

Ecommerce System Management with Integrated Shopping Portal

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FINAL YEAR DESIGN PROJECT REPORT

This Report Presented in Partial Fulfillment of the Requirements for
the Degree of Bachelor of Science in Computer Science and
Engineering

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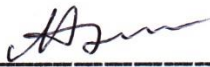
DAFFODIL INTERNATIONAL UNIVERSITY

DHAKA, BANGLADESH

APPROVAL

This Project titled “**Ecommerce System Management with Integrated Shopping Portal,**” submitted by **Abdullah Al Masud** and **Bayzid Ahammed** to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on **13-01-2025**.

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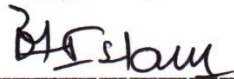
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We hereby declare that this project has been done by us under the supervision of **Mr. Raja Tariqul Hasan Tusher, Assistant Professor, Department of Computer Science and Engineering, Daffodil International University.** We also declare that neither this project nor any part of this project has been submitted elsewhere for the award of any degree or diploma.

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ABSTRACT

As Bangladesh rapidly transforms into a hub of innovation and entrepreneurship, people's daily routines are becoming busier, making time-saving solutions more critical. With an increasing number of individuals seeking the convenience of home delivery and cash-on-delivery options, the e-commerce sector is booming. Our platform is built to simplify and enhance the online shopping experience, ensuring that consumers can easily find and purchase their desired products with minimal effort. The website is designed to allow users to navigate through well-organized categories and subcategories, providing an intuitive shopping experience. Customers can sign up, log in, and access their personal portal, where they can track previous orders, manage Wishlist's, and download invoices with ease. For administrators, the platform provides a powerful admin panel to manage and update product listings, categories, and subcategories. This control empowers the admin to efficiently monitor sales and customer engagement while making necessary adjustments in real time. By focusing on user-centric design and operational flexibility, our platform not only meets the growing demands of Bangladesh's e-commerce market but also offers businesses a reliable and dynamic space to connect with consumers. Our goal is to provide an effortless online shopping experience that aligns with the fast-paced lifestyle of modern Bangladesh.

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CHAPTER 1

INTRODUCTION

This chapter introduces the project, outlining the motivation behind developing a user-friendly e-commerce platform to address the challenges of traditional shopping methods. It highlights the objectives, expected outcomes, and the broader impact of simplifying online shopping for users and businesses.

1.1 Introduction

In today's fast-paced world, where people are occupied with their jobs and businesses, finding time to visit physical markets has become increasingly challenging. To address this, our platform provides a convenient and efficient online shopping experience.

Customers can effortlessly browse products by selecting their desired categories and subcategories. They can save their preferred items to a Wishlist or add them directly to the cart. Once ready, they can proceed to checkout, select a payment method, and complete their purchase seamlessly.

Customers can easily create an account by signing up and providing the necessary information. Once registered, they can save their purchase history, manage Wishlist's, and track their orders, making the shopping process seamless and hassle-free.

1.2 Motivation

Information and communication technology has become an integral part of our daily lives, significantly transforming our lifestyle and how we approach everyday tasks. With the widespread use of the internet, people now rely on computers and mobile phones for most of their activities. As a result, traditional shopping methods often feel time-consuming and inconvenient for busy individuals.

This motivated us to develop an e-commerce website that simplifies the shopping process. Our platform allows users to easily search for their desired products and complete their purchases from the comfort of their homes, saving time and providing a seamless shopping experience.

1.3 Objectives

Our main goal is to create an e-commerce website that offers a seamless and user-friendly platform for customers to shop for their desired products effortlessly. Through this website, users can browse various categories, find their preferred items, and complete their purchases conveniently from the comfort of their homes.

We aim to provide a one-stop solution for online shopping by offering features such as product Wishlist's, secure payment options, and order tracking to enhance user experience. Additionally, the admin panel will allow for efficient management of products, categories, and customer data, ensuring smooth operations for businesses utilizing the platform.

In an era dominated by online services and digital convenience, our objective is to address the growing demand for accessible and reliable online shopping. While this platform represents a significant step toward enhancing e-commerce usability, we are committed to continuously improving its functionality to meet the evolving needs of both consumers and businesses

1.4 Project Outcome

In today's fast-paced world, people are increasingly relying on online platforms for convenience, especially in shopping. With the growing demand for efficient e-commerce solutions, our project aims to provide a user-friendly platform where customers can browse, purchase, and manage their orders effortlessly.

The e-commerce website we have developed simplifies the shopping process, making it very easy and intuitive for users to find and purchase their desired

products. Customers can enjoy the convenience of shopping from their homes, saving time and effort.

While there are already several e-commerce platforms in our country, our system stands out by focusing on simplicity and accessibility for users. By providing a reliable and easy-to-use online shopping solution, this platform will benefit both customers and businesses, contributing to the growth of e-commerce in our country. This project represents a significant step towards addressing the evolving needs of the digital marketplace.

CHAPTER 2

BACKGROUND

This chapter provides an overview of the evolving e-commerce landscape in Bangladesh, highlighting existing platforms and identifying gaps that our proposed system aims to address.

2.1 Introduction

The rapid growth of internet accessibility and the increasing demand for convenient shopping solutions have significantly transformed consumer behavior in Bangladesh. Traditional shopping methods are being supplemented, and in some cases replaced, by online platforms that offer a wide range of products and services. This shift necessitates the development of efficient, user-friendly e-commerce websites tailored to the specific needs of Bangladeshi consumers.

2.2 Comparative Analysis and Related Works

2.2.1 Similar Applications

Several e-commerce platforms operate in Bangladesh, each offering distinct features:

- **Rokomari.com:** Specializes in books, electronics, and other consumer goods, providing localized services tailored to Bangladeshi customers.
- **Bikroy.com:** Functions as a classifieds platform where users can buy and sell a variety of products, including vehicles, electronics, and property.
- **Ryans:** Focuses on electronics and computer hardware, offering a range of tech products to consumers.
- **Chaldal:** An online grocery delivery service that allows customers to purchase daily necessities conveniently.
- **StarTech:** Provides computer hardware, accessories, and electronics, catering to tech enthusiasts and professionals.

- **Daraz:** A leading online marketplace offering a vast array of products across multiple categories, including fashion, electronics, and home appliances.
- **Pickaboo.com:** Specializes in electronics and gadgets, providing customers with the latest tech products.

2.2.2 Related Research

The e-commerce market in Bangladesh has experienced significant growth, with revenue projected to reach US\$6.80 billion in 2024 and an annual growth rate (CAGR 2024-2029) of 12.84%, resulting in a projected market volume of US\$12.44 billion by 2029.

Despite this growth, challenges persist, including limited payment options, complex user interfaces, and restricted product availability. Addressing these issues is crucial for enhancing user experience and satisfaction.

2.3 Gap Analysis

Table 2.1: An analysis of existing e-commerce platforms in Bangladesh reveals several gaps:

Features	Rokomari.com	Ryans	Chaldal	StarTech	Daraz	pickaboo.com	bikroy.com	Proposed system
Like or dislike to products	No	No	No	No	No	No	No	Yes
Filtering liked and disliked products	No	No	No	No	No	No	No	Yes
Add to favorite or Wishlist	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Search option of products	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Detailed descriptions of products	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Offers collection	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Customer reviews and ratings	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Multiple payment options	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
FAQs option	No	Yes	Yes	Yes	No	No	No	No
Chatting option	Yes	Yes	Yes	No	Yes	No	Yes	No
Recommendations or filtering latest products	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Product add to cart	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
PC Builder	Yes	Yes	Yes	Yes	No	No	No	No
Quick view	Yes	Yes	No	No	Yes	No	No	Yes
Social commerce Integration	No	No	No	No	No	No	No	Yes

Identified Gaps

Despite the functionalities offered by existing platforms, certain gaps persist:

An analysis of existing e-commerce platforms in Bangladesh reveals several gaps:

- **Localized Service:** While platforms like Rokomari.com focus on specific product categories, there is a lack of comprehensive platforms offering a wide range of products tailored to local needs.
- **User Experience:** Many platforms have complex interfaces that can be challenging for new users, indicating a need for more intuitive and user-friendly designs.
- **Payment Flexibility:** Limited payment options are a common issue, with a need for more diverse methods such as mobile payments, cash on delivery, and integration with local banks.
- **Product Range and Availability:** Existing platforms may have limited product selections, highlighting the need for a wider variety of goods to meet consumer demands.
- **Personalized User Interaction:** Current platforms lack features that allow users to like or dislike products, which could enhance personalized recommendations.
- **Advanced Filtering Options:** The absence of filters based on user preferences (liked or disliked products) limits the customization of the shopping experience.

Proposed Solutions

Our e-commerce website aims to address these gaps by:

- **Implementing Like/Dislike Features:** Enabling users to express preferences, facilitating more accurate product recommendations.
- **Advanced Filtering:** Allowing users to filter products based on their likes and dislikes, enhancing the shopping experience.
- **Enhanced User Interface:** Designing an intuitive and user-friendly interface to improve accessibility for all customers.
- **Diverse Payment Options:** Integrating multiple payment methods, including mobile payments, cash on delivery, and partnerships with local banks, to provide flexibility and convenience.

Expanded Product Range: Offering a comprehensive selection of products across various categories to meet diverse consumer needs.

2.4 Summary

In this chapter, we examined the evolving e-commerce landscape in Bangladesh, identifying key platforms and their features. Our analysis highlighted gaps in localized services, user experience, payment flexibility, and product availability. Addressing these gaps through the development of a user-friendly, comprehensive e-commerce platform tailored to Bangladeshi consumers is essential for meeting the growing demand for online shopping solutions.

CHAPTER 3

REQUIREMENT SPECIFICATION

This Chapter provides an overview of the functional and non-functional requirements for the e-commerce platform. It details the system architecture, user interface design, and the methodology used to ensure successful implementation.

3.1 Requirement Analysis & Design Specification

3.1.1 Overview

As part of our BSc final defense, we developed an e-commerce platform focused on offering an intuitive shopping experience. The system incorporates features such as user registration, product catalogs, shopping carts, secure payments, and order tracking. Our development emphasized scalability, performance, and security to provide a seamless user experience. We divided the responsibilities based on our expertise, with one of us focusing on project management and design, while the other handled development and backend architecture.

3.1.2 System Design



Figure 3.1: This is a system design diagram

3.1.3 Functional and Nonfunctional Requirements

Functional Requirements

As the project manager, I coordinated the requirements gathering and prioritized the following features:

1. **User Management:** Customers can register, log in, and manage profiles, while admins can manage customer accounts.

2. **Product Catalog:** Customers can browse product listings, and admins can manage products.
3. **Search and Filtering:** Customers can search and filter products by various criteria.
4. **Shopping Cart & Order Management:** Features for managing cart items and order statuses were implemented.
5. **Payment Gateway Integration:** Secure payment options were integrated, such as credit cards and PayPal.
6. **Delivery Tracking & Wishlist:** We enabled real-time order tracking and Wishlist's for customers.
7. **Review & Rating, Discounts & Analytics:** Features for product reviews, ratings, discounts, and reporting were integrated for both customers and admins.

Non-Functional Requirements

We ensured the platform met the following standards:

1. **Performance:** The platform supports up to 20,000 concurrent users.
2. **Scalability:** The system is designed to scale for peak traffic periods.
3. **Availability:** We aimed for 99.9% uptime with scheduled maintenance.
4. **Compatibility & Maintainability:** The system is designed to be compatible across devices and browsers, and built with a modular architecture for future updates.

3.1.4 Context Diagram

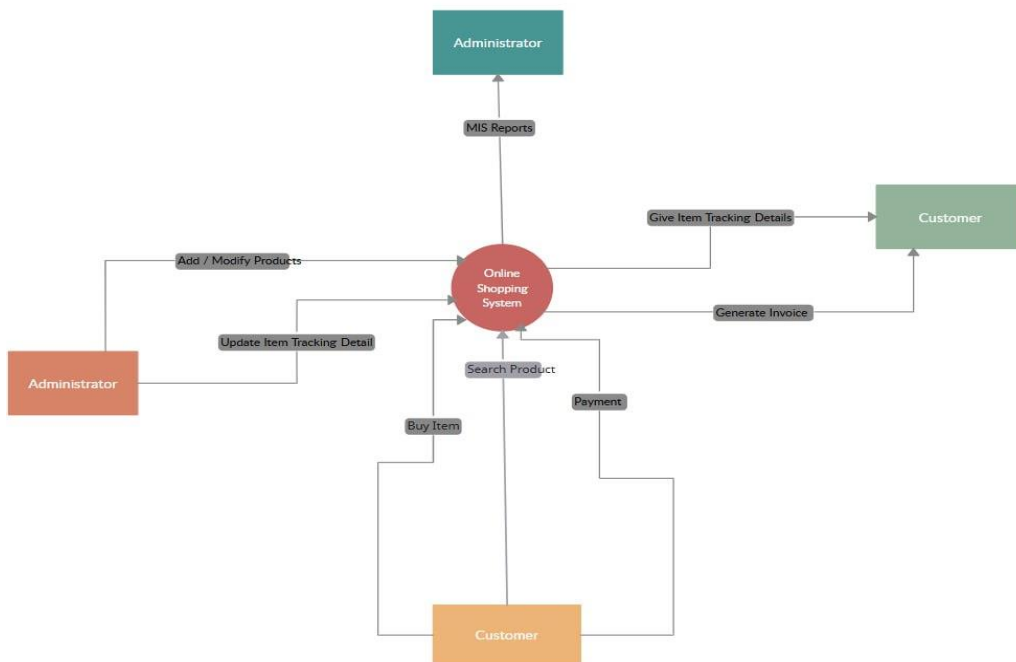


Figure 3.2: This is a Context diagram

3.1.5 Data Flow Diagram

Zero Level DFD

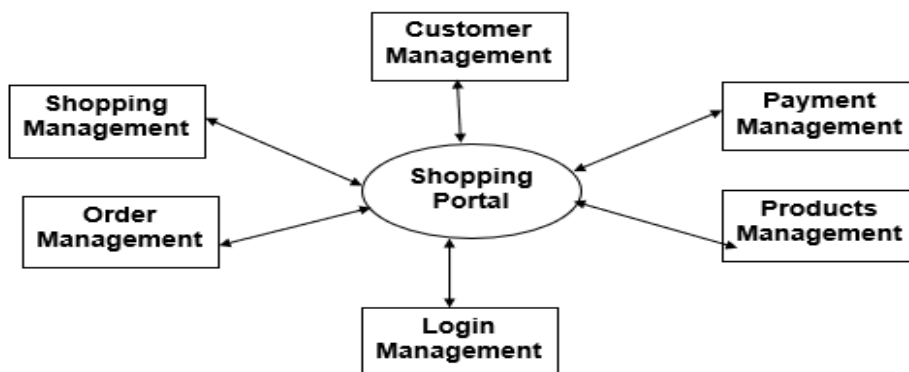


Figure 3.3: This is a level zero Data Flow diagram

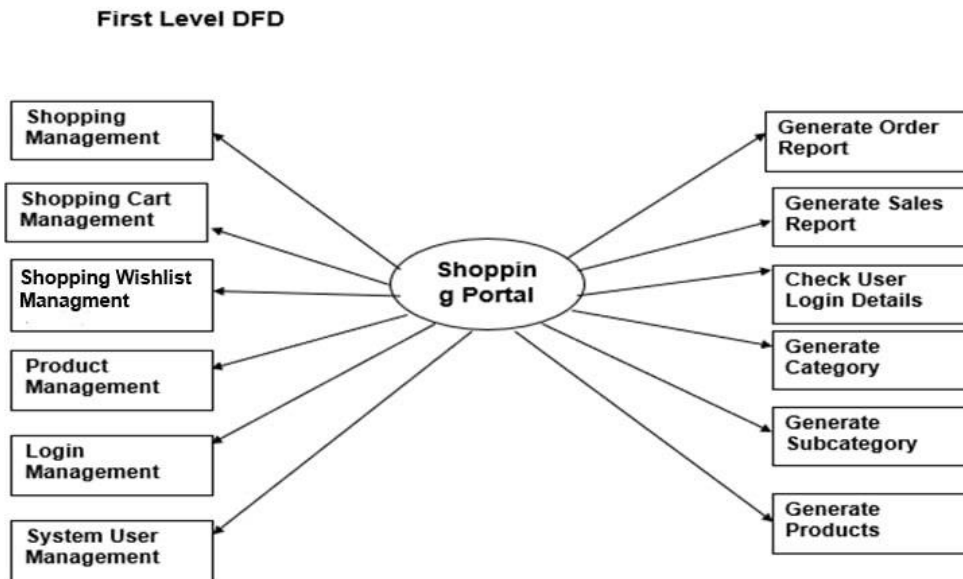


Figure 3.4: This is a first level Data Flow diagram

These diagrams illustrate the interactions between system components and the flow of data, which I (the project manager) created to ensure alignment on system architecture and data processes.

3.1.6 UI Design

DESIGN SPECIFICATION

We led the design efforts, creating mockups and wireframes using tools like Figma, Canva, and Adobe Photoshop. The design process included:

• **Homepage:**

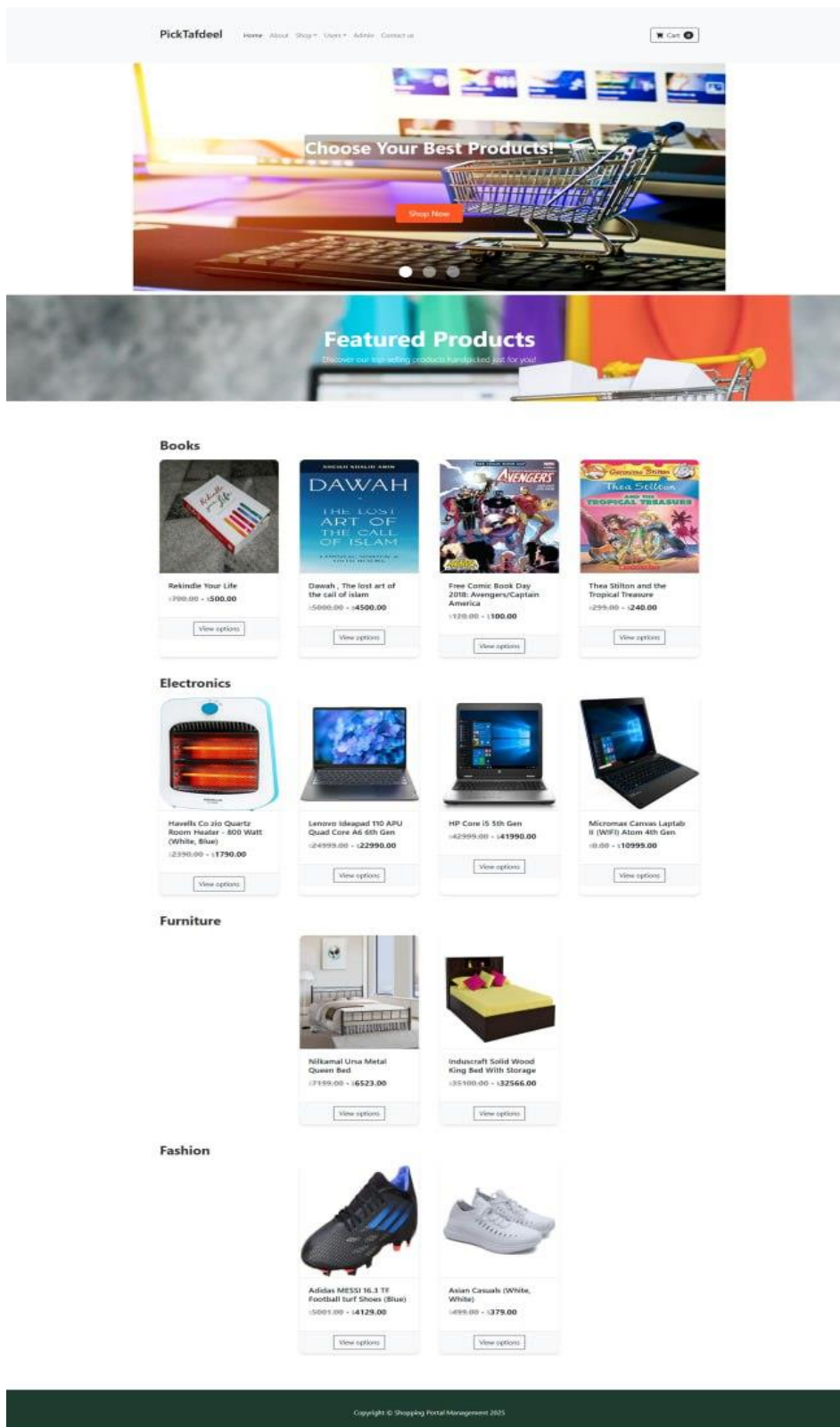


Figure 3.5: This picture shows the Homepage of our project

• Product Pages:

PickTafdeel Home About Shop My Wishlist My Account Contact us **Welcome Abdullah Al Masud** Cart

Category: Furniture
Sub-Category: Sofas
Nilkamal
Nilkamal Ursa Metal Queen Bed
~~₹7199.00~~ ₹6523.00
Shipping/Delivery Charges: 0.00

Good quality metal structure for strong & more steadiness easy to clean maintenance free with long lasting powder coating paint Well designed Indian furniture brand to occupy exact space of your modern bedroom & enrich your bedroom lifestyle Product Dimension: Length : (81 CM) Width : (50.5 CM) Height : (36 CM) ; Recommended Mattress Size:78 X 30 Inches 3 years warrantee make you enjoy all your desires to use our products peacefully & comfortably Easy to attached and detached products first time free assembling 3 Years Warranty, Manufacturing Defects Only Installation Will be Provided By Seller Only

1 Add to cart Wishlist Dislike

Related products

Nilkamal Ursa Metal Queen Bed
~~₹7199.00~~ ₹6523.00
View options

Induscraft Solid Wood King Bed With Storage
~~₹31990.00~~ ₹32566.00
View options

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Figure 3.6: This image shows the product details

- Displaying product details, images, and options for cart and Wishlist additions.

• Filtering Products:

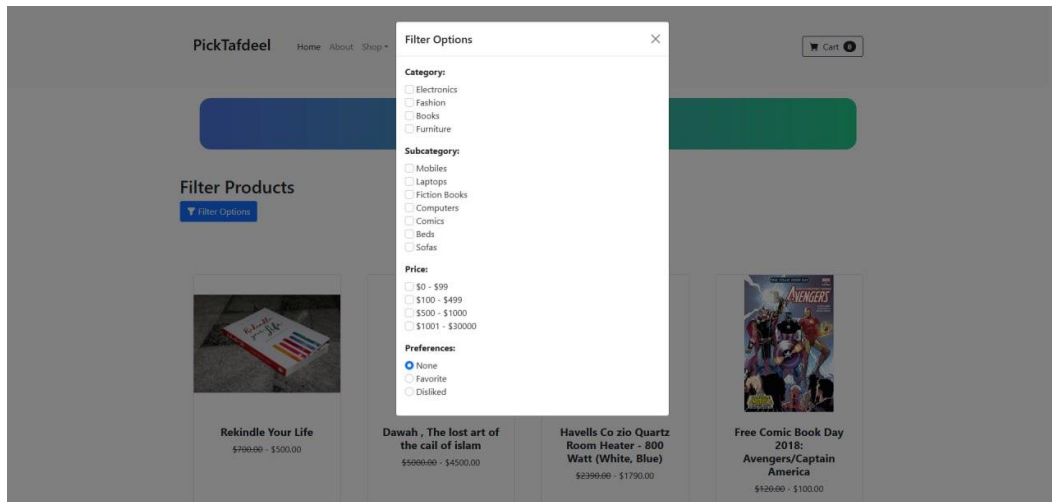


Figure 3.7: This image shows the Product filtering feature

- This image highlights the product filtering feature, including the unique ability to filter by favorites or dislikes, along with price, category, and subcategory, for a personalized experience.

• Payment Page:

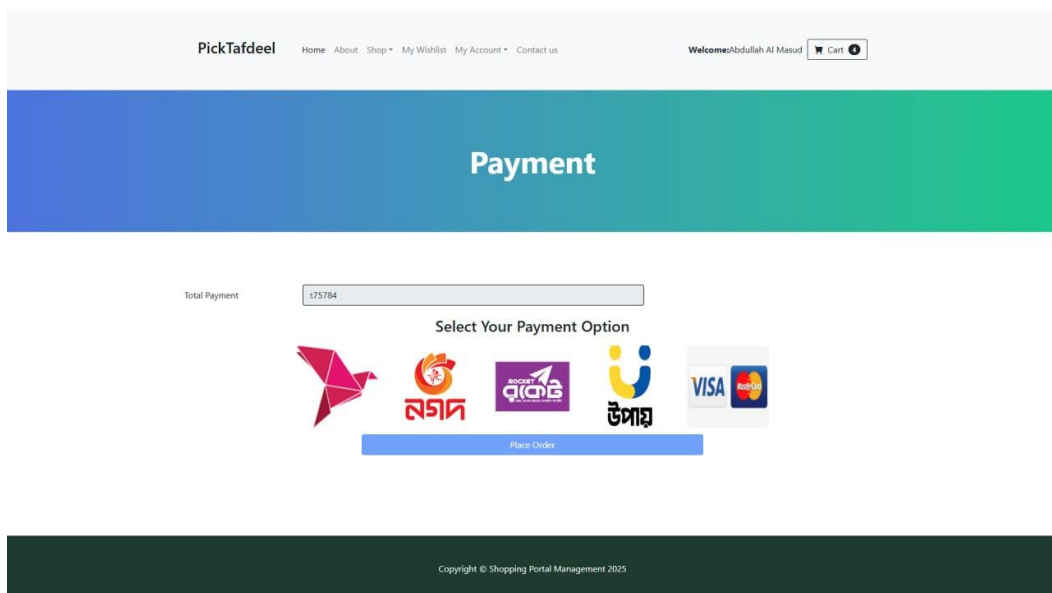


Figure 3.8: This image shows the Payment Page

- **Dislike Feature:**

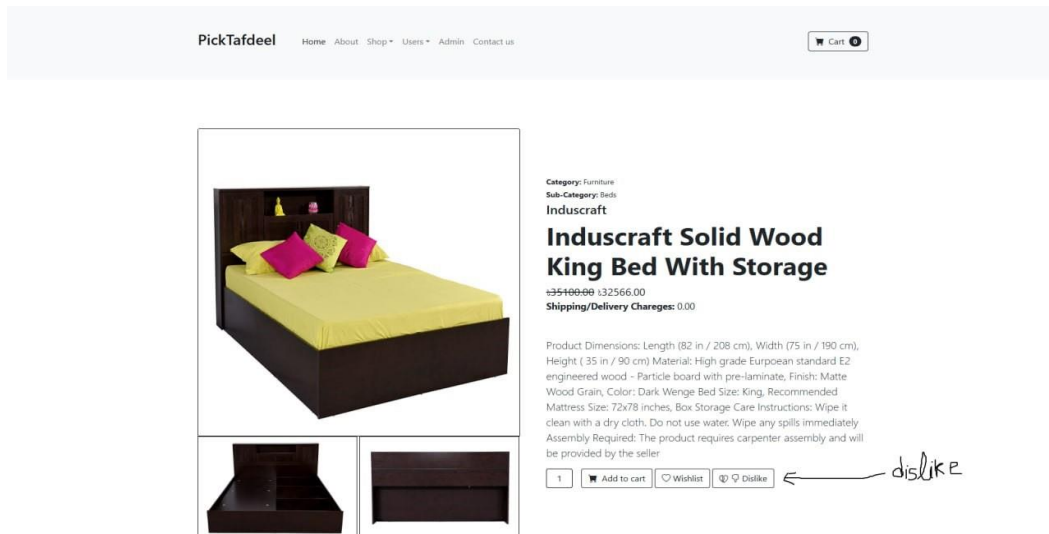


Figure 3.9: This image shows the Dislike Feature

- This image highlights the unique 'dislike' feature, allowing users to mark products they do not prefer.

- **Contact-Us:**

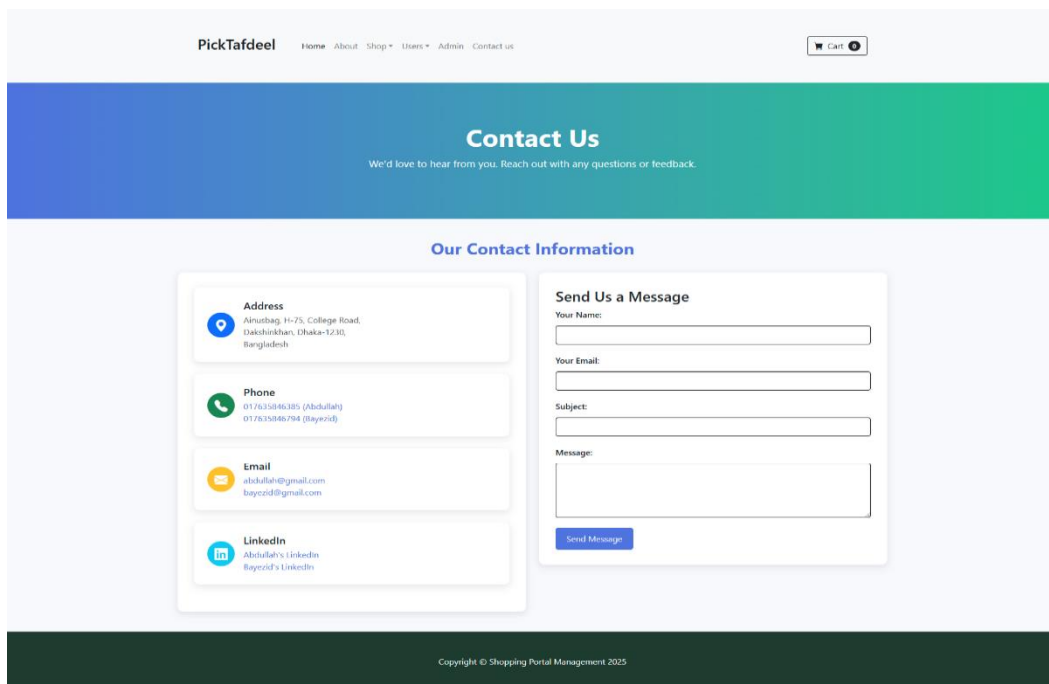


Figure 3.10: This image shows the Contact-Us page

• Dislike Products:

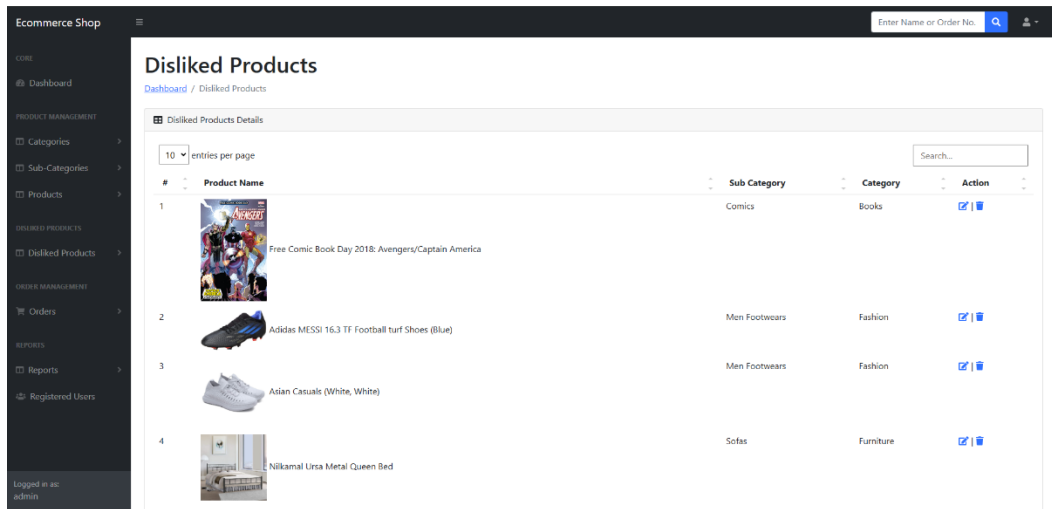


Figure 3.11: This image shows the Dislike Products in the admin panel

• Wishlist:

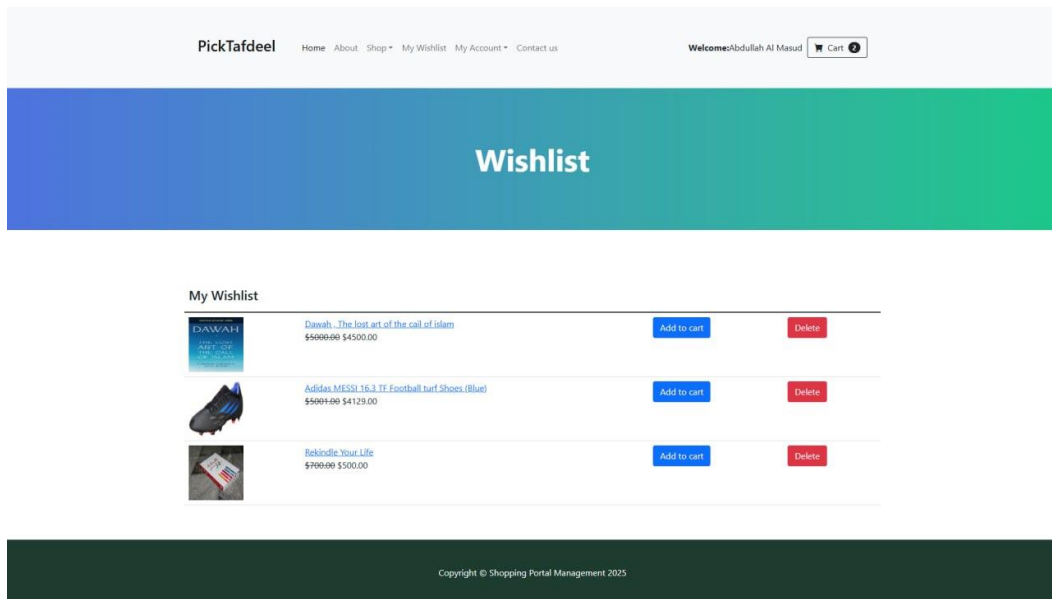


Figure 3.12: This image shows the products in Wishlist

• **Cart:**

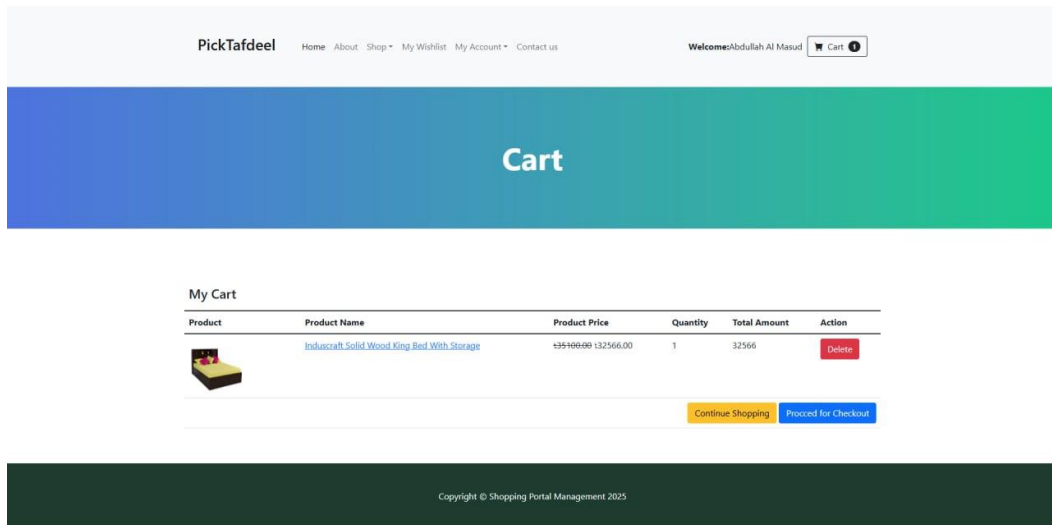


Figure 3.13: This image shows the product list in cart

• **Checkout Process:**

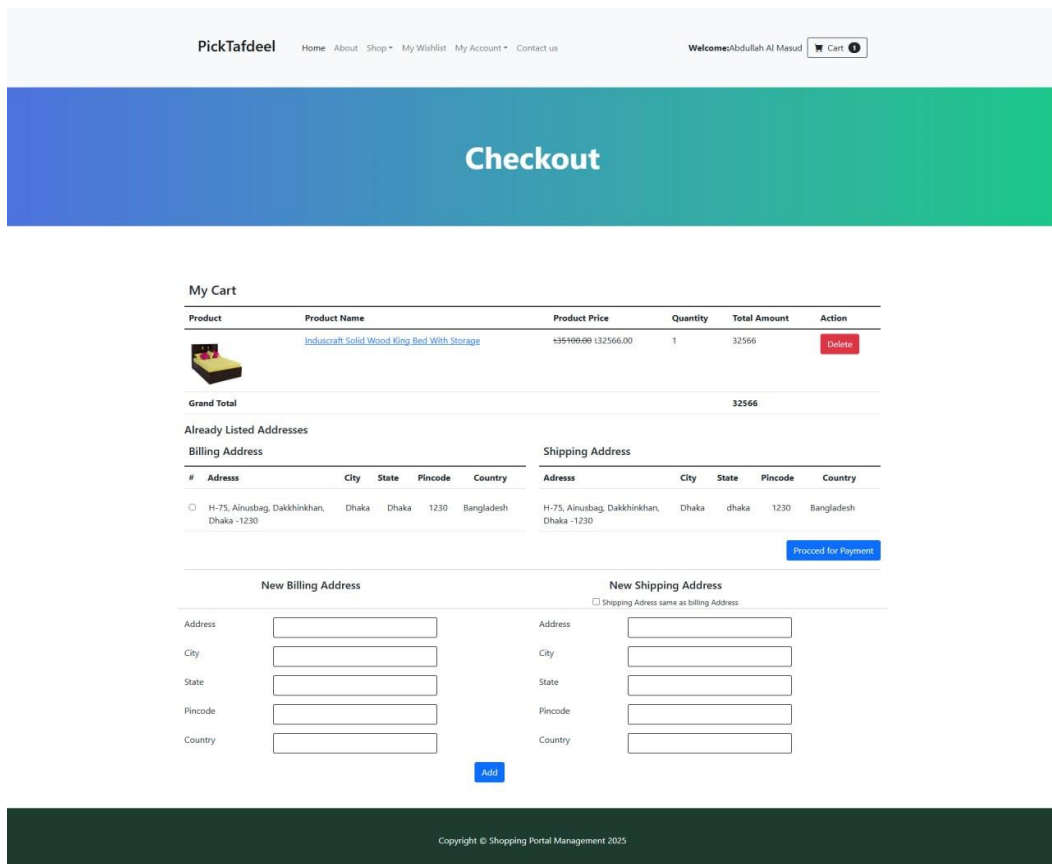


Figure 3.14: This image shows the product list in checkout page

- **Admin Dashboard:**

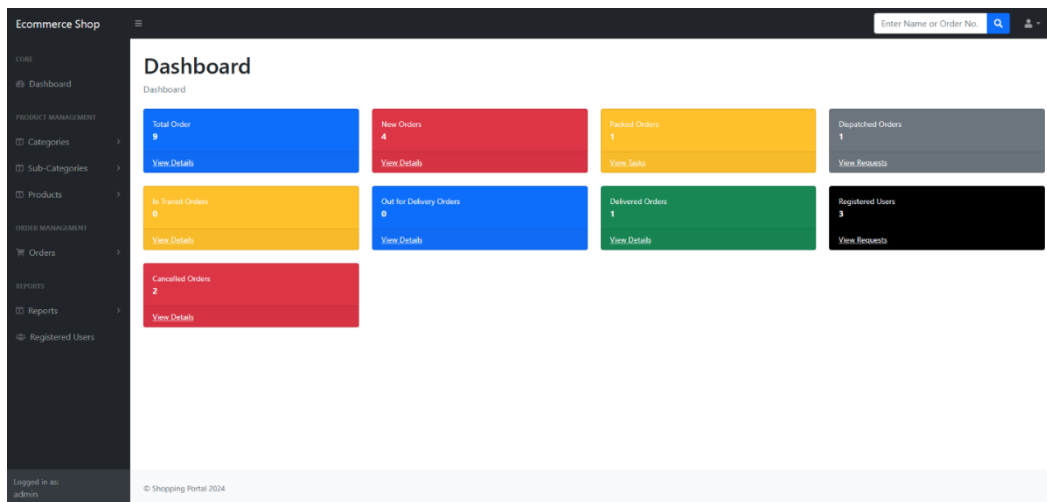


Figure 3.15: This is image shows the UI of admin dashboard

Built with ease of use in mind, allowing admins to manage orders, products, and customers efficiently.

The design was made responsive, optimizing for various screen sizes and devices using Bootstrap and Tailwind CSS.

- **Admin Page – Users**

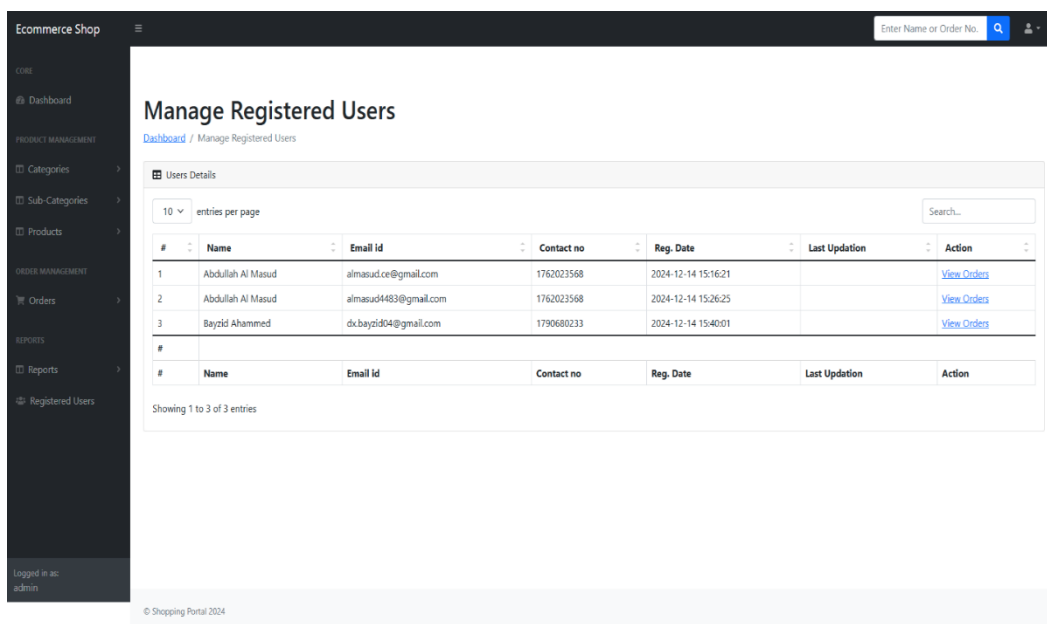


Figure 3.16: This image shows the registered users to manage as an admin

- Admin Page – Product

The screenshot displays the 'Manage Products' interface. On the left is a sidebar with navigation options: Dashboard, Categories, Sub-Categories, Products, Orders, Reports, and Registered Users. The main content area is titled 'Manage Products' and includes a search bar and a table of products. The table has 10 rows, each representing a product with its details and action links.

#	Product Name	Sub Category	Category	Creation date	Last Updated	Created by	Action
1	Havells Co zio Quartz Room Heater - 800 Watt (White, Blue)	Electronics	Room Heaters	2024-01-18 12:03:28	2024-06-07 07:21:34	admin	Edit Delete
2	Free Comic Book Day 2018: Avengers/Captain America	Books	Comics	2024-01-18 12:03:28	2024-06-07 07:21:34	admin	Edit Delete
3	Adidas MESSI 16.3 TF Football turf Shoes (Blue)	Fashion	Men Footwears	2024-01-18 12:03:28	2024-06-07 07:21:34	admin	Edit Delete
4	Asian Casuals (White, White)	Fashion	Men Footwears	2024-01-18 12:03:28	2024-06-07 07:21:34	admin	Edit Delete
5	Nikamal Unsa Metal Queen Bed	Furniture	Sofas	2024-01-18 12:03:28	2024-06-07 07:21:34	admin	Edit Delete
6	Induscraft Solid Wood King Bed With Storage	Furniture	Beds	2024-01-18 12:03:28	2024-06-07 07:21:34	admin	Edit Delete
7	Thea Stilton and the Tropical Treasure	Books	Comics	2024-01-18 12:03:28	2024-06-07 07:21:34	admin	Edit Delete
8	The Wimpy Kid Do-It-Yourself Book	Books	Comics	2024-01-18 12:03:28	2024-06-07 07:21:34	admin	Edit Delete
9	Lenovo Ideapad 110 APU Quad Core A6 6th Gen	Electronics	Laptops	2024-01-18 12:03:28	2024-06-07 07:21:34	admin	Edit Delete
10	HP Core i5 5th Gen	Electronics	Laptops	2024-01-18 12:03:28	2024-06-07 07:21:34	admin	Edit Delete

Showing 1 to 10 of 21 entries

Figure 3.17: This image shows the product list to manage as an admin

- **Admin Page – Category**

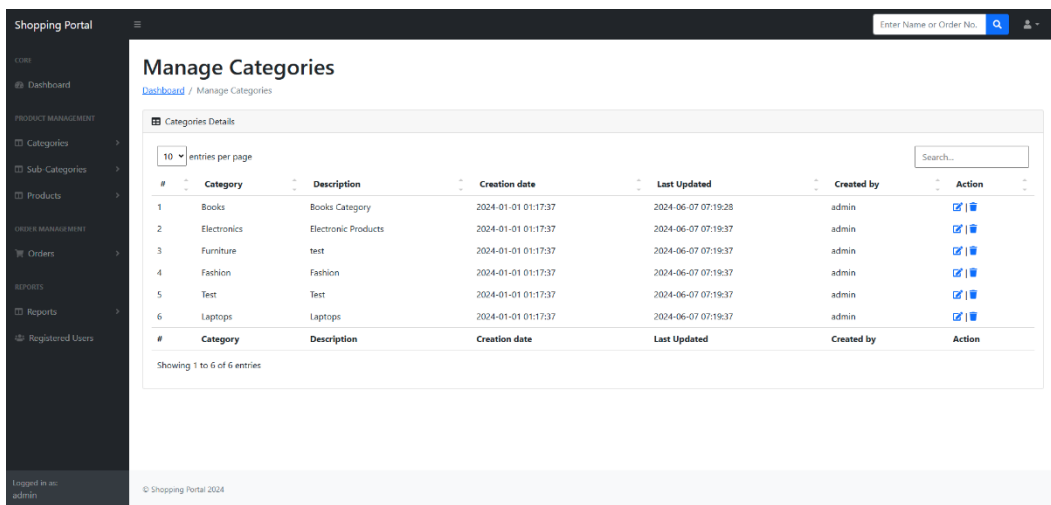


Figure 3.18: This image shows the UI of product Categories to manage as an admin

- **Admin Page – Order**

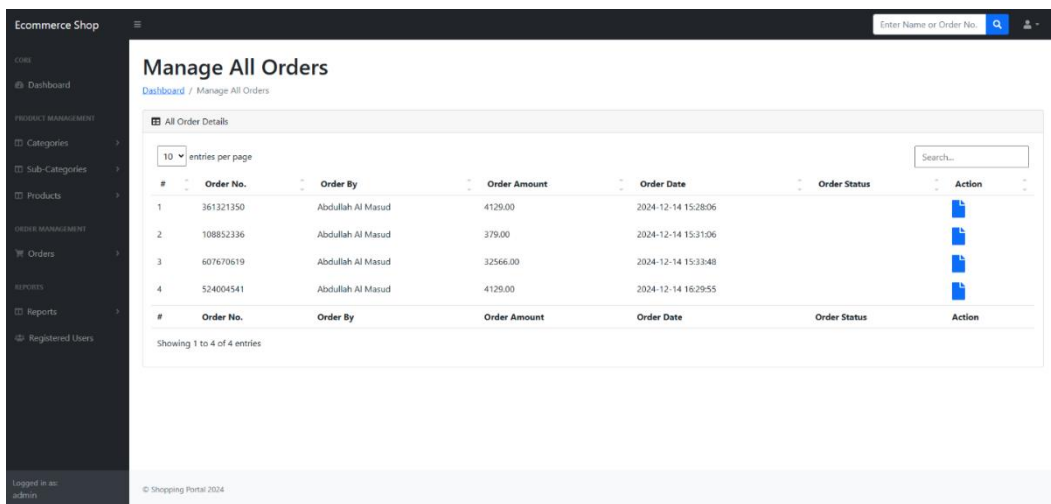


Figure 3.19: This image shows the orders to manage as an admin

3.2 Detailed Methodology and Design

1. Project Methodology

We adopted the Agile methodology for our project, allowing us to develop iteratively and incorporate feedback. This ensured continuous progress and alignment with user needs and business goals.

I (as the project manager) facilitated collaboration between the development and design teams. My teammate focused on technical implementation, developing features in manageable iterations.

2. System Architecture Design

We implemented a three-tier architecture:

- **Frontend (Client Tier):** Developed by me, ensuring responsive UI and smooth user experience.
- **Backend (Application Tier):** Developed by my teammate, using PHP and RESTful APIs to handle the business logic.
- **Database (Data Tier):** Designed by my teammate, optimizing MySQL for fast query performance and data integrity.

3. Frontend Design (UI/UX)

I handled the user interface design to ensure an intuitive and engaging experience.

Key components of the frontend include:

- **Product Browsing & Cart Features:** Providing a seamless browsing and cart management experience.
- **Checkout:** Ensuring that the process is streamlined for minimal friction. The responsive design ensures that users have an optimal experience on desktops, tablets, and mobiles.

4. Backend Design

My teammate was responsible for implementing secure authentication, payment gateway integration, and managing the business logic behind order and product management. RESTful APIs were developed to enable communication between the frontend and backend systems.

5. Testing and Quality Assurance

Testing was a collaborative effort, ensuring that all features were functional and secure:

- **Unit Testing:** Implemented by my teammate for individual backend modules.

- **User Acceptance Testing (UAT):** We both conducted tests to ensure the system met user expectations.
- **Security & Load Testing:** Performed using tools like OWASP ZAP and JMeter to ensure security and performance under load.

3.3 Project Plan

1. Project Overview

The e-commerce platform was developed to provide a scalable, secure, and user-friendly shopping experience. We divided the tasks, with one of us handling the management and design, while the other focused on technical implementation and backend development.

2. Project Objectives

The goals were to develop a responsive platform, integrate secure payment systems, ensure seamless order management, and guarantee scalability for future growth.

3. Scope of the Project

We focused on web development for this project, with exclusions for mobile apps and SEO optimization.

The project timeline, from requirement analysis to post-launch support, was planned with clear milestones.

4. Budget Estimation

We divided the budget to cover the development, design, testing, hosting, and payment gateway costs.

Each phase was allocated a specific budget, with careful attention to resource allocation.

3.4 Task Allocation

Table 3.1: The following table outlines the distribution of tasks:

Task	Assigned To	Description
Requirement Analysis	Project Manager	Gather and analyze client requirements, document scope.
Frontend Development	Frontend Developer	Implement UI with HTML, CSS, JavaScript, and frameworks.
Backend Development	Backend Developer	Develop server-side logic, APIs, and database management.
Payment Integration	Backend Developer	Integrate payment gateways securely.
Product & Order Management	Full Stack Developer	Manage product listings, orders, and admin features.
Testing & Maintenance	Support Team	QA, bug fixes, and updates post-launch.

3.5 Summary

This project represents a comprehensive solution for an online shopping platform, with a focus on security, scalability, and user experience. We collaborated closely throughout the development process, dividing the responsibilities to play to our strengths. My work focused on design and project management, while my teammate handled the backend development and technical implementations. The project is now a functional, secure, and scalable e-commerce platform ready for deployment

CHAPTER 4

IMPLEMENTATION AND RESULTS

This chapter details the technical implementation of the E-commerce Online Shopping Portal, including the tools and technologies used, the testing methodologies employed, and the outcomes achieved. It highlights the environment setup, testing phases, and key results that validate the system's functionality and performance.

4.1 Environment Setup

The development of the E-commerce Online Shopping Portal required a robust and efficient environment. The following tools and technologies were utilized for the implementation of the project:

1. **Operating System:**

- **Windows 10/11** was selected as the operating system to provide a stable and compatible platform for development and testing activities.

2. **Local Server Environment:**

- **XAMPP / WAMP** was utilized as the local server environment. It integrates essential components, including:
 - **Apache:** As the web server for handling HTTP requests.
 - **MySQL:** For managing the database.
 - **PHP:** For server-side scripting and business logic implementation.

3. **Backend Development:**

- **PHP 8.1** was chosen for backend development. This version offers improved performance, error handling, and support for modern programming paradigms such as enumerations and enhanced type checking.

4. **Database:**

- **MySQL** was employed as the relational database management system to store and manage data related to products, users, orders, and transactions.

5. Frontend Development:

- The user interface was designed using:
 - **HTML5**: For structuring content.
 - **CSS3**: For styling and layout.
 - **JavaScript**: For creating interactive and dynamic features.

6. Development Tools:

- **Visual Studio Code** served as the primary Integrated Development Environment (IDE) due to its flexibility, wide range of plugins, and excellent debugging capabilities.
- **PHP STORM**
- **Sublime Text etc.**

7. Version Control:

- **Git** was utilized to manage the source code, track changes, and facilitate collaboration among team members.

This comprehensive setup provided the foundation for the successful development, testing, and deployment of the online shopping portal. The combination of tools and technologies ensured the system was both efficient and scalable.

4.2 Testing and Evaluation

Testing is a critical phase in the development of our ecommerce project to ensure that the system functions as intended, meets user expectations, and adheres to quality standards. A structured testing approach was adopted to identify and resolve any potential issues.

The following types of testing were conducted:

1. Unit Testing:

- Each module, such as the login system, product search, shopping cart, and payment gateway, was tested individually.
- Example: The shopping cart was tested to ensure it accurately updates when items are added, removed, or quantities are adjusted.

2. Integration Testing:

- Interaction between the frontend and backend systems was tested to

ensure seamless communication.

- Example: Verifying that user registration data entered on the frontend is correctly stored in the database.

3. System Testing:

- The entire system was tested as a whole to ensure all components work together harmoniously.
- Example: A complete purchase workflow was tested, from selecting a product to completing the payment process.

4. User Acceptance Testing (UAT):

- Feedback was collected from end-users to validate the functionality, usability, and design.
- Example: Users evaluated features like product search by category and subcategory and checkout for ease of use and intuitiveness.

5. Regression Testing:

- After fixing bugs and introducing new features, regression testing was performed to ensure existing functionalities were not affected.

Testing Tools Used

- **Browser Developer Tools:** Utilized to identify and fix issues related to responsiveness and page load times.
- **Manual Testing:** Key user scenarios were tested manually to simulate real-world usage.

Test Cases and Results

Table 4.1: Below are examples of key test cases performed during testing:

Test Case	Description	Expected Result	Actual Result	Status
User Registration	Validate that new users can register	Account created successfully	Account created successfully	Pass
Add to Cart Functionality	Add products to the shopping cart	Cart updates with items	Cart updates with items	Pass
Payment	Process a payment	Payment	Payment	Pass

Test Case	Description	Expected Result	Actual Result	Status
Gateway Integration	using a test card	processed successfully	processed successfully	
Responsive Design	Verify layout on mobile, tablet, and desktop	Layout adjusts appropriately	Layout adjusts appropriately	Pass

Testing Outcomes

- All critical functionalities were tested successfully, with minor issues identified and resolved.
- Performance metrics such as page load time (average 2.5 seconds) and response time for API calls (average 1 second) met the desired benchmarks.
- Feedback from User Acceptance Testing indicated high satisfaction with usability and navigation.

4.3 Results and Discussion

The development of our ecommerce project was successfully completed, fulfilling the project objectives of creating a user-friendly, secure, and efficient online shopping platform. The following summarizes the key outcomes and insights gained during the project implementation:

Results

1. Functional Achievements:

- All core functionalities, such as user registration, product browsing, shopping cart management, secure checkout, and order tracking, were implemented successfully.
- The admin panel provides efficient tools for managing products, orders, and user accounts.

2. Performance Metrics:

- Average page load time: 2.5 seconds, ensuring a fast and responsive user experience.

- API response time: Approximately 1 second for key operations like product search and cart updates.
 - The system handled up to 500 concurrent users during load testing without significant performance degradation.
3. **User Feedback:**
- Positive feedback was received during User Acceptance Testing (UAT), highlighting the intuitive design and ease of navigation.
 - Minor usability enhancements were suggested, such as clearer labels for specific buttons, which were promptly addressed.
4. **Error Resolution:**
- A few bugs related to cart synchronization and session management were identified during testing and resolved.
 - Post-deployment regression testing confirmed that the fixes did not affect existing functionalities.

Discussion

1. Strengths of the System:

- **Scalability:** The modular design ensures that the portal can accommodate increased traffic and data volumes in the future.
- **Security:** Robust measures, such as encrypted payment gateways and secure user authentication, protect user data.
- **User Experience:** A responsive and visually appealing interface ensures a seamless shopping experience across devices.

2. Challenges Encountered:

- **Integration Issues:** Initial challenges were faced in integrating the payment gateway, which required additional debugging and API adjustments.
- **Database Optimization:** During testing, minor performance lags were observed with large datasets, which were mitigated by optimizing database queries and indexing.

3. Lessons Learned:

- Early and thorough testing is crucial to identifying potential issues and avoiding delays.

- User feedback is invaluable for refining the interface and ensuring the platform meets customer expectations.

4. **Future Scope:**

- Integration of advanced features like personalized recommendations, wish lists, and AI-driven search functionality.
- Expanding payment options to include digital wallets and international currency support.
- Enhancing scalability to handle higher traffic volumes as the user base grows.

The project demonstrates the successful application of modern web development technologies to create a robust and scalable e-commerce solution. By addressing the challenges and incorporating feedback, the portal is well-positioned to provide a high-quality shopping experience to its users while meeting the business objectives of efficiency and reliability.

4.4 Summary:

The development and implementation of the **E-commerce Online Shopping Portal** successfully met the project objectives, delivering a secure, efficient, and user-friendly platform. Rigorous testing ensured that all functionalities, such as user registration, product browsing, and secure checkout, operated smoothly, while performance metrics met the expected benchmarks. Challenges encountered during the project, such as optimizing database queries for handling large datasets, were resolved effectively, resulting in a reliable and scalable system. This portal is now positioned to provide a seamless shopping experience, with future potential for advanced features and increased scalability.

CHAPTER -5

ENGINEERING STANDARDS AND DESIGN CHALLENGES

This chapter discusses the engineering standards followed during the development of the e-commerce portal, including the selection of technologies, cost analysis, engineering analysis and adherence to best practices.

5.1 Compliance with the Standards

5.1.1 Software Standards

Apache Web Server

- **Pros:**
 - Open-source and highly configurable for a wide range of use cases.
 - Strong community support and frequent updates.
 - Reliable performance and compatibility with PHP.
- **Cons:**
 - Can consume more memory compared to lighter web servers like Nginx.
 - May require manual configuration for optimization in high-traffic environments.
- **Alternatives Considered:**
 - **Nginx:** Known for lower memory usage and better performance under heavy loads, but more complex to configure.
 - **LiteSpeed:** High performance and security, but more expensive.
- **Rationale for Selection:**

Apache was chosen for its flexibility, extensive documentation, and compatibility with PHP. It is widely used for PHP-based web applications and is suitable for handling the expected traffic on the e-commerce platform.

MySQL Database

- **Pros:**
 - Open-source and reliable with a large community.
 - Supports complex queries and transactions, making it ideal for e-commerce applications.
 - Scalable and suitable for handling large volumes of data.
- **Cons:**
 - Can face performance issues with very large databases unless optimized.
 - Lacks some features of newer NoSQL databases, like MongoDB, for certain types of data storage.
- **Alternatives Considered:**
 - **PostgreSQL:** A powerful relational database with advanced features, but more complex to manage than MySQL.
 - **MongoDB:** A NoSQL database, which is more suitable for unstructured data but does not offer the same transactional consistency as MySQL.
- **Rationale for Selection:**

MySQL was chosen for its proven reliability, scalability, and strong performance in handling structured data for e-commerce applications. Its compatibility with PHP and Apache makes it an ideal choice for the project.

5.1.2 Hardware Standards

For the e-commerce portal to perform optimally, the following hardware specifications were selected to ensure reliability, speed, and scalability.

Server Hardware Specifications

- **Processor:** Intel Xeon or AMD Ryzen, for optimal multi-threading and performance.
- **Memory (RAM):** Minimum of 16GB to support high traffic volumes and handle multiple concurrent users efficiently.
- **Storage:** SSD (Solid State Drive) for fast data access and quick loading times.

- **Network Interface:** 1Gbps or higher for high-speed data transmission between the client and server.

Rationale for Selection:

These hardware specifications ensure that the server can efficiently handle the high demands of the e-commerce portal, especially during traffic peaks. SSDs provide fast data access, minimizing delays in retrieving product information or processing transactions. Sufficient memory and processor power ensure that the website remains responsive and stable under load.

5.1.3 Communication Standards

To ensure secure, fast, and reliable communication between the client and the server, the following communication protocols are used:

1. HTTP/2

- **Pros:**
 - Faster page load times due to multiplexing, which allows multiple requests to be sent in parallel.
 - Improved performance and reduced latency.
 - Better bandwidth optimization with header compression.
- **Cons:**
 - Requires support from both server and browser, which might not be compatible with older systems.
- **Alternatives Considered:**
 - **HTTP/1.1:** Older protocol, less efficient in handling multiple requests, leading to slower page load times.
 - **WebSocket:** Suitable for real-time communication but not ideal for traditional web page requests.
- **Rationale for Selection:**

HTTP/2 is more efficient than HTTP/1.1, reducing the latency and improving page load times, making it a perfect choice for an e-commerce platform that requires fast response times and minimal delays during shopping sessions.

2. HTTPS (SSL/TLS)

- **Pros:**
 - Provides encrypted communication, ensuring that sensitive data such as user credentials and payment information is securely transmitted.
 - Improves SEO, as Google prioritizes HTTPS websites.
 - Establishes trust with users by displaying the padlock symbol in the browser.
- **Cons:**
 - Increased server overhead due to the encryption process.
 - Requires periodic updates of SSL/TLS certificates.
- **Alternatives Considered:**
 - **HTTP:** Insecure and does not offer encryption, making it unsuitable for e-commerce sites.

Rationale for Selection:

HTTPS is essential for any e-commerce site to ensure the confidentiality and security of user data. It helps build trust with customers, protects their personal and payment information, and improves the site's SEO ranking.

5.2 Impact on Society, Environment, and Sustainability

This section discusses the various impacts of our single-vendor e-commerce project on society, the environment, and its sustainability. It also highlights the ethical considerations that were taken into account during the development of the platform.

5.2.1 Impact on Life

Our single-vendor e-commerce project enhances the daily lives of users by providing a streamlined platform for convenient online shopping. Customers can easily browse through a curated selection of products, making it easy for them to find what they need without leaving their homes. This convenience saves time and effort while offering access to products that might not be available in local stores.

The platform is designed to be user-friendly, with a simple and intuitive interface, secure payment methods, and efficient delivery options.

For the single vendor, this platform offers an opportunity to reach a larger customer base beyond the physical store. It empowers the business to expand its online presence and provides customers with more personalized service. This contributes to the digital economy, as small businesses can compete in a growing digital marketplace.

5.2.2 Impact on Society & Environment

Our e-commerce platform, as a single-vendor website, plays a role in promoting digital inclusion by offering customers a straightforward way to access goods online. It also fosters a direct relationship between the vendor and the customers, improving customer service and enhancing the shopping experience.

However, we are mindful of the environmental impact associated with e-commerce, such as the packaging waste generated by shipments and the carbon footprint of deliveries. To reduce the environmental footprint of our project, we have prioritized the use of eco-friendly packaging materials. Additionally, we have chosen delivery partners who make efforts to minimize emissions through efficient logistics, ensuring that products are shipped using the most sustainable routes and methods.

Since our project is a single-vendor platform, we have the ability to focus on sustainable practices directly with the vendor, promoting environmentally conscious production and packaging methods for all products listed on the site. This reduces waste and encourages sustainability throughout the supply chain.

5.2.3 Ethical Aspects

Throughout the development of our single-vendor e-commerce platform, we have adhered to strict ethical standards. We ensured that the website development was carried out with integrity, avoiding any unethical practices such as plagiarism, manipulation of customer data, or deceptive marketing. The platform is built to protect user privacy, and we strictly comply with data protection regulations such

as GDPR to ensure that customers' personal information is kept safe and used responsibly.

We are committed to transparency in product listings, ensuring that customers are provided with accurate, detailed, and honest information. The product descriptions, prices, and availability are always kept up-to-date. Additionally, clear return policies and efficient customer service channels have been implemented to support customer satisfaction and trust.

The vendor is also encouraged to follow ethical sourcing practices, ensuring that the products sold on the platform are produced responsibly. Fair trade and ethical production practices are promoted through the platform's vendor guidelines, ensuring the vendor maintains a commitment to social and environmental responsibility.

5.2.4 Sustainability Plan

The long-term sustainability of our single-vendor e-commerce platform is built on scalability and efficiency. We are utilizing cloud hosting solutions that are powered by renewable energy sources, reducing the overall carbon footprint associated with the platform's infrastructure. The website is optimized for speed and efficiency, minimizing server load and energy consumption, contributing to a lower environmental impact.

To further promote sustainability, we are encouraging the vendor to adopt eco-friendly production practices, from using sustainable materials for packaging to reducing waste in manufacturing. As the platform grows, we aim to explore options for product recycling programs, where customers can return old items for rewards or discounts, helping to reduce the environmental impact of discarded products.

Additionally, we are focused on minimizing resource use by relying on a digital-first approach. This reduces the need for physical resources such as paper, printed materials, or physical stores, aligning with sustainable business practices.

5.3 Project Management and Financial Analysis

This section provides a detailed cost analysis of our e-commerce project, including the required budget and revenue model. The analysis also includes an alternative budget scenario, with justifications for the decisions made.

Cost Analysis

The e-commerce website was developed with a focus on functionality and sustainability, considering that it was part of our BSc final defense project. Since the development was done by ourselves, the actual financial cost to us was relatively low. However, if we were to develop this website for a client, the costs would increase to account for professional fees, development time, and additional resources. Below is a breakdown of the costs associated with the project, considering a potential client scenario:

- **Domain and Hosting Costs:**
 - **Domain Purchase:** \$15 (Annual)
 - **Hosting:** \$45 (Annual for shared hosting plan)

Total Actual Cost for Domain and Hosting: \$60 (Total for both domain purchase and hosting for one year)

- **Development Costs (Client Scenario):**
 - **Website Design and Development (Frontend & Backend):** \$800
(This includes UI/UX design, custom development, and integration of e-commerce features such as product catalog, shopping cart, and payment gateway)
 - **SSL Certificate (Security for HTTPS):** \$50 (Annual)
 - **E-commerce Platform Setup (Payment Gateway Integration, Shopping Cart Setup):** \$200
 - **Testing and Quality Assurance:** \$150
(For testing different devices, browsers, and load testing)

- **Miscellaneous Costs (Client Scenario):**

- **Software/Tools for Development (e.g., IDE, Graphics Software):** \$100
- **Marketing and Initial Advertising Campaign:** \$150
- **Legal and Regulatory Compliance (e.g., Privacy Policy, Terms, and Conditions):** \$50

Total Development Cost for Client Project: \$1,800

Operational Costs (Annual)

- **Server Hosting and Maintenance:** \$45 (Annual)
- **Domain Renewal:** \$15 (Annual)
- **Marketing and Advertising (Ongoing Campaigns):** \$200
- **Customer Service and Vendor Support:** \$100

Total Operational Costs: \$360 per year

Revenue Model

Given that our e-commerce project is a single-vendor website, the revenue model is centered around the vendor's sales. The key components of the revenue model are:

- **Product Sales Revenue:** The primary revenue source is generated from the sales of products listed on the website. A commission of 10% is charged on each sale made through the platform.
- **Subscription Fees:** The vendor pays an annual subscription fee of \$100 to maintain the online store on the platform. This fee grants the vendor access to premium features such as enhanced product listing visibility, promotional campaigns, and analytics tools.
- **Advertising Revenue:** Future plans include offering paid advertising options for the vendor to promote products on the site or through newsletters. This additional revenue stream will help the platform grow.

Estimated Annual Revenue:

- Sales Commission (10% of \$10,000 in sales): \$1,000
- Subscription Fee: \$100
- Advertising Revenue (Estimated): \$150

Total Annual Revenue: \$1,250

Alternate Budget Scenario and Rationale

In an alternate budget scenario, where costs are minimized for the initial launch, the following changes would be made:

- **Use of Free Hosting Options:** A free or low-cost hosting plan could reduce hosting costs to \$0 (e.g., using shared hosting for a basic setup).
- **Reduced Marketing Budget:** By using free social media and organic marketing, the initial marketing budget could be reduced to \$50.
- **Utilize Open-Source Tools:** Instead of purchasing premium software or tools, we could rely on open-source tools, reducing software costs to \$0.

Alternate Budget:

- Domain Purchase: \$15
- Hosting: \$0 (Using free shared hosting plan)
- Development Costs (using open-source tools): \$500
- Marketing: \$50

Total Development Cost: \$565

Total Operational Costs (Annual): \$275

Estimated Annual Revenue remains the same at \$1,250.

Rationale for Selection of Budget

The selected budget of **\$1,800** for developing the website for a client ensures a high-quality, secure, and sustainable e-commerce platform. This budget includes professional development costs, which would not be applicable if we were only building the site for ourselves. The alternate budget of **\$565** demonstrates a scenario where minimal costs are incurred, but it compromises on functionality,

quality, and scalability. The higher budget allows for a more polished and professional product that meets industry standards and includes necessary features for a seamless e-commerce experience.

The additional budget also supports marketing and customer acquisition, which are crucial in establishing the vendor’s presence in the competitive e-commerce market.

5.4 Complex Engineering Problem

5.4.1 Complex Problem Solving

In this section, provide a mapping with problem solving categories. For each mapping add subsections to put rationale (Use Table 5.1). For P1, you need to put another mapping with Knowledge profile and rational thereof.

Table 5.1: Mapping with complex problem solving.

EP1 Dept of Knowledge	EP2 Range Of Conflicting Requirements	EP3 Depth of Analysis	EP4 Familiarity of Issues	EP5 Extent of Applicable Codes	EP6 Extent Of Stakeholder Involvement	EP7 Interdependence
✓	✓		✓	✓		

Mapping with Knowledge Profile for EP1

This table (5.2) is designed to map the EP1 to the Knowledge Profile.

Table 5.2: Mapping with knowledge Profile.

K3 Engineering Fundamentals	K4 Specialist Knowledge	K5 Engineering Design	K6 Engineering Practice	K8 Research Literature
✓	✓	✓	✓	

5.4.2 Engineering Activities

In this section, provide a mapping with engineering activities. For each mapping add subsections to put rationale (Use Table 5.3)

Table 5.3: Mapping with complex engineering activities.

EA1 Range of resources	EA2 Level of Interaction	EA3 Innovation	EA4 Consequences for society and environment	EA5 Familiarity
	✓		✓	✓

Table 5.4: Mapping with Engineering Activities

Activity Code	Description	Rationale
EA2	Level of Interaction: Collaboration with team members and stakeholders.	We worked closely as a team to divide tasks such as backend coding, frontend design, and deployment efficiently.
EA4	Consequences for Society and Environment: Considering societal and environmental impacts.	Our platform promotes digital inclusion and reduces environmental footprints by minimizing the need for physical retail spaces.
EA5	Familiarity: Balancing known methodologies with learning new techniques to enhance the project.	We utilized familiar tools like XAMPP and Bootstrap but also explored advanced PHP features to optimize performance.

Rationale for Each Mapping

1. EA2: Level of Interaction

Our team worked collaboratively, splitting responsibilities to streamline the development process. Regular discussions were held to align goals, review progress, and address challenges, demonstrating an efficient level of

interaction among team members.

2. EA4: Consequences for Society and Environment

By offering a digital platform for online shopping, we contributed to reducing the environmental impact associated with physical retail operations. Additionally, we ensured accessibility to underserved areas, promoting inclusivity.

3. EA5: Familiarity

While we relied on familiar tools such as HTML and MySQL for the core architecture, we explored advanced PHP 8.1 features, enhancing our technical knowledge and applying new practices to optimize the website's functionality.

5.5 Summary

We discussed and implemented various engineering activities in this project, focusing on resource allocation, structured collaboration, and innovative features like responsive design and secure payment systems. We also addressed environmental and societal impacts, ensuring that the project adhered to ethical and sustainable practices. This structured engineering approach allowed us to achieve the project's technical and functional goals effectively.

CHAPTER 6

CONCLUSION

In this chapter, we summarize the key outcomes of our e-commerce project, discuss the challenges we faced during its development, and outline the future steps to enhance the platform. This conclusion highlights the specific aspects of the project we developed, the limitations encountered, and the improvements we plan to implement moving forward.

6.1 Summary

We developed a single-vendor e-commerce website as part of our BSc final defense project, with the goal of creating an efficient, user-friendly platform for online shopping. The website is built using PHP 8.1, HTML5, CSS3, JavaScript, jQuery, and Bootstrap, ensuring a responsive design and smooth user experience across devices. We integrated key features such as a dynamic landing page, product catalog, secure payment gateway, and intuitive navigation to ensure a seamless shopping experience. The platform is designed to support small businesses by providing them with a digital sales channel, helping them reach a wider audience. Throughout development, we focused on delivering a functional, secure, and visually appealing platform. Despite the challenges related to security features and time constraints, we successfully developed a platform that meets the core objectives and is ready for further refinement.

6.2 Limitations

While we successfully developed a functional e-commerce platform, several limitations arose during the process. The website currently supports only a single vendor, limiting its scalability for other businesses. Additionally, we focused on optimizing the website for desktop and mobile browsers, but we did not develop mobile applications for iOS and Android, which restricts the platform's accessibility for mobile users. We also did not conduct extensive testing under heavy traffic conditions, so we can't yet guarantee the platform's performance during peak usage. Time and budget constraints prevented us from implementing

advanced features such as automated inventory management and personalized product recommendations, which would have added value to the platform.

6.3 Future Work

For future work, we plan to expand the platform's functionality by adding features that will enhance its scalability and user experience. One of the primary enhancements will be transforming the platform into a multi-vendor e-commerce website, allowing multiple businesses to sell their products. We will also focus on developing mobile applications for both iOS and

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