all products to decrease in price.
Alternative Flow	No
Precondition	No

3.4.2.9. View Purchase History

Use Case Name	View Purchase History
Brief Definition	Users can view the order history and order status in the purchase history.
Brief Flow	1. Users need to go to the website and login to the website. 2. Users need to press on the “View Purchase History” button, and users can go to the Purchase History page. 3. Users can keep track of the order and watch the ordered products.
Alternative Flow	No
Precondition	Users need to login to access the Purchase History.

3.4.2.10. Notification

Use Case Name	Notification
Brief Definition	All users can receive notifications from administrators
Brief Flow	1. Users need to go to the website and press on the “Notification”. 2. Users can see the announcements, which are promotion notifications, maintenance notifications, product price reduction notifications,...
Alternative Flow	No
Precondition	Users need to login to view the notification.

3.4.2.11. Order Management

Use Case Name	Order Management
Brief Definition	The administrator can manage the order. He/she can view all the orders of any user, he/she also can update the status of the

	order, and send an automatic email to the user, who bought this order.
Brief Flow	1. After opening the website for admin, the administrator needs to choose the Order Management part to view the order management. 2. In the Order Management page, the administrator can view all the orders from all users and he/she can change the status of the order of any order. 3. The administrator needs to click on the “Accept Order” button to accept this order.
Alternative Flow	Whenever the order is confirmed, an automatic email will be sent to the gmail of this user, to announce about the acceptance of his/her order.
Precondition	No

3.4.2.12. Product Management

Use Case Name	Product Management
Brief Definition	The administrator can manage the goods. He/she can add products, view products, update products, and delete products.
Brief Flow	1. After opening the website, the admin can choose categories or brands to view the products 2. The admin can add products to the system by clicking the “Create” button. Then fill out the information and click the “OK” button. 3. The admin can update product information in the system by clicking the “Update” button. Then fill out the information that he or she wants and press the update button for each section. 4. The admin can delete products by pressing the “Delete” button on each product.
Alternative Flow	No
Precondition	No

3.4.2.13. Send Notification

Use Case Name	Send Notification
Brief Definition	The Administrator can send the notification to users.
Brief Flow	1. The administrator needs to go to the website for admin and press on the “Notification” button. 2. The administrator needs to enter the notification and the title, then press on the “Send Notification” button. 3. Then Users can get a notification from the administrator.
Alternative Flow	No
Precondition	No

4. Methodology

This section offers a summary of the procedures and techniques used in the creation of the asset management system after examining the goals of the e-commerce website for an organization. It builds a strong foundation for an e-commerce website and ensures that important tasks are completed in a planned and systematic way.

4.1. Tool and Technique

4.1.1. ReactJS

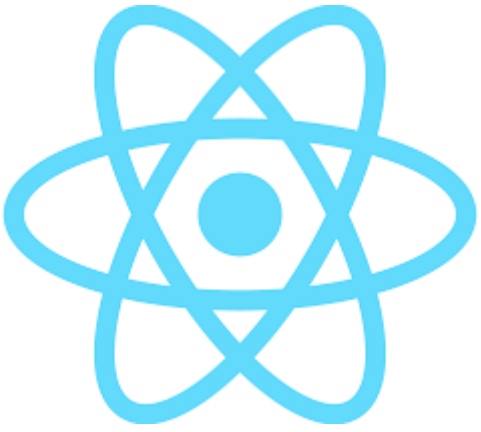

Figure 8. ReactJS Logo

React is a JavaScript library used for building user interfaces using components. It is an open-source, publicly accessible library that is managed by Meta and includes

input from programmers and community organizations. By utilizing frameworks like Next.js, React makes it possible to construct a variety of applications, including single-page, mobile, and server-rendered ones. Additional libraries are frequently used for tasks like routing and creating client-side functionality because React mainly concentrates on the user interface and displaying components to the Document Object Model (DOM).

4.1.2. NodeJS

Figure 9. NodeJS logo

Node.js is a multi-platform, open-source server environment that works with Windows, Linux, Unix, macOS, and other operating systems. Node.js is a back-end JavaScript runtime environment that uses the V8 JavaScript engine to execute JavaScript code outside of a web browser. JavaScript can be used by developers to create server-side scripting and command-line tools using Node.js. Before a page is sent to the user's web browser, dynamic web page content is frequently created using the server's capacity to run JavaScript code. Therefore, Node.js offers a "JavaScript everywhere" paradigm, uniting web application development around a single programming language, as opposed to using multiple languages for the server- versus client-side programming. We used NodeJS for the Server in our project.

4.1.3. MySQL

Figure 10. MySQL Logo

MySQL is a relational database management system (RDBMS) that is free to use. A relational database arranges data into one or more tables where the data may be related to one another; these relations aid in the data's structure. Programmers can create, change, and extract data from relational databases using the SQL language, which they also use to manage user access to the database. Along with relational databases and SQL, an RDBMS like MySQL works with an operating system to implement a relational database in a computer's storage system, manages users, permits network access, and makes it easier to test the integrity of the database and create backups. With MySQL, we can easily store the database.

4.1.4. Ant Design and Material UI Libraries

Figure 11. Ant Design Logo & Material UI Logo

Additionally, we incorporate two libraries into the project that can aid with UI development. Ant Design and Material UI are used.
Businesses can utilize Ant Design right away as a professional design system. It offers top-notch tools and examples for creating interactive user interfaces (UIs). These elements can also be modified to meet your design requirements.
Google's Material Design has been combined with the React Components package known as Material UI. By replacing the current Bootstrap user's housework with new buttons, icons, etc., Material UI gives you and your website a whole new user interface.

4.2. System Architecture

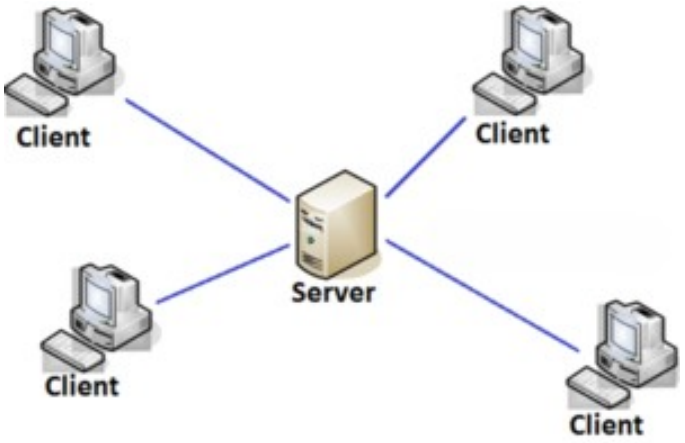

Figure 12. Client-Server Model

The client-server model is a distributed application structure that divides tasks between the provider of a resource or a service (server) and a service requester (client).

A request-response communications pattern is used when clients and servers communicate. The server responds to the request the client submits.
This structure brings a lot of advantages to both the client side and the server side. Since the resources are maintained in a specific place, it is easier to maintain and manage resources.

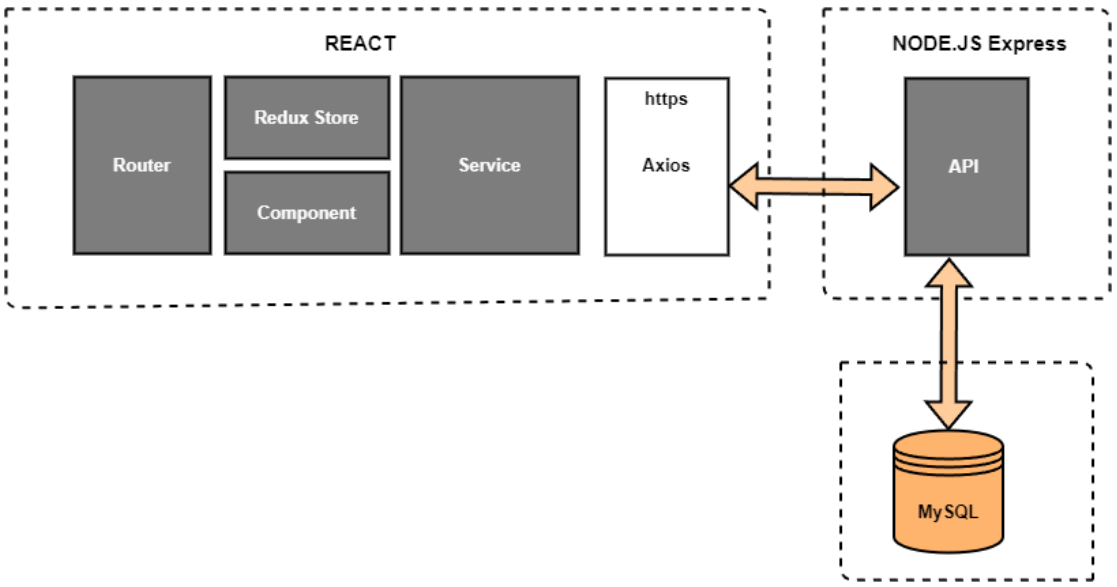

Figure 13. System Architecture Diagram

This system is divided into three sections: Frontend (Client-side), Backend (Server-side), and Database (MySQL). We used ReactJS for building the User Interface, Node.JS Express for building the Server, and MySQL to store the data of the database.

To communicate with the client site and server site via API, an intermediary library called Axios was used. The Axios library will help to send HTTPS requests and handle the HTTPS response. After retrieving the response returned by the API, the data will be saved to a separate Action called the Reducer in Redux. Then, the Router will help to move between the components of the website and between single pages without affecting the existing states.

- Frontend: For the frontend, we created many components and single pages. We used ReactJS for building the User Interface, combined with the support library for UI.

- Backend: For the functionalities and objectives of the backend component, the server will listen to the incoming requests from client-side and handle them appropriately. In Node.JS Express, you typically use and handle different HTTP methods, like GET, POST, PUT, DELETE, and combined with the API of Axios library to establish the communication channel between the server and client side.

- Node.JS servers often interact with databases to store and retrieve data. For the database, we use MySQL to store the data.

Our e-commerce website has two kinds of user sites and one server site. About two user sites, we have the user site, where users and customers can access to make purchases, and the admin site, a place for the administrator, allowing him/her to manage products, orders, user details,... and interact with the user or customer. On the other hand, we have only one server site for both user sites.

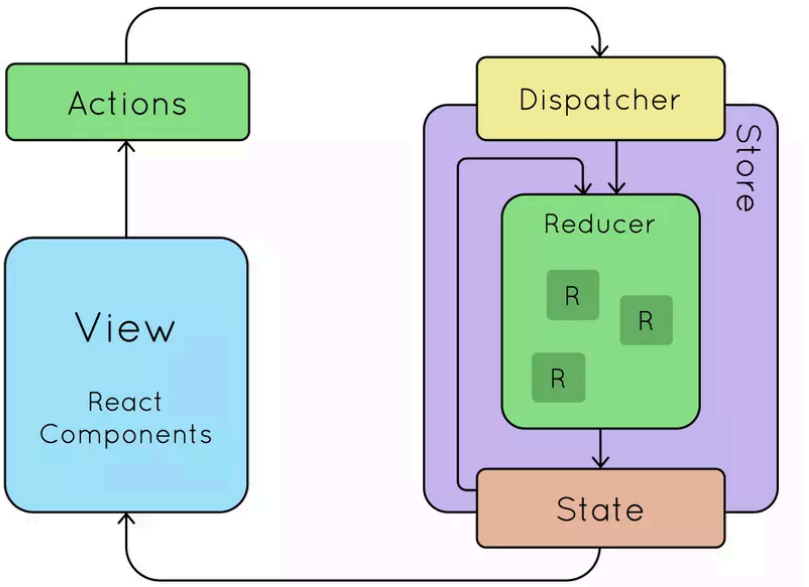

Figure 14. Redux Structure

Redux is a powerful library that is used a lot in React applications. Redux enhances the consistency and effectiveness of React apps by enabling the client-side storing of significant amounts of data. A system to handle shared states between components had to be developed since as an application's importance increases, more and more component states need to be managed.

When using Redux, a Store will be present to keep track of shared state data among components. When there is a requirement that several components use a particular value or when we wish to store a state for the entire application, we will push values to the Store. We may call the state value from the Store and use it instead of having to find the state value for each parent component separately. By sending the proper actions, which will update the modifications, we may also quickly change the values in the store.

4.3. Use Case Implementation

This section will offer a sequence diagram for the key system components.

4.3.1. Login

First, users need to click on the "Login" button. The login page will be displayed. The user will enter his/her email and password. Then, the system will check if the form has been filled out and start to validate the information. This email/password of the user will be sent as a part of the MySQL part.

The system will check the information. If the account is right and exists, the server will respond, and the system will redirect to the Home Page. And if the account is not correct (wrong email or password or not exited), the server will return to respond with the error message and the system will be alerted on the screen.

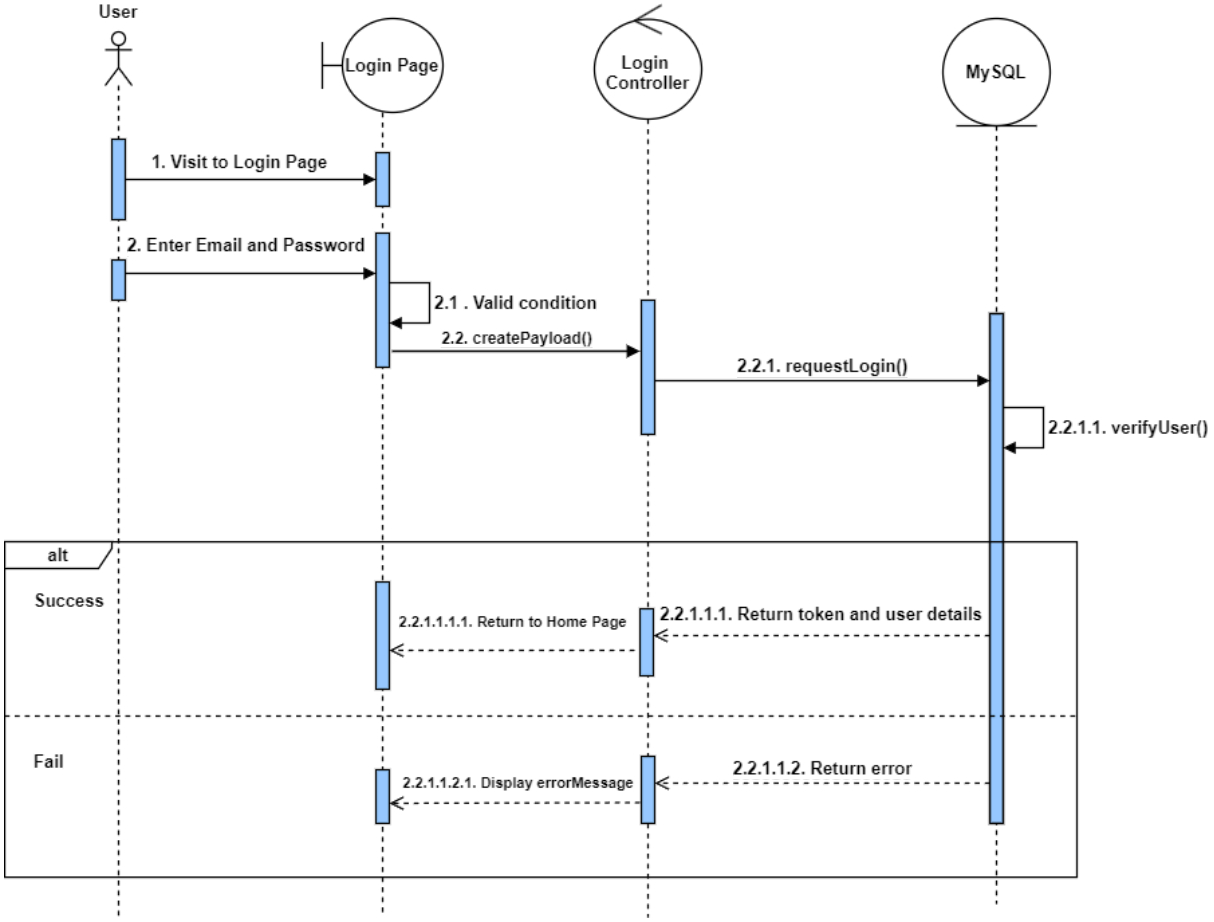

Figure 15. Login Sequence Diagram

4.3.2. Register

An unauthorized user, he/she can visit the register page. The user needs to fill in all information on the form.
After that, the system will check if the form has been filled out and start to validate the information. This information of the user will be added in MySQL. And, the system will be redirected to the Login Page.

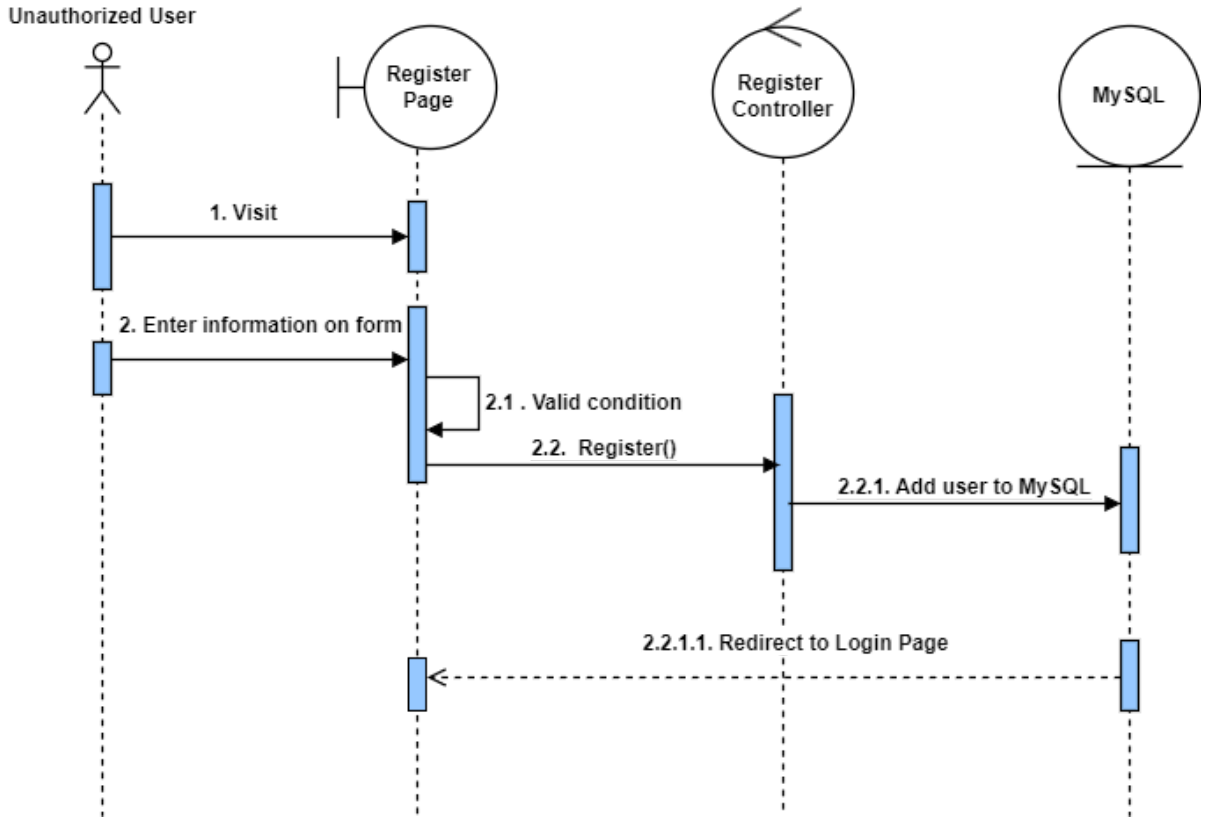

Figure 16. Register Sequence Diagram

4.3.3. Order Sequence Diagram

Users need to choose the product that they want to buy. Then, in the Order Screen, users need to fill user information and choose the shipping method. After that, the data about order will be saved to MySQL. Finally, if the order is saved successfully, the system will display a confirmation message to the browser.

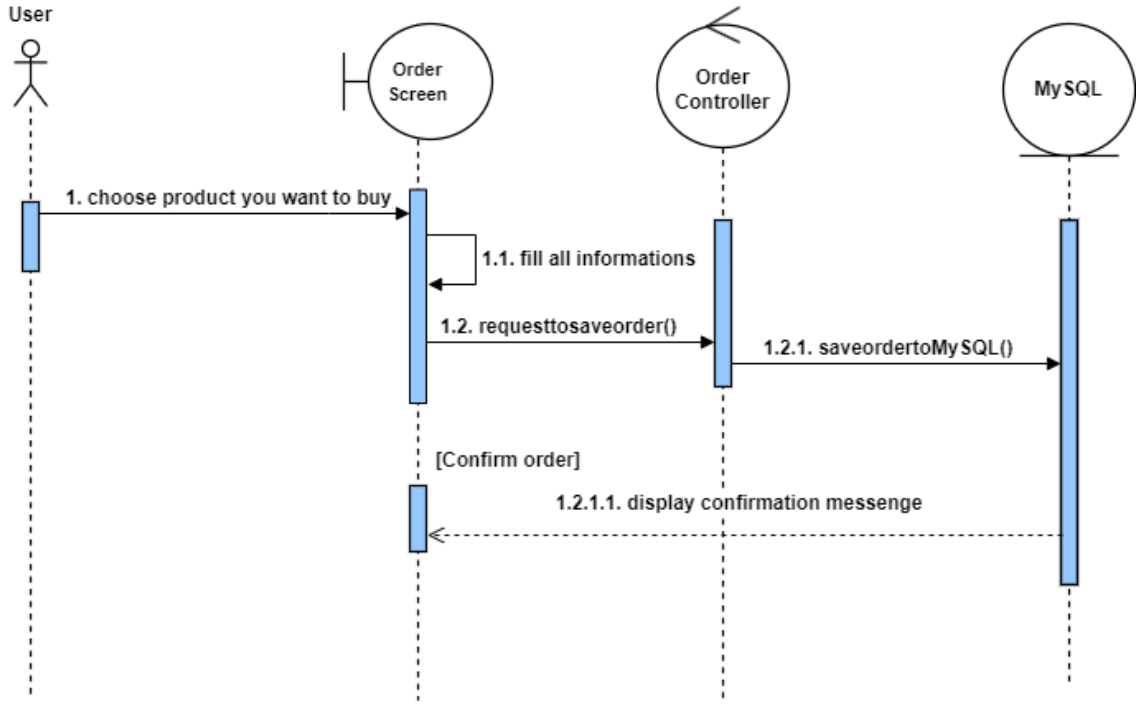

Figure 17. Order Sequence Diagram

4.3.4. View/Create/Update/Delete Product

Admin can see the product in the Administrator Page or in MySQL.
To create a product, the administrator has to press the “Create” button at the top of the website to visit the Create form. For filling in the information in the form, there are two kinds of input, it’s ‘string’ data input and ‘image’ data input.
To add ‘image’ data to MySQL, I use Multer() middleware for uploading images to the admin computer, then insert that image_name with the file path of the file image in Admin computer to the database as string type.
To update any product, the administrator has to press the “Update” button on each product to go to the Update Form. In Update Form, if the administrator wants to update what ‘string’ information, the administrator will fill in that input, then press the “Update” button at the end of each input to update that information.
To delete a product, the admin just needs to press the ”Delete” button. For deleting a product, we need to get the ID of this product and delete this product by ID.

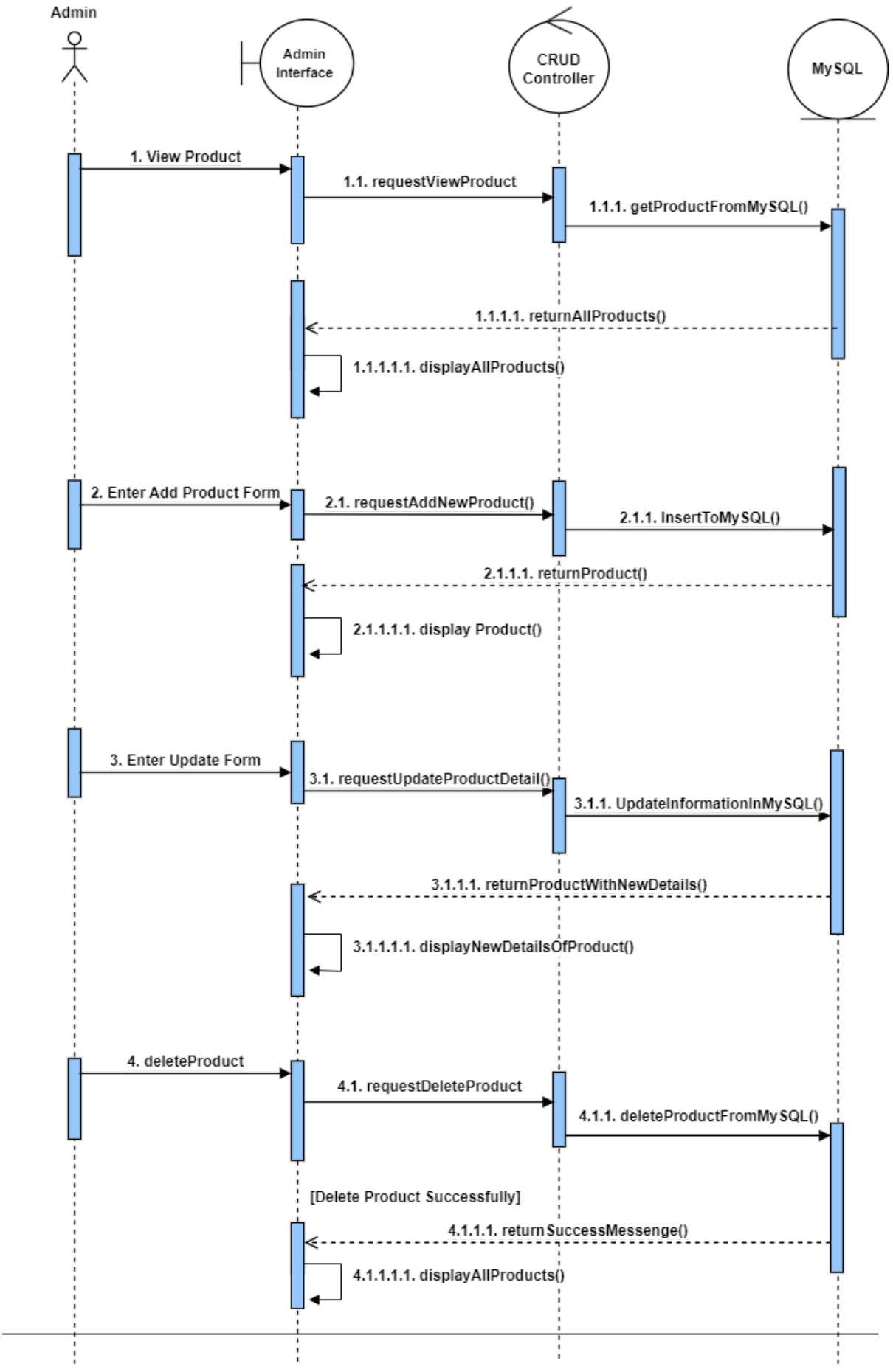
Admin
Admin Interface
CRUD Controller
MySQL
1. View Product
1.1. requestViewProduct
1.1.1. getProductFromMySQL()
1.1.1.1. returnAllProducts()
1.1.1.1.1. displayAllProducts()
2. Enter Add Product Form
2.1. requestAddNewProduct()
2.1.1. InsertToMySQL()
2.1.1.1. returnProduct()
2.1.1.1.1. display Product()
3. Enter Update Form
3.1. requestUpdateProductDetail()
3.1.1. UpdateInformationInMySQL()
3.1.1.1. returnProductWithNewDetails()
3.1.1.1.1. displayNewDetailsOfProduct()
4. deleteProduct
4.1. requestDeleteProduct
4.1.1. deleteProductFromMySQL()
[Delete Product Successfully]
4.1.1.1. returnSuccessMessenge()
4.1.1.1.1. displayAllProducts()

Figure 18. CRUD Product Sequence Diagram

4.3.5. Update User Information

To update the user's information, the user needs to press on the "setting" icon in the navbar - header of the website, to access the user update information page. And the user can change their information in that page, and then, the user's details will be updated in MySQL.

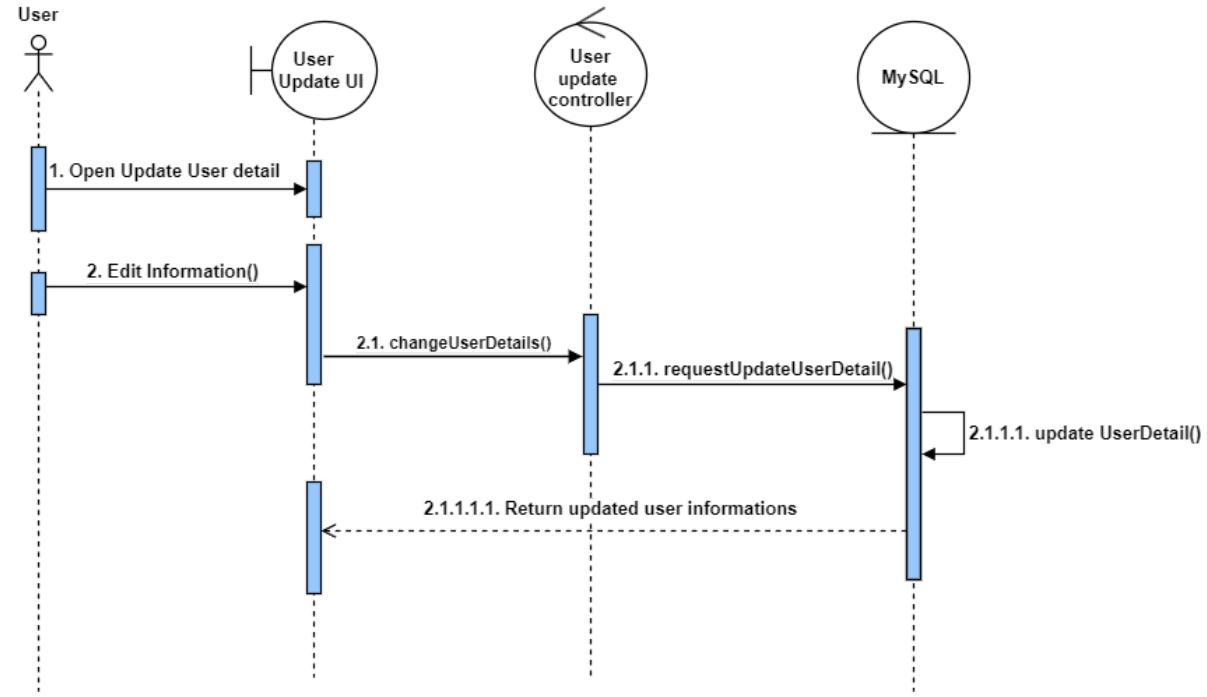

Figure 19. Update User Information Sequence Diagram

4.3.6. Notification

To view notifications, users need to login to the e-commerce website. Then, users need to go to "Notification" by pressing on the "Notification" icon on the navigation bar on the header of the website. And users can see all notifications.

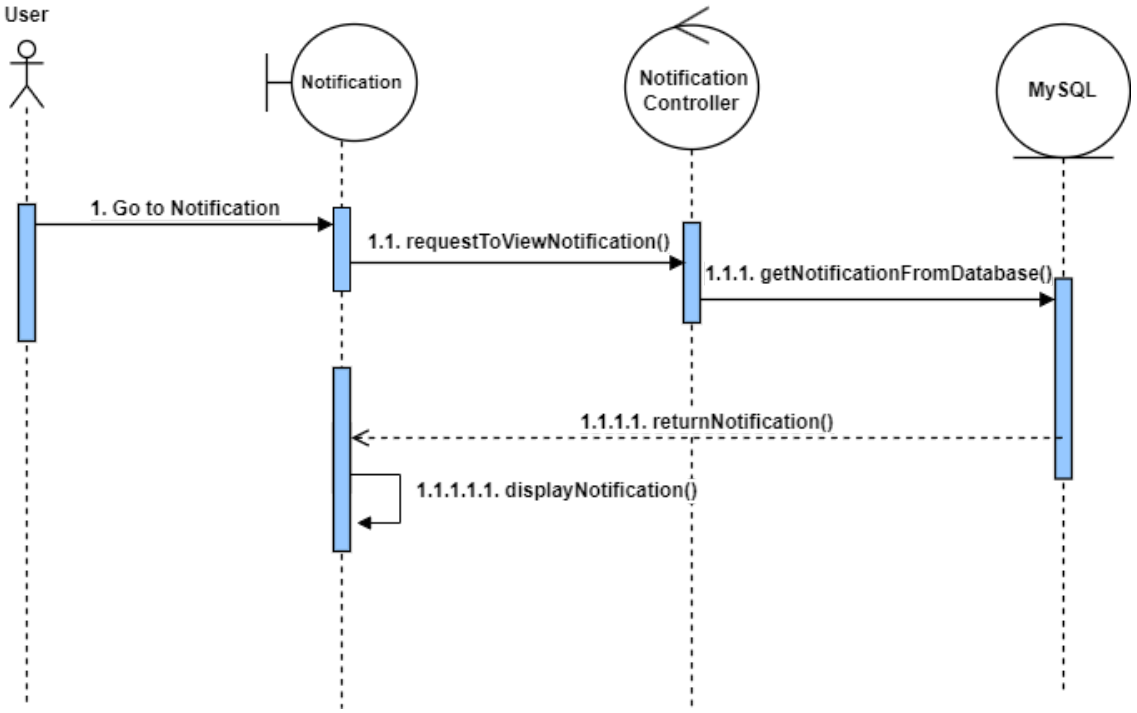

Figure 20. Notification Sequence Diagram

4.3.7. Send Notification

To send notifications to all users, the administrator needs to go to the admin website. Then, users need to enter the title and the notification. After pressing the “Send Notification” button, the notification can be stored in the database. After that, the notification can be sent to all users.

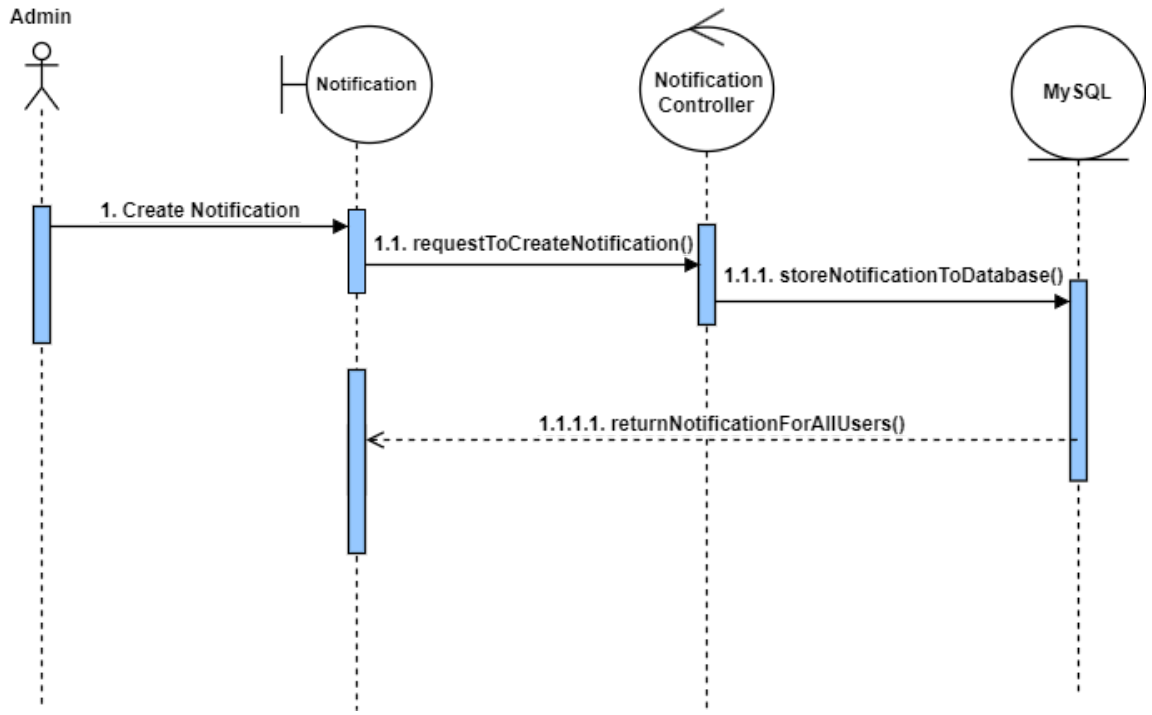

Figure 21. Send Notification Sequence Diagram

4.3.8. View Order/Purchase History

To view order/purchase history, users need to go to the order history page. They will see the orders they have placed and successfully received before; the products and orders they are placing and in the process of being delivered. When the order is in the process of being delivered, users can see the status of this order and the status of the shipping update.

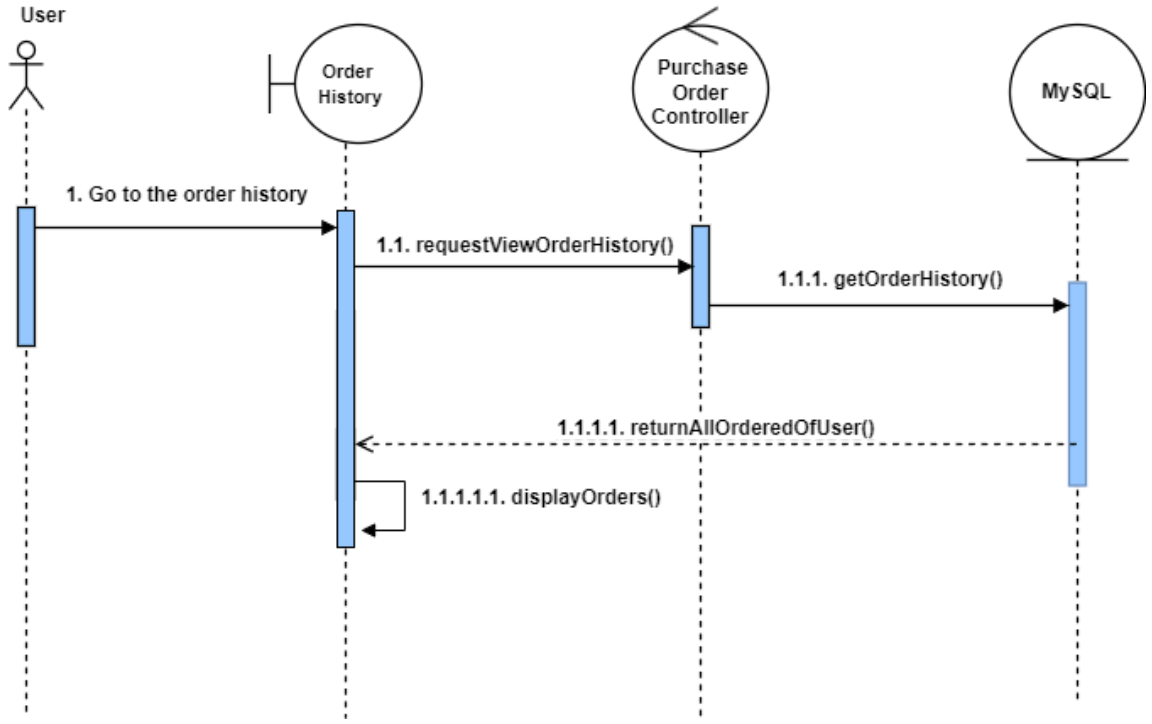

Figure 22. View Order/Purchase History Sequence Diagram

4.3.9. Search

To search products by name on our Eco Shop website, the user has to access the Search bar, and enter the name of the product that he/she wants to search. Then, the system will send the request to the database. And, this product will be displayed in the User Interface.

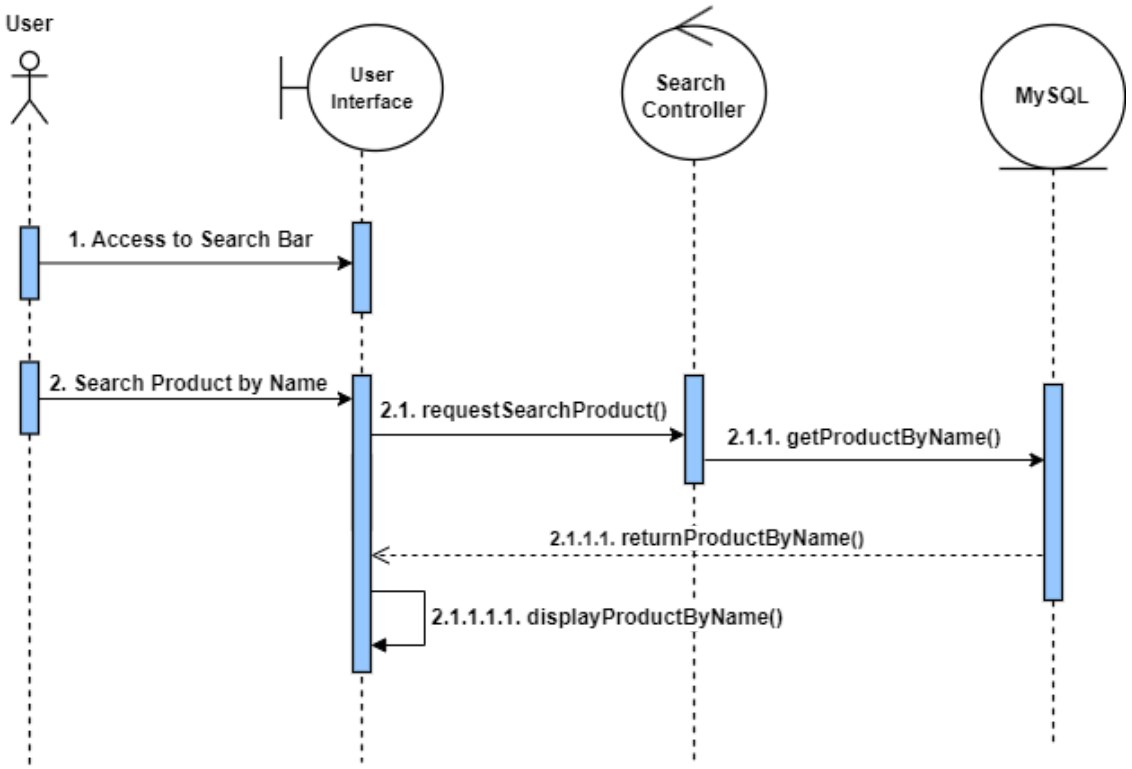

Figure 23. Search Sequence Diagram

4.4. Database Design

In this project, we are using MySQL to manage all the functionalities and features of the website application.

4.4.1. Database Diagram

This is database design, which contains all database structures, relationship between them, information of each table and data types of individual fields.

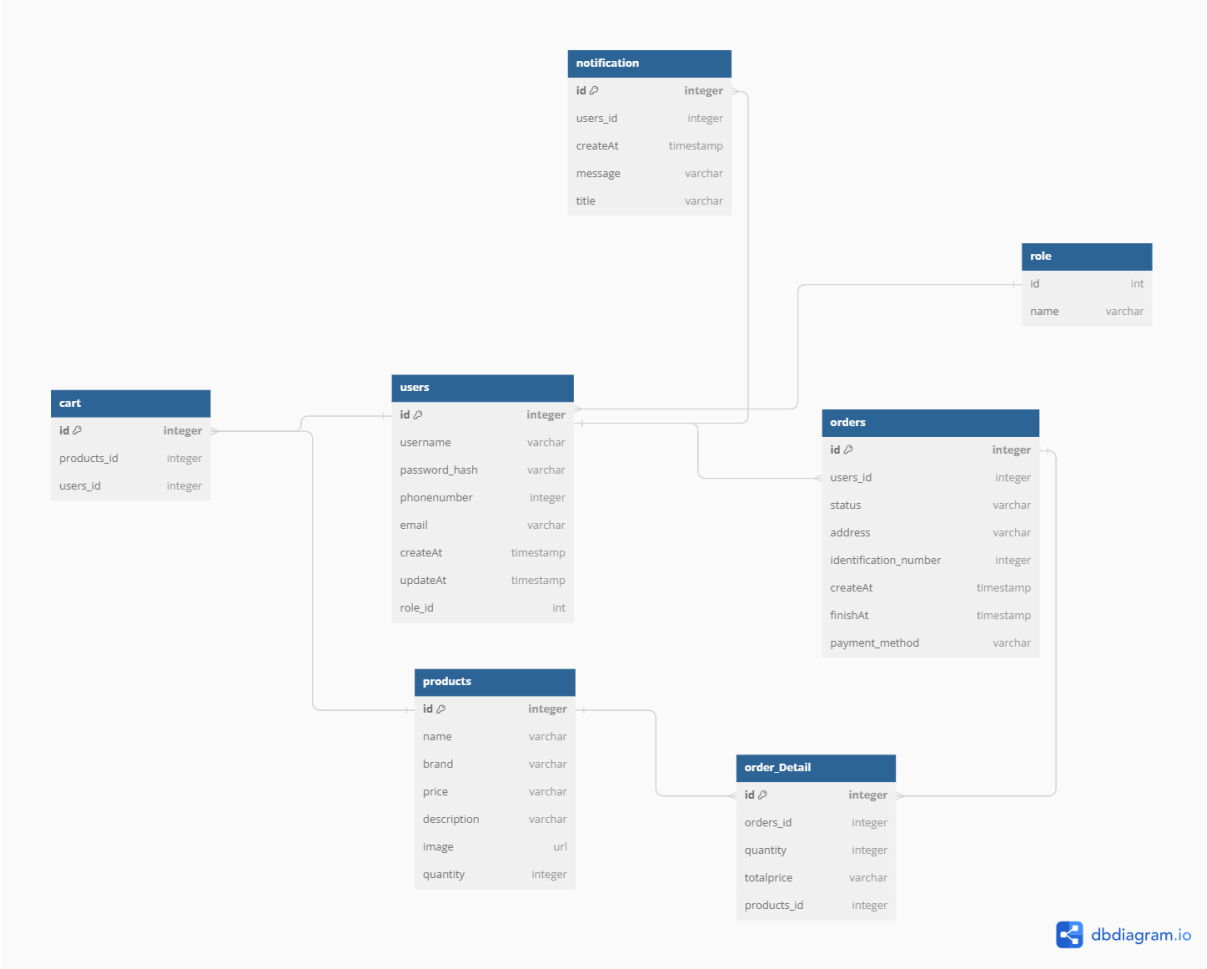

Figure 24. Database Diagram

4.4.2. MySQL Tables

The tables below are the descriptions of table data in MySQL for our project. These tables use the concept of a relational database and are used to store, retrieve, and manipulate data.

User					
	Attribute	Data Type	Constraint	Description	Example

1	ID	int(11)	PK	ID of a user (auto Increment)	1
2	username	varchar(30)		username of user	Nguyễn Văn A
3	phonenumber	varchar(15)		phonenumber of user	0123456789
4	email	varchar(30)		email of user	NVA@gmail.com
5	password	varchar(30)		password of user	123456
6	role_id	int(11)		role of user	user

Table 1. User Information

The User Information table stores all the information from the user, such as username, phonenumber, email,...

Product_management					
	Attribute	Data Type	Constraint	Description	Example
1	ID	int(11)	PK	ID of a product (auto Increment)	1
2	Name	varchar(30)		name of product	Bamboo Sticks
3	Brand	varchar(15)		brand of product	Đồ Tre
4	Price	varchar(30)		price of product	20.000
5	Description	varchar(30)		description of product	Đây là đồ tre việt
6	image	varchar(100)		url of image	http://localhost:8081/….
7	quantity	int(11)		quantity of product	3
8	category_id	int(11)		id of category table	2

Table 2. Product Information

The Product Information table stores all the information of the product, such as Name, Brand, Description,...

Order_items					
	Attribute	Data Type	Constraint	Description	Example
1	ID	int(11)	PK	ID of an order item (auto Increment)	1
2	Orders_ID	varchar(30)		id of order	2
3	product_id	varchar(15)		id of product	5
4	price	varchar(30)		price of each product in the order	20.000
5	quantity	varchar(30)		description of product	2

Table 3. Item in Order Information

The Item in Order Information table stores the item in each order, each order can have many items in order, such as price, product_id, quantity,...

orders					
	Attribute	Data Type	Constraint	Description	Example
1	ordersID	int(11)	PK	ID of an order (auto Increament)	1
2	CustomerName	varchar(50)		Name of customer	Nguyễn Văn A
3	CustomerEmail	varchar(50)		Email of customer	NVA@gmail.com
4	CustomerPhonenumber	int(20)		Phonenumber of customer	0123456789
5	CustomerAddress	varchar(30)		Address of customer	18-Hoàng Quốc Việt
6	CustomerIDNum	varchar(100)		Identification number of customer	12345678

7	create_at	timestamp(6)		time of placing order	2023-09-05 20:58:10
8	update_at	timestamp(6)		time to update order	2023-09-07 01:10:45
9	status	varchar(20)		status of order	Delivered
10	Paymentmethod	varchar(20)		payment method of shipping	Quick Payment
11	TotalPrice	varchar(11)		total order value	197

Table 4. Order Information

The Order Information table stores all the information of order from the user/customer, such as CustomerName, CustomerIDNum, PaymentMethod,...

Notification					
	Attribute	Data Type	Constraint	Description	Example
1	ID	int(11)	PK	ID of notification (auto Increment)	1
2	users_id	int(11)		ID of the user	3
3	create_at	timestamp(6)		time of creating notification	2023-09-05 20:58:10
4	message	varchar(50)		message	Product is being delivered …
5	title	varchar(20)		title of notification	Your order …

Table 5. Notification Information

The Notification Information table stores all the information of the notification, which is sent to all users, such as message, title,...

5. Result and Discussion

5.1. Result

For this project, we have completed features:
- **Product Functions:** Enables users to view the products.
- **Account Registration:** Enables users to sign up to the website.
- **Account Login/Logout:** Enables users to login and logout from the website.
- **Search/ Sort:** The search function enables users to search products by name, and sort products by price.
- **Add to Shopping Cart/ Delete from Shopping Cart:** The add to shopping cart function enables users to temporarily save “Eco” products in a list that are being considered for purchase. The delete from shopping cart function enables users to remove any unwanted “Eco” product from the cart.
- **Checkout:** Enables users to purchase “Eco” products online securely.
- **Update Account Information:** Enables current account members to edit their stored information.
- **Account Purchase History:** Enables account members to see previous purchases made under their username, and helps users keep track of their orders.
- **Notification**: Enables members to get notified of order status and the update on shipping status.
- **Product management**: Enables administrators to manage the products.
- **Order management:** Enables administrators to manage the order of users.
- **View user information function**: Enables administrators to view the user information and the list of users.

5.2. Difficulties and Problems

Lack of experience: Without sufficient knowledge, it can be challenging to connect project objectives to business requirements. Understanding the system's complexity and making sure it meets the unique requirements of the product takes additional time and effort.

Project Time: The project was completed by me at the same time as a new project started at my company, so I had to find a way to arrange a reasonable time to complete both well. The limited time is quite challenging for me, but now, I feel very happy with what knowledge I have achieved.

6. Conclusions and Future Works

6.1. Conclusion

To sum up, we have successfully built almost all essential features for a typical E-commerce website and features that we already desired. I have tried my best to design and create a friendly and convenient user interface that users can easily interact with. Moreover, I feel very satisfied with the website because I always want to create a website specializing in selling "Eco-friendly" goods.
According to the use case diagram I have designed, I have successfully imported all add those features to the project. But also, we missed some required features for an E-commerce website, like a wish list, an auto chat bot, chat with admin, and a Search filter,...

6.2. Future Work

To further expand upon this project, here are some of the features that could be beneficial to the website.
For users, I want to successfully forget password function, wishlist function, setting management for registered users, multiple languages, chatbot, product reviews and ratings, and complete the payment process.
For admin, I want to successfully inventory control, Payment and Financial Management, Promotions, and Marketing.
Moreover, I really want to write APIs for the backend and build a mobile version for the e-commerce website.

REFERENCE

[1] Ant Design. [Online]. Available: https://ant.design/

[2] Axios documentation. [Online]. Available: https://www.npmjs.com/package/axios

[3] Client-server model. [Online]. Available: https://en.wikipedia.org/wiki/Client%E2%80%93server_model

[4] Firebase documentation. [Online]. Available: https://firebase.google.com/docs?

authuser=0

[5] Functional and Non-Functional Requirements of Online Shopping System [Online]. Available: https://elogic.co/blog/functional-and-non-functional-requirements-for-ecommerce-websites/

[6] Material UI [Online]. Available: https://mui.com/

[7] ReactJS documentation - Getting started with React [Online]. Available: https://developer.mozilla.org/en-US/docs/Learn/Tools_and_testing/Client-side_JavaScript_frameworks/React_getting_started

[8] React-router-dom documentation. [Online]. Available: https://www.npmjs.com/package/react-router-dom

[9] Redux documentation. [Online]. Available: https://redux.js.org/

[10] Styled-Components documentation. [Online]. Available: https://www.npmjs.com/package/styled-components

[11] node-google-oauth2 documentation. [Online]. Available: https://www.npmjs.com/package/google-oauth2