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ELECTRONIC COMMERCE (CO3027)

Developing an E-commerce Web Application for Selling Electronic Devices

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1 Introduction

This report details our assignment for the Electronic Commerce (CO3027) course in semester HK222 at Ho Chi Minh City University of Technology. As part of the assignment, we were given specific requirements that we had to fulfill:

- Create a certain business process which is well suited to electronic commerce, and does not violate Vietnam E-commerce law.
- Specify the category B2C, B2B or C2C.
- Assignment requires student to plan, conduct surveys, feasibility analysis, etc. Therefore, groups should choose your own ideas carefully through analyzing market, estimating cost, identifying customers etc.

Our objective was to create an E-commerce web application that allows customers to purchase electronic devices with ease. Here is the structure of our report:

1. Introduction

In this section, we provide an overview of our report and assignment.

2. Project Identification

In this section, we conduct market research and identify the problems, motivations, and customer groups for our E-commerce project.

3. Business Model Canvas

In this section, we define the business model canvas for our project, which outlines target market, value-based pricing strategy, and essential tools for success.

4. Monetization Strategies

In this section, we discuss the monetization strategies we have developed for our E-commerce platform.

5. Development Plan

In this section, we devise a development plan for our E-commerce project, including cost estimates and a risk management plan.

6. System Analysis

In this section, we analyze our system in theory before designing it in practice, including its architecture, components, and functionalities.

7. System Design

In this section, we design our system, including its user interface, database, and security features.

8. Implementation

In this section, we implement our system, which involves coding, testing, and debugging.

9. Evaluation

In this section, we evaluate our assignment and web application, including usability testing, functionality testing, and user feedback.

10. Summary

In this section, we summarize our efforts and achievements, highlighting our key findings and recommendations for future improvements.



2 Project Identification

Within this segment, our focus is on conducting market research to recognize the issues, driving factors, and customer demographics for our E-commerce initiative.

2.1 Problem Statement

In recent years, electronic devices such as smartphones, laptops, and tablets have become an integral part of our daily lives. As a result, the demand for these devices has increased significantly. With the advent of the internet and smartphones, the trend of online shopping has also gained momentum. E-commerce platforms have revolutionized the way we shop, making it convenient for customers to buy products from the comfort of their homes.

Furthermore, the COVID-19 pandemic has had a profound impact on our daily lives, including the way we shop. With lockdowns and social distancing measures in place, many customers have turned to online shopping to meet their needs. Electronic devices such as smartphones, laptops, and tablets have become even more important as people have had to work and study from home.

However, current E-commerce platforms for selling electronic devices face several problems that can affect the shopping experience for customers. Limited product information, lack of personalized recommendations, inconsistent product quality, and delivery and returns are all areas that require improvement. As the demand for electronic devices grows, it is important for E-commerce platforms to address these issues and provide a seamless shopping experience for customers.

2.2 Motivations

Witnessing the problems, we are motivated to develop an E-commerce application for selling electronic devices that can provide a safe and convenient shopping experience for customers. Using this product, customers can browse and purchase electronic devices without having to leave their homes. The application can show detailed information about the products which helps the customers choose suitable products for their needs. Furthermore, our application also supports many methods for online payment and various shipping methods, which is extremely convenient and friendly for customers to purchase online.

2.3 Survey

To understand the needs of users and customers as well as have a clear vision of E-commerce market, our team has conducted a survey whose title is “A Survey on Internet Usage Habits and Online Shopping”. The followings are some statistics that we have achieved.

Trung bình mỗi ngày bạn dành bao nhiêu thời gian truy cập Internet:
104 câu trả lời

 Sao chép

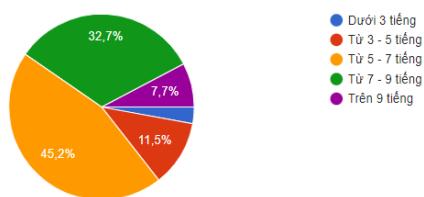


Figure 1: On average, how much time do you spend accessing the internet per day?

Thời điểm bạn hay truy cập Internet nhất:
104 câu trả lời

 Sao chép

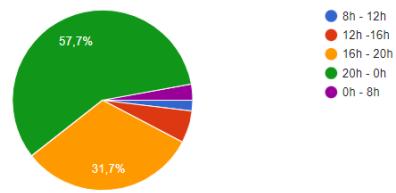


Figure 2: What time of day do you most often access the internet?

Phương tiện truy cập Internet bạn hay dùng nhất:
104 câu trả lời

 Sao chép

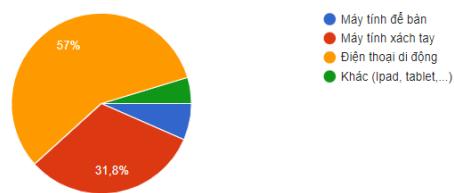


Figure 3: What is the device that you most often use to access the internet?



Figure 4: Have you ever participated in online shopping?



Figure 5: What kind of goods or services do you usually buy online?

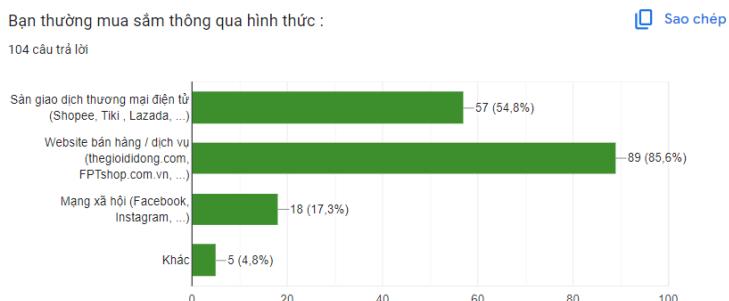


Figure 6: What method do you usually use to shop?

Khi tham gia mua sắm trực tuyến, bạn thường thanh toán qua hình thức nào : [Sao chép](#)
104 câu trả lời

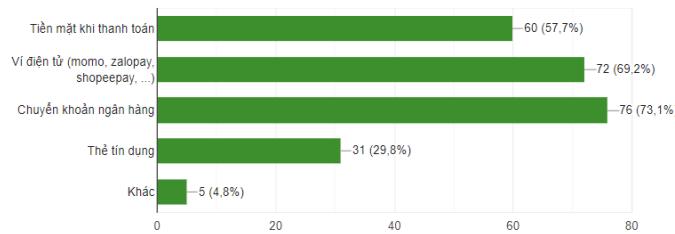


Figure 7: When you shop online, what payment method do you usually use?

Những yếu tố bạn quan tâm khi mua sắm trực tuyến? [Sao chép](#)
104 câu trả lời

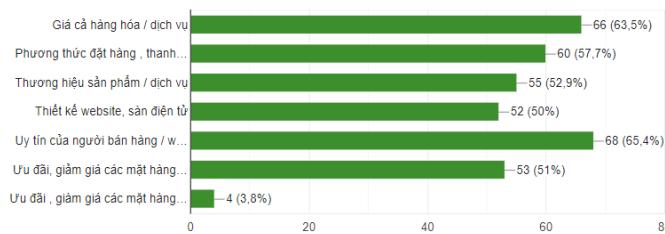


Figure 8: What factors do you consider when shopping online?

Using the statistics coming from this survey, we have had a good resource to consult when analyzing the market and customers' needs.

2.4 Market Analysis

2.4.1 Barriers to Entry

- This sector requires high advertisement and promotion costs. It is also necessary to implement many social programs to get more exposure to customers. Therefore, Building a strong brand and gaining customer trust can be difficult for new E-Commerce businesses.
- E-Commerce businesses are subject to numerous legal and regulatory requirements, including data privacy laws, consumer protection regulations, and taxation rules.
- Managing inventory, shipping, and returns can be a challenging and complex process. This requires expertise in logistics and supply chain management.
- Attracting and retaining customers is critical to the success of any E-commerce business. This requires expertise in digital marketing, social media marketing, and SEO.
- Building an E-Commerce website requires technical expertise in web development, UX/UI design, and system architecture. This costs the business a huge amount of expense to employ enough human resources to actualize the ideas.

2.4.2 Competitors

The E-Commerce sector is extremely competitive, with both long-standing businesses and daily newcomers. Some of the major competitors in the E-Commerce space include:

- Amazon: Amazon is the largest E-Commerce company in the world, offering a wide range of products and services, including Amazon Prime, Amazon Fresh, and Amazon Web Services.
- Alibaba: Alibaba is a Chinese E-Commerce company that operates several online marketplaces, including Alibaba.com, AliExpress, and Taobao.
- eBay: eBay is a global E-Commerce platform that allows individuals and businesses to buy and sell goods and services online.
- Shopee: is a rapidly growing E-Commerce company that was founded in Singapore in 2015. Shopee operates in several countries across Southeast Asia, including Singapore, Malaysia, Thailand, Vietnam, Indonesia, and the Philippines.

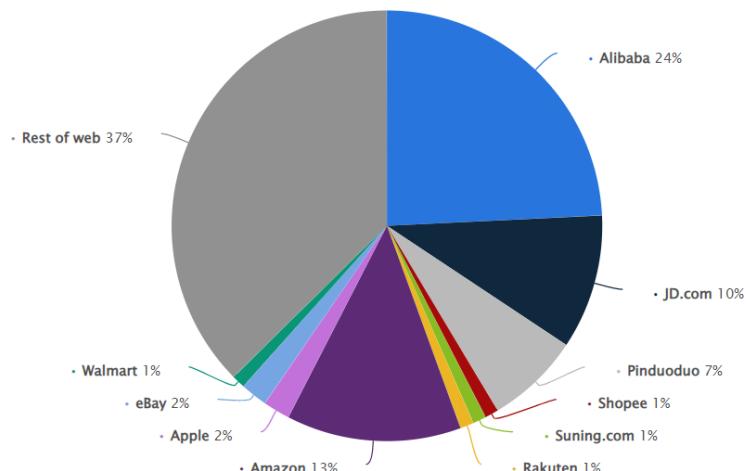


Figure 9: E-commerce market share of leading e-retailers worldwide in 2021 [18]



2.4.3 Potential Opportunities

According to Forbes [1], 20.8% of retail purchases are expected to take place online in 2023. Nowadays, the first touchpoint a customer has with a business typically takes place online, especially if the company has a presence on social media. As entrepreneurs look to start new businesses with little overhead, renting a physical retail space may no longer be a top priority. The focus is shifting to establishing a web presence that can capture online sales.

Since 20.8% of retail purchases are expected to take place online in 2023, it's no surprise that E-commerce sales are supposed to increase as well. With more customers shopping online, most businesses can sell more and earn more as a result. Whether their goal is to boost their sales by a small percentage or they hope to completely transform their businesses from a startup to a large organization, E-commerce can help. This has enhanced the belief and expectations of business owners on E-commerce platforms, which leads to the expansion of the E-commerce market - the global E-commerce market is expected to total \$6.3 trillion in 2023.

Another truth referred by Forbes is 79% of shoppers shop online at least once a month. While some customers might shop online every once in a while, most of them do so on a monthly basis. Online shopping is simply a part of their regular routine, regardless of what they're looking for. It's second nature for them to turn to the internet every time they have a particular purchase in mind.

All those trends together have helped the E-commerce market gain an endless number of potential opportunities.

2.5 Customers Identification

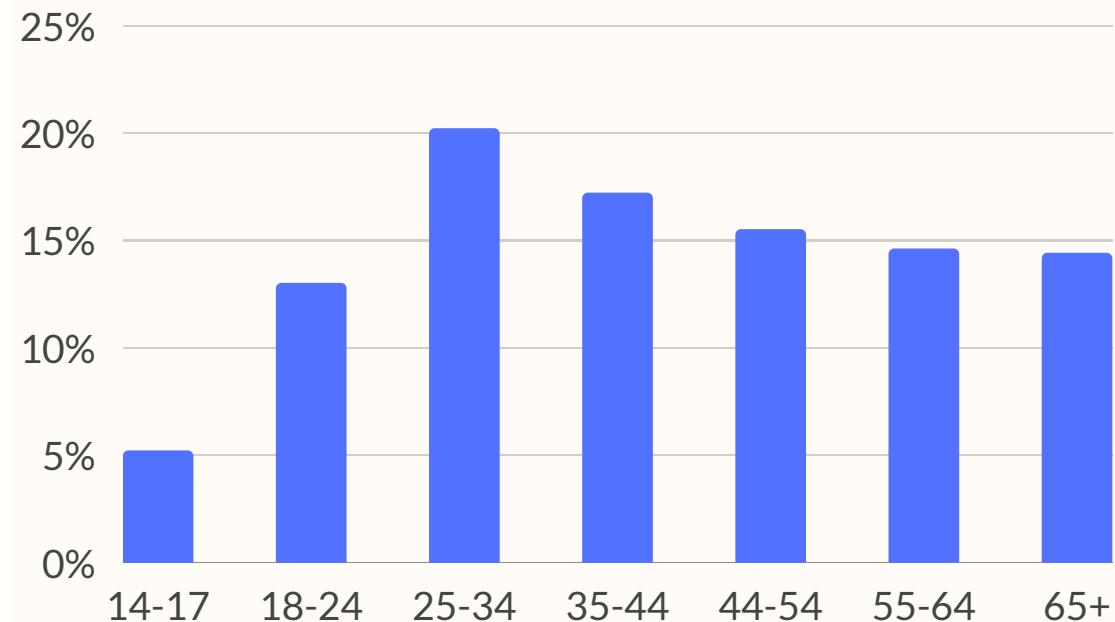
The customers of our E-commerce platform for selling electronic devices can vary depending on the types of devices being sold. There are some main potential customer segments that an E-commerce platform selling electronic devices may target:

1. Tech enthusiasts: This segment includes customers who are passionate about technology and are always looking for the latest and greatest electronic devices. They tend to be early adopters and are willing to pay a premium for cutting-edge products.
2. Gamers: Gamers are a growing segment of the electronic device market. They are interested in high-performance devices, such as gaming laptops, gaming consoles, and gaming accessories.
3. Professionals: Professionals who rely on electronic devices for their work, such as graphic designers, photographers, and video editors, require high-performance devices with specific features and capabilities.
4. Students: Students are a large segment of the electronic device market. They are looking for devices that are affordable, lightweight, and have long battery life to support their studies.
5. Everyday consumers: This segment includes customers who are looking for reliable and affordable electronic devices for everyday use, such as smartphones, tablets, and laptops.

In terms of customers' age group, according to Finical [5], Millennials are the largest age group to use online shopping, with 20.2% of online shoppers falling between the ages of 25 to 34 and

another 17.2% of online shoppers between the ages of 35 to 44. Therefore, we aim to focus on customers from two age groups: Gen Z and Millennials.

Online Shopping % by Age Group



2.6 Feasibility Analysis

To estimate the feasibility of our project, we conduct the analysis on five main aspects: Strength of the Business Idea, Industry-Related Issues, Target Market and Customer-Related Issues, Founder's- (or Founders'-) Related Issues, Financial issue.



2.6.1 Strength of the Business Idea

	Low Potential (-1)		Moderate Potential (0)		High Potential (+1)	
1. Extent to which the idea: <ul style="list-style-type: none">• Takes advantage of an environmental trend• Solves a problem• Addresses an unfilled gap in the marketplace					Strong	+1
2. Timeliness of entry to market	Not timely	-1				
3. Extent to which the idea “adds value” for its buyer or end user					High	+1
4. Extent to which the customer is satisfied by competing products that are already available			Moderately satisfied	0		
5. Degree to which the idea requires customers to change their basic practices or behaviors					Small to no changes required	+1
Sum	2					

2.6.2 Industry-Related Issues

	Low Potential (-1)		Moderate Potential (0)		High Potential (+1)	
1. Number of competitors	Many	-1				
2. Stage of industry life cycle			Growth phase	0		
3. Growth rate of industry					Strong growth	+1
4. Importance of industry's products and/or services to customers			“Would like to have”	0		
5. Industry operating margins					High	+1
Sum	1					



2.6.3 Target Market and Customer-Related Issues

	Low Potential (-1)		Moderate Potential (0)		High Potential (+1)	
1. Identification of target market for the proposed new venture			May be able to identify	0		
2. Ability to create "barriers to entry" for potential competitors			May or may not be able to create	0		
3. Purchasing power of customers					High	+1
4. Ease of making customers aware of the new product or service			Moderate	0		
5. Growth potential of target market					High	+1
Sum	2					

2.6.4 Founder's- (or Founders') Related Issues

	Low Potential (-1)		Moderate Potential (0)		High Potential (+1)	
1. Founder's or founders' experience in the industry			Moderate experience	0		
2. Founder's or founders' skills as they relate to the proposed new venture's product or service					Skilled	+1
3. Extent of the founder's or founders' professional and social networks in the relevant industry	None	-1				
4. Extent to which the proposed new venture meets the founder's or founders' personal goals and aspirations					Strong	+1
5. Likelihood that a team can be put together to launch and grow the new venture			Moderately likely	0		
Sum	1					



2.6.5 Financial Issues

	Low Potential (-1)		Moderate Potential (0)		High Potential (+1)	
1. Initial capital investment			Moderate	0		
2. Number of revenue drivers (ways in which the company makes money)			Two to three	0		
3. Time to break even	More than two years	-1				
4. Financial performance of similar businesses					Strong	+1
5. Ability to fund initial product (or service) development and/or initial start-up expenses from personal funds or via bootstrapping.			Moderate	0		
Sum	0					

2.6.6 Overall Potential

Based on the above five aspects, we can evaluate the overall potential of our project as follows:

Score (-5 to +5)	Overall Potential of the Business Idea Based on Each Part	Suggestions for Improving the Potential
Part 1: Strength of Business Idea	High potential	<ul style="list-style-type: none">- Constantly updating.
Part 2: Industry-Related Issues	Moderate potential	<ul style="list-style-type: none">- Making things simpler, create competitive breakthroughs.
Part 3: Target Market and Customer Related Issues	High potential	<ul style="list-style-type: none">- Focusing more on potential market such as the youth.- Spending more money on marketing the product.
Part 4: Founder's (or Founders') Related Issues	Moderate potential	<ul style="list-style-type: none">- Building strong professional and social networks in the relevant industry.- Assembling a group of people with shared interests or aims.- Gaining more experience in the relevant industry.
Part 5: Financial Issues	Moderate potential	<ul style="list-style-type: none">- Finding more ways to increase profit via several sources (etc: advertisements, promotions, ...).- Calling for investment from investors who are interested in the field of E-commerce in particular, or technology in general.
Overall Assessment	Moderate potential	<ul style="list-style-type: none">- Try to solve issues with the suggestions mentioned above

To summarize, we give our business idea the overall assessment of moderate potential because while it has high potential in the strength of business idea and target market and customer-related



issues, it still has some issues in three other aspects that we cannot turn a blind eye to. It is especially noteworthy that our business idea still faces “Founder’s (or Founders’) Related Issues”, this is the issue originating from the founders who are going to lead the business. Therefore, if we ignore this aspect, it may become a deadly problem in the future.



3 Business Model Canvas

This segment is dedicated to defining the business model canvas for our project, which entails outlining the target market, value-based pricing strategy, and essential tools necessary for achieving success.

Our target market includes tech-savvy consumers and small enterprises seeking affordable, high-quality electronics. We offer a range of premium electronic equipment at competitive prices through an easy-to-use online storefront. Managing the website, handling inventory, and providing customer support are all critical tasks that we undertake. The online storefront, technology infrastructure, and competent staff are our essential tools for success. Our value-based pricing strategy is primarily driven by the sale of electronic gadgets, which generates the bulk of our revenue. We prioritize self-service as our primary customer interaction method, but we also offer additional options such as email and live chat. Our distribution channels include E-commerce platforms, social media, and sponsored advertising. Our business approach aims to provide a streamlined and effective purchasing experience to our customers while generating a sustainable revenue stream.

The business model canvas [4] below highlights critical aspects of our business model.

KEY PARTNERS	KEY ACTIVITIES	VALUE PROPOSITIONS	CUSTOMER RELATIONSHIPS	CUSTOMER SEGMENTS
<p>Who are our key partners? Electronic device suppliers/manufacturers, payment gateway providers, logistics and delivery partners, marketing and advertising agencies, web hosting and domain providers.</p> <p>Who are our key suppliers? Electronic device manufacturers.</p> <p>Which key resources are we acquiring from our partners? High-quality electronic</p>	<p>What key activities do our value propositions require? Sourcing high-quality devices, secure payment processing, efficient logistics and delivery, effective marketing and advertising, and robust website infrastructure and maintenance.</p> <p>Our distribution channels? Web application, social media, third-party logistics providers, Internet.</p>	<p>What value do we deliver to the customer? Convenience, quality, security, speed and efficiency, and competitive pricing.</p> <p>Which one of our customers' problems are we helping to solve? Limited access to high-quality devices.</p> <p>What bundles of products and services are we offering to each segment? Wide selection of high-quality products, secure, convenient and</p>	<p>How do we get, keep, and grow customers? Marketing campaigns, personalized recommendations, timely customer service, customer feedback, targeted promotions, and continuous improvement.</p> <p>Which customer relationships have we established? Self-service and automated.</p> <p>How are they integrated with the rest of our business model? Full rights to use their</p>	<p>For whom are we creating value? Customers who are looking for a convenient, reliable, and secure way to purchase high-quality electronic devices at competitive prices.</p> <p>Who are our most important customers? Tech-savvy individuals, gadget enthusiasts, and bulk buyers who value the convenience, security, and reliability of online shopping for high-quality electronic devices at competitive prices.</p> <p>What are the customer archetypes?</p>

<p>devices, reliable and efficient delivery services, secure payment gateways.</p> <p>Which key activities do partners perform?</p> <p>Provide funds, supplying high-quality electronic devices, providing logistics and delivery services and ensuring secure payment processing.</p>	<p>Customer relationships?</p> <p>Self-service, personal assistance, community engagement, and post-purchase follow-up.</p> <p>Revenue streams?</p> <p>Sales of devices, commission-based fees.</p>	<p>user-friendly interface.</p> <p>Which customer needs are we satisfying?</p> <p>Convenient, reliable, and safe.</p> <p>What is the minimum viable product?</p> <p>Browse and purchase electronic devices, secure payment gateway.</p>	<p>own funds</p> <p>How costly are they?</p> <p>Free or minor fees</p>	<ul style="list-style-type: none"> - Innocent - Artist - Caregiver - Jester - Sage
<p>KEY RESOURCES</p> <hr/> <p>What key resources do our value propositions require?</p> <p>A user-friendly and secure e-commerce platform, delivery and logistics systems , a robust customer support system, IT,</p>			<p>CHANNELS</p> <hr/> <p>Through which channels do our customer segments want to be reached?</p> <p>Internet/Social media, advertising, affiliate marketing.</p> <p>How do other</p>	

	<p>skilled and knowledgeable staff, marketing and advertising resources</p> <p>Our distribution channels? Internet, web application.</p> <p>Customer relationships? Users.</p> <p>Revenue streams? Services fee, advertising.</p>	<p>companies reach them now?</p> <p>Via online advertising, search engine optimization (SEO), email marketing, social media marketing, affiliate marketing.</p> <p>Which ones work best? SEO, Internet/Social media.</p> <p>Which ones are most cost-efficient? SEO, Internet/Social media.</p> <p>How are we integrating them with customer routines? Advertisements, social media, relevant and engaging content.</p>	
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COST STRUCTURE	REVENUE STREAMS
<p>What are the most important costs inherent to our business model?</p> <p>Human resources costs and operating expenses.</p>	<p>For what value are our customers really willing to pay?</p> <p>Convenience, quality, speed, reliability, and affordability.</p>
<p>Which key resources are most expensive?</p> <p>Human resources.</p>	<p>For what do they currently pay?</p> <p>Faster shipping, warranties, installation, and technical support.</p>
<p>Which key activities are most expensive?</p> <p>Developing and maintaining the application, marketing and advertising.</p>	<p>What is the revenue model?</p> <p>SaaS Revenue Model.</p> <p>What are the pricing tactics?</p> <p>Penetration pricing, cost-plus pricing</p>



4 Monetization Strategies

The purpose of this section is to discuss the monetization strategies that have been developed for our E-commerce platform.

For E-commerce firms to maximize profitability and maintain long-term growth, a clearly defined monetization strategy must be in place. This part often provides information on the many revenue models, pricing plans, and marketing initiatives the business use to increase sales and profit.

Any stakeholders can acquire insight into how successful firms function in the online marketplace and how they can apply these concepts to their own E-commerce enterprises by knowing the various monetization tactics used by E-commerce organizations.

4.1 Pricing Model

Price model describes the process a business uses to determine the selling price for its goods or services. The pricing model takes into account a number of variables, including perceived value, market demand, competition, and manufacturing costs. A well-defined pricing model is essential for E-commerce businesses to maximize their profitability, retain customers, and gain a competitive advantage.

Typically, this part provides information about the various price strategies the project uses, such as cost-plus pricing, value-based pricing, dynamic pricing, and subscription pricing, among others. By understanding the pricing models used by successful E-commerce companies, stakeholders can gain valuable insights into how to price their own products or services competitively and attract customers in the online marketplace.

4.1.1 Value-based Pricing

Value-based pricing is a pricing strategy that considers the perceived value of a product or service to the customer rather than the cost of producing it. This strategy takes into account the benefits that the product or service offers to the customer, such as time savings, convenience, and increased productivity. By understanding the customer's perspective on the value of a product or service, E-commerce companies can set prices that reflect its true worth, increasing customer satisfaction and loyalty while maximizing profitability.

E-commerce businesses can set themselves apart from rivals, increase margins, and expand their customer base by integrating value-based pricing into their pricing plan. Any E-commerce website project must have the value-based pricing section since it provides strategic guidance on pricing and revenue development.

For instance, let us consider the case of a high-end laptop that costs \$1,000 to import. After evaluating the laptop's unique features and capabilities, we might determine that it is worth more than other laptops on the market. In this case, we could set a higher selling price of \$1,499. Such a pricing strategy allows us to capture the full value of our laptop, providing a competitive advantage in the market while generating sufficient profit.



4.1.2 Competitive Pricing

Competitive pricing is a strategy that takes this consumer behavior into consideration, by setting a price based on what your competition charges. It's used by E-commerce companies to set prices that are in line with or below those of their competitors. This approach involves monitoring the prices of similar products or services offered by other companies in the same market and adjusting prices accordingly. By understanding the competitive landscape, E-commerce businesses can make informed decisions about pricing that help them remain competitive and attract customers.

By incorporating competitive pricing into their pricing model, E-commerce companies can stay ahead of the competition, improve their market position, and grow their customer base. The competitive pricing section is a critical part of any E-commerce website project, as it helps to inform strategic decisions about pricing and revenue generation.

While setting our product prices at a low and straightforward rate may seem like a safe strategy, it neglects the perceived value our customers place on our offerings. In other words, by engaging in a "race to the bottom" pricing strategy, we may be leaving potential profits on the table. It is important for us to consider the value our products bring to customers and ensure our pricing reflects that.

The pricing strategy we choose is a critical factor in determining the profitability of our products. While a low-cost pricing approach may seem like a safe option, it can have negative consequences on our bottom line. Specifically, such a strategy overlooks the importance of our customers' perceived value of our products. By failing to consider the value our products bring to the market, we may be missing out on potential profits. For instance, let us consider the case of a high-end laptop that costs \$1,000 to import. A market research study shows that similar laptops from our competitors are priced around \$1,300. To remain competitive, we could set our selling price at \$1,299. By doing so, we strike a balance between profitability and market competitiveness, ensuring that we neither undercut our value nor alienate customers with inflated prices.

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4.1.3 Dynamic Pricing

Competitive pricing is a strategy used by E-commerce companies to set prices that are in line with or below those of their competitors. This approach involves monitoring the prices of similar products or services offered by other companies in the same market and adjusting prices accordingly. By understanding the competitive landscape, E-commerce businesses can make informed decisions about pricing that help them remain competitive and attract customers.

E-commerce businesses can stay ahead of the competition, strengthen their position in the market, and expand their customer base by incorporating competitive pricing into their pricing model. Any E-commerce website project must include a competitive pricing section because it provides important information for making strategic decisions about pricing and revenue generation.

A dynamic pricing model is an alternative strategy that involves adjusting prices based on factors such as market demand, inventory levels, or other variables. While it can be complex to implement, dynamic pricing can lead to increased revenue and profits. This approach requires monitoring market conditions and adjusting prices accordingly.



For example, suppose we are selling a high-end laptop that costs \$1,000 to import. With a dynamic pricing strategy, we could offer a 10% discount to encourage sales when inventory levels are high or when we need to boost sales. By monitoring the market demand and inventory levels, we can adjust the price of the laptop to remain competitive in the market while maximizing profitability.

4.2 Revenue Model

An essential part of an E-commerce website is the revenue model, which describes how a business makes money from its goods and services. For E-commerce firms to maximize profitability, keep consumers, and gain a competitive advantage, a clearly defined revenue model is crucial.

The revenue model is considered a high-level look at the revenue structure of a business. Within this model, a company can have a number of different revenue streams, i.e. different sources of income.

4.2.1 Sales Revenue Model

The most common of all E-commerce revenue models, here profits are achieved by selling products or providing services online versus, or in addition to, brick-and-mortar stores. Any business selling items through the internet, regardless of their business model, is following the sales revenue model. While they may have other revenue streams, this tends to be their bread-and-butter.

The sales revenue model involves generating revenue from selling products directly to customers.

For example, the website may sell Apple and Samsung smartphones, as well as cases, chargers, and other accessories. The website earns revenue by charging a markup on the products it sells. The sales revenue model may also involve offering discounts, promotions, or loyalty programs to attract customers and encourage repeat purchases.

4.2.2 Advertising Revenue Model

This model generates revenue through advertising partnerships, where companies pay to display ads on a website, mobile app, or other platform.

The advertising revenue model involves generating revenue from advertising on the E-commerce website.

For example, the website may display ads from mobile phone carriers, app developers, or other companies that offer products or services related to mobile phones. The website earns revenue by charging these companies a fee for displaying their ads. The advertising revenue model may also involve offering sponsored content or native advertising to provide more value to advertisers and improve user engagement.

4.3 Sale and Payment Method

Just because E-commerce payments occur over the internet doesn't mean they all happen in the same way. As E-commerce has expanded at a rapid rate, the methods by which people pay for goods and services online have diversified. Customer preferences around E-commerce payment methods vary considerably in different parts of the world, and the field is constantly evolving.



Globally, credit and debit cards and digital wallets are the most popular E-commerce payment methods, but other payment methods, like bank transfers and cash on delivery (COD), remain popular in certain regions. The use of mobile payments is also growing, particularly in markets with high smartphone penetration.

Here are some of the most popular global E-commerce payment methods available today:



The screenshot shows a web-based e-commerce platform. At the top, there's a blue header bar with a logo, navigation links (Home, Products, News, About, Contact), a search bar, user account information, and a shopping cart icon indicating four items. Below the header, a grey navigation bar shows 'Home / Cart'. The main content area displays a product listing for a 'Vsmart Aris Pro' smartphone, showing two images of the phone (silver back and black front), the product name, price (5,490,000 ₫), amount (1), and a 'REMOVE ITEM' button. To the right, under 'Payment methods', are icons for PayPal, VISA, MasterCard, and American Express. Below this, a 'Total:' label is followed by a breakdown: Product price: 5,490,000 ₫, Shipping fee: Freeship, and a final Total: 5,490,000 ₫. Two blue buttons at the bottom offer 'Pay by cash' and 'Online transfer'.

Figure 10: Sale and Payment Method

4.3.1 Credit and Debit Cards

Credit and debit cards are the most common payment methods for E-commerce transactions. They allow customers to make payments quickly and conveniently.

4.3.2 Cash On Delivery (COD)

COD is a payment method in which customers pay for their purchases when they receive them, not before. This payment method is common in countries where credit and debit card usage is low.

4.3.3 Digital Wallets

Digital wallets, such as MOMO, PayPal, Apple Pay, and Google Pay, have become increasingly popular. They allow customers to store payment information securely and make payments with just a few clicks. According to "vneconomy.vn", MOMO is the biggest Digital Wallets provider in Vietnam, which have almost 31 million users.

5 Development Plan

Within this segment, our objective is to devise a development plan for our E-commerce project that encompasses cost estimates and a risk management plan.

To create a successful E-commerce website, it is crucial to understand the needs and preferences of the target audience. Therefore, I will also discuss the importance of conducting market research and analyzing customer behaviour to gain insights into their shopping habits and preferences. By incorporating these insights into the development plan, the website can be tailored to meet the needs of its target audience, ultimately leading to increased customer satisfaction and higher conversion rates.

While creating a development plan for our product, there are several crucial factors that should be included on the website, such as a user-friendly interface, efficient search functionality, secure payment options, and effective marketing strategies. Additionally, in this part, we explored the importance of website optimization and how it can help to improve the website's ranking on search engines and increase its visibility to potential customers.

5.1 Customer Phases and Strategies for Each Customer Phase

To develop an effective strategy for each customer phase, it is crucial to have a clear understanding of the different phases of the customer journey. The customer journey can be divided into several phases, including awareness, consideration, conversion, loyalty, and advocacy.



Figure 11: Customer's phases. Source: www.cim.co.uk

The **awareness phase** is where potential customers first become aware of our brand and products. To increase brand visibility and attract potential customers, we can leverage social media advertising, influencer marketing, and content marketing strategies.



During the **consideration phase**, customers are looking for more information to make an informed purchasing decision. In this phase, our goal is to provide customers with relevant information about our products and services. We can implement strategies such as product reviews and comparisons, informative blog posts, and email marketing campaigns to keep potential customers engaged and informed.

Once the customer has decided to make a purchase, they enter the **conversion phase**. Our goal in this phase is to make the purchasing process as seamless as possible. Strategies such as offering special promotions and discounts, providing a hassle-free checkout process, and delivering excellent customer service can help increase the chances of converting a potential customer into a paying customer.

In the **loyalty phase**, our focus shifts to retaining customers and encouraging repeat purchases. Strategies such as offering loyalty programs, providing personalized customer service, and sending targeted email campaigns can help foster strong relationships with customers and increase the chances of repeat purchases.

Finally, in the **advocacy phase**, our goal is to turn satisfied customers into brand advocates who promote our products to others. We can implement strategies such as asking for customer reviews and testimonials, encouraging social media sharing, and offering referral programs to incentivize satisfied customers to spread the word about our products. [8]

By developing a comprehensive strategy for each customer phase, we can optimize the customer journey, attract and retain customers, and build a strong brand reputation in the highly competitive world of E-commerce.

5.2 General Goals

Our product is a website selling all kinds of electronic gadgets. It includes different types of services such as allowing customers to pay for goods and control actions for administration. After considering, there are 4 main goals that we concluded which will be presented in this part.

5.2.1 Attract and Retain Customers

By implementing strategies, our product can attract and retain customers, ultimately leading to increased sales and profitability.

Create a user-friendly interface: Creating a user-friendly interface is one of the most important aspects of designing an E-commerce website. It not only helps attract more customers but also provides them with a seamless shopping experience. We believe that our website is designed in a way that is easy to navigate, with clear categories and product descriptions.

To ensure that our website is user-friendly, we have used a clean and modern design that is visually appealing and easy on the eyes. The design is intended to be intuitive and easy to use, with a clear focus on the most important elements of the website, such as the search bar and shopping cart.

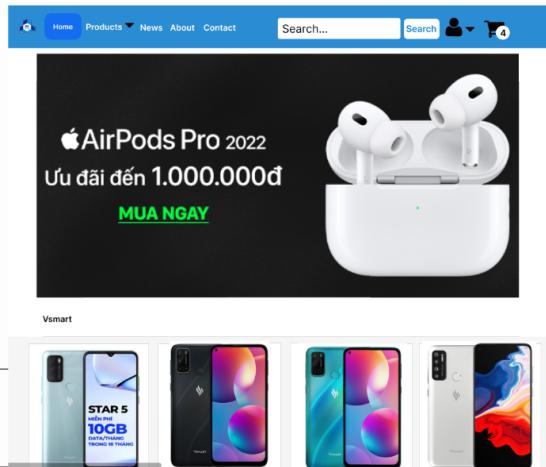


Figure 12: Website homepage with clear categories

Personalize the customer experience: Offer personalized recommendations based on customer behaviour, such as recently viewed products or related items. Use data analysis to segment customers and provide targeted promotions and discounts based on their preferences.

Offer exceptional customer service: Provide multiple channels for customer support, including email, phone, and address. Respond to customer inquiries promptly and professionally, and offer a clear and easy-to-understand return policy.

Provide high-quality product information: Use high-quality images and videos to showcase products and provide detailed descriptions and specifications. Include customer reviews and ratings to provide social proof and build trust with potential customers.

Optimize for search engines: Use SEO (Search Engine Optimization) best practices to optimize the website's content and structure for search engines. This includes using relevant keywords, optimizing images and videos, and building high-quality backlinks to improve search rankings.

5.2.2 Generate Sales and Revenue

To achieve our goal of generating sales and revenue through our E-commerce website, we have developed a comprehensive development plan that focuses on several key areas. These include pricing strategies, product quality, and marketing initiatives.

Pricing strategies: We understand that competitive pricing is one of the most important factors in attracting and retaining customers. To achieve this, we regularly conduct market research to ensure that our prices are competitive with other retailers in our industry. We also monitor our pricing and adjust as necessary to remain competitive.

Product quality: Providing high-quality products is essential for building customer trust and satisfaction. To achieve this, we work with reputable suppliers and manufacturers to source high-quality products that meet our customers' needs and expectations. We also regularly review our product selection to ensure that we are offering the latest and most innovative products in our

industry.

Marketing initiatives: Implementing effective marketing strategies is key to attracting new customers and retaining existing ones. To achieve this, we use a variety of marketing channels, including targeted advertising, email marketing, and social media promotions. Our targeted advertising campaigns are designed to reach potential customers who are most likely to be interested in our products. Our email marketing campaigns are tailored to specific customer segments and offer personalized promotions and discounts. Our social media promotions help us to engage with customers and build brand awareness.

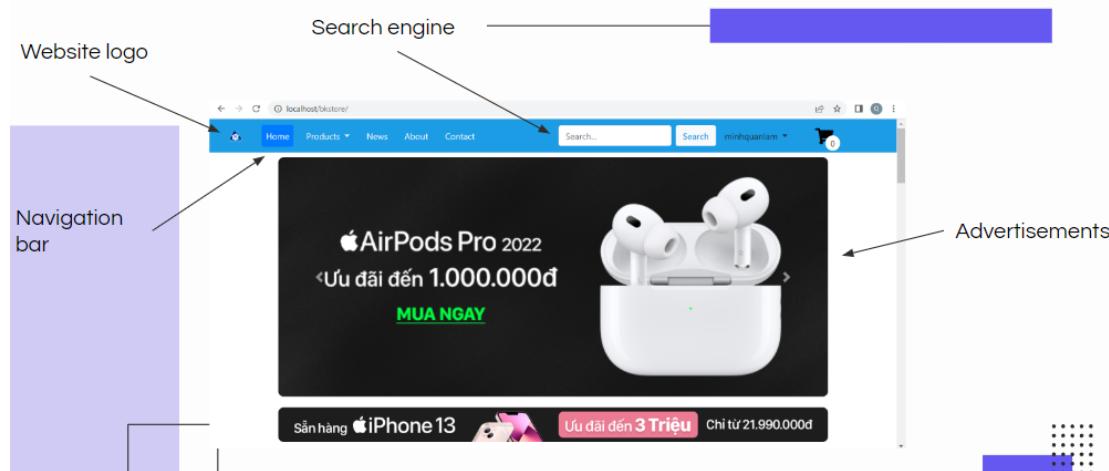


Figure 13: Website homepage's elements

Overall, our development plan is focused on providing a high-quality shopping experience for our customers while maximizing sales and revenue. By implementing pricing strategies, ensuring product quality, and utilizing effective marketing initiatives, we aim to build strong relationships with our customers and grow our E-commerce business.

5.2.3 Increase Online Visibility

Creating a website that is easy to navigate and optimized for search engines is essential for attracting potential customers and driving sales. To achieve this, we will implement effective search engine optimization (SEO) strategies that focus on three key areas: keyword optimization, high-quality content creation, and website speed and performance.

Keyword optimization: By conducting thorough research on relevant keywords related to our products and industry, we can ensure that our website appears at the top of search engine results pages. We will incorporate these keywords into our website's content, metadata, and URL structure to improve our website's visibility to potential customers.

High-quality content creation: Providing valuable and informative content is essential for engaging with potential customers and building brand awareness. We will create high-quality content such as blog posts, product descriptions, and guides that provide value to our customers and are optimized for search engines. This can help to increase our website's visibility and credibility, and ultimately drive more sales.



Website speed and performance: Ensuring that our website loads quickly and performs well is crucial for providing a positive user experience and improving search engine rankings. We will optimize our website's speed and performance by compressing images, using caching techniques, and minimizing the use of external scripts and plugins. This can help to improve our website's search engine rankings and increase our visibility to potential customers.

By implementing these SEO strategies, we aim to create a website that is not only easy to navigate but also highly visible to potential customers. This will help us to attract more traffic to our website, engage with customers, and ultimately drive more sales and revenue. [10]

5.2.4 Resource Optimization

Resource optimization is another important aspect of a development plan for an E-commerce website selling electronics. Resource optimization involves making the best use of available resources, such as time, money, and human resources, to achieve business goals efficiently and effectively.

Automation: We use automation tools to streamline our business processes and reduce the time and effort required to manage our website. This includes automating tasks such as order fulfilment, inventory management, and customer service.

Outsourcing: We consider outsourcing certain tasks, such as website design, SEO, and content creation, to third-party service providers. This can help us to save time and resources and allow us to focus on our core competencies.

Performance tracking: We track and analyze key performance metrics, such as website traffic, conversion rates, and customer satisfaction, to identify areas for improvement and make data-driven decisions. This can help us to optimize our resources and allocate them to the areas that have the greatest impact on our business goals.

Manage human resources: Human resources are a critical component of any development plan for an E-commerce website selling electronics. Having a team of skilled and motivated employees is essential for delivering high-quality products and services, providing excellent customer service, and achieving business objectives.

By implementing these resource optimization strategies, we can make the best use of available resources to achieve our business goals efficiently and effectively. This can help us to improve our website's performance, increase customer satisfaction, and drive sales and revenue growth.

5.3 Estimated Prices

To determine the average cost for a business selling electronic devices, various factors need to be considered, such as the company's size, the types of electronic devices being sold, the target market, and the level of competition. These factors can greatly influence the overall expenses, including production, marketing, and operational costs, associated with running the business. [9]

Table 1: Estimated prices per month.

No.	Category	Expense/Unit
1	App and Database Server (AWS)	297\$/month
2	The initial cost of goods purchased	12000\$/month
3	FE Developer	800\$/month
4	BE Developer	1000\$/month
5	Social media advertising	0.05\$/click \simeq 100\$/month
6	Email marketing	50\$/month
7	Content Creator	300\$/month
8	Customer service	500\$/month
9	Transportation and Inventory	2000\$/month
	TOTAL	17047\$/month

5.4 Expected Profit

After surveying our team of over 100 individuals, we found that approximately 90 percent of them have browsed E-commerce websites that sell electronic devices. This data demonstrates the promising potential of our own website in this market.

Bạn đã từng tham gia mua sắm trực tuyến chưa?

103 câu trả lời

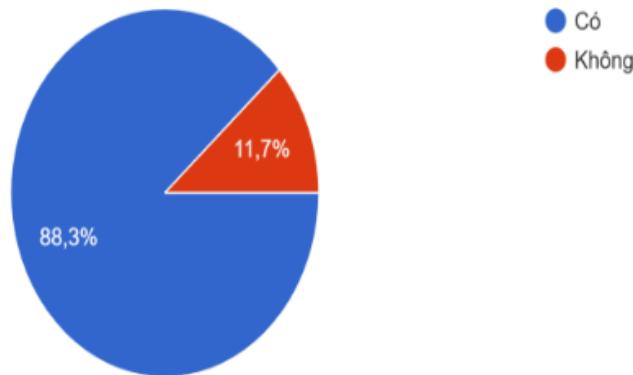


Figure 14: Survey of surfing E-commerce website

In addition to the high percentage of people who have visited E-commerce websites selling gadgets, our survey also revealed a trend towards more intentional spending. Based on this data, we anticipate approximately 200 transactions per month and an influx of 2000 visitors during that period.

Ước tính chi tiêu mua sắm trực tuyến của bạn tới hiện tại trong năm 2022:

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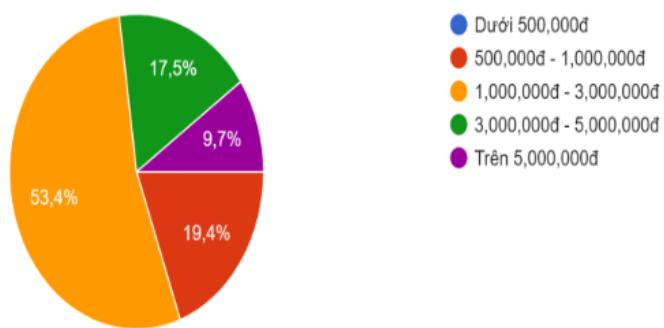


Figure 15: Survey of buying gadgets via E-commerce website

According to the pie chart presented above, it is evident that a majority of the individuals interviewed have paid around \$150 for each transaction when purchasing electronic devices. This data is a positive indication for our business, as we can expect to generate revenue of around \$30,000 for the expected 200 transactions every month.

After analyzing the estimated costs for our E-commerce website, we determined that the initial cost of goods purchased would be \$12000. Based on the projected sales and revenue, we expect to generate about \$22000 in total revenue (tax included) from the sale of electronic devices.

Taking into consideration the cost of goods sold, shipping, and other expenses, we expect to make **a profit of about \$4953**. This profit margin would allow us to reinvest in the business and expand our inventory, as well as invest in marketing efforts to increase our sales.

It is important to note that these projections are based on our estimated sales and may fluctuate depending on market conditions, customer demand, and competition. However, we are confident that our user-friendly interface, high-quality products, and competitive pricing will help us reach our projected sales targets and achieve our financial goals.



6 System Analysis

This section involves analyzing our system in theory before its practical design, including its architecture, components, and functionalities.

6.1 System Requirements

6.1.1 Functional Requirements

- Access authentication: Users can create accounts, log in to the web with different permissions to modify data.
- View electronics list: Users can search for electronics based on color, model code, style, price, brand, etc.
- Ordering: Customers can order (add, remove, cancel) orders as required.
- Manage electronics listings: Employees can edit information about electronic items. It is also possible to add or remove categories, and electronic devices.
- Order management: Staff can update order status (Delivering/Completed).
- Revenue statistics: Staff statistics the number of orders, revenue, best-selling electronics models, etc.
- Allow various payment methods: PayPal, Banks, VNPAY, VISA, MasterCard, etc.

6.1.2 Non-functional Requirements

- The system is able to work 24/7.
- Function response time must be less than 3 seconds.
- Customer information is secured.
- The number of simultaneous accesses is about 100 people.
- Need 1 training hour for admin to use.
- Website interface must be simple, intuitive, and easy to use for users.

6.2 UML Diagrams

6.2.1 Use-case Diagram

A use case diagram is a graphical representation of the interactions between actors (users, systems, or other entities) and a system or application. It is used in software engineering to visualize the various ways that users might interact with a system, and to identify the specific tasks or use cases that the system must support.

We apply the use case diagram to identify system requirements, ensure that the system meets the needs of our users, and test our system's functionality before it is implemented.

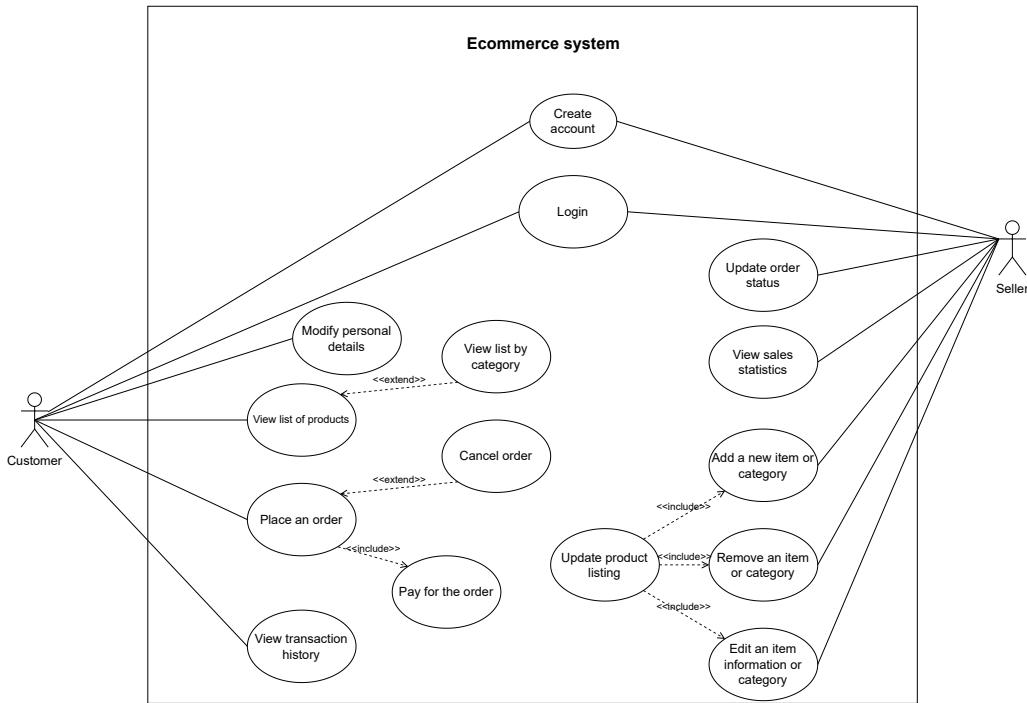


Figure 16: Use-case diagram.

6.2.2 Class Diagram

A class diagram is a type of UML (Unified Modeling Language) diagram that represents the structure of a system or application by showing the classes, their attributes, and the relationships between them. It is used in software engineering to model the objects, classes, and their relationships within a system. We apply the class diagrams to design, understand, and document our system architecture. They also help us to identify clearly the system requirements, which is a good preparation before implementing the system.

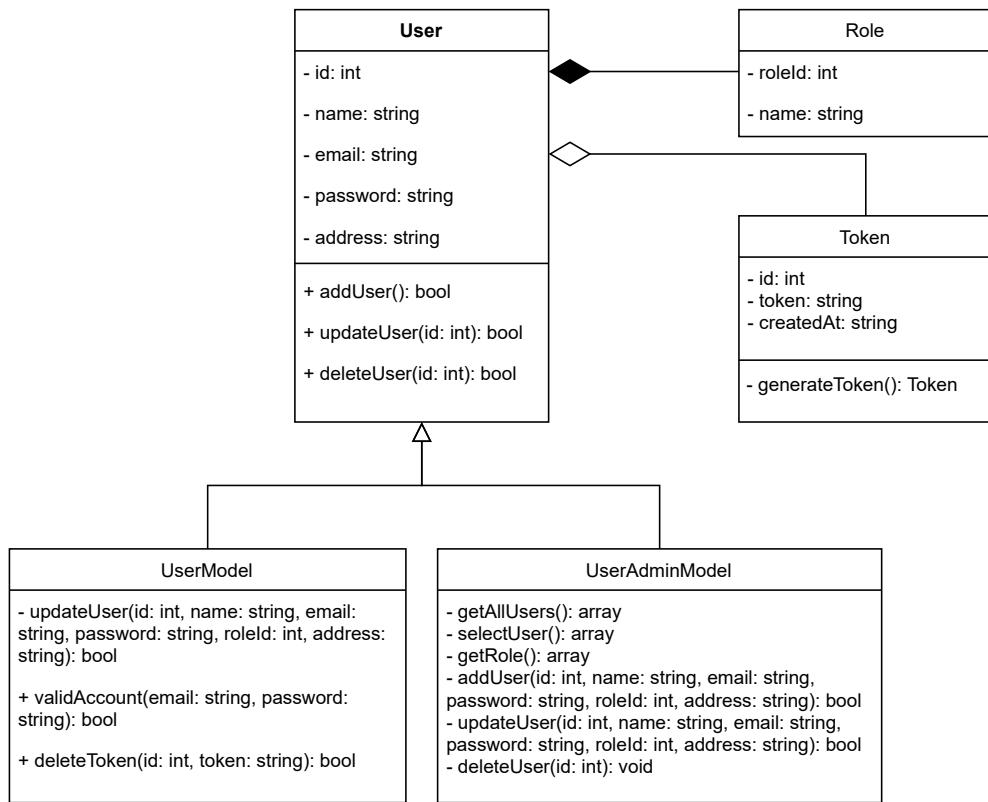


Figure 17: User Class Diagram.

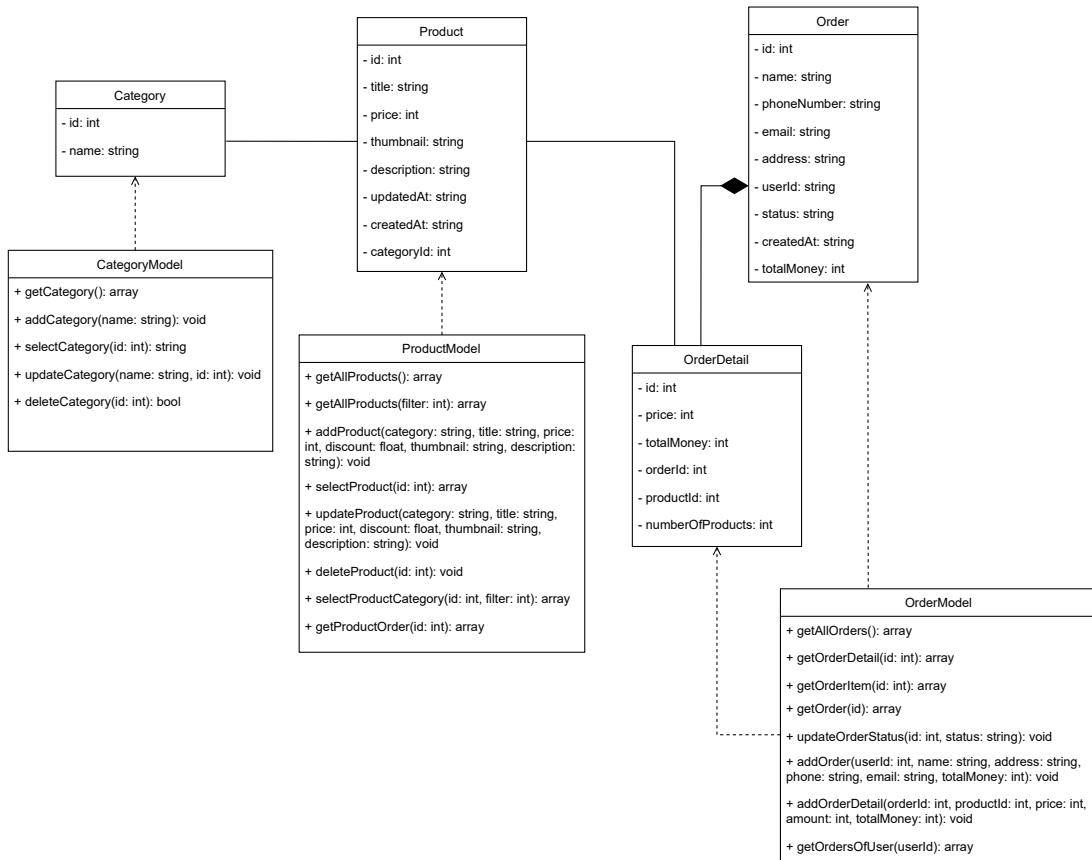


Figure 18: Order Class Diagram.

6.2.3 Package Diagram

A package diagram is a type of UML (Unified Modeling Language) diagram that represents the relationships between packages, components, and classes within a software system or application. It is used to organize the system components and to show the dependencies between them.

The package diagram provides us with a high-level view of our system structure and shows how the various components are organized and interrelated. We also use it to manage the complexity of our software system by organizing the components into smaller, more manageable packages.

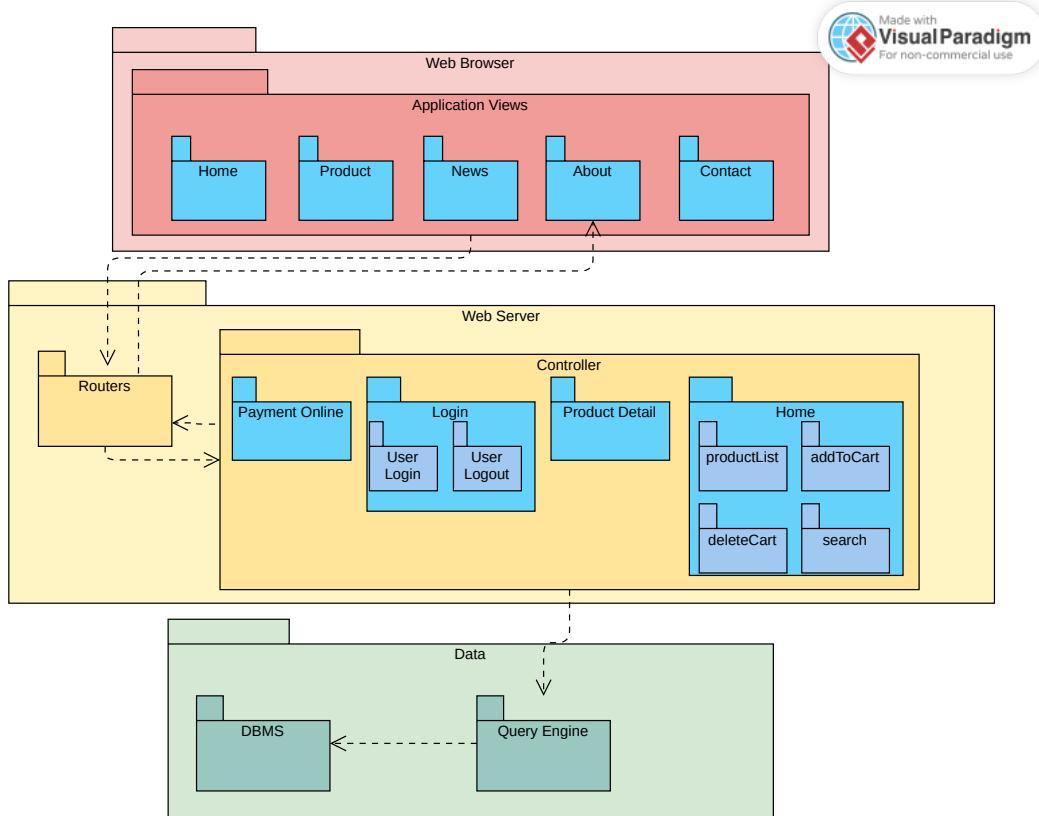


Figure 19: Package diagram.

6.3 Project Management

A work breakdown structure (WBS) is a hierarchical decomposition of the deliverables of a project into smaller, more manageable components. It is a tool used in project management to break down a project into smaller, more manageable tasks and sub-tasks. The WBS defines the work that needs to be done in order to achieve the project objectives.

We use WBS to identify the work that needs to be done and to define the scope of the project. It helps the team leader to estimate the time and resources required for each task and to allocate them accordingly.

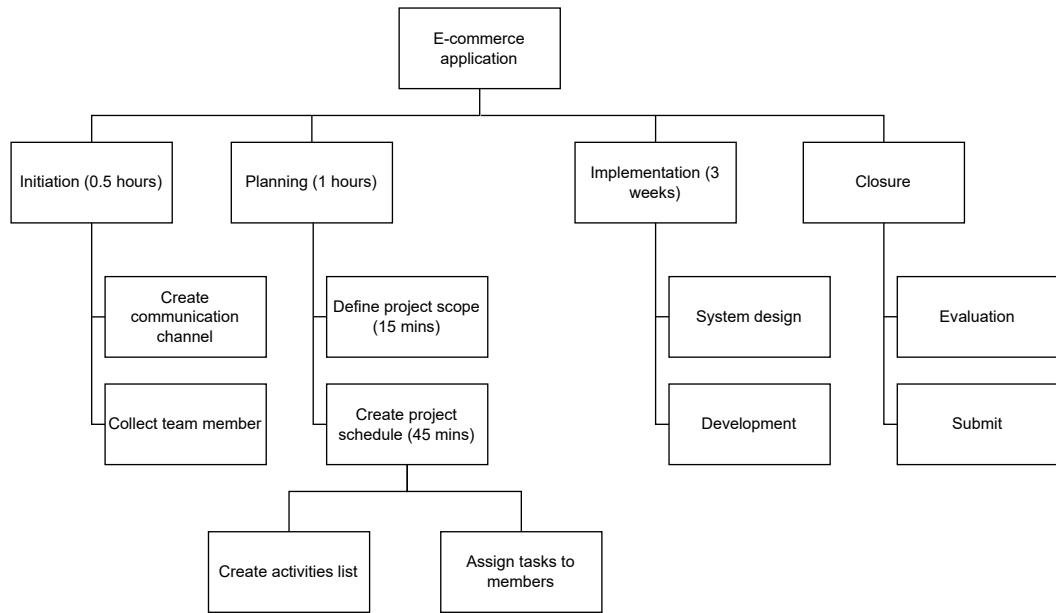


Figure 20: Work breakdown structure.



7 System Design

This section involves designing our system, including its user interface, database, and security features.

7.1 UI Design

To have the best product released to our customers, we understand the importance of providing our users with an excellent experience when using our products. To achieve this goal, our team strives to learn and consult from a variety of resources to constantly improve our UI design.

As we recognize the vital role that user interface plays in creating a positive user experience, We have applied some rules of thumb for designing effective output and input referred in **System Analysis and Design** [11], a book that has gained the trust of numerous UI developers worldwide, which has provided us with a wealth of knowledge, from the fundamentals of UI design to more advanced concepts such as user testing and data-driven design.

To begin with, we have gone through general guidelines for designing websites including:

- Use professional tools
- Study other websites
- Examine the website of professional designers
- Use storyboarding, wireframing, and mockups
- Consult the books
- Look at some poor examples of web pages
- Create templates of your own
- Use plug-ins, audio, and video very sparingly

We also followed guidelines for Display Design which have improved the way that our website displays data to the users:

1. Keep the display simple
2. Keep the presentation consistent
3. Facilitate user movement among displayed output
4. Create an attractive and pleasing display

Since our website has a large number of input forms, we also have to follow guidelines for some of the elementary aspects of input form and display design:

1. Provide clear instructions because Web users may not be familiar with technical terminology.
2. Demonstrate a logical entry sequence for fill-in forms, especially because the users may have to scroll down to a region of the page that is not visible at first.



3. Use a variety of text boxes, push buttons, drop-down menus, check boxes, and radio buttons to serve specific functions and to create interest in the form.
4. Provide a scrolling text box if you are uncertain about how much space users will need to respond to a question, or about what language, structure, or form users will use to enter data.
5. Prepare two basic buttons on every Web fill-in form: Submit and Clear Form.
6. If the form is lengthy and the users must scroll excessively, divide the form into several simpler forms on separate pages.
7. Create a feedback screen that refuses submission of a form unless mandatory fields are filled in correctly. The returned form screen can provide detailed feedback to the user in a different color. Red is appropriate here. For example, a user may be required to fill in a country in the country field, or indicate a credit card number if that type of payment has been checked off. Often a required field is denoted on an initial input screen with a red asterisk.

The admin side is a vital component of our website which is one of the main advantages of this product. We have applied some rules for dashboards design:

- Make sure the data have context.
- Display the proper amount of summarization and precision.
- Choose appropriate performance measures for display.
- Present data fairly.
- Choose the correct style of graph or chart for display.
- Use well-designed display media.
- Limit the variety of item types.
- Highlight important data.
- Arrange the data in meaningful groups.
- Keep the screen uncluttered.
- Keep the entire dashboard on a single screen.
- Allow flexibility.

After having a clear understanding and knowledge of UI design, we then used Figma to design and give an overview of how our front-end would look like before we could really develop it in HTML, and CSS.

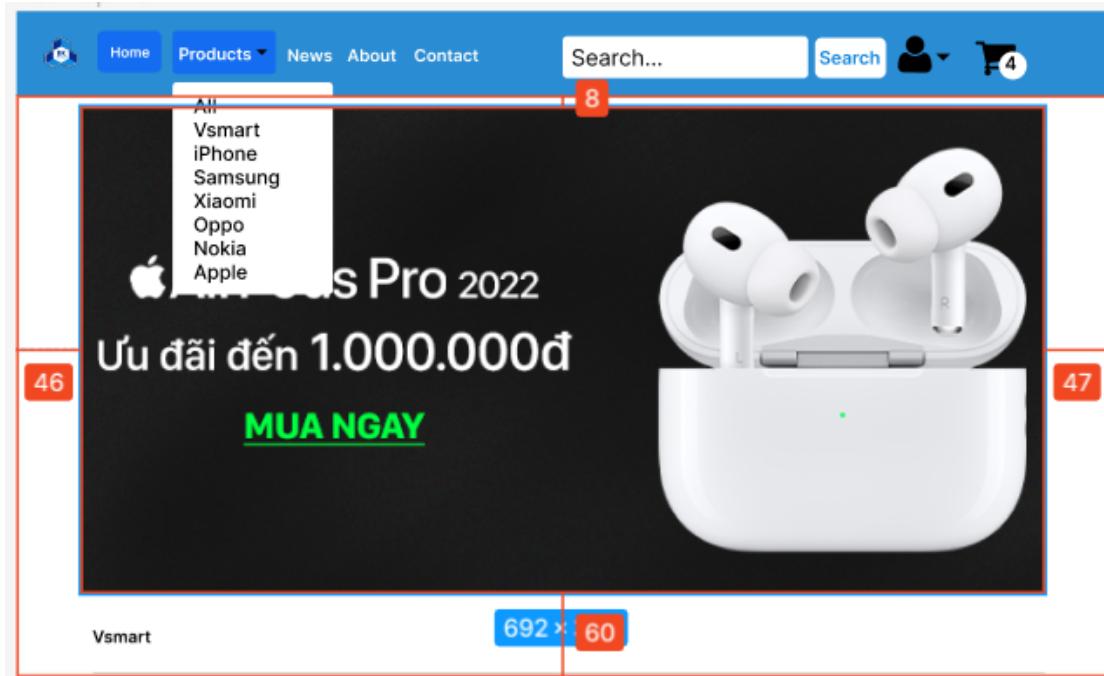


Figure 21: UI Design for Home Page.

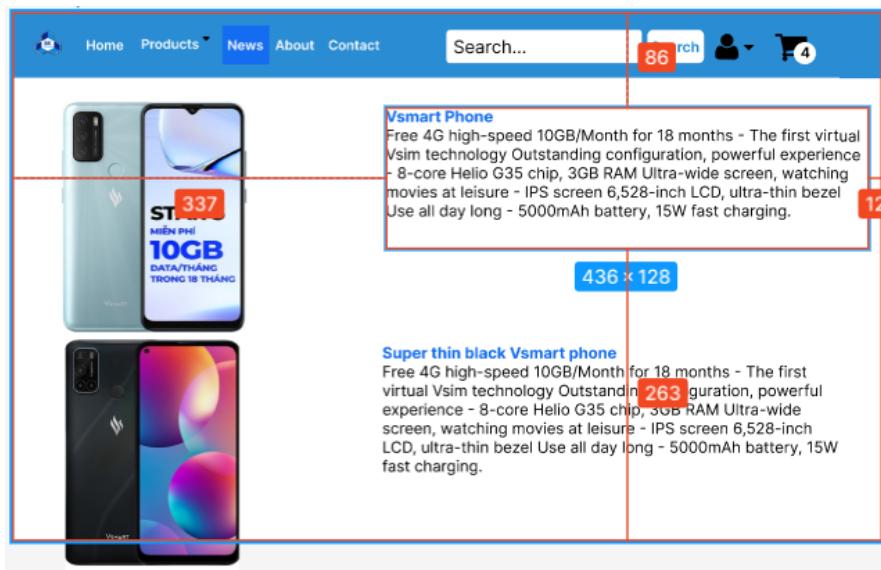


Figure 22: UI Design for Products Page.

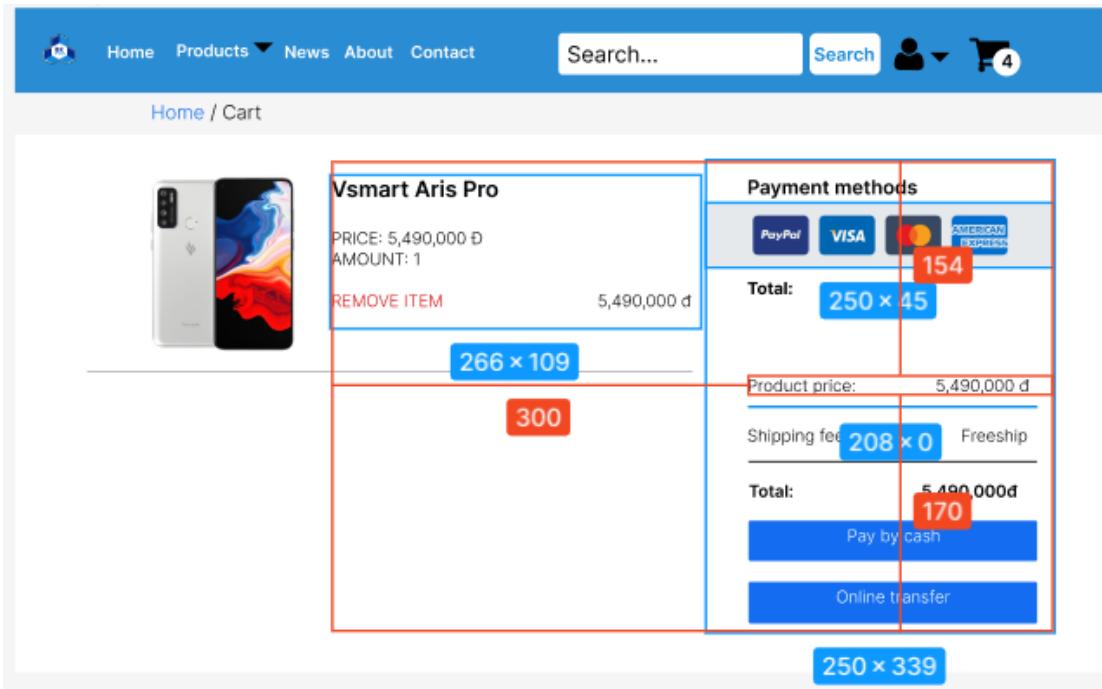


Figure 23: UI Design for Payment Page.

7.2 Database Design

7.2.1 Conceptual Database Design

Conceptual database design is the process of creating a high-level abstract representation of a database. It is the first step in designing a database and involves identifying the important entities and their relationships to create a conceptual schema.

Conceptual Database Design shows us everything about the entities, and the relationship between them so we can implement our database correctly in the later phase.

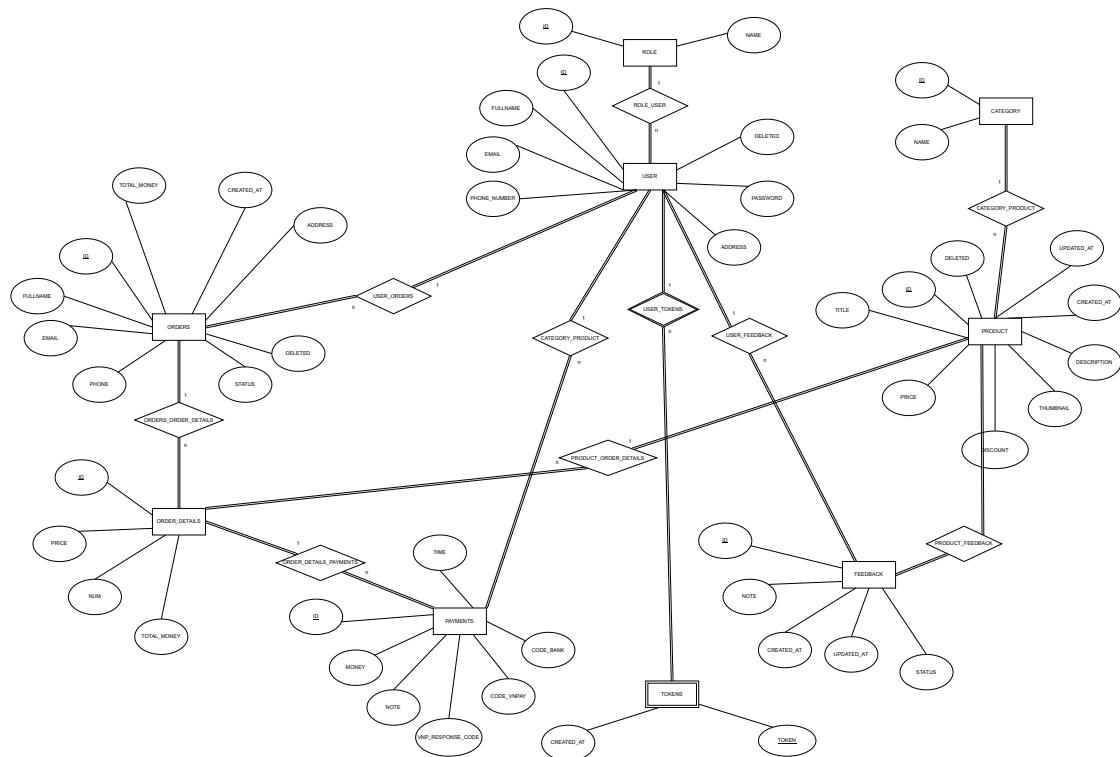


Figure 24: Conceptual Database Design.

7.2.2 Logical Database Design

Logical database design is the process of converting a conceptual schema into a logical schema that can be implemented in a database management system. It involves the translation of the high-level abstract representation of the database into a more detailed and concrete representation of the database schema. Basically, logical database design is an important step in database design that involves creating a well-structured and efficient database schema that can be easily transformed into a physical database schema.

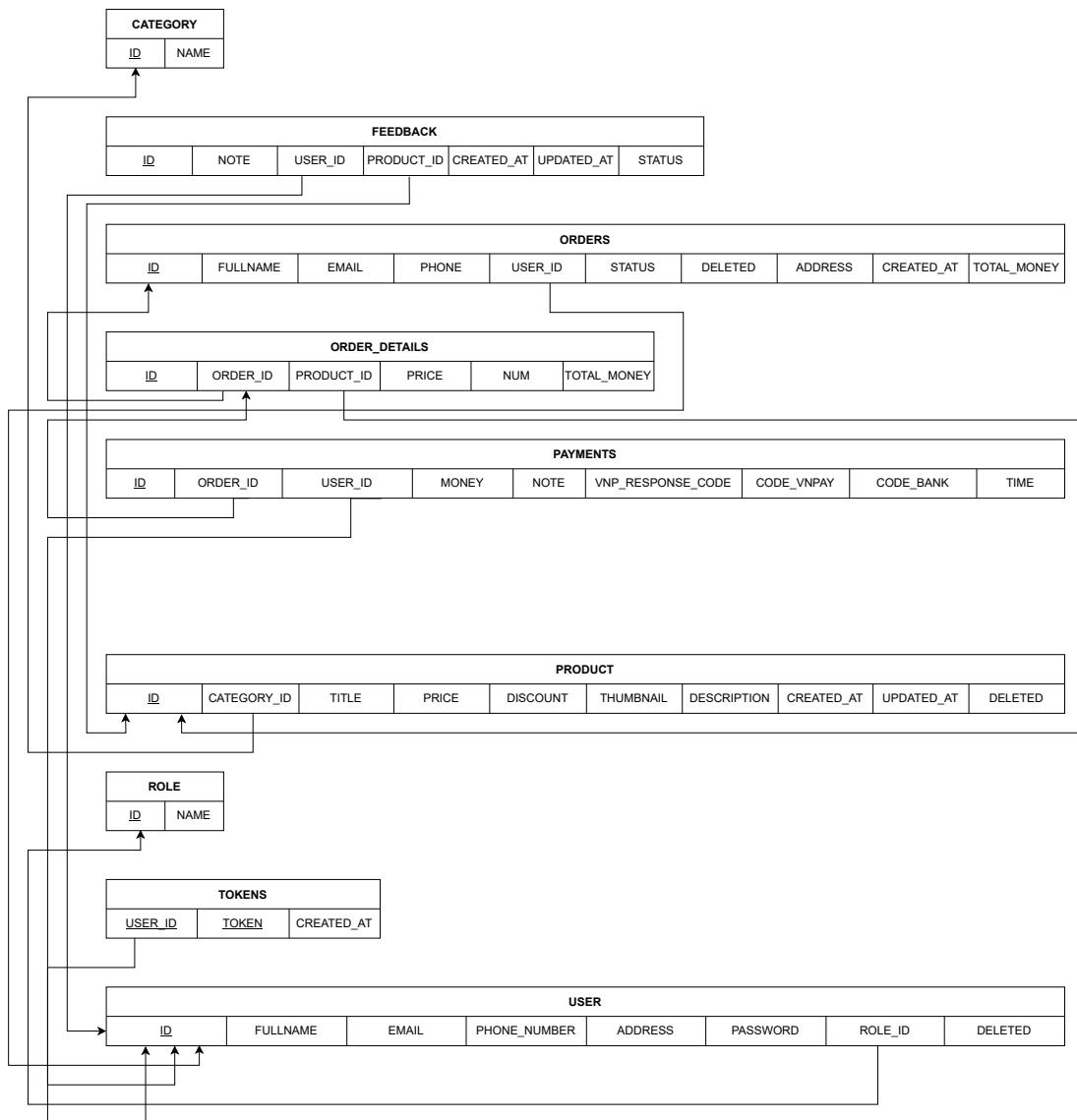


Figure 25: Logical Database Design.

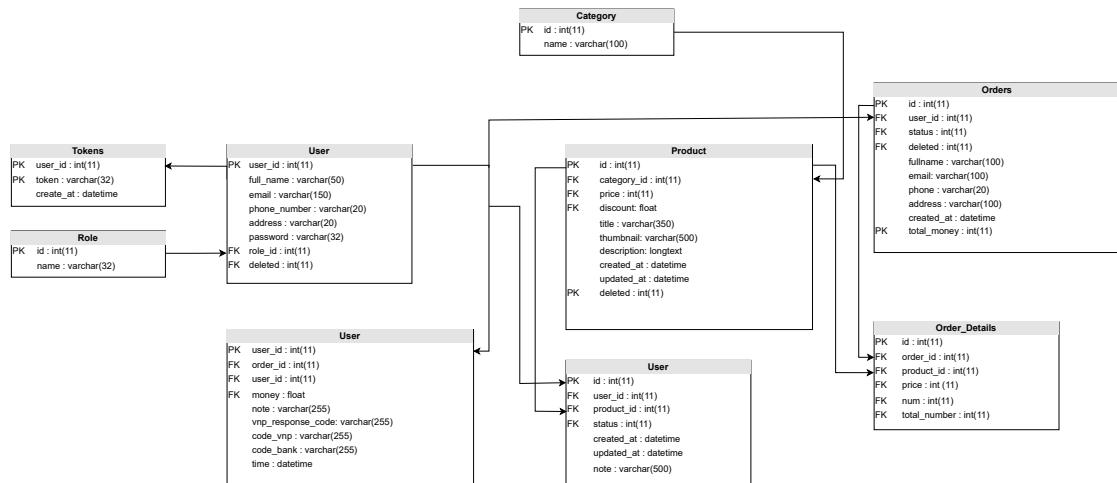


Figure 26: Database Class Diagram

7.3 MVC Model Design

MVC stands for Model-View-Controller, which is a design pattern used in software engineering to organize and structure code. It separates an application into three interconnected components:

- Model: This component represents the data and business logic of the application. It handles the interactions between the data and the rest of the application.
 - View: This component represents the user interface of the application. It handles the presentation of the data to the user.
 - Controller: This component acts as the intermediary between the Model and the View. It handles user input, updates the Model, and communicates with the View to update the display.

The main idea behind MVC is to separate the concerns of the application into three distinct parts, making it easier to modify and maintain each part separately. This allows developers to work on one component without affecting the other components. It also promotes code reusability and makes the application easier to test.

Figure 11 represents the MVC architecture for our E-commerce system. This architecture is a popular design pattern used in the development of web applications, where it provides a clear separation of concerns between the presentation layer, the application logic layer, and the data layer.

The MVC architecture is divided into three main components, namely Models, Views, and Controllers. The Models component represents the application's data layer, where all the data related to the system is stored. It consists of various model classes, such as

- CategoryModel
 - RoleModel
 - TokenModel

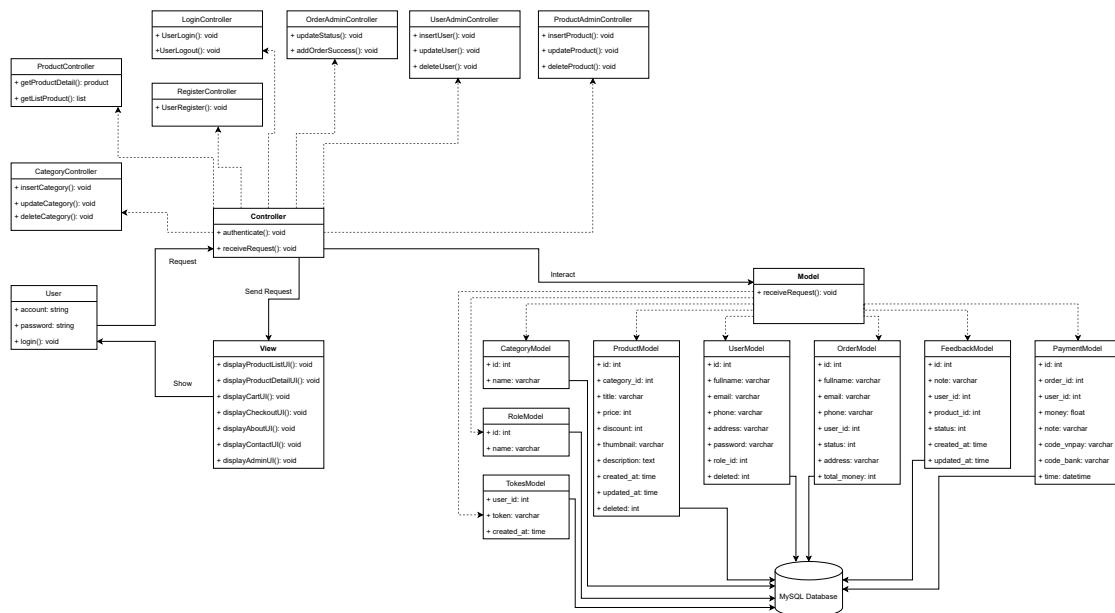


Figure 27: MVC Model Diagram.

- ProductModel
- UserModel
- OrderModel
- FeedbackModel
- PaymentModel

Each model represents a specific entity in the system. These models contain properties and methods for performing CRUD (Create, Read, Update, and Delete) operations on their respective entities.

The Views component represents the presentation layer of the system and consists of various view classes such as:

- displayProductListUI()
- displayProductDetailUI()
- displayCartUI()
- displayCheckoutUI()
- displayAboutUI()
- displayContactUI()



These views are responsible for rendering the data from the models and displaying it to the users in a user-friendly manner.

The Controllers component represents the application logic layer and consists of various controller classes such as:

- `ProductController`
- `LoginController`
- `OrderAdminController`
- `UserAdminController`
- `CategoryController`
- `ProductAdminController`
- `RegisterController`
- `Controller`

Each controller is responsible for handling specific tasks related to the system's functionalities, such as user login/logout, adding/deleting/updating products and categories, updating order status, and registering new users.

Additionally, the given architecture also includes the `User` class. This class represents the users of the system and contains properties such as `account`, `password`, and `login()`.

In conclusion, the given MVC architecture provides a clear separation of concerns between the presentation layer, the application logic layer, and the data layer, which is crucial for the development of scalable and maintainable web applications.

8 Implementation

This section is dedicated to implementing our system, which involves coding, testing, and debugging.

8.1 Frontend

The Frontend section of our report covers the client-side components of our web application. We are using HTML, CSS, and JavaScript as our primary tools for building the user interface and functionality. Bootstrap is used as a front-end framework to facilitate responsive and mobile-first web pages, while AJAX enables asynchronous data transfer between the client and the server without interrupting the user experience. A well-designed and optimized Frontend is crucial for creating a user-friendly and intuitive web application.

8.1.1 HTML

HTML (Hypertext Markup Language) is a standard markup language used to create and design content for the web. It provides a structure and a set of instructions for web browsers to understand how to display text, images, videos, links, and other types of content on a web page. HTML documents consist of a series of elements, each of which begins with a start tag and ends with an end tag, or is a self-contained tag. These tags define the structure and layout of the content on a web page, including headings, paragraphs, lists, tables, forms, and more. HTML is an essential part of web development, and it is used in combination with other web technologies such as CSS (Cascading Style Sheets) and JavaScript to create dynamic and interactive web pages.



Figure 28: HTML5 logo.

With HTML, we will be able to:

- Add titles, paragraph formatting, line breaks controls.



- Create lists, emphasize text, create special characters, insert images, create links.
- Build tables, control some models.

In this project, we will use HTML5 to display necessary content of our web page such as image, product and form.

HTML5 (Hypertext Markup Language version 5) is the latest version of the markup language used for creating web pages and applications. It is the successor to HTML 4.01 and XHTML 1.0, and was released in 2014.

HTML5 includes a number of new features and enhancements that make it easier to create more complex and interactive web pages and applications. Some of the key features of HTML5 include support for multimedia content (such as audio and video), new semantic elements for better structuring of web pages (such as `<header>`, `<nav>`, and `<footer>`), and improved support for form input fields and validation.

In addition, HTML5 also includes support for geolocation, offline web applications, and web storage, which allow web pages and applications to function even when the user is not connected to the internet. HTML5 is also designed to work seamlessly with other technologies such as CSS and JavaScript, making it a key part of modern web development.

8.1.2 CSS

CSS (Cascading Style Sheets) is a language used to describe the presentation of web pages, including their layout, colors, fonts, and other visual elements. It is used to separate the content of a web page from its presentation, allowing web designers to create visually appealing and consistent websites. CSS works by attaching styles to HTML elements, using selectors to target specific elements, and defining properties to control their appearance. For example, a CSS rule might specify that all paragraphs should have a font size of 16 pixels and a line height of 1.5. By separating the presentation from the content, CSS allows web designers to easily make changes to the visual style of a website without affecting the underlying HTML structure. CSS is an essential part of modern web development and is often used in combination with other web technologies such as HTML and JavaScript.

Using CSS, we can:

- Styling and styling elements written in a markup language, like HTML.
- Save effort by controlling the format of multiple web pages.
- Distinguish the appearance of the web page from the main content of the page by controlling the layout, colors, and fonts.

CSS3 (Cascading Style Sheets version 3) is the latest version of the style sheet language used for describing the presentation of web pages and applications written in HTML and XHTML.

CSS3 includes a wide range of new features and enhancements over its predecessor, CSS2, such as new selectors, new units of measurement, and new properties for styling elements. Some of the key features of CSS3 include support for transitions and animations, multiple background images, and web fonts.



Figure 29: CSS3 logo.

CSS3 also includes support for responsive design, which allows web pages and applications to adapt to different screen sizes and devices, and for media queries, which allow developers to define different styles for different devices and screen sizes. CSS3 is a crucial component of modern web development, enabling developers to create visually appealing and responsive web pages and applications.

Because of properties of CSS3, we use them to make our web page like real and professional.

8.1.3 JavaScript

JavaScript (JS) is a high-level, dynamic programming language that is commonly used for creating interactive effects within web browsers. It allows web developers to add interactivity, animation, and other dynamic features to web pages. JavaScript can be used to create complex applications that run within a web browser, such as games, interactive maps, and social media platforms. It is also commonly used on the server-side with Node.js to create back-end web applications. JavaScript is a versatile and flexible language that is easy to learn, making it a popular choice for both novice and experienced developers. It is supported by all modern web browsers and is an essential part of modern web development [17].

Using JavaScript, web developers can achieve a wide range of functionality and interactivity on a web page, including:

- Dynamically update and manipulate the content of a web page without needing to reload the page.
- Create interactive user interfaces with animations, hover effects, and other dynamic visual elements.



Figure 30: JavaScript logo.

- Validate user input in forms, such as checking for required fields, ensuring correct formatting, and preventing spam.
- Add interactivity to multimedia elements, such as audio and video, allowing users to control playback and adjust settings.
- Create and modify cookies to store user preferences and other information.
- Create and manage browser cookies and sessions to store user data.
- Send and receive data from web servers using AJAX (Asynchronous JavaScript and XML) to dynamically update a web page without needing to reload the entire page.
- Perform complex calculations and data manipulation in real-time, without needing to rely on server-side processing.
- Create games, quizzes, and other interactive applications.
- Integrate with other web technologies, such as HTML and CSS, to create modern, dynamic web applications.

On our front-end, JavaScript is used to add interactivity and dynamic features to web pages, such as user interface elements, animations, and multimedia. It is executed by the user's web browser, and the code is embedded within HTML and CSS files.

8.1.4 Bootstrap

Bootstrap is a popular front-end framework for building responsive, mobile-first websites and web applications. It is an open-source toolkit that includes pre-built HTML, CSS, and JavaScript

components that can be easily customized and combined to create a visually appealing and functional website or web application [3].



Figure 31: Bootstrap logo.

Bootstrap provides a range of UI components such as buttons, forms, tables, grids, and navigation, along with JavaScript plugins for creating interactive features such as modals, carousels, and dropdowns. The framework uses a responsive grid system that adjusts the layout of a page depending on the screen size and device, ensuring that the website or application looks great and is easy to use on any device.

Bootstrap was originally created by Twitter and has since been maintained by a community of developers. It is widely used by web developers and designers, and its popularity is due in part to its ease of use and flexibility. With Bootstrap, developers can quickly build a professional-looking website or application, without needing to write extensive CSS or JavaScript code from scratch.

8.1.5 AJAX

AJAX (Asynchronous JavaScript and XML) is a web development technique used for creating dynamic and interactive web applications. It allows web pages to update content without requiring a full page refresh [16].

AJAX is based on JavaScript and works by making asynchronous requests to a server using the XMLHttpRequest object. The server can then return data in various formats, such as XML, JSON, or HTML, which can be used to update the content of the web page dynamically.

AJAX can be used to create various interactive features on a web page, such as auto-suggest search fields, real-time chat applications, and live updates of sports scores or stock prices. It has become an essential technique in modern web development, as it allows for a more responsive and seamless user experience.

In our project, we utilize AJAX because it enables us to:

- Update a web page without reloading the page.



Figure 32: AJAX logo.

- Request data from a server - after the page has loaded.
- Receive data from a server - after the page has loaded.
- Send data to a server - in the background.

8.2 Backend

The Backend section of our report focuses on the server-side components of our web application. We are using PHP for building dynamic web pages and MariaDB as our primary data storage solution. XAMPP is used to create a local development environment for testing PHP-based web applications. The Backend provides security, authentication, and authorization mechanisms to protect the application and its data, as well as optimizing performance and providing logging and debugging functionality. A well-designed and optimized Backend is essential to ensure the smooth operation of the application.

8.2.1 PHP

PHP (Hypertext Preprocessor) is a server-side scripting language used primarily for web development. It is an open-source language that is widely used for creating dynamic web pages, web applications, and content management systems (CMS) [19].

PHP code is executed on the server, and the resulting HTML is sent to the client's browser for display. It is used to perform tasks such as database access, form processing, and session management. PHP can be embedded within HTML code or used to generate HTML code dynamically.

PHP is a popular choice for web development because of its simplicity, flexibility, and ease of use. It has a large and active community of developers who contribute to its development and create many useful open-source libraries and frameworks.

Some of the most popular websites and content management systems (CMS) such as WordPress, Facebook, and Wikipedia are built using PHP.



Figure 33: PHP logo.

8.2.2 MariaDB

MariaDB is a highly performant and reliable open-source relational database management system (RDBMS) that is often used in web and enterprise applications. It is a fork of MySQL and offers similar functionality, with additional features and improvements. Its support for multiple storage engines, advanced features like parallel replication and dynamic column compression, and built-in support for NoSQL databases, JSON, and spatial data types make it a popular choice among developers [13].



Figure 34: MariaDB logo.

MariaDB is licensed under the GNU General Public License (GPL) and is maintained by the MariaDB Foundation, a non-profit organization that oversees its development and support. Its large and active community of developers and users contribute to its ongoing development and provide support through various channels.

The popularity of MariaDB can be attributed to its compatibility with MySQL, robust fea-

ture set, and scalability. It is used in various industries such as E-commerce, healthcare, finance, and government and is supported by major cloud providers. As a flexible and powerful RDBMS, MariaDB is a reliable choice for businesses and developers seeking high-performance database management solutions.

8.2.3 XAMPP

XAMPP is a free and open-source cross-platform web server solution that provides a complete stack of software components required for web development. It includes Apache web server, MySQL or MariaDB database, PHP scripting language, and Perl programming language, all pre-configured and integrated to work together out of the box [2].



Figure 35: XAMPP logo.

XAMPP is commonly used by developers to create and test dynamic web applications on their local machines before deploying them to a live web server. It is available for Windows, macOS, and Linux, and can be easily installed and configured.

Apart from the basic stack, XAMPP also includes other useful tools such as phpMyAdmin for managing databases, Mercury mail server, FileZilla FTP server, and Tomcat server for Java applications. XAMPP provides an easy-to-use interface to manage and start or stop the web server and database server.

We use XAMPP because this is a convenient tool for web developers to set up a local web server environment quickly and easily, and to develop, test and debug their web applications before deploying them to a live web server.

8.3 Development Tools

In the Development Tools section, we describe the software tools and utilities we use to facilitate the development and testing of our applications.

8.3.1 Visual Studio Code

Visual Studio Code (VS Code) is a lightweight and versatile code editor that is optimized for building and debugging modern web and cloud applications. It is built on top of the Electron framework and leverages the power of the open-source Monaco editor, which is used in Microsoft's online code editor, Visual Studio Online [15].

One of the key features of Visual Studio Code is its integrated debugging support. Developers can debug their code directly within the editor using built-in debuggers for popular languages



Figure 36: Visual Studio Code logo.

such as JavaScript, TypeScript, and Python. Visual Studio Code also supports debugging for Node.js applications and can be configured to work with other external debuggers.

Visual Studio Code has a rich extension ecosystem, which allows developers to customize their development environment with a variety of plugins and extensions. The extensions marketplace offers a wide range of extensions for popular programming languages, frameworks, and tools, such as Angular, React, Vue.js, Docker, and Kubernetes, to name a few. Developers can also create their own extensions to tailor Visual Studio Code to their specific needs.

In addition, Visual Studio Code has a built-in terminal, Git support, and integrated version control, which enables developers to manage their code repositories directly within the editor.

Overall, Visual Studio Code is a powerful and flexible code editor that offers a range of features and customizations to support modern web and cloud application development.

We use Visual Studio Code to program our application.

8.3.2 Github

GitHub is a widely used web-based platform for version control and collaboration among developers. It provides a user-friendly interface for managing code repositories using Git, which is a distributed version control system that allows multiple people to work on the same codebase without disrupting each other's work [6].

One of the key features of GitHub is its support for collaboration and code review. Developers can easily share their code with others, review and discuss changes, and merge code changes into the main codebase. It also provides features such as issues, pull requests, and project boards, which allow developers to track bugs, feature requests, and other project-related tasks.

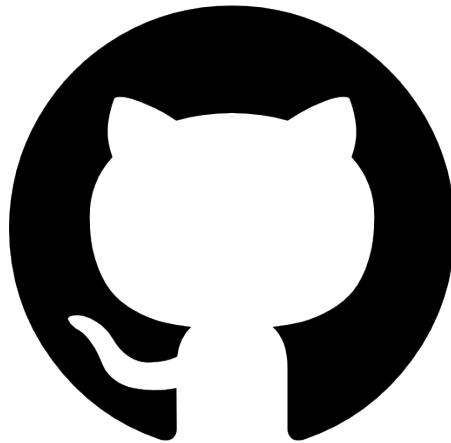


Figure 37: Github logo.

GitHub also supports branching, which enables developers to work on different versions of the code in parallel, and hosting for documentation, web pages, and other project-related resources. It also provides integrations with a range of third-party tools, such as code editors, continuous integration and delivery (CI/CD) platforms, and project management tools.

In general, GitHub is a powerful and versatile platform that offers a range of features to support modern software development workflows. It has become an essential tool for many developers and organizations worldwide, and its popularity continues to grow as more and more developers adopt it for their projects.

We use Github to host and share the source code of the application.

8.4 Interface

In this section, we provide an overview of our application, which comprises three main components:

- Overview
- User Interface
- Admin Interface



8.4.1 Overview Interface

The screenshot shows a mobile commerce website for Vsmart phones. At the top, there is a navigation bar with links for Home, Products, News, About, and Contact, along with a search bar and a user account icon. The main content area features several promotional banners:

- A large banner for the **GALAXY S23 ULTRA 512GB** with a price of **Giá cuối chỉ: 24.590.000đ**. It includes offers for **Thu cũ giảm 4 TRIỆU + Giảm thêm 5 TRIỆU + Sạc 45W**, **Tặng SIM 4G MobiFone + Hoàn tiền ví điện tử 2TRIỆU**, and a **XEM NGAY** button.
- A banner for the **ĐỘC QUYỀN Galaxy A73 5G 256GB** with a price of **Giá chỉ 10.19 Triệu**. It includes offers for **Tặng SAMSUNG Care+** and **Giảm thêm 400K qua Grab moca**, with a **MUA NGAY** button.
- A banner for the **iPad chính hãng** with a price of **Lên đời chỉ từ 6.690.000đ**, featuring a **MUA NGAY** button.
- A banner for the **Săn hàng iPhone 13** with a price of **Ưu đãi đến 3 Triệu** and a **Chỉ từ 21.990.000đ**.

Below these banners, there is a section titled "Vsmart" displaying four Vsmart smartphone models in a grid:

- Vsmart Aris Pro**: Two phones shown side-by-side, one dark gold and one black.
- Vsmart Aris 6GB 64GB**: Two phones shown side-by-side, one black and one white.
- Vsmart Live 4**: Two phones shown side-by-side, one silver and one black.
- Vsmart Joy 4 4GB**: Two phones shown side-by-side, one blue and one purple.

Figure 38: Homepage.



Home Products News About Contact Search... Search

Home / Product

Products

All Vsmart iPhone Samsung Xiaomi Oppo Nokia Apple

Filter

Price (High > Low) Price (Low > High) Name (A > Z) Name (Z > A)

45 products in total (From: 1 -> 12)

MacBook Pro 14 inch 2022

95,990,000đ 99,990,000đ

Order

Samsung Galaxy Z Fold3 5G

40,990,000đ 41,990,000đ

Order

iPhone 13 Pro Max | Chính hãng VN/A

33,990,000đ

Order

iPhone 13 Pro | Chính hãng VN/A

30,990,000đ

Order

Figure 39: Products page.

Home Products News About Contact Search... Search

Google Pixel 7 Pro

Introducing the new Pixel 7 Pro - a sleek and advanced addition to the Pixel family. With a 6.7-inch OLED display, Snapdragon 888 chipset, and up to 12GB of RAM, this top-of-the-line smartphone sets a new standard in mobile technology. It also features a powerful triple camera system with a 50MP primary sensor, 48MP ultrawide sensor, and a 12MP periscope telephoto sensor, and a 16MP front-facing camera. Other highlights include 256GB non-expandable storage, a 4,500mAh battery with fast charging and wireless charging support, 5G connectivity, IP68 water and dust resistance, and the latest Android 12 operating system with 3 years of software updates.

Samsung Galaxy S23 Ultra

Samsung Unveils Galaxy S23 Ultra: A Next-Gen Powerhouse Smartphone with Unmatched Features. The device comes with a 6.8-inch Dynamic AMOLED display, Exynos 2200 chipset, and up to 16GB of RAM. It boasts an impressive quad-camera setup with a 108MP primary sensor, 48MP ultra-wide lens, 12MP periscope telephoto lens, and a 5MP macro lens, and a 40MP front-facing camera. Other notable features include a 5,000mAh battery with fast charging and wireless charging support, 5G connectivity, IP68 water and dust resistance, and the latest Android 13 operating system with 5 years of software updates. With its exceptional performance and innovative features, the Galaxy S23 Ultra sets a new benchmark for premium smartphones.

iPhone 14 Pro Max

Introducing the all-new iPhone 14 - featuring the latest A18 Bionic chip and a whopping 8GB of RAM, it delivers unprecedented speed and power for all your mobile needs. With lightning-fast 5G connectivity and a free 30GB data allocation per month for 24 months, you can stay connected and stream content seamlessly. Immerse yourself in the stunning OLED display with ultra-thin bezels, providing a cinematic viewing experience like never before. The advanced camera system lets you capture stunning

Figure 40: News page.

[Home](#) [Products](#) [News](#) [About](#) [Contact](#) [Search](#)  

About Us

BK Store is a prime branch of the BKU Electronics Corporation, situated in the heart of District 10, Ho Chi Minh City. Our unwavering commitment is to offer top-quality products at the most competitive prices in the market.

Our motto, 'All for the trust of our customers,' reflects our commitment to delivering the best possible experience to every customer we serve.



About us	Trending	Support	Contact us
 BK Store	 Vsmart	 Account Management	 HCM University of Technology
 Research & Development Team	 iPhone	 Help	 0123 456 789
	 Samsung	 News	 bkstore@phat.hcmut.edu.vn
	 Oppo	 Contact	 Working 24/7



Figure 41: About page.

Contact Us

Do you have any questions for us? Please do not hesitate to ask. We will reply you as soon as possible!

Figure 42: Contact page.



8.4.2 User Interface

The screenshot shows a "SIGN IN" form. It has two input fields: "Email" and "Password". Below the fields are two buttons: "Create an account" and a blue "Login" button. At the bottom left is a link "Back to home".

Figure 43: Login page.



SIGN UP

Full name

Name

Email

Email

Password

Password

Phone number

Phone

Address

Address

Have an account [Back to home](#) [Register](#)

Figure 44: Register page.

Account Management

Full name:

Email:

Phone number:

Address:

Password:

[Save](#)

About us

BK Store
Research & Development Team

Trending

Vsmart
iPhone
Samsung
Oppo

Support

Account Management
Help
News
Contact

Contact us

HCM University of Technology
0123 456 789
bkstore@phat.hcmut.edu.vn
Working 24/7

Figure 45: Account Management page.



The screenshot shows a product listing for a "MacBook Pro 14 inch 2022". The product image is a laptop displaying a colorful screen. Below the image, it says "Authorized Reseller" and "PRICE: 95,990,000 ₫". The quantity is set to "AMOUNT: 1". A red "REMOVE ITEM" button is visible. To the right, there's a section titled "Payment methods" with icons for VISA, MASTERCARD, PAYPAL, and other payment options. The total price is listed as "95,990,000 ₫". Below the total, it says "Total:" followed by "Product price: 95,990,000 ₫" and "Shipping fee: Freeship". The final total is "95,990,000 ₫". At the bottom, there are two buttons: "Pay by cash" and "Online transfer".

Home Products News About Contact Search... phat Cart

Home / Cart

MacBook Pro 14 inch 2022
PRICE: 95,990,000 ₫
AMOUNT: 1
 REMOVE ITEM

95,990,000 ₫ Total:
Product price: 95,990,000 ₫
Shipping fee: Freeship
Total: 95,990,000 ₫

Pay by cash
Online transfer

About us Trending Support Contact us

BK Store Vsmart Account Management HCM University of Technology
Research & Development Team iPhone Help 0123 456 789
Samsung News bkstore@phat.hcmut.edu.vn
Oppo Contact Working 24/7

Figure 46: Cart page.

The screenshot shows a payment form for a product. It includes fields for "Full name" (phat.tran.k19), "Address" (Faculty of Computer Science and Engineering), "Phone number" (123), and "Email" (phat.tran.k19@hcmut.edu.vn). The "Payment method" section shows a summary: "Total:" (95,990,000 ₫), "Product price:" (95,990,000 ₫), and "Shipping fee:" (Freeship). The final total is "95,990,000 ₫". A "Submit" button is at the bottom. Below the form is a footer with links to "About us", "Trending", "Support", and "Contact us".

Home Products News About Contact Search... phat Cart

Home / Order

Payment method

Total:
Full name: phat.tran.k19
Address: Faculty of Computer Science and Engineering
Phone number: 123
Email: phat.tran.k19@hcmut.edu.vn

Product price: 95,990,000 ₫
Shipping fee: Freeship
Total: 95,990,000 ₫

Submit

About us Trending Support Contact us

BK Store Vsmart Account Management HCM University of Technology
Research & Development Team iPhone Help 0123 456 789
Samsung News bkstore@phat.hcmut.edu.vn
Oppo Contact Working 24/7

Figure 47: Cash payment page.

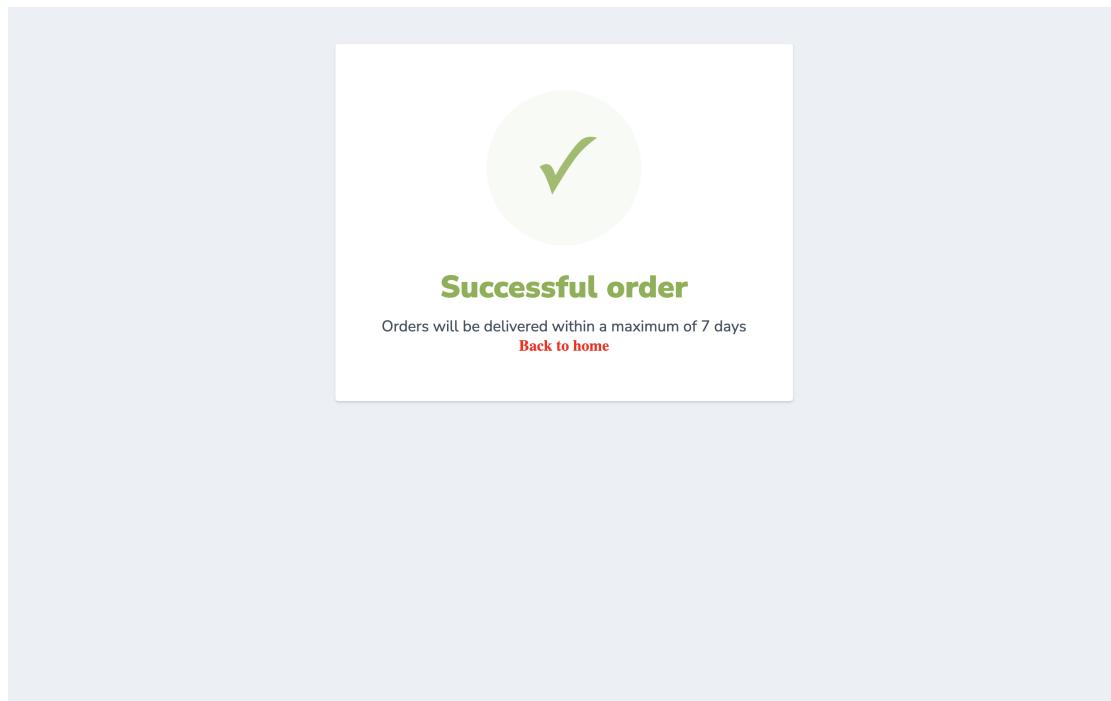


Figure 48: Cash payment sucessful page.

The screenshot shows an 'Order details' form on a website. The top navigation bar includes links for Home, Products, News, About, Contact, a search bar, and a shopping cart icon showing 1 item. The form fields are as follows:

- Full name: phat.tran.k19
- Phone number: 1234
- Email: phat.tran.k19@hcmut.edu.vn
- Address: Faculty of Computer Science and Engineering
- Product type: Payment
- Order Id: 20230410102236
- Price: 95990000
- Payment details: Payment details
- Bank: NCB Bank

Figure 49: Online payment page.



The figure consists of two screenshots of a VNPAY payment page. Both screenshots are in Vietnamese (Vi) and show a payment amount of 95,990,000 VND.

Screenshot 1: Order information

This screen shows the following details:

- Payment amount: 95,990,000 VND
- Order amount: 95,990,000 VND
- Transaction fee: 0 VND
- Order ID: 20230410102236
- Provider: VNPAY - TryItNow

Screenshot 2: Payment via NCB

This screen shows the payment method "Payment via NCB" and "Domestic card". It includes fields for:

- Card number: ****2198 (with NCB logo)
- Card holder: NGUYEN VAN A
- Issuing date: 07/15
- Promotion code: (input field with placeholder "Select or enter promotion code")

At the bottom, there are "Cancel" and "Continue" buttons, along with contact links (1900.5555.77, hotro@vnpay.vn) and security seals (secure, GlobalSign, FPT).

Screenshot 3: OTP Confirm

This screen displays a message: "⚠ Please do not close the web browser until receiving the ultimate result on the website. Thank you!"

It shows the following details:

- Order information (same as Screenshot 1)
- OTP Confirm: A field containing 123456 (with NCB logo)
- Text: "OTP has been sent to the registered phone number. Please enter OTP to complete the payment"
- Buttons: "Cancel" and "Confirm"

At the bottom, there are contact links (1900.5555.77, hotro@vnpay.vn) and security seals (secure, GlobalSign, FPT). A Zalo icon is also present.

Figure 50: VNPAY payment page.



Billing Information

Order Id: 20230410102236

Price: 95,990,000 VND

Billing content: Payment details

Response Code: 00

VNPAY Code: 13986714

Bank Id: NCB

Date: 20230410152431

Result: Transaction successful

[Back to home](#)

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Figure 51: Billing page.

Order Management					
No	Name	Phone number	Date	Total	Status
1	phat.tran.k19	123	2023-04-10 10:17:24	95,990,000 ₫	Pending
2	phat.tran.k19	1234	2023-04-10 15:23:27	95,990,000 ₫	Shipping
3	phat	1	2023-04-10 14:12:54	95,990,000 ₫	Paid

About us	Trending	Support	Contact us
BK Store	Vsmart	Account Management	HCM University of Technology
Research & Development Team	iPhone	Help	0123 456 789
	Samsung	News	bkstore@phat.hcmut.edu.vn
	Oppo	Contact	Working 24/7

Figure 52: User Order Management page.



8.4.3 Admin Interface

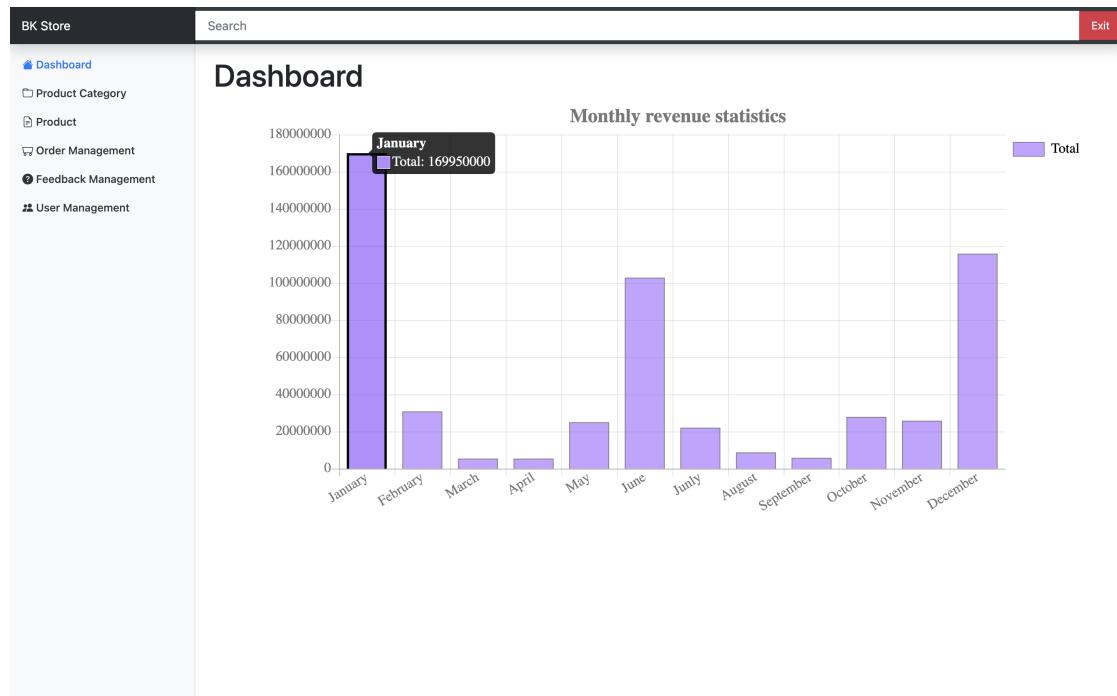


Figure 53: Admin Dashboard page.



BK Store Search Exit

Dashboard Product Category Product Order Management Feedback Management User Management

Product Category Management

Product: Save

No	Product	Modify	Delete
0	Vsmart	Modify	Delete
1	iPhone	Modify	Delete
2	Samsung	Modify	Delete
3	Xiaomi	Modify	Delete
4	Oppo	Modify	Delete
5	Nokia	Modify	Delete
6	Apple	Modify	Delete

Figure 54: Admin Product Category Management page.

BK Store Search Exit

Dashboard Product Category Product Order Management Feedback Management User Management

Product Management

Add Product

No	Thumbnail	Product	Price	Category	Modify	Delete
0		MacBook Pro 14 inch 2022	95,990,000 VND	Apple	Modify	Delete
1		Samsung Galaxy Z Fold3 5G	40,990,000 VND	Samsung	Modify	Delete
2		iPhone 13 Pro Max Chính hãng VN/A	33,990,000 VND	iPhone	Modify	Delete
3		iPhone 13 Pro Chính hãng VN/A	30,990,000 VND	iPhone	Modify	Delete
4		iPhone 12 Pro Max	30,900,000 VND	iPhone	Modify	Delete
5		iPhone 12 Pro	28,000,000 VND	iPhone	Modify	Delete

Figure 55: Admin Product Management page.

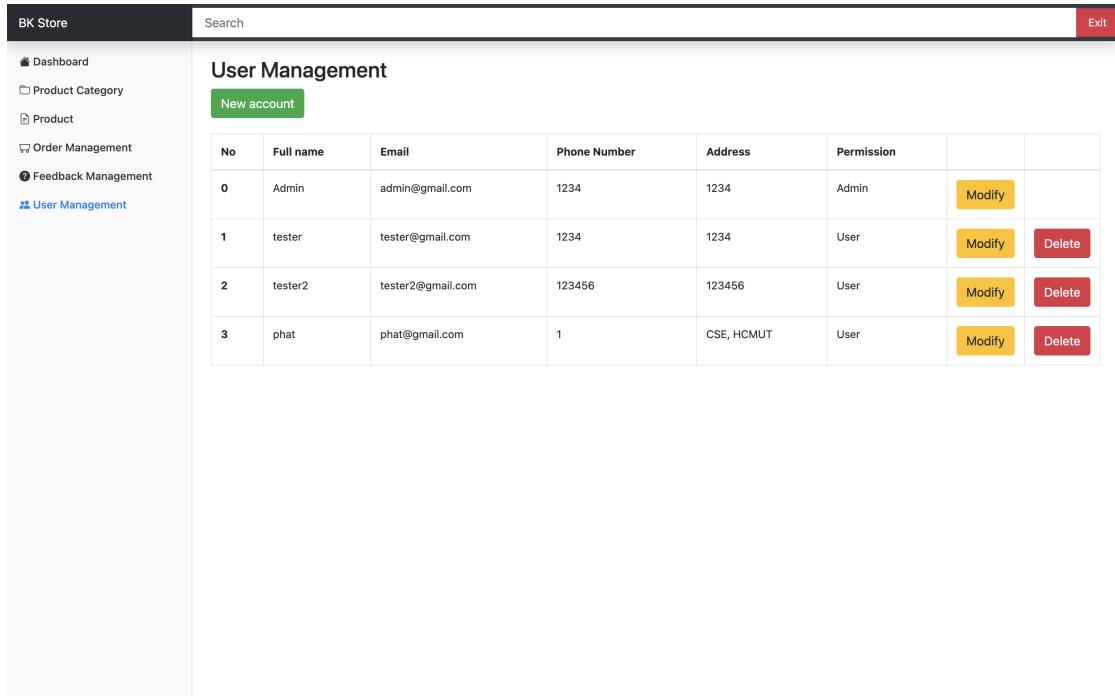


BK Store		Order Details				Exit
		Search				
Dashboard		No	Full name	Email	Total	date
Product Category		0	phat.tran.k19	phat.tran.k19@hcmut.edu.vn	95,990,000 ₫	2023-04-10 10:17:24
Product Management						
Feedback Management						Accept
User Management						Cancel
		1	phat.tran.k19	phat.tran.k19@hcmut.edu.vn	95,990,000 ₫	2023-04-10 15:23:27
		2	tester	tester@gmail.com	115,970,000 ₫	2022-12-12 07:12:07
		3	tester2	test@gmail.com	25,990,000 ₫	2022-11-11 07:11:51
		4	tester2	1@yahoo.com	28,000,000 ₫	2022-10-10 07:11:34
		10	test_ip_2	tester2@gmail.com	33,990,000 ₫	2022-06-05 09:40:55
		11	tester	1234@gmail.com	25,000,000 ₫	2022-05-05 11:51:58
		12	tester2	tester2@gmail.com	5,490,000 ₫	2022-04-04 06:51:26
		13	tester_1	tester_1@gmail.com	5,490,000 ₫	2022-03-03 06:48:12
		14	tester	tester@gmail.com	30,900,000 ₫	2022-02-02 11:39:03
		15	tester	tester@gmail.com	169,950,000 ₫	2022-01-01 06:38:29
		16	phat	phat@gmail.com	95,990,000 ₫	2023-04-10 14:12:54
						Accept
						Cancel Paid

Figure 56: Admin Order Management page.

BK Store		Feedback Management						Exit
		Search						
Dashboard		No	Name	Phone Number	Email	Product	Details	Date
Product Category		0	Admin	1234	admin@gmail.com		Chủ đề Hello- Nội dung Tester	2023-04-06 07:17:08
Product Management								Seen
Feedback Management		1	Admin	1234	admin@gmail.com	iPhone 13 Pro Max Chính hãng VN/A	Good!	2023-04-05 07:17:29
User Management								Seen
		2	Admin	1234	admin@gmail.com		Chủ đề Test_2- Nội dung None	2023-03-05 07:20:33
		3	tester	1234	tester@gmail.com		Chủ đề Tester- Nội dung Tester	2023-02-05 09:11:27
		4	Admin	1234	admin@gmail.com		Chủ đề Alo- Nội dung Alo	2023-01-05 09:47:25
								Seen

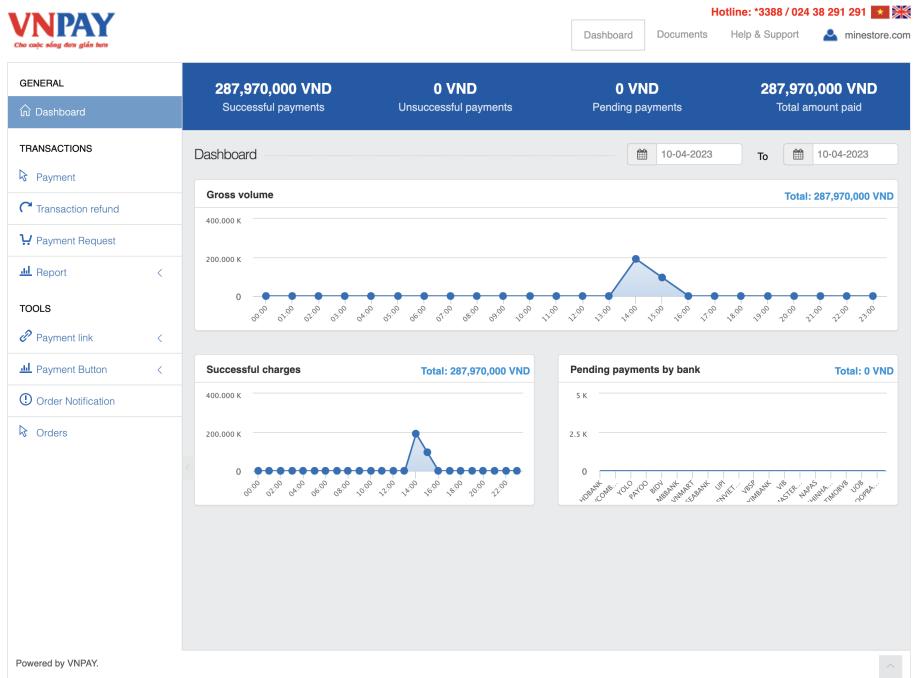
Figure 57: Admin Feedback Management page.



The screenshot shows the 'User Management' section of the BK Store admin interface. On the left sidebar, 'User Management' is selected under the 'Product' category. The main area displays a table of users:

No	Full name	Email	Phone Number	Address	Permission	Actions
0	Admin	admin@gmail.com	1234	1234	Admin	<button>Modify</button>
1	tester	tester@gmail.com	1234	1234	User	<button>Modify</button> <button>Delete</button>
2	tester2	tester2@gmail.com	123456	123456	User	<button>Modify</button> <button>Delete</button>
3	phat	phat@gmail.com	1	CSE, HCMUT	User	<button>Modify</button> <button>Delete</button>

Figure 58: Admin User Management page.



The screenshot shows the VNPAY admin dashboard. The left sidebar includes sections for General (Dashboard), Transactions (Payment, Transaction refund, Payment Request, Report), Tools (Payment link, Payment Button, Order Notification), and Orders. The main dashboard displays summary statistics and two line charts.

GENERAL

Successful payments	287,970,000 VND
Unsuccessful payments	0 VND
Pending payments	0 VND
Total amount paid	287,970,000 VND

TRANSACTIONS

Dashboard (Date range: 10-04-2023 to 10-04-2023)

Gross volume (Total: 287,970,000 VND)

Successful charges (Total: 287,970,000 VND)

Pending payments by bank (Total: 0 VND)

Figure 59: Admin VNPAY Dashboard page.



GENERAL

TRANSACTIONS

TOOLS

Powered by VNPAY.

Search Payment

Bank	Vnpay Id
All	

From Date	To Date
10-04-2023	10-04-2023

Receipt No.	Payment Types
	All

Trace No.	Status
	All

Description	Installment Status
	All

Total No. of Transaction	3 Transactions			Total Amount		287,970,000 VND			
No.	Transaction Code	Receipt No.	Trace No.	Amount	Bank	Description	Status	Installment	Transaction Date
1	13986714	20230410102236	2139137	95,990,000	NCB	Payment details	Success	No	4/10/2023 15:24:31
2	13986636	20230410092707	2138945	95,990,000	NCB	Payment details	Success	No	4/10/2023 14:27:29
3	13986608	20230410091241	2138886	95,990,000	NCB	Payment details	Success	No	4/10/2023 14:13:31

GENERAL

TRANSACTIONS

TOOLS

Powered by VNPAY.

VNPAY

Chia cuộc sống đơn giản hơn

Hotline: *3388 / 024 38 291 291

Dashboard Documents Help & Support minestore.com

Payment request details

Receipt No.:	2139137
Trace No.:	20230410102236
Bank:	NCB
Amount:	95,990,000 VND
Transaction Date:	4/10/2023 15:23:27
Description:	Payment details
Payment transactions Id:	13986714

Figure 60: Admin VNPAY Payment page.



8.5 Introductory Video

We have produced a video showcasing our application and we invite you to view it here:

- Full version detailed as a solution
[2P2H1X E-commerce Solution.](#)
- Short version
[2P2H1X E-commerce.](#)

9 Evaluation

Within this section, our focus is on evaluating our assignment and web application, including usability testing, functionality testing, and gathering user feedback.

9.1 Agile Metrics

Agile is a software development methodology that emphasizes iterative development, collaboration between cross-functional teams, and a flexible, adaptive approach to project management [12].

Agile development involves breaking a project down into small, incremental iterations, each with its own goals and deliverables. Team members work closely together and collaborate on all aspects of the project, with a focus on continuous improvement, feedback, and adaptation to changing requirements.

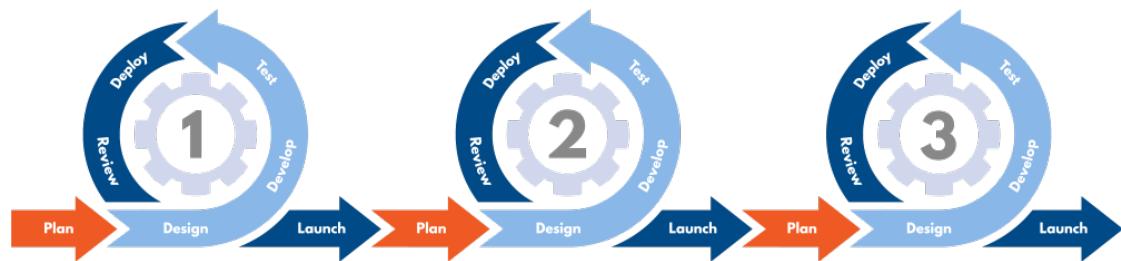


Figure 61: Agile Scrum Process.

The Agile approach emphasizes delivering working software quickly and frequently, allowing teams to gather feedback from stakeholders and adjust their approach as needed. This approach promotes transparency, flexibility, and responsiveness to customer needs, and can lead to more efficient and effective development processes.

There are many different Agile methodologies, including Scrum, Kanban, Extreme Programming (XP), and Lean, each with its own unique approach to project management and development. However, all Agile methodologies share a common set of values and principles, as outlined in the Agile Manifesto.

Agile metrics are a set of quantitative and qualitative measurements used to track the progress and performance of an Agile software development team. These metrics are designed to provide insight into the team's ability to deliver high-quality software in a timely and efficient manner.

Examples of Agile metrics include sprint velocity, which measures the amount of work completed by the team in each sprint; lead time, which measures the time it takes for a user story to move from the backlog to production; and defect density, which measures the number of defects identified in a specific period of time.



Agile metrics are an important tool for Agile teams to evaluate their performance, identify areas for improvement, and make data-driven decisions to optimize their development processes. However, it is important to use metrics in a balanced way and to ensure that they are aligned with the team's goals and values, rather than becoming a target-driven approach that can undermine the Agile principles.

In our project, we use 4 Agile metrics to evaluate:

1. Lead Time

Lead Time refers to the time it takes for a team to complete a project from start to finish, from creation to production. In this project, our team required 4 weeks to complete the project, including all the stages of development.

2. Velocity

Velocity is a metric used in Agile project management to measure the rate at which a team delivers working software. Our team was able to maintain a steady velocity throughout the project, thanks to a well-designed plan and effective monitoring of progress. This allowed us to deliver high-quality software within the project timeline.

3. Circle Times

Cycle Time is the amount of time it takes for a team to complete one iteration of a project, from requirements gathering to deployment. In our project, we were able to maintain a cycle time of under a week for each feature development. This was achieved by ensuring that every team member had a clear understanding of the requirements and by prioritizing effective communication throughout the development process.

4. Team Satisfaction

Team satisfaction is a crucial aspect of any project, as it can have a significant impact on the success of the team's performance. In our project, we were able to maintain a positive work environment, thanks to effective leadership and open communication. As a result, the team members felt supported, engaged, and motivated throughout the project, leading to a high level of satisfaction and a successful outcome.



9.2 Performance Testing

9.2.1 Lighthouse

Lighthouse is a powerful tool for web developers and site owners, providing them with insights and guidance to optimize their websites. It can be used to perform audits for web accessibility, performance, search engine optimization (SEO), and best practices. The tool is designed to be fast, efficient, and accurate, and it provides a detailed report of the analysis results [7].

Lighthouse uses a set of predefined audits, each of which tests a specific aspect of a website. For example, the performance audit measures page load time and suggests ways to reduce it. The accessibility audit checks for accessibility issues that could prevent users with disabilities from accessing the website, such as keyboard navigation and contrast ratios. The SEO audit provides recommendations for improving the website's visibility in search engine results pages.

Lighthouse can be run in a web browser or from the command line, and it can be customized with additional flags and settings to suit specific needs. It is widely used by web developers, webmasters, and SEO professionals to improve the quality and performance of their websites.

4/19/23, 4:20 AM

Lighthouse Report



<http://localhost/bkstore/>

⋮



Performance

Values are estimated and may vary. The [performance score is calculated](#) directly from these metrics. [See calculator.](#)

▲ 0–49

■ 50–89

● 90–100



METRICS

Expand view

● First Contentful Paint

0.6 s

● Largest Contentful Paint

0.9 s

● Total Blocking Time

0 ms

● Cumulative Layout Shift

0.055

● Speed Index

0.6 s

 [View Treemap](#)



<file:///C:/Users/nk/Downloads/localhost-20230410T161323.html>

1/6

Figure 62: Lighthouse Report.



4/19/23, 4:20 AM

Lighthouse Report

Show audits relevant to: [All](#) [FCP](#) [LCP](#) [TBT](#) [CLS](#)

OPPORTUNITIES

Opportunity	Estimated Savings
Serve images in next-gen formats	0.68s ▾
Eliminate render-blocking resources	0.34s ▾

These suggestions can help your page load faster. They don't [directly affect](#) the Performance score.

DIAGNOSTICS

▲ Image elements do not have explicit <code>width</code> and <code>height</code>	▼
▲ Page prevented back/forward cache restoration — 1 failure reason	▼
▲ Serve static assets with an efficient cache policy — 27 resources found	▼
○ Avoid chaining critical requests — 6 chains found	▼
○ Keep request counts low and transfer sizes small — 35 requests • 1,558 KiB	▼
○ Largest Contentful Paint element — 1 element found	▼
○ Avoid large layout shifts — 5 elements found	▼

More information about the performance of your application. These numbers don't [directly affect](#) the Performance score.

PASSED AUDITS (31)

Show



Accessibility



4/19/23, 4:20 AM

Lighthouse Report

These checks highlight opportunities to [improve the accessibility of your web app](#). Only a subset of accessibility issues can be automatically detected so manual testing is also encouraged.

ARIA

▲ ARIA IDs are not unique

These are opportunities to improve the usage of ARIA in your application which may enhance the experience for users of assistive technology, like a screen reader.

CONTRAST

▲ Background and foreground colors do not have a sufficient contrast ratio.

These are opportunities to improve the legibility of your content.

NAVIGATION

▲ [\[id\]](#) attributes on active, focusable elements are not unique

▲ Heading elements are not in a sequentially-descending order

These are opportunities to improve keyboard navigation in your application.

NAMES AND LABELS

▲ Links do not have a discernible name

These are opportunities to improve the semantics of the controls in your application. This may enhance the experience for users of assistive technology, like a screen reader.

ADDITIONAL ITEMS TO MANUALLY CHECK (10)

Show

These items address areas which an automated testing tool cannot cover. Learn more in our guide on [conducting an accessibility review](#).

PASSED AUDITS (15)

Show

file:///C:/Users/nk/Downloads/localhost-20230410T161323.html

3/6



4/19/23, 4:20 AM

Lighthouse Report

NOT APPLICABLE (24)

Show



Best Practices

USER EXPERIENCE

- ▲ Serves images with low resolution

▼

GENERAL

- ▲ Issues were logged in the [Issues](#) panel in Chrome Devtools

▼

- Detected JavaScript libraries

▼

TRUST AND SAFETY

- Ensure CSP is effective against XSS attacks

▼

PASSED AUDITS (11)

Show

NOT APPLICABLE (1)

Show



4/19/23, 4:20 AM

Lighthouse Report



SEO

These checks ensure that your page is following basic search engine optimization advice. There are many additional factors Lighthouse does not score here that may affect your search ranking, including performance on [Core Web Vitals](#). [Learn more about Google Search Essentials](#).

ADDITIONAL ITEMS TO MANUALLY CHECK (1)

Show

Run these additional validators on your site to check additional SEO best practices.

PASSED AUDITS (10)

Show

NOT APPLICABLE (4)

Show



PWA

These checks validate the aspects of a Progressive Web App. [Learn what makes a good Progressive Web App](#).



4/19/23, 4:20 AM

Lighthouse Report

INSTALLABLE

- ▲ Web app manifest or service worker do not meet the installability requirements — 1 reason

PWA OPTIMIZED

- ▲ Does not register a service worker that controls page and `start_url`
- ▲ Is not configured for a custom splash screen **Failures: No manifest was fetched.**
- ▲ Does not set a theme color for the address bar.
Failures: No manifest was fetched, No `<meta name="theme-color">` tag found.
- Content is sized correctly for the viewport
- Has a `<meta name="viewport">` tag with `width` or `initial-scale`
- ▲ Manifest doesn't have a maskable icon **No manifest was fetched**

ADDITIONAL ITEMS TO MANUALLY CHECK (3)

Show

These checks are required by the baseline [PWA Checklist](#) but are not automatically checked by Lighthouse. They do not affect your score but it's important that you verify them manually.

Captured at Apr 10, 2023, 4:23 PM

GMT+7

Initial page load

Emulated Desktop with Lighthouse

10.0.1

Custom throttling

Single page load

Using Chromium 112.0.0.0 with devtools

Generated by **Lighthouse** 10.0.1 | [File an issue](#)



Overall, our E-commerce web application for selling electronic products performs admirably, especially in terms of performance and SEO.

- Our E-commerce web application for selling electronic products has a score of 98 out of 100 in terms of performance. This means our website is loading quickly and efficiently, which is vital for retaining visitors and boosting user experience.
- In terms of accessibility score of 85 out of 100, indicating that it is relatively accessible to users with disabilities but could yet benefit from improvements in this area.
- The website earned an 83 out of 100 for best practices, indicating that there may be some places where we can improve our website for better performance and usefulness.
- The website achieved a flawless SEO score of 100 out of 100, indicating that it is search engine optimized and may help your website rank higher in search engine results pages.

About metrics expand view:

- The First Contentful Paint (FCP) statistic tracks how long it takes for your website's first element to appear on the user's screen. A score of 0.6 seconds is considered extremely fast and indicates that your website loads rapidly.
- The Largest Contentful Paint (LCP) metric gauges the loading speed of your website's largest element. A score of 0.9 seconds is likewise considered very fast, implying that your website should allow users to interact with it swiftly and effortlessly.
- Total Blocking Time (TBT) indicates how long a user is prevented from interacting with your website while it is loaded. A score of 0 ms shows that your website does not cause users any delays or interruptions.
- The amount of unexpected layout changes that occur on your website while it is loading is measured by Cumulative Layout Shift (CLS). A score of 0.055 indicates that your website is stable and free of major layout flaws.
- Finally, the Performance Index indicator assesses your website's total loading performance. A score of 0.6 seconds is considered very fast, indicating that your website should give an excellent customer experience.

In general, the website's Lighthouse analysis indicates that it is functioning incredibly well in terms of loading speed, stability, and user experience.



9.2.2 Performance-Analyser

Performance-Analyser is a browser extension that allows web developers to analyze the performance of their websites by measuring page load times, resource usage, and other metrics. It provides a detailed report of the website's performance, including suggestions for optimization and areas for improvement [14].

The extension is available for popular web browsers such as Google Chrome, Mozilla Firefox, and Microsoft Edge. It works by monitoring network traffic and measuring the time it takes for each resource to load, including HTML, CSS, JavaScript, and images.

Performance-Analyser also provides a waterfall view of the network requests, allowing developers to see the order in which resources are loaded and identify any bottlenecks or delays. Additionally, it can be used to test the website's responsiveness under different network conditions, such as 3G or 4G.

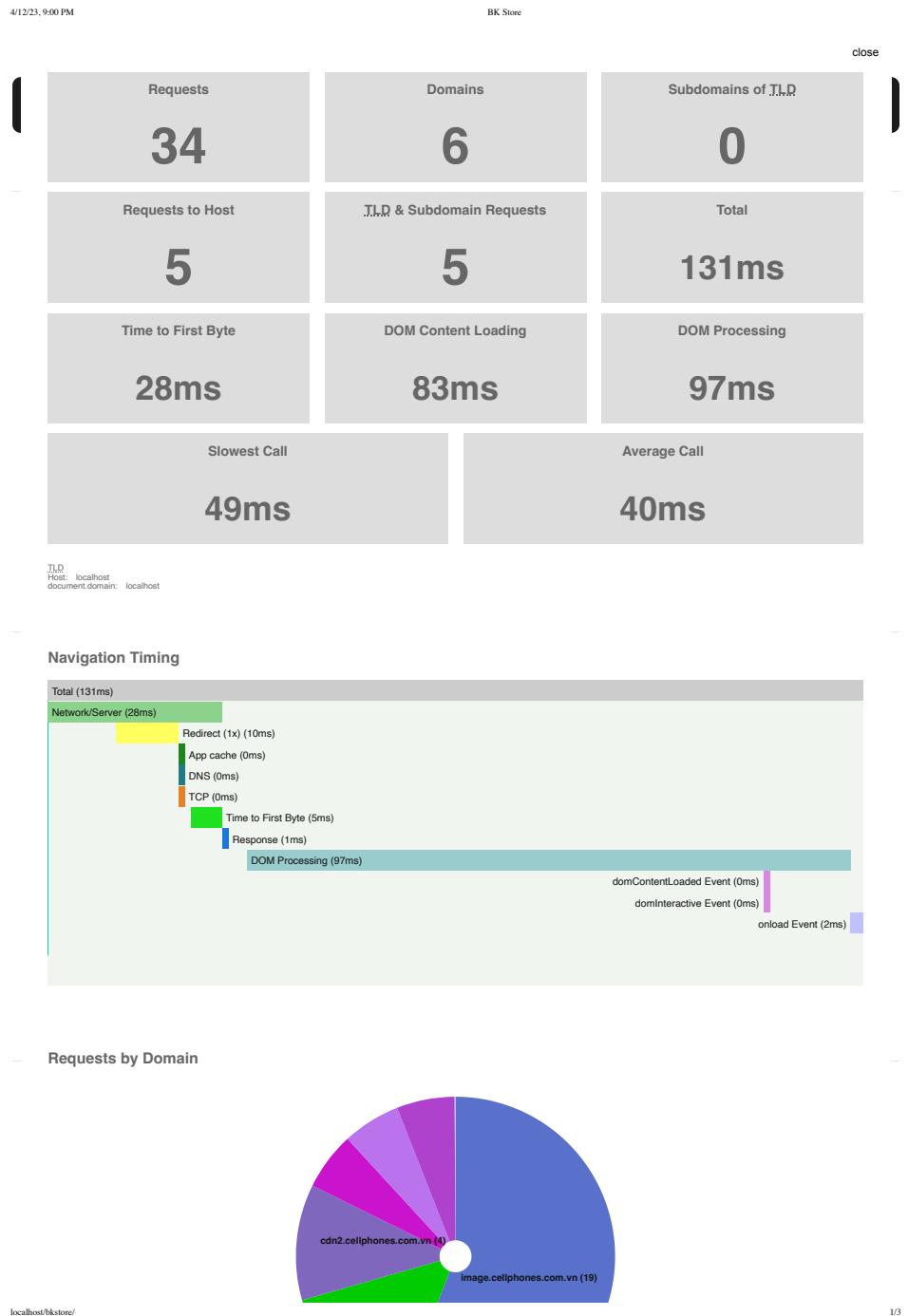
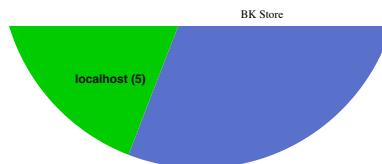


Figure 63: Performance Report.



University of Technology, Ho Chi Minh City Faculty of Computer Science and Engineering

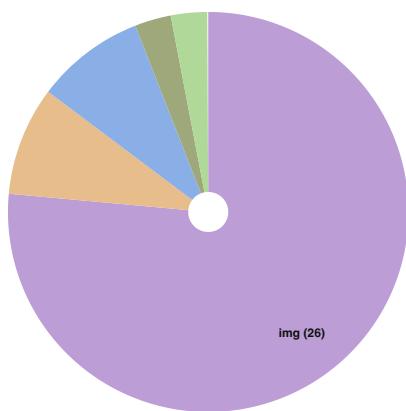
4/12/23, 9:00 PM



Total Requests: 34
Domains Total: 6

Requests by Domain	Requests	Avg. Duration (ms)	Duration Parallel (ms)	Duration Sum (ms)	Percentage
image.cellphones.com.vn	19	48	51	908	56%
localhost	5	23	75	117	15%
cdn2.cellphones.com.vn	4	40	46	160	12%
cdn.cellphones.com.vn	2	45	46	91	5.9%
cdnjs.cloudflare.com	2	26	31	53	5.9%
maxcdn.bootstrapcdn.com	2	27	34	55	5.9%

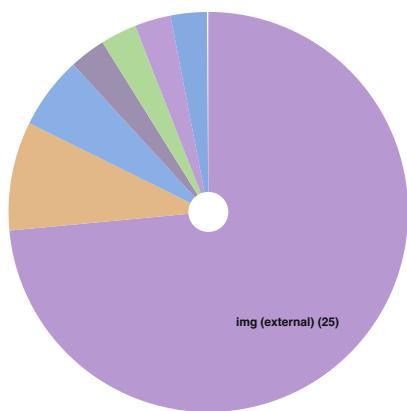
Requests by Initiator Type



Total Requests: 34

Requests by Initiator Type	Requests	Percentage
img	26	76%
script	3	8.8%
link	3	8.8%
other	1	2.9%
css	1	2.9%

Requests by Initiator Type (host/external domain)

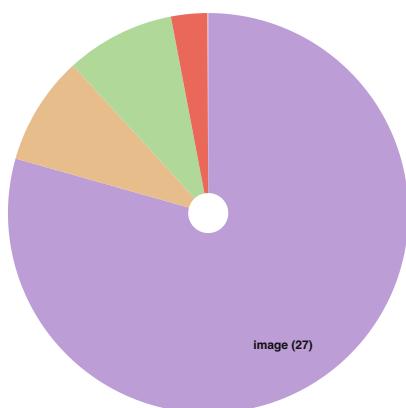


Total Requests: 34

Requests to Host: 5
Host: localhost

Requests by Initiator Type (host/external domain)	Requests	Percentage
img (external)	25	74%
script (external)	3	8.8%
link (host)	2	5.9%
other (host)	1	2.9%
css (host)	1	2.9%
img (host)	1	2.9%
link (external)	1	2.9%

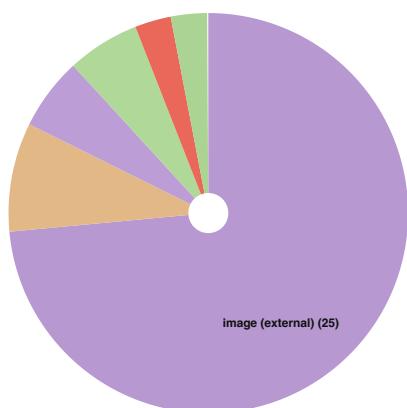
Requests by File Type



Total Requests: 34

localhost/bkstore/

Requests by File Type (host/external domain)



Total Requests: 34

Domains in Host: 5

2/3



4/12/23, 9:00 PM

Requests by File Type		
image	27	79%
js	3	8.8%
css	3	8.8%
font	1	2.9%

Requests	Percentage
27	79%
3	8.8%
3	8.8%
1	2.9%

BK Store
http://localhost/bkstore/

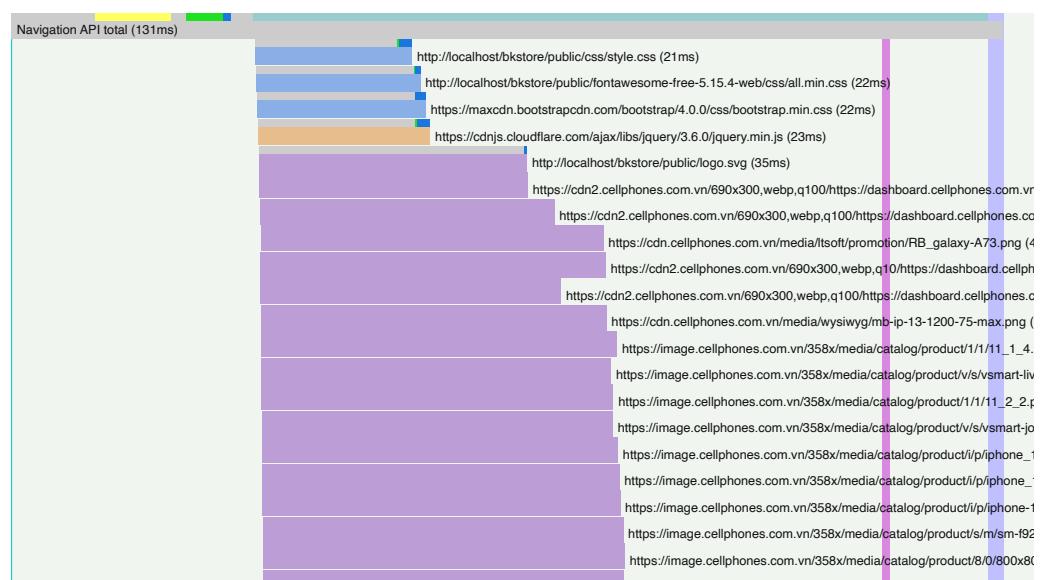
Host: localhost

Requests by File Type (host/external domain)	
image (external)	25
js (external)	3
image (host)	2
css (host)	2
font (host)	1
css (external)	1

Request FileTypes & Initiators

FileType	Count	Count Internal	Count External	Initiator Type	Count by Initiator Type	Initiator Type Internal	Initiator Type External
css	3	2	1	link	3	2	1
js	3		3	script	3		3
image	27	2	25	img	26	1	25
				other	1	1	
font	1	1		css	1	1	

Resource Timing



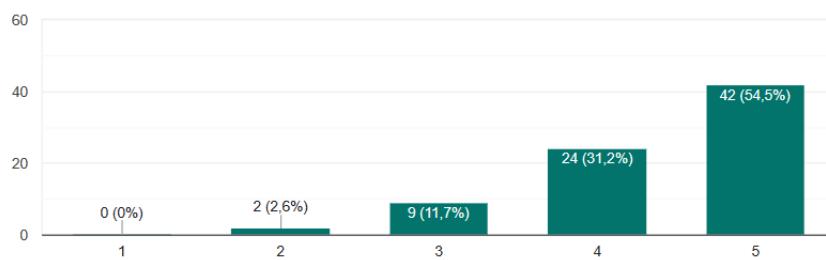
Based on the metrics above, we can see that the website is performing well in terms of speed and efficiency with a total of 34 requests, fast TTFB at 28ms, and quick loading times for both DOM Content and Processing. The Slowest Call took 49ms and the Average Call was completed in 40ms. Overall, the metrics suggest that your website is efficient and provides a good user experience.

9.3 Customer Response

Additionally, we carry out a survey that centers on the customer's experience while using our website. This survey can provide valuable insights and feedback on areas that need improvement. This can help in enhancing the overall user experience and increasing customer satisfaction.

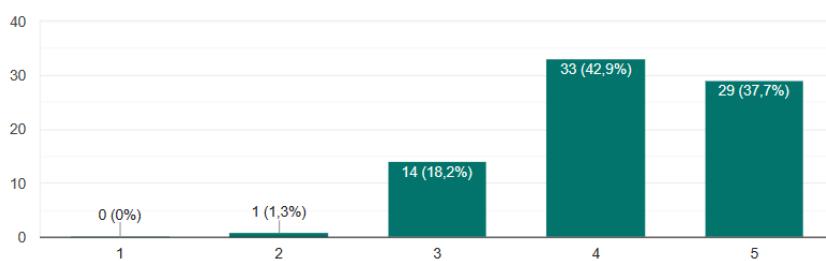
On a scale of your choice, how would you evaluate the **overall appearance** and **user experience** of our website?

77 câu trả lời



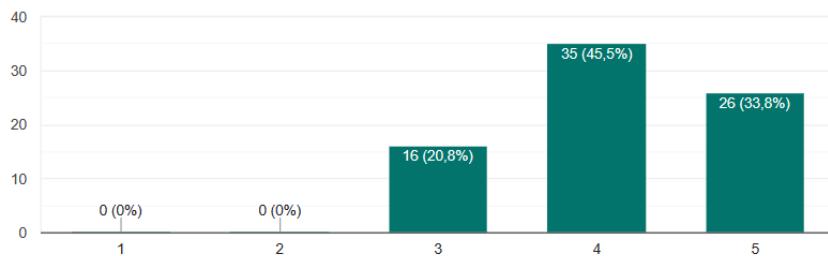
On a scale of your choosing, how would you assess the user-friendliness of our website?

77 câu trả lời



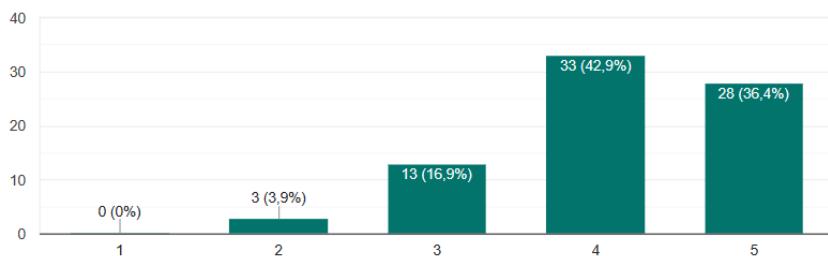
On a scale of your choosing, how would you assess the variety of products offered on our website as well as the quality of the product descriptions?

77 câu trả lời



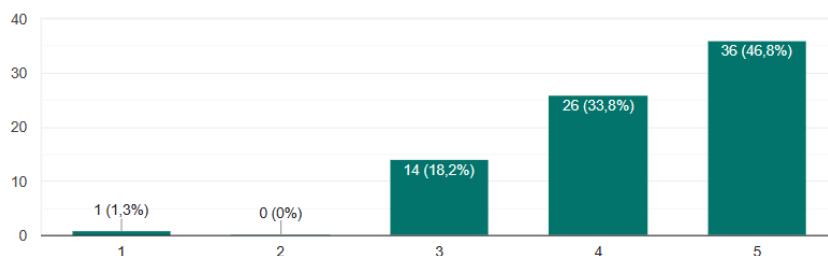
On a scale of your preference, how would you evaluate the quality of our customer support service?

77 câu trả lời



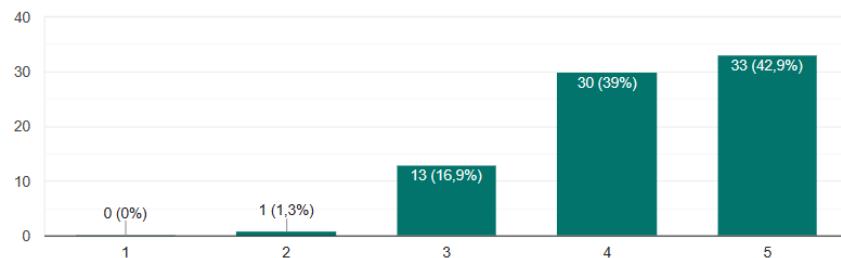
On a scale of your choosing, how would you assess the ease of the payment options provided on our website?

77 câu trả lời



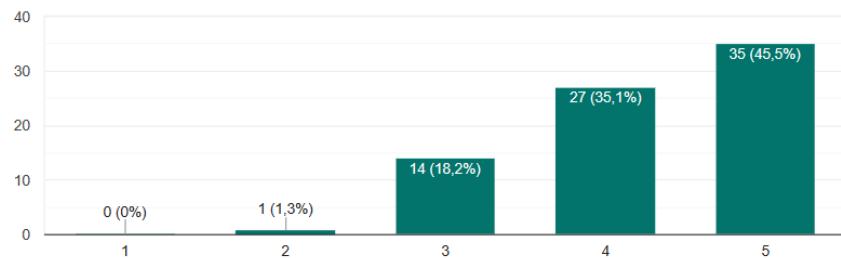
On a scale of your preference, how would you evaluate the speed at which our website responds?

77 câu trả lời



What is the probability that our website can enter the E-commerce market?

77 câu trả lời



The results above indicate that, despite positive feedback overall, there is still room for improvement in the website's design. In addition, we requested that customers provide any additional feedback or suggestions, and there are several valuable recommendations that we can use to guide our efforts towards further improving the website. We also received a few constructive and constructive comments for our system:

- Inquiry about the possibility of making MoMo and ZaloPay purchases.
- Suggestion to include more than one picture for each product.
- Recommendation to display remaining stock for each size..
- Proposal to implement a recommendation system

9.4 Assignment Criterias

In this section, we assess against the criteria outlined in the major assignment requirements.

1. Introductory

(a) Identify

- We have successfully identified the problem, motivation, and idea behind this project.



- To further understand the market, we conducted surveys through Google Forms to collect valuable feedback from customers.
- Using the information gathered from the surveys and other studies, we were able to identify our target customer demographic.
- After engaging in extensive meetings and discussions regarding the various aspects of the project, we came to the conclusion that this business model and system are feasible.

(b) Business Model Canvas

- Specifically for this project, we meticulously crafted the Business Model Canvas to ensure its alignment with our goals.
- Our team created a comprehensive pricing model, revenue model, sales model, and payment method that accurately reflect our business objectives.
- In addition, we have formulated a development plan for our e-commerce project, taking into account estimated costs and risk management strategies.

2. Design

- With the end user in mind, our team meticulously designed the User Interface/User Experience (UI/UX) using Figma.
- Our aim was to create a user-friendly and visually appealing interface that enhances the overall user experience.

3. Implementation

- Our team has successfully designed and developed a fully functional website that can either be utilized for our own purposes or sold as a solution to interested parties.
- For those who are interested, the source code for our website application is available at [Github](#).

4. Evaluation

- To ensure that our report caters to both technical and non-technical audiences, we have incorporated comprehensive reviews in all sections of the document, including our business models and applications.
- This approach allows us to present our ideas and concepts in a manner that can be easily understood by individuals with varying levels of technical expertise.

5. Presentation

- Our team delivered a compelling presentation for our assignment, receiving positive feedback from the audience.
- For those interested, the presentation slides are available at [E-commerce presentation](#).
- To provide a comprehensive understanding of our project, our team created two introductory videos: a short version and a full version. Please refer back to the 8.5 section for access to these videos.
- Our report demonstrates a high level of organization, logical flow, and structure. We ensured that the formatting of the report is clear, concise, and visually appealing.

6. Bonus



- As part of our marketing strategy, we have implemented an effective online marketing method known as Search Engine Optimization (SEO).
- Our system seamlessly integrates with the popular online payment service, VNPAY, to provide a hassle-free payment experience for our customers.
- Additionally, to keep our customers informed about the status of their orders, our system incorporates a status feature that accurately reflects the shipping progress of each order. Our system has the following order statuses:
 - Pending (Paid/Unpaid)
 - Shipping
 - Done



10 Summary

The report was successfully able to meet all the requirements specified for the Electronic Commerce course at Ho Chi Minh City University of Technology. The aim of the project was to design a web application that could enable customers to purchase electronic items in a secure and user-friendly manner.

The report was structured to include various components, including a problem description, analysis of the market and clients, feasibility study, business model canvas, and monetization strategies. Each of these elements was presented in a clear and concise manner, outlining the steps that were taken to achieve the final outcome.

The growth strategy devised for the project was designed to assist in achieving the objectives of the project. System analysis and design steps were taken to ensure that the software system met the requirements of all stakeholders, while also being reliable, efficient, and easy to operate.

After completing the project, rigorous testing was carried out using the Lighthouse tool and the Performance-Analyzer browser plugin. During the testing process, usability issues, technical defects, poor content quality, SEO challenges, and conversion roadblocks were identified and addressed to improve the functionality and overall experience of the website.

In conclusion, the report was able to effectively capture the essence of the project by providing an in-depth analysis of the market and clients, while also presenting feasible solutions to the identified problems. The application designed was a success, and the testing process helped to ensure its overall effectiveness and usability. For future improvements, we recommend continued testing and optimization to maintain the effectiveness and usability of the web application.



References

- [1] Anna Baluch. *38 E-Commerce Statistics Of 2023*. <https://www.forbes.com/advisor/business/ecommerce-statistics/>. 2023.
- [2] Apache Friends. *XAMPP*. <https://www.apachefriends.org/index.html>. 2023.
- [3] Bootstrap Contributors. *Bootstrap*. <https://getbootstrap.com/>. 2023.
- [4] femaleswitch. *The Essential Guide to the Business Model Canvas*. <https://isaacjeffries.com/blog/2018/9/8/how-to-fill-in-a-business-model-canvas>. Sept. 2018.
- [5] Finical. *Online Shopping Statistics and Trends in the USA*. <https://finicalholdings.com/online-shopping-statistics-and-trends-in-the-usa/>. 2022.
- [6] GitHub, Inc. *GitHub Docs*. <https://docs.github.com/en>. 2023.
- [7] Google. *Lighthouse Overview*. Chrome Developer. URL: <https://developer.chrome.com/docs/lighthouse/overview/>.
- [8] Hamilton, R., Price, L.L. *Consumer journeys: developing consumer-based strategy*. *J. of the Acad. Mark. Sci.* 47, 187–191. <https://doi.org/10.1007/s11747-019-00636-y>. 2019.
- [9] Isidora Markovic. *How to Create a Software Development Plan for Your Dev Team*. <https://tms-outsource.com/blog/posts/software-development-plan/>. 2023.
- [10] Jacob Hill. *10 Strategies to Improve Your Company's Online Visibility*. <https://axiomq.com/blog/10-strategies-to-improve-your-companys-online-visibility/>. 2022.
- [11] Kenneth E. Kendall. *Systems Analysis and Design*. 10th. Pearson, 2021.
- [12] Kenneth E. Kendall. *Systems Analysis and Design*. 10th. Pearson, 2021. Chap. Chapter 6: Agile Modeling and Prototyping. In Part II: Information Requirements Analysis.
- [13] MariaDB Foundation. *MariaDB*. <https://mariadb.org/>. 2023.
- [14] Marcel Micmro. *Performance Bookmarklet*. GitHub repository. Oct. 2021. URL: <https://github.com/micmro/performance-bookmarklet>.
- [15] Microsoft Corporation. *Visual Studio Code Documentation*. <https://code.visualstudio.com/docs>. 2023.
- [16] Mozilla Foundation. *AJAX (Asynchronous JavaScript and XML)*. <https://developer.mozilla.org/en-US/docs/Web/Guide/AJAX>. 2023.
- [17] Mozilla Foundation. *JavaScript*. <https://developer.mozilla.org/en-US/docs/Web/JavaScript>. 2023.
- [18] Statista. *E-commerce market share of leading e-retailers worldwide in 2021, based on GMV*. <https://www.statista.com/statistics/664814/global-e-commerce-market-share/>. 2022.
- [19] The PHP Group. *PHP: Hypertext Preprocessor*. <https://www.php.net/>. 2023.