EU ENGINEERING FACULTY

EGE UNIVERSITY

BACHELOR THESIS

E-COMMERCE APPLICATION

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Kibru KUTURE

Supervisor : Assoc. Prof. Dr. Şebnem BORA

Bachelor of Science in Computer Engineering

Date of Submission : 18.02.2022

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ABSTRACT

E-COMMERCE APPLICATION

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The main goal of this thesis is to develop an online shopping application, which offers various product categories such as cosmetics, clothing, books, electronics, etc. This venture allows viewing diverse items available, empowers enrolled clients to purchase desired items instantly. This venture gives a simple and straightforward access to Administrators and Store Managers to see orders placed by the clients using Pay Afterward and Instant Pay alternatives.

In this project, to develop such an application, a number of appropriate technologies and platforms must be considered, understood and utilized. As front-end technologies, HTML, CSS, JS, and React JS have been used. For the backend, utilities such as Node JS, Express JS, and Web Socket. As for database, firebase and firestore have been utilized.

Usually a venture with the objective to develop a fundamental application where a consumer is provided with a shopping cart, to view items, and meaningful categories application.

This document will talk about each of the fundamental technologies used to form, develop and execute such an e-commerce application.

Keywords: E-commerce, Online Shopping, Customer, User, HTML, CSS, JS, MySQL

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In completing this graduation thesis, we have been blessed to have guidance, support and encouragement from numerous valuable individuals. We would like to acknowledge them for their cooperation.

First and greatest profoundly appreciative and thankful to our supervisor Assoc. Prof. Dr. Şebnem Bora, for her superb guidance in our thesis process. We would also like to thank Prof. Dr. Aylın Kantarcı, our thesis committee member, who showed immense patience and understanding throughout the project presentation.

Finally, we would like to dedicate this thesis to our parents, our friends and dear professors, for their love, encouragement and support throughout the graduation thesis.

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Index Abbreviations

HTML	Hyper Text Markup Language
CSS	Cascading Style Sheets
JS	Javascript
UI	User Interface
HTTP	Hyper Text Transfer Protocol
WWW	World Wide Web
IDE	Integrated Development Environment
Adobe XD	Adobe Experience Design
E-Commerce	Electronic Commerce
CMS	Content Management System

1. Introduction

In this project, we are developing an e-commerce application that lets users/customers shop for their required products and make these products delivered to their specific addresses. This application offers various product categories such as cosmetics, clothing, books, electronics, etc.

Some of the tasks that customers can do are:

- Set and update their personal information such as email, address details, and payment information
- Search, view, and filter the products
- Add their desired products into their shopping cart
- Benefit from coupons and discounts (If any)
- Mark their favourite products
- Place their orders
- Track their orders
- Comment on their orders after they are delivered
- Return their orders.

Some of the tasks that Market/Store Managers can do are listed below:

- Set/update a physical store location
- Define/update new products for their marketplace
- Keep track of the stock
- Define/update coupons and discounts

- Fulfill the orders
- View the comments regarding their products
- Get statistics and reports about orders
- Get technical support

Ultimately, our developed e-commerce application will be accessible from different platforms such as web browsers, smartphones, tablets, etc (It will be responsive).

2. Literature Review

In this project, first, we have observed the existing relevant platforms and applications such as Amazon, Ali Express, and Wish. In addition, we have reviewed some local platforms like Trendyol and Hepsiburada. Furthermore, to obtain a plain idea about what we are going to develop, we have dived into some brand-specific online shopping websites such as Apple, Decathlon, Media Markt, etc.

Then we have picked some effective and bold features from each of those platforms based on our own observations. Since the given time, our technical ability and experience are not adequate; it's obvious that we are not able to develop a perfect and fully functional application. However, we will try our best to use our knowledge, to put what we have learned into practice.

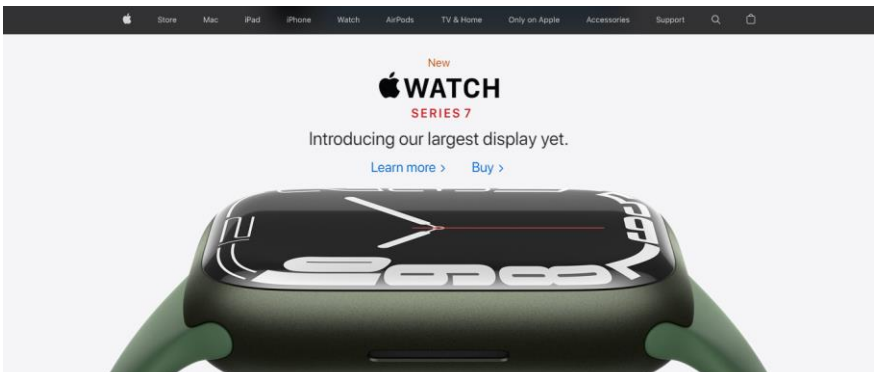


Figure 1 Apple online shopping webpage.

3. Requirement Specification and Analysis

In this section, the requirements specification phase is going to be discussed, the necessary viewpoints have been identified, some functional and non-functional requirements have been listed, several use cases have been determined for main scenarios, and the domain model have been drawn using the UML diagram.

3.1. Viewpoints

A viewpoint could be a way of organizing the prerequisites for a software package, based on a few point of view such as an end-user point of view or a manager's perspective.Viewpoints can be utilized as a way of classifying diverse sorts of stakeholder and other sources of requirements.

3.1.1. Identification of Viewpoints

There are three generic sorts of viewpoint:

Interactor Viewpoints

- Customer – The user role which can search and buy the products.
- Market/ Store Manager – The user role which sells, define, update, and fulfill the orders.
- System Administrator – The user role, which have access to all the system and maintain the server.

Indirect Viewpoints

- Courier / Cargo Companies
    - Deal with the shipment of orders.
    - May demand access to customer’s details such as their name, address, invoice…

- Payment System
    - Covers the payment process.
    - Control the transactions
    - Can accept/reject the order depending on customer's balance or coupon.

- Stock Market
    - The increase / decrease in the number of stocks can affect the system

Domain Viewpoints Requirements

- UI Standards
    - Interface rules that abstract the user from complex code

- Ministry of Commerce and Finance
    - Rules that contain all the restrictions for each product (Customs affairs, tax acts…)

3.1.2. Viewpoint Hierarchy Diagram

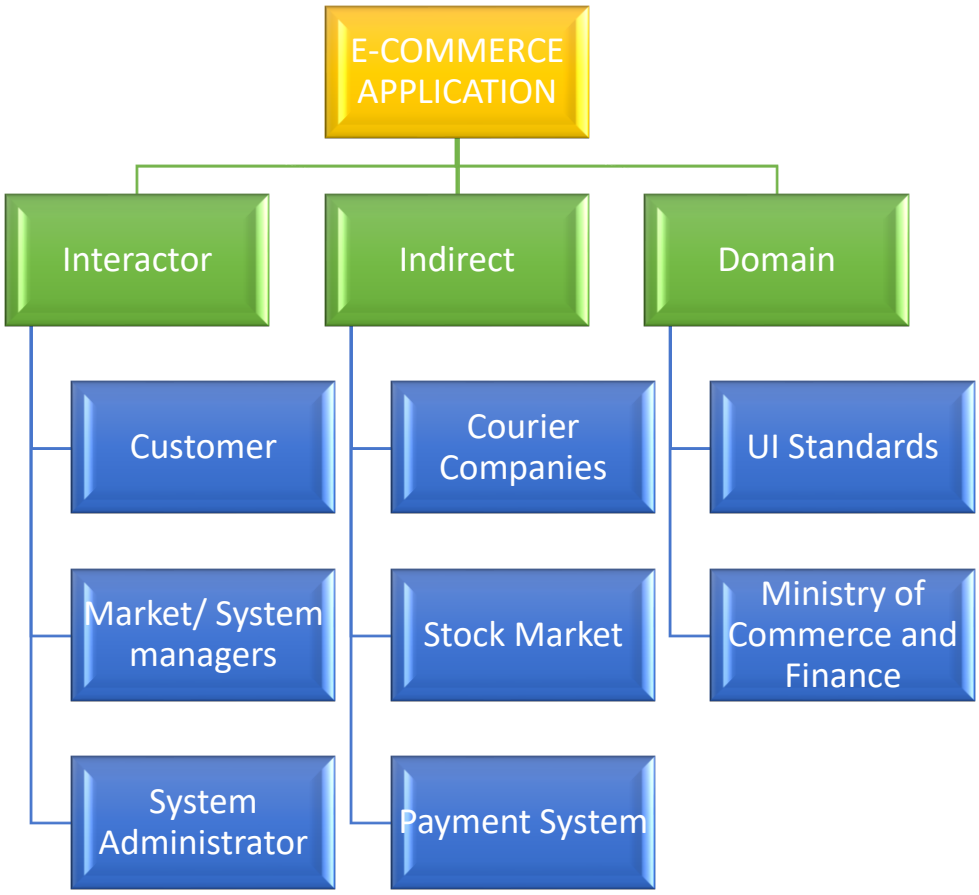


Figure 2 Viewpoint Hierarchy Diagram.

3.2. Requirements Classification (Considering Functionality)

Here, some functional, non-functional, and domain requirements are going to be discussed and listed below.

3.2.1. Functional requirements

General system requirements are as follow:

- The system should provide a login UI that only an authorized user can access
- The system should provide high uptime speed
- The system should provide mobile first / responsive UI
- The system should provide personalization
- Accessibility should be a standard
- The system should have a well-designed shopping cart
- The system should assure that a customer's data is safe
- The system should be built with the capability of Search and Filter.
- The system should be capable of promoting new products/campaigns.

Customer related requirements are as follow:

- Customers can log into their profiles with login credentials
- Customers can change password
- Customers can change their personal information and modify their profiles

- Customers can place an order/ orders
- Customers can cancel their order and have right to get their money back
- Customers can talk to customer-help-agent online and get help.

Store manager related requirements are as follow:

- Store managers can log into their profiles with login credentials
- Store managers can change password
- Store managers can change their personal information and modify their profiles
- Store managers can store products, put price tag , and describe products in the system
- Store managers can put the physical location of stores
- Store managers can access customers information like names and their addresses
- Store managers are capable of contacting carrier companies.

System administrator related requirements are as follow:

- The system administrator has full rights to the E-COMMERCE APPLICATION.
- The system administrator can edit, change, insert and delete the informations on E-COMMERCE APPLICATION.

3.2.2. Non-functional requirements

- System should be efficient, consistent, secure, user friendly reliable and robust. The system administrator can edit, change, insert and delete the information on E-COMMERCE APPLICATION.

- The software must support the use of multiple users at the same time.

- When system goes down, it shall be recovered in 2.5 seconds.

- The system should keep personal information from any threats.

- Response time of the system shall not exceed 2 seconds.

- The users ID must be unique, and users' passwords should be stored with the SHA 256 encryption algorithm There should only be three account roles (Customer, Store manager and System Admin)..

- The system should support all device types.

3.2.3. Domain requirements

- The system should comply with General Data Protection Regulation

- The system should comply with the rules put forward by the ministry of finance and commerce, etc.

3.3. Requirements Classification (Considering Lifetime)

Requirements advancement amid the re-engineering process and after a system has gone into service is unavoidable. Developing software requirements focuses attention on software capabilities, business objectives and other business systems. As the requirements definitions are developed, you normally develop a better understanding of users' needs. This feeds information back to the user who may then propose a change to the requirements.

Hence, this may take several years to specify and develop a large system. Over that time, the system's environment and the business objectives change, and the requirements evolve to reflect this.

From an evolution perspective, requirements fall into two classes:

3.3.1. Volatile Requirements

These are requirements that are likely to change during the system development process or after the system has been become operational. For example, in a e-commerce application, data, cookie and privacy requirements (because they are subject to national and international law which are always evolving).

- Most non-functional requirements are likely to change and can be considered as volatile requirements.
- Users' passwords should be stored with the SHA-2 encryption algorithm (encryption algorithm may change).
- User Interface is likely to change with the system administrator choosing more modern UIs to keep customers engaged.
- Implementation requirements (organization might demand to change development process and development environment).
- Data usage, cookie and privacy agreements are likely to change with evolving national and international laws.

- The maximum response time for any user request (it may need to be faster)

3.3.2. Enduring Requirements

These are relatively stable requirements that derive from the core activity of the organization, and which relate directly to the domain of the system. For example, in a e-commerce application, there will always be requirements concerned with system administrators, sellers, payment solutions, couriers and customers.

Core functional requirements are unlikely to change and can be considered as enduring requirements.

- System administrators can manage customers, sellers, payment systems, couriers, and all related data. Managing may include on-boarding to system, management of data, off-boarding from system, defining relationship between on-boarders, managing interfaces, and setting quality standards.

- The system permissions for each user should be different.

- The system must have a memory capacity and bandwidth that supports all registered users.

- The system should be open 24/7.

- The system software must use a secure algorithm to ensure safety.

- Sellers can fulfill orders, set/update a physical store location, define/update new products, keep track of the stock, define/update coupons and discounts and get statistics & reports about orders.

- The system permissions for each user should be different.

- Customers can search and filter products, add desired products into their shopping cart, benefit from coupons and discounts, specify some of the products as their favorites, set and update their personal information such as address details and payment information and place their order.

- Couriers can receive information about orders that they can fulfill and gain access to customers' addresses.

- Payment solutions can get information regarding the sellers, customers, and system administrator's bank/payment details.

3.4. Fully Dressed Use Cases of Main Scenarios

We have defined some use cases such as view products, customer registration, making purchase, delivery processing, payment processing, returning items, flash/discounts, notification, etc. One of those use cases are explained in detail in below.

3.4.1. View Products

Use Case Name: view products

Scope: E-commerce application (search Bar)

Level: User goal

Primarily Actor: Customer

Stakeholder Interests: Customer wants to search, filter products

Precondition: Customer doesn't need to be registered or logged in as products can be viewed by any customer.

postcondition: customer finds details regarding his desired products.

Main Scenario:

1. The customer starts for looking a product.

2. Customer enters the search product parameters and request a search product.

3. The system checks the product through product category in database.

4. The system sets / displays the product with details (including price / shipment date).

5. The customer selects the product.

6. The system displays add to card option.

7. The customer either adds or terminates the search.

Exceptions:

- At any time, system fails:
    - The system restarts again.

Ex-1 customer types of invalid product name.

- System issues an error message.

Ex-2 the item isn’t available due to shortage.

- System issues and message to customer and asks to notify if the item is soon available.

- customer terminates the process.

4. Design Phase

We have collected the requirements specification regarding our project. Let's move onto the next phase.

In this section, we will define the architectural model; then we will determine and explain the main components and subsystems, and the relationships between them which all the details will be included in our final report. E-commerce Application is based on the client-server architecture in which the client can be an application, which uses a graphical user interface that sends requests to a server for certain services and the server is the provider of the services requested by the client. That's the reason why we preferred to use client-server architecture model, apart from this, client-server architecture is common choice for this type of project.

You can observe the block diagram below, demonstrating the architectural model:

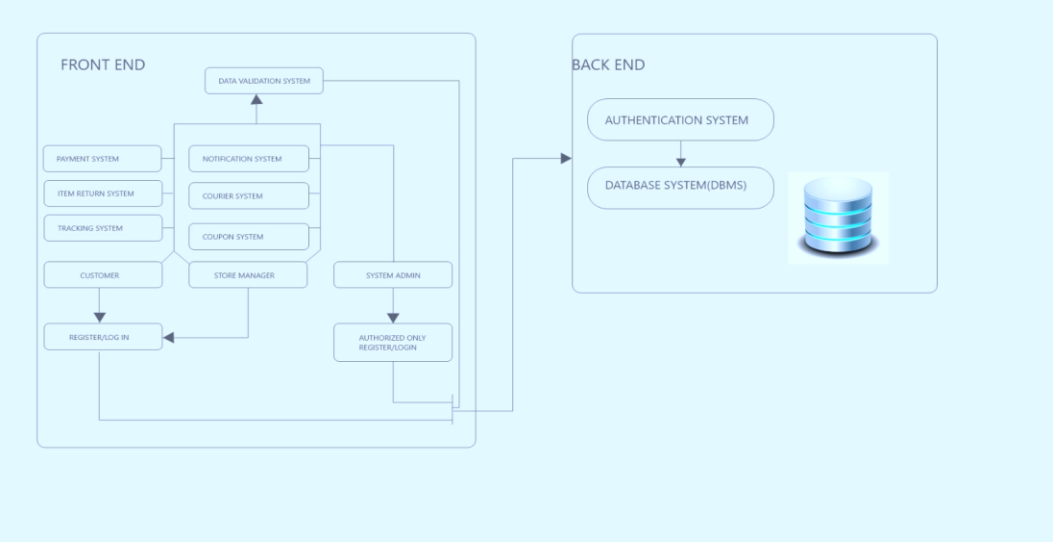


Figure 3 Architectural Model as a Block Diagram

User Interface Design

In this project, Adobe XD features have been used as a prototyping tool for creating prototypes and screen designs. Some examples of our work have been mentioned below, which some prototypes can be found for webpages such as home, veiw, orders, sign-in, sign-up, review, payment, return, etc.

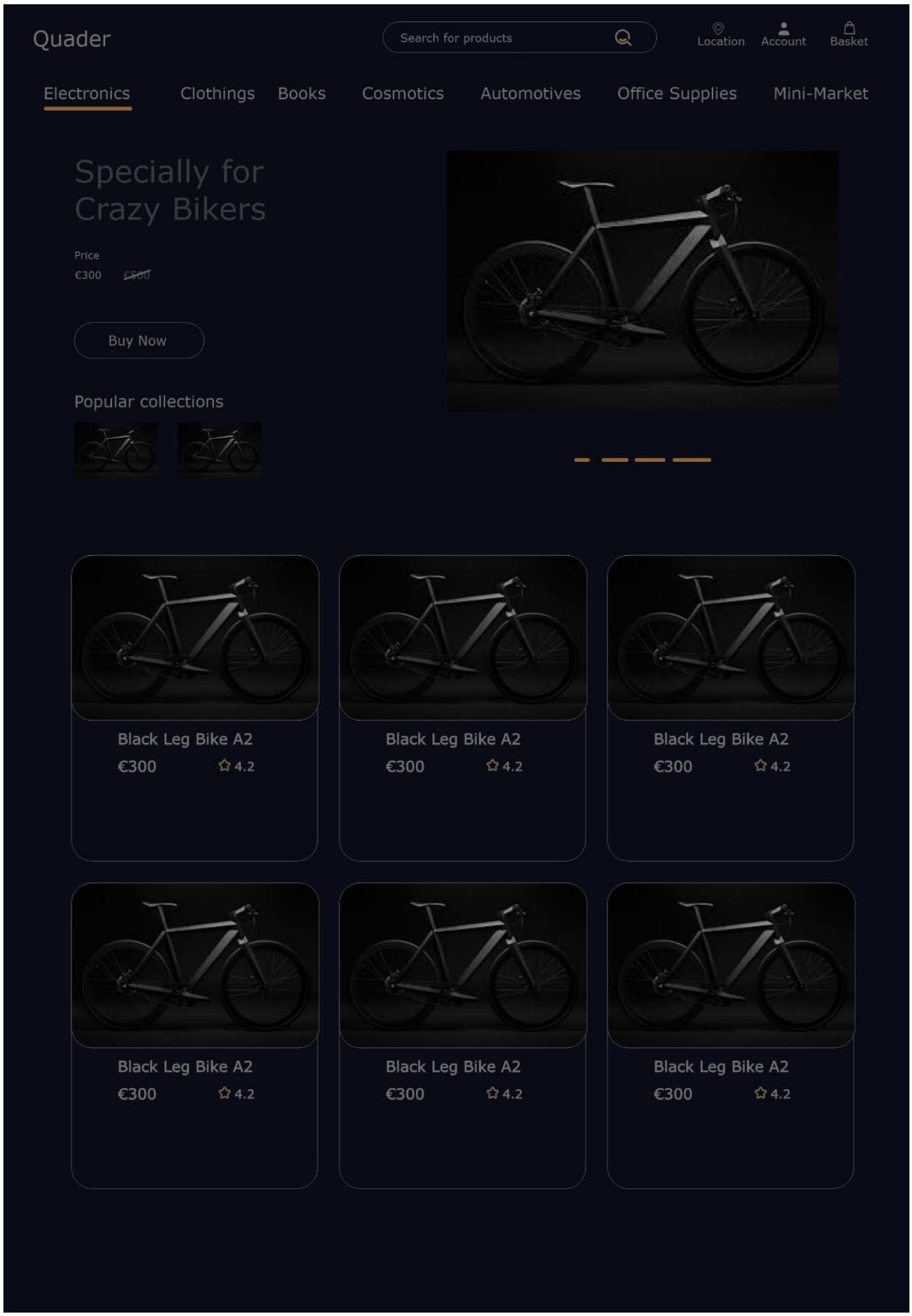
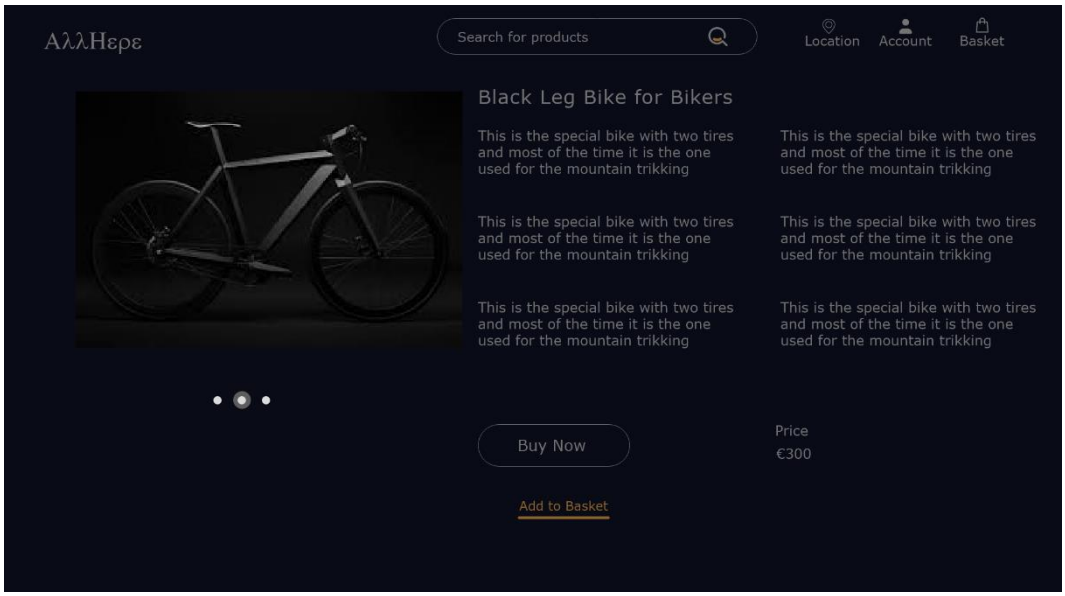


Figure 4 Landing page / home page.



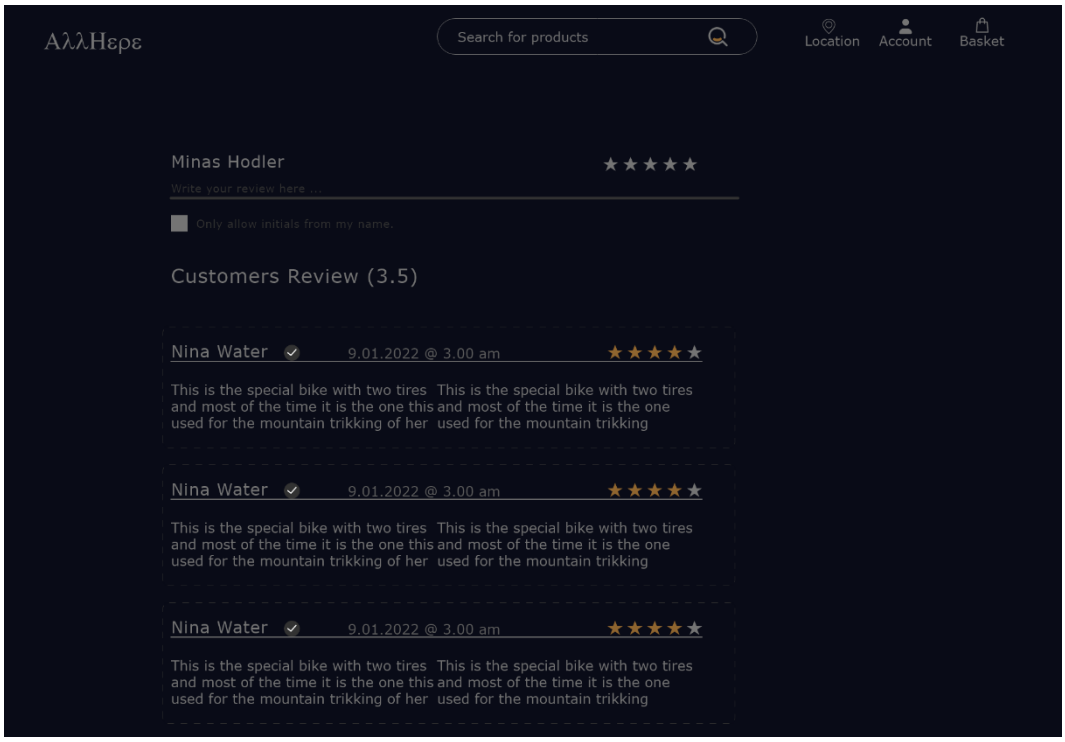


Figure 5 View Product and Rating Pages

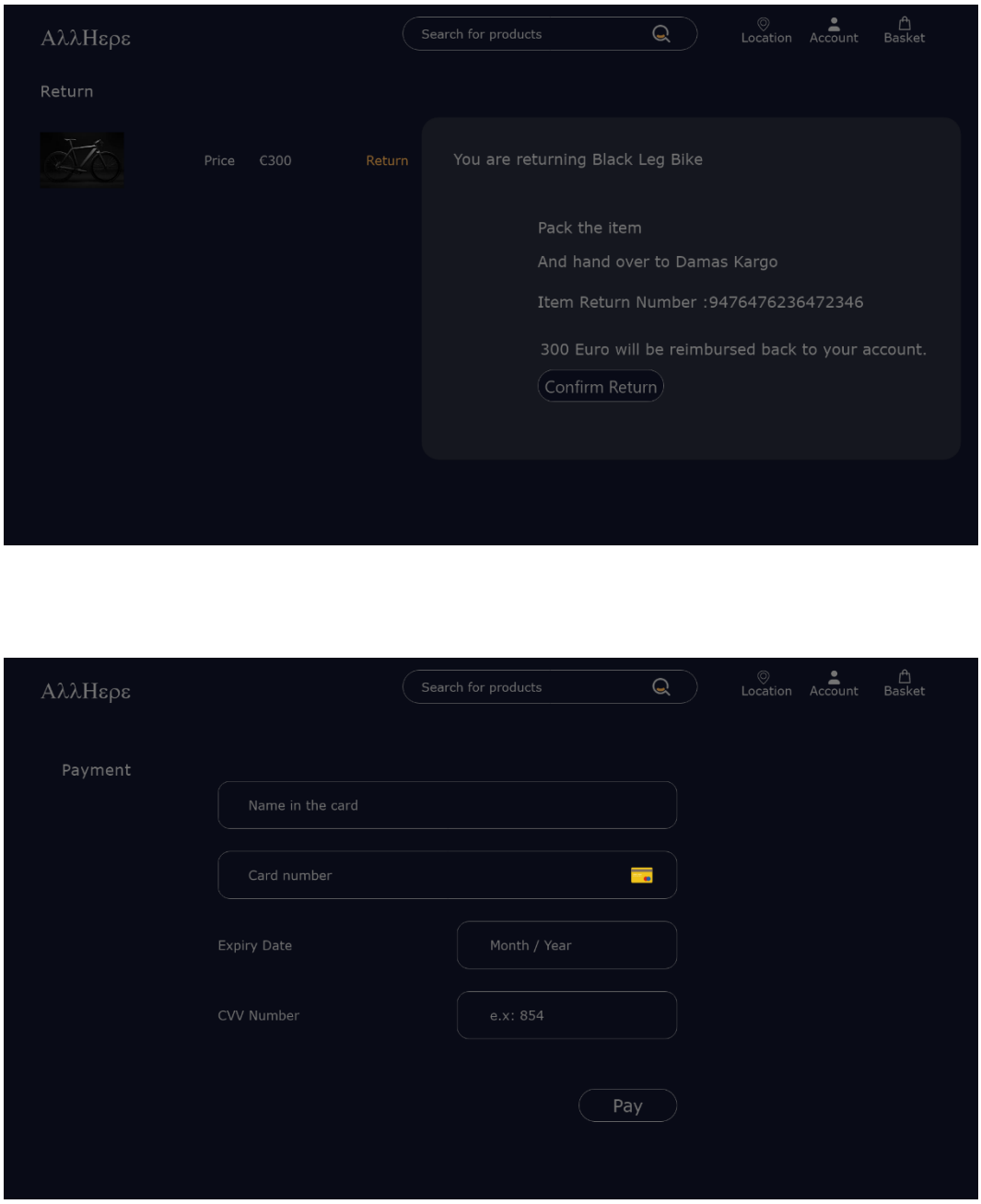


Figure 6 Return and Payment Pages

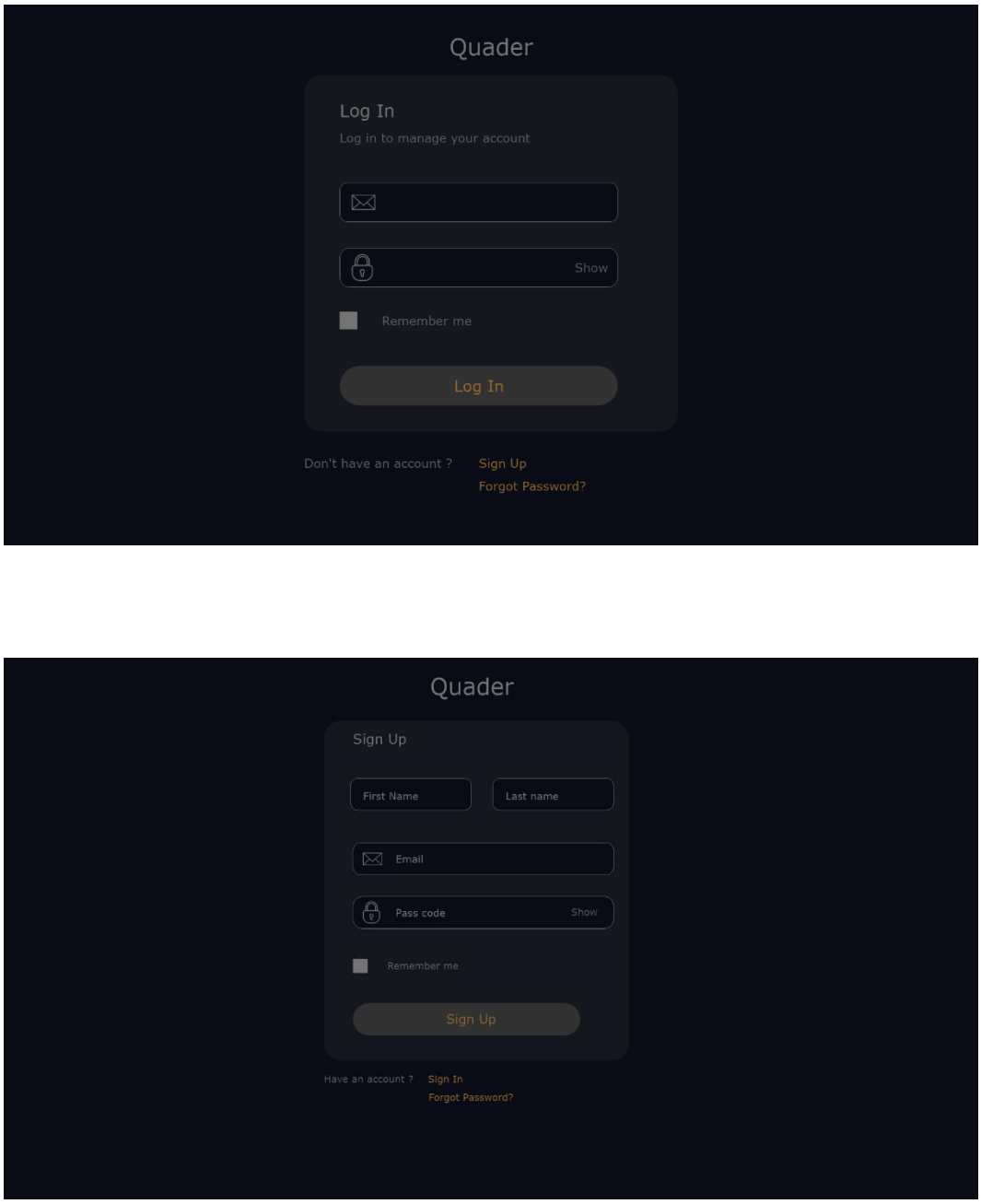


Figure 7 Log in and Sign-Up Pages

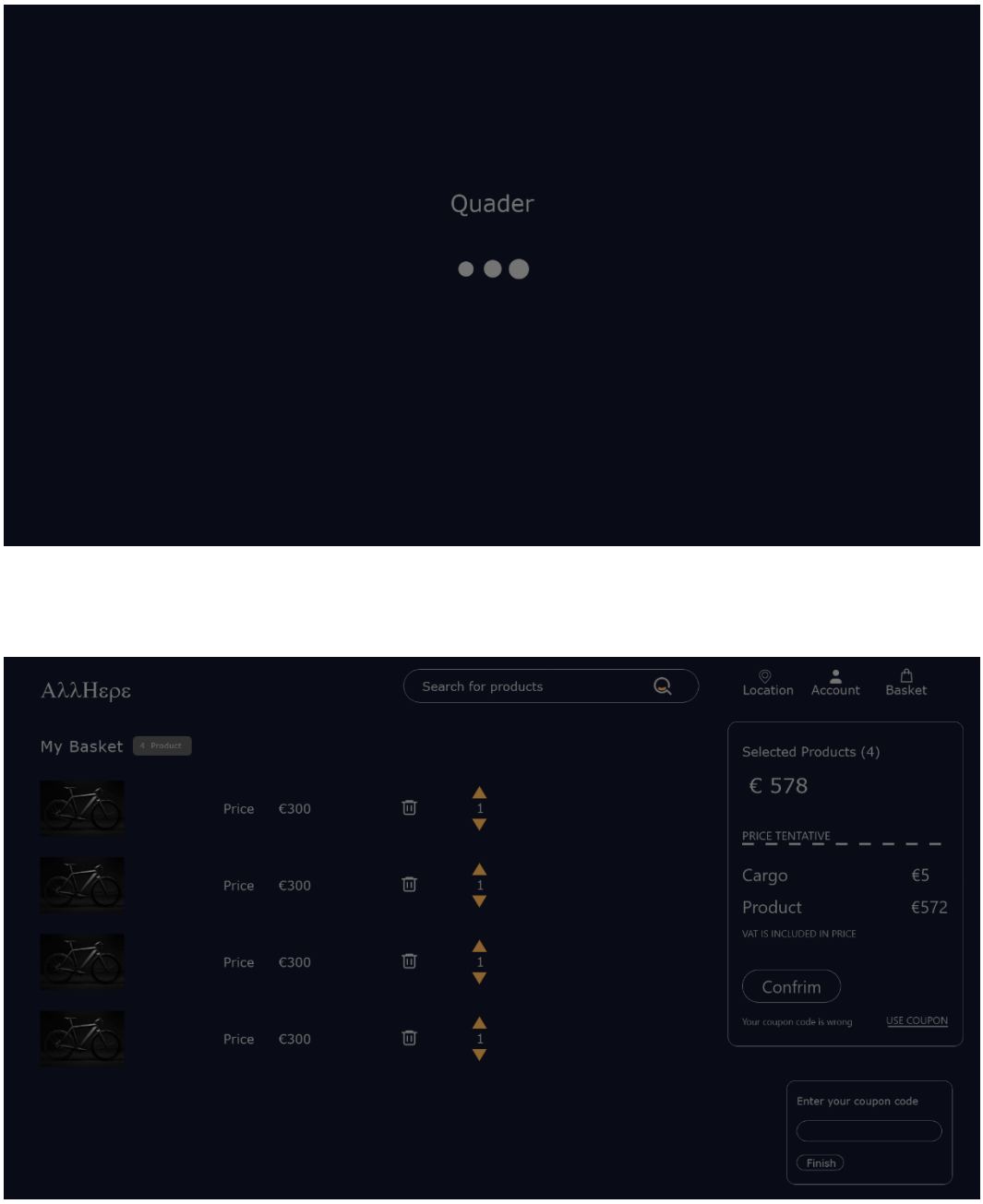


Figure 8 Loading and My Basket Pages

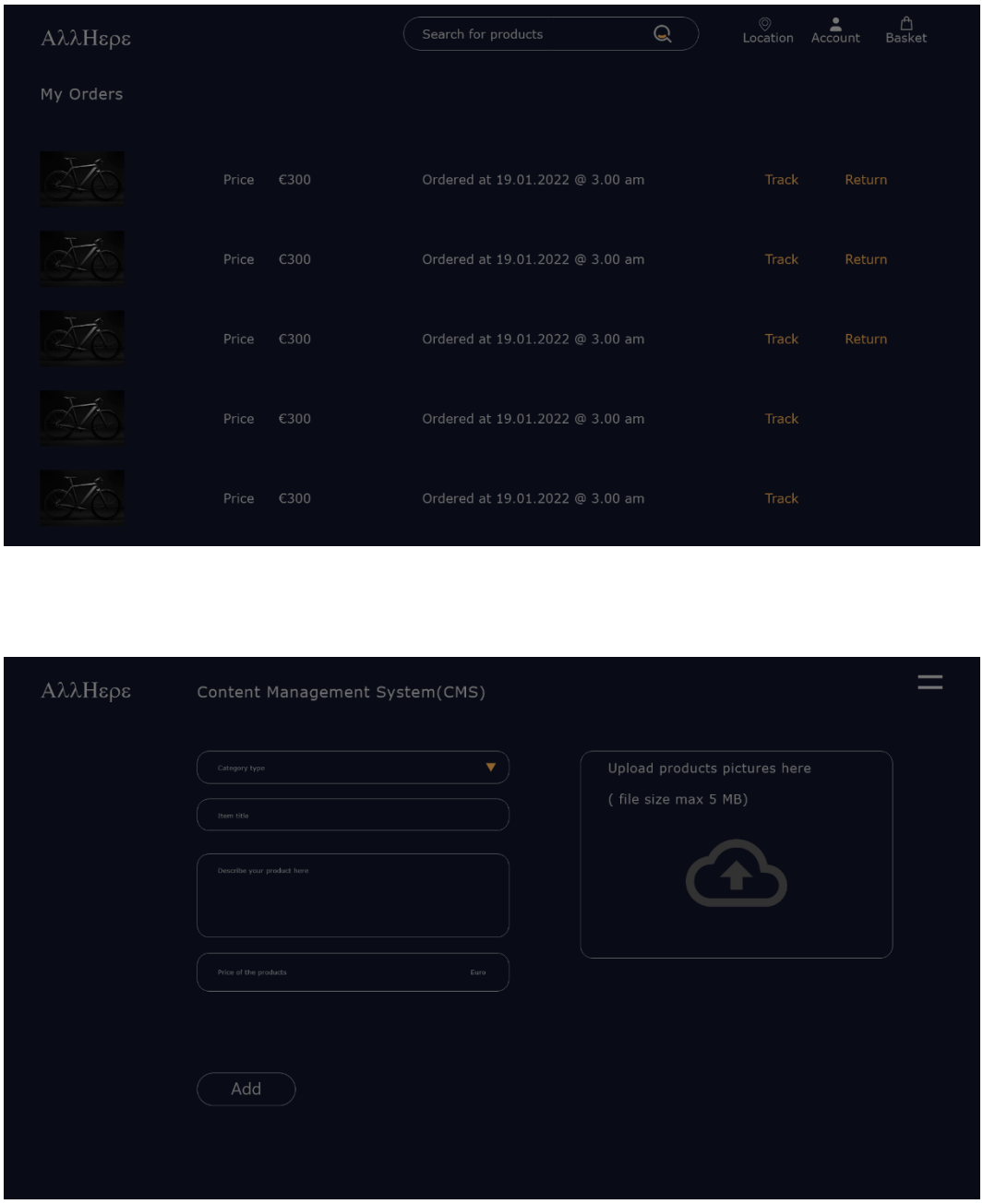


Figure 9 My Orders and CMS Pages

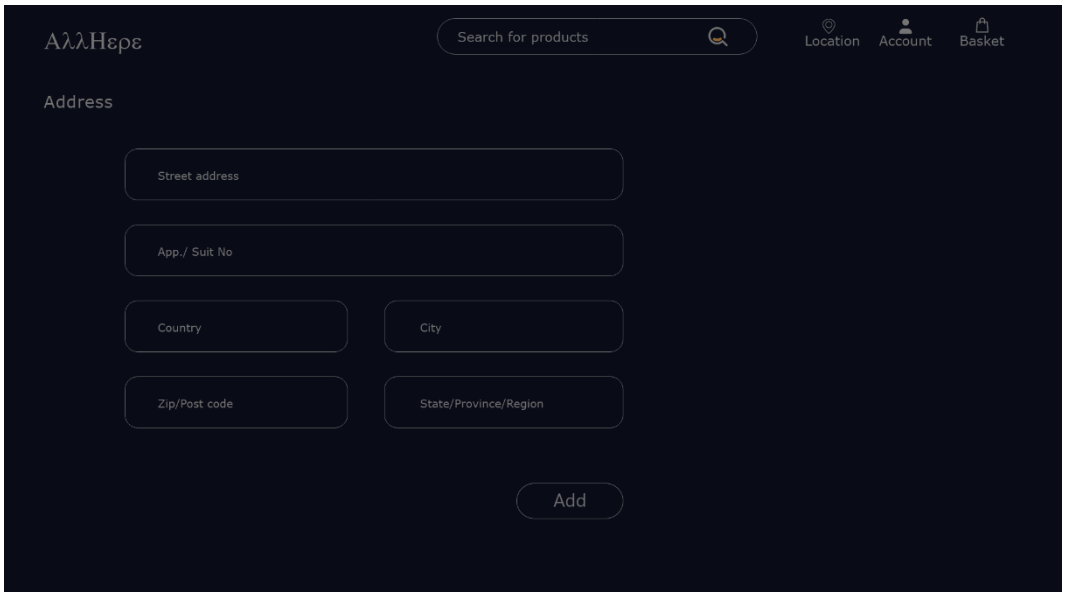


Figure 10 Address Page

5. Implementation and Testing

In this project, to develop such an application, some relevant tools and technologies have been utilized in both front-end and backend sections. Those utilities are listed below:

5.1. Tools, Technologies and Implementation

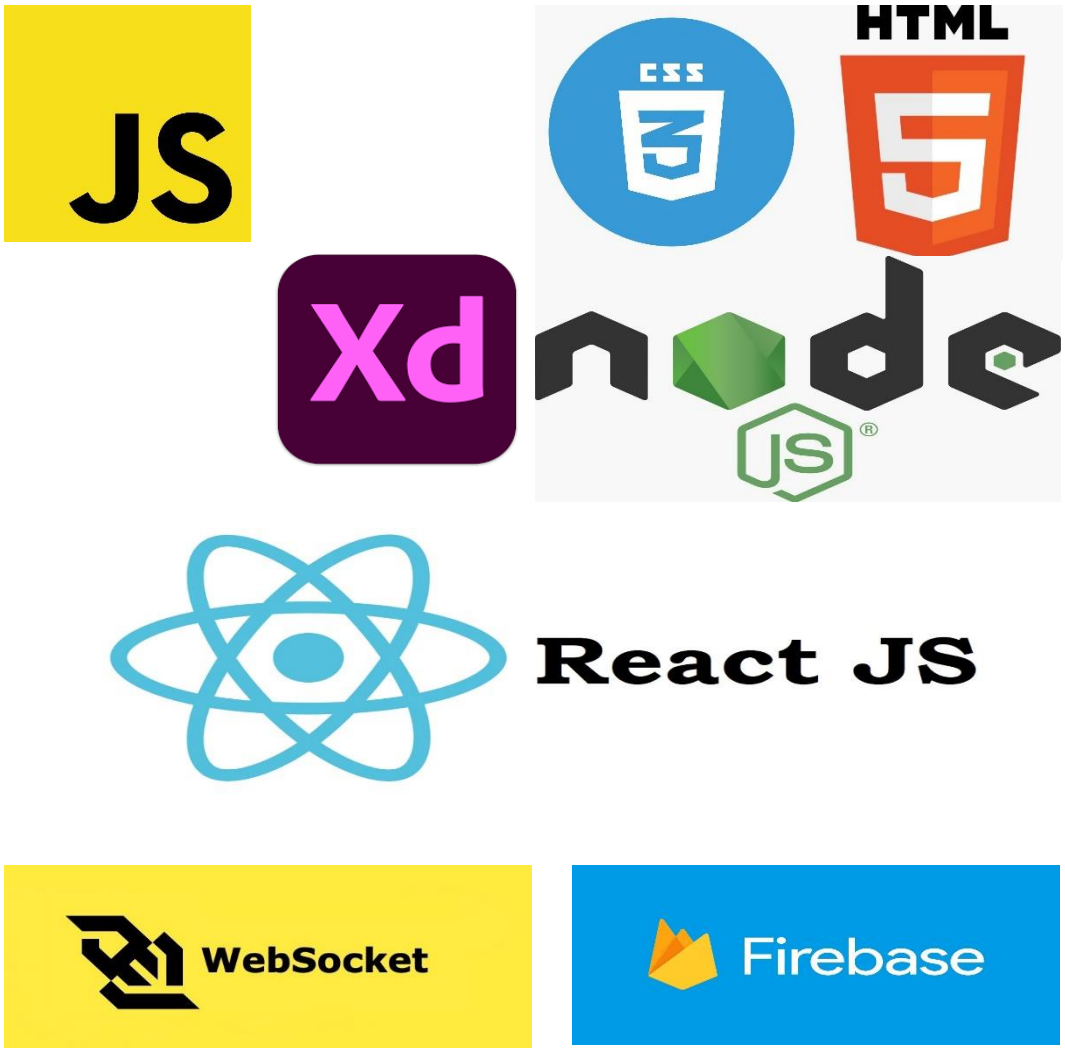


Figure 11 Tools and Technologies

HTML, CSS, JS, and React JS are used as front-end technologies. React JS is a lightweight library, which is designed to write UI's in browser, tailwindcss is also used to write style sheet documents.

In order to write the whole application, MVC model is beeing used. The whole application has been broken into components. The components are divided into two section pages and sub components. Pages are self sufficient where as sub components are used in pages as building components. The following pages show the pages and sub components.

Figure 12 The Pages and Sub-components

In order to navigate to different pages, the React router dom library has been used. It's the same as the standard link element in HTML, however, page to be reload is not the desired situation. React automatically intercepts every request to a server. However, for the first time, a request is needed to be sent to a server, react caches frequently visited page locally. If a user navigates to uncached page, React sends a request and the response is cached again in local database.

When the dataset is stored into database, Universal Indentifying Unique ID is necessary. The lodash library has been installed. (yarn add uid)

In order to run the application locally, you need to open your command line and run the following script. Make sure that command prompt is in the app repository.

Now, run: yarn start or npm start (this will spin up the application in your localhost)

As for the database, firestore and firebase have been utilized. For the backend, Node JS and its surrounding technologies like Express JS, Web Socket for tunnelled communication have been used.

Before using MySQL for the implementation, we will use Data Modeller to help simplify Data modelling and generate DDL query language for us. Employing queries generated from the data modeller, we set up database management system for our system.

5.2. Test Cases and Results

How to unmask the reviews/comments?

In order to reviewev the comment section regarding to each product, you need to login first, otherwise you will not be able to view the reviews.

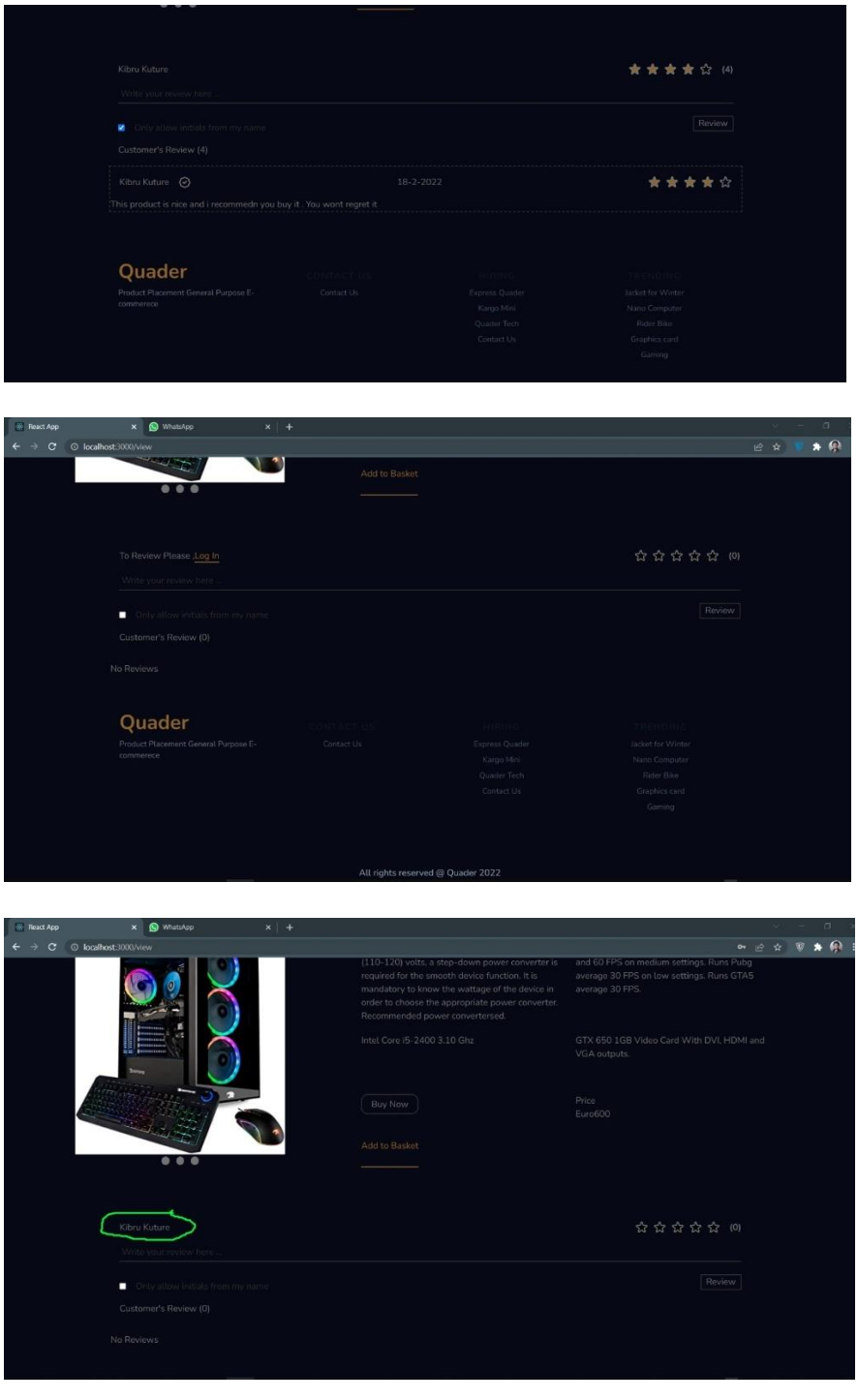


Figure 13 Review / Comments

How to place an order?

When you open the landing page you can see an icon called basket (shopping cart) at the top right corner. If you check it out for the first time, you will realize that it is empty. In order to purchase some products you need to add them to the basket first, you can see the basket before and after some products in below.

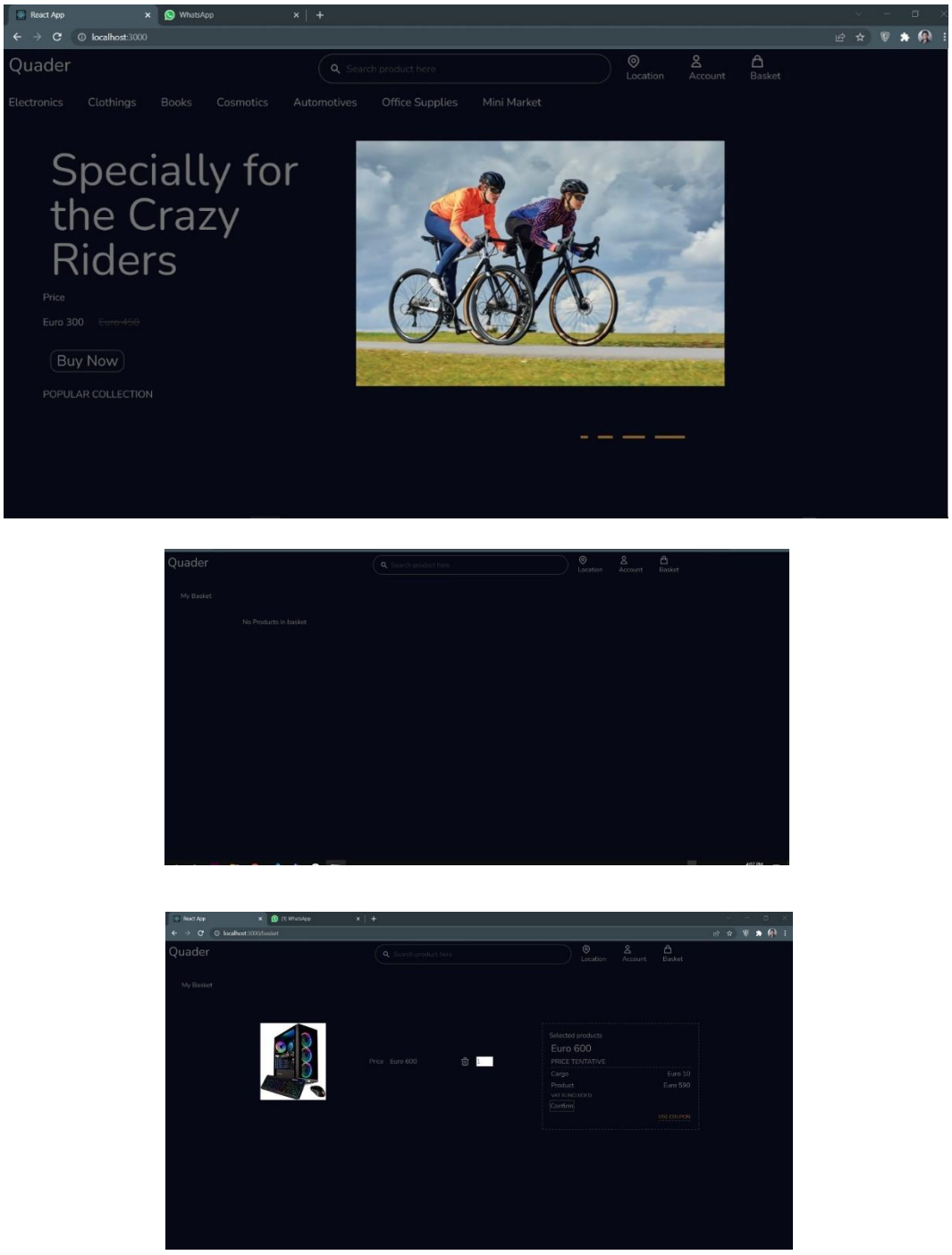


Figure 14 How to place an order?

How to check the sub-categories?

when categories are hovered over, a user can select sub categories and go to products page of that sub-category.

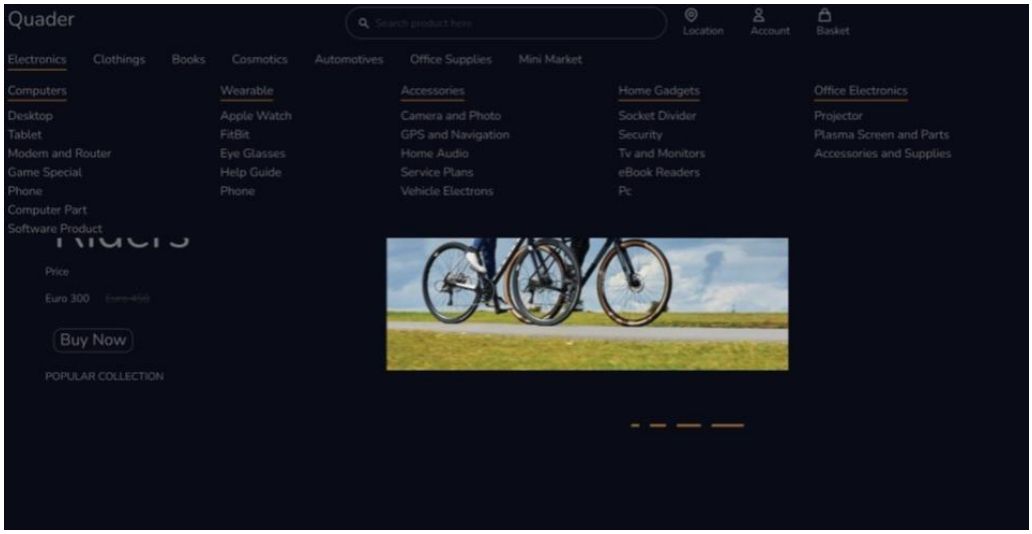


Figure 15 How to check the sub-categories?

Here, you can see a product placement, full of cards with products of different categories.

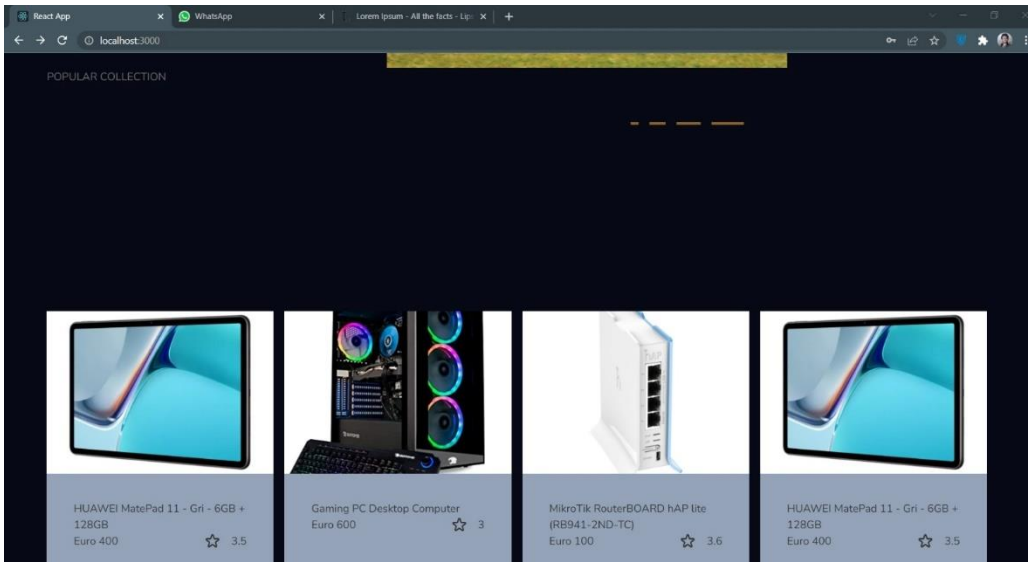


Figure 16 Product Placement

6. Conclusion

As far as anyone knows, the internet has become an inseparable part of society and a major resource in modern business; hence e-commerce has achieved a significant role to play from both the entrepreneur's and the customer's perspective. It has many benefits for both of them; it can be considered as a new business opportunity for an entrepreneur, and an alternative, comparative and easy way of shopping for a customer.

In this day and age, we're all witnesses to how the internet has affected this industry. Amazon, Ebay, AliExpress, and Wish, are all familiar brands to do shopping worldwide. To be more specific, we can see some local alternatives also here in Turkey, platforms such as Hepsiburada, Trendyol, Getir, and Yemeksepeti, which they have succeeded in these areas.

This thesis project will help you gain a better understanding of the creation of an interactive web page, and the road map for how to accomplish it. The technologies and tools that have been used in this project are briefly explained in the related section. As a short recap, first, we find out what are or what could be the requirements for this software, which will answer the questions of what we're up to? What should we do? It draws a road map and navigates us to our destination.

Subsequently, we've moved to the next step to design some prototypes and define which methods we're going to follow. It helps to have a better and clearer image of the project. In the afterwards, we've selected an appropriate architectural model that has the best approach to this project. Finally, when the guidelines have become as clear as crystal, we move to the next step, which is the implementation phase.

We've already explained all the details regarding which platforms and methods have been utilized in this project for the front-end, back-end, and database sections. Of course, to make sure our application is working, we've run some test cases; some of them are mentioned before. We have had limited time to develop such an application. Therefore, the implementation phase might seem inadequate. The main focus was on main scenarios and crucial parts; there are several parts that are ignored

The source code will be submitted together with this document, which you can have your own experience of working with our application if you desire. If there’s anything you want to know regarding this project, do not hesitate and feel free to contact us.

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